EDUCATIONAL WEB PAGE ACCESSIBILITY FOR BLIND AND LOW VISION USERS

WPI
WORCESTER POLYTECHNIC INSTITUTE

Australian Bureau of Statistics

An Interactive Qualifying Project Report submitted to the Faculty of Worcester Polytechnic Institute in partial fulfilment of the requirements for the Degree of Bachelor of Science by:

R. William Lapp
James W. Deloge
Melissa J. Morgan

Advised By:
Professor Holly K. Ault, Major Advisor
Professor Jonathan R. Barnett, Co-Advisor

Project Number: IQP-HXA-OZ01
(Division #) (51)

EDUCATIONAL WEB PAGE ACCESSIBILITY

FOR BLIND AND LOW VISION USERS

An Interactive Qualifying Project Report
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfilment of the requirements for the
Degree of Bachelor of Science
by

James W. Deloge

R. William Lapp

Melissa J. Morgan

Date: May 1, 2001

Approved:

Holly K. Ault

Professor Holly K. Ault, Major Advisor

Professor Jonathan R. Barnett, Co-Advisor

Abstract

This project, prepared for the Australian Bureau of Statistics, National Education Services Unit in Melbourne, Australia, explores Web-based education for the visually impaired. Working from literature and interviews of visually impaired students and their teachers, new guidelines and techniques were designed to maximise not only accessibility but also user comprehension of Web pages, particularly those containing tabular and graphical information. A usability study was then performed to evaluate the effectiveness of these new guidelines. Accessibility and comprehension for both blind and low vision users were increased when Web pages were developed following the new guidelines and techniques.

Acknowledgments

The authors would like to acknowledge the help and support of the follow individuals and agencies.

The staff of the Melbourne office at the Australian Bureau of Statistics: National Educational Services Unit, especially Soo Kong, for their unwavering support and help in realising this beneficial project, not just for the ABS, but for all agencies in the Australian Government.

The teachers and students of the Royal Victorian School for the Blind for their enthusiasm, shared knowledge about the study and for allowing us the opportunity to work with present and former students towards a common goal to make the web an accessible environment for all visually impaired individuals.

Professors Holly Ault and Jonathan Barnett for their guidance in keeping the project team focused and challenging them to push their limits.

Michael Gorse, Larry Raymond, Connie Raymond and Sharon Latka Davis for their help in the background research of this IQP.

The parents and students whose participation was essential to the success and completion of this project.

Michael Cooper of the Center for Applied Special Technologies (CAST).

Special Thanks to Garry Stinchcombe and Chris Baillie.

Executive Summary

The Problem

In today's world, the New Economy is an Internet Economy, and people depend on technology in order to function in their everyday lives. There were four hundred million people on the Internet as of the year 2000, with a projected one billion by the year 2005 (Newsbytes, 2001). According to the World Wide Web Consortium however, ten to twenty percent of the world's population have a disability that could hinder access to the Internet (W3C, 1999a).

Visually impaired users have been able to access the Internet since the introduction of screen readers, but with strictly text-only Web pages. Newer Web elements such as images, tables, graphs, and multimedia have placed limitations on accessibility for the visually impaired in recent years. These barriers inhibit visually impaired persons from using online resources, such as e-commerce sites and Web based education.

The ABS Website

The Australian Bureau of Statistics, National Education Services Unit (ABS, NESU) has an extensive Web based education system online, complete with lesson plans for teachers. As a department of the government, regulations are currently in place that require the ABS to make its content accessible to users with disabilities, including persons with visual impairments. The ABS is investigating a solution to make their Website not only accessible, but also a useful educational tool for the visually impaired.

Current Solutions

The World Wide Web Consortium, or W3C, has created a set of guidelines, as well as a set of techniques to implement these guidelines (W3C, 1999a and 2000d). Another organization that has put accessibility high on its priority list is WGBH, which has developed a set of design guidelines including math and science solutions, aimed at making this type of educational content more accessible to individuals with various disabilities. A unique feature about these guidelines is that they delve into some descriptions on making graphs and tables accessible, which the W3C does not cover in as much detail.

The Australian Bureau of Statistics has its own set of guidelines, in part adapted from the W3C guidelines, but specific to the way the ABS develops and publishes Web content. These guidelines have recently been revised to include a minimum level of accessibility compliance, and are currently in the process of being tested.

Shortcomings of Current Solutions

Although the W3C guidelines are accepted as the international standard, they still have some limitations. One major shortcoming is a lack of discussion on how to properly describe graphs and tables. The guidelines require a Web content developer to provide long descriptions of complicated graphs and tables, but do not provide enough guidance to create meaningful descriptions. Complexity is a characteristic inherent within many of the graphs and tables used by ABS. As a result of this trait, descriptions that provide a comprehendible understanding of the material on ABS web pages is of particular importance when addressing the issue of accessibility. Also, the W3C guidelines are relatively new, and therefore, their effectiveness has not yet been investigated.

The Project Overview

The first goal of the project was to create additions to the newly revised ABS guidelines and standards to allow a greater portion of the visually impaired population to access ABS Web pages. Next, the project team developed a way to describe graphs and tables to a visually impaired audience. The project team then catered these standards to the needs of the ABS, by devising a method to implement these techniques using Lotus Notes. Finally, a usability study was done to measure the success of these methods.

Deliverables

The Addendums to the ABS' newly revised guidelines were extracted from the W3C and WGBH guidelines. Each addendum contains a summary simplifying and explaining each guideline, and the Addendums are compatible with the newly revised ABS guidelines.

The Graph and Tables Handbook was created using information gained from interviews with blind adults, blind secondary students, and educators of visually impaired students. The Handbook is a step-by-step explanation of how to describe tables, line graphs, bar graphs, pie charts, scatter plots, and geographical maps, which are used extensively by the ABS.

Since the ABS uses Lotus Notes exclusively for Web content development, the project team developed a Lotus Notes Accessibility Tutorial. This is a detailed tutorial that allows ABS Web content developers to create accessible Web content without requiring any knowledge of Internet programming languages.

Student Usability Study

Two different usability studies were done as a part of this research project. First, a Student Usability Study was performed to compare existing inaccessible Web pages to accessible Web pages created with the new guidelines. Thirteen secondary students with prior Internet experience tested the Web pages. Seven of them were partially sighted and six were totally blind. Actual ABS Web pages were selected for the test content, and three sets of content were tested in all. The first set was taken from the ABS Website and left untouched, as a control. The project team modified the second set of content by changing the data and incorporating the newly revised ABS guidelines. The third set of test content incorporated the project team's Addendums and the Graph and Tables Handbook. Each student was given ten activities to perform for each test content set, which tested the navigability, accessibility, and comprehension of the pages. After each set of ten activities, the project team conducted a group interview with the students to gain feedback about the pages.

Four different areas of accessibility were evaluated: navigation, accessibility, comprehension/educational value, and user opinions. Ease of navigation was determined by the amount of time taken to navigate the Web content and complete the activities. Accessibility was determined by the number of activities a student could not complete due to inaccessible elements on the Web page, be it a graph or image without a description, a poorly formatted table, or anything else that prompted the last resort choice of "Unable to Determine" (UTD). The number of comprehension activities completed successfully on a page determined the educational value.

With regards to navigability, neither the low vision nor the blind students had much of a problem. The blind students scored 100% on all navigation activities, but completed the project team's modified Web pages in one-third the time that it took to finish the original Web pages. The low vision students finished their navigation activities in one-fifth the time they did the original Web pages.

Table accessibility also showed promising improvement. The low vision students improved from 43% in the original Web pages to 57% in the revised ABS pages, then to 71% in the project team's pages. Blind students improved from 83% correct to 100% correct, and in one-third less time than the original Web pages. The percentage of inaccessible table questions for low vision students dropped from 33% in the original Web pages none in the project team's pages.

The comprehension results indicate that the project team's modified Web pages provided substantial additional understanding of the content. Low vision students were unable to answer 10% of the questions pertaining to graphs and tables in the original Web pages, but that percentage dropped to zero in the project team's pages. Blind students were unable to answer 53% of the graph and table questions in the original Web pages, but that dropped to 10% in the project team's pages. Blind students' scores rose from 40% correct in the original Web pages to 73% in the project team's Web pages. Compared to the original Web pages, blind students took only two-thirds the time and low vision students took only one-third the time to complete the project team's modified Web pages.

In the Group Interviews, the project team found that the number of difficulties mentioned dropped from 28 for the original Web pages to 18 for the revised ABS pages, then to 11 for the project team's modified Web pages. Useful features mentioned about the Web content more than doubled from only 14 for the original Web pages to 29 for the project team's Web pages. This summary shows that as the Web pages were repaired, there were fewer and fewer difficulties encountered, and many more compliments given about the design and usability.

Graph and Tables Handbook

The success of the Graph and Tables Handbook is backed by the results of the Student Usability Test. Fourteen out of twenty-seven sources used for answers in the project team's Web pages were from the graph descriptions rather than the tables. The number of "Unable to Determine" responses dropped by fifty percent from the revised ABS pages to the project team's Web pages. The final and most encouraging statistic from the results of the project team's modified Web pages is the percentage of correct answers. The comprehension scores for blind students jumped from 47% in the second set to 73% in the third set, a 26% increase.

Employee Usability Study

To evaluate the success of the Lotus Notes Accessibility Tutorial, the project team asked three ABS employees to perform an Employee Usability Study. The three employees had varying degrees of experience developing Web content for the ABS. Each employee was given the original Web pages, the Lotus Notes Accessibility Tutorial, and the Graph and Tables Handbook, and was then asked to repair the Web pages. Evaluation was based on how well the employee was able to repair the Web pages, according to a set of checkpoints, and using the project team's modified Web pages as a benchmark. If the employee met or exceeded the accessibility of the project team's pages, the checkpoint was considered a success. The Tutorial was then revised for the checkpoints with which the employees had difficulty.

All three of the employees were able to repair the Web content to minimum accessibility as noted in the ABS guidelines. Two out of the three employees exceeded the minimum requirements and included additional accessibility features and provided helpful descriptions for page elements. Those results indicate that the project team's Addendums are understandable and able to be implemented through Lotus Notes.

Conclusions

In conclusion, the project team found that incorporating accessibility features into Web content greatly increases the ease of navigation, the amount of information on a page that can be accessed, the educational value of a page, and the overall ease of use. The ABS will be able to easily integrate the project team's Addendums into their existing guidelines, thereby creating a simple reference for creating accessible Web content. The Lotus Notes Accessibility Tutorial was proven to be an effective teaching tool for Web content developers to use whether creating new content or repairing existing content. Finally, the Graph and Tables Handbook provides a uniform, standard, and effective way to describe graphical and tabular data.

Overall these findings are not only of value to the Australian Bureau of Statistics but to every corporation, organization, or person who has a presence on the Internet. There are now concrete results and findings about Internet accessibility when applying the W3C's and WGBH's Web content guidelines. The improvement shown when applying these guidelines and techniques is substantial, and may convince Web content developers to implement these guidelines in their own Web sites.

TABLE OF CONTENTS

List of Figures

List of Tables

1. Introduction

The project team worked in Melbourne, Australia with the Australian Bureau of Statistics (ABS) and the Royal Victorian Institute for the Blind. While in Melbourne, the primary goal was to design guidelines for Web content developers at the ABS to follow in future projects, in order to make their Web-based education system accessible to visually impaired students.

The project team's sponsor, the Australian Bureau of Statistics, is a national statistical organization headed by Dennis Trewin, the Australian Statistician. Its mission is to "...assist and encourage informed decision-making, research and discussion within governments and the community, by providing a high quality, objective and responsive national statistical service" (ABS, 2000). The ABS has its head office in Canberra and a regional office in each State and Territory, for a total of eight regional offices.

The division of the ABS with which our team worked most closely is the National Education Services Unit (NESU). This division's goal is to promote greater understanding, knowledge and access to ABS statistics by teachers, librarians and students. The medium emphasised by the NESU is the Internet, through an increasingly elaborate system of Web-based education pages. The pages integrate online publications with products designed specifically for classroom work. In their current form, however, these pages are extremely difficult for visually impaired students to access and comprehend.

In order to make their Web-based education system more accessible to its visually impaired audience, the NESU enlisted the project team's efforts to research optimal methods to convey the content of the ABS Website. This project includes a breakdown of the problem, complete with background information, and how the group sought to solve it and their solution as presented to the ABS. Some of the issues discussed include the current accessibility guidelines; methods classroom teachers employ to teach visually impaired students, and how to incorporate our knowledge base into new guidelines that can be applied to the ABS' existing Web content, using the technology available to the ABS.

There are many possible social rewards for the completion of such a meaningful project. At the top of the list is the chance that students across Australia, and possibly even the world, will not only be able to access the information as a result of these new guidelines, but they will also be able to understand the content and grasp the concept of statistics.

In order to gauge the effectiveness of our product, the project team conducted usability tests and focus groups with a select group of visually impaired students from the Royal Victorian Institute for the Blind. The project team took the wishes of each student into consideration in designing these new guidelines. By comparing the students' test scores prior to updating the content and after applying these new guidelines, improvement in the navigability and comprehension of the Web pages can be measured as a quantifiable change.

2. Background

2.1 The Problem

2.1.1 Introduction

One of the goals of this project is to develop accessible content by adhering to the guidelines set forth by the Australian Bureau of Statistics and the World Wide Web Consortium. While this goal is of utmost importance to us, the project team also have another task in mind; to convey the concept of statistics to the visually impaired in a manner consistent with the ways they learn. This is not an easy task, since many statistical concepts expect the student to draw conclusions from various sets of graphical data, and visually impaired students find it difficult to benefit from graphics, unless given in a tactile manner. So the project team set out to understand the ways visually impaired students learn best.

2.1.2 Sources of Comparison

Since there are no real case studies documenting how visually impaired students learn from Web-based content, the project team had to use a more traditional learning medium for comparison: the classroom. Many correlations can be drawn from the way students learn in the classroom to the way content should be presented on the Web. Unfortunately, sometimes the way material is presented in the classroom is not accomplishable electronically. Current methods are normally tactile based such as raised line drawings or just Braille in general. The technology is available for Braille screen readers, but they are expensive, so most blind students must cope without one. These factors need to be considered and compensated for when the project team design new content.

2.2 Tools Commonly Used in the Classroom

Many tools are at the disposal of the visually impaired student if he or she can gain access to them. Some are much more costly than others, and some are bulkier and more burdensome. For the student who is able to write Braille, a slate and stylus may be helpful. A more technical and expensive version of that is a Braillewriter, but those are extremely expensive and therefore inaccessible to most students (Scholl, 1986). For normal classroom work, the student should always carry his or her Braille textbook, and any other supplementary materials provided by the teacher. For mathematics, an Abacus is helpful, along with a talking calculator, click measuring wheel, auditory timer, graph board, and a ruler with notches (Webster, 1998). Besides those basics, the most valuable learning tool for a visually impaired student is a physical model of the concept (Lowenfeld, 1973). Here, it is up to the teacher to use his or her imagination. The simplest things, such as coins of various denominations, can turn into a valuable mathematics lesson for the visually impaired student in counting and addition.

2.3 General Purpose Methods by Which Blind Students Learn Best

2.3.1 Mediated Learning Experience (MLE)

MLE is a cognitive development method that "requires the presence and activity of a human being to filter, select, interpret, and elaborate that which has been experienced"

(Feuerstein, 1999). A very common practice in the world of the visually impaired is for students to be assigned a **resource teacher**[1] in addition to their regular classroom teacher. This resource teacher plays the role of mediator in the Mediated Learning Experience. But there does not necessarily have to be a resource teacher for MLE to take place. Just about anyone can play the role of mediator, if they understand what must be conveyed to the visually impaired student (Feuerstein, 1999). The mediator must constantly stimulate the student's awareness, vigilance, and sensitivity in regards to various stimuli in the learning environment (Feuerstein, 1999). Events that the student cannot observe must be relayed in full detail by the mediator. Sometimes, even when the student is able to experience the lesson, he or she may need extra explanation in order to fully grasp the concept (Feuerstein, 1999).

Each task can be broken down into seven parameters in order to analyse the level of difficulty and approximate time to budget on the task. These seven parameters are content, modality, phase, operation, level of complexity, level of abstraction, and level of efficiency (Feuerstein, 1999). The content parameter is merely a question of whether or not the subject matter is new to the learner. Modality is the way in which a task is presented, which can be verbal, pictorial, numerical, figural, or a combination of those (Feuerstein, 1999). The phase deals with the stage of the mental act in which the learner is involved: input, elaboration, or output. The way a student accomplishes a task is known as the "operations" (Feuerstein, 1999). The levels of complexity and abstraction go hand in hand. As a task must be further abstracted from real-world applications, it becomes more complex to the student. The level of efficiency is simply the efficiency with which it may be possible for a student to complete a task. By properly analysing each task on this level of detail, the mediator can adequately prepare both instructor and student for each lesson (Feuerstein, 1999).

2.3.2 Instrumental Enrichment (IE)

The Instrumental Enrichment program, or IE, is designed to help all students, not just visually impaired ones. The program seems particularly suited to blind students, because tasks are intended to make the student invest much more meaningfully in his or her perception (Feuerstein, 1999). Unlike MLE, the Instrumental Enrichment program does not require a mediator. Instead, it uses the tasks themselves to act as a mediator. Tasks are designed to provide the student with immediate feedback, which causes the student to reform his or her methods, and hopefully achieve a better outcome on the next trial (Feuerstein, 1999). An example of this would be to time a student in various typing lessons. The immediate feedback of the lesson would occur if the child made a mistake, and perhaps a buzzer or other sound would alert the student to his or her mistake. The motivation to improve on the next trial would come from the final score, which could be a combination of the time it took the student to complete the lesson, plus penalties for any errors. In order to achieve a faster time, and perhaps a smaller penalty on the next lesson, the student would be motivated to correct any deficiencies in his or her typing skills.

Another aspect of IE is to equip the student with the ability to transfer known methods and strategies to unknown tasks (Feuerstein, 1999). This portion of the

[1] All boldfaced underlined words are found in the glossary, located at the end of this document.

program may sometimes require a mediator to point out correlations between tasks, but ultimately, the goal is for the student to be able to transfer principles independently. A major part of achieving this goal is building the student's motivation (Feuerstein, 1999). Without motivation, the student will not utilise any of the methods he or she has already learned to conquer a new task. He or she may not even attempt the task at all. To counteract this, tasks in the IE program are designed to form healthy habits in the student to apply acquired knowledge to slightly different situations (Feuerstein, 1999).

2.4 The Blind Student in the Regular Classroom

2.4.1 General Strategies and Techniques

To actively involve a blind student in the regular classroom, several strategies have been proven to work. The student should sit at the front of the room, close to the teacher's desk. This allows the teacher to observe the student without being too obvious, and it also provides a sense of comfort to the blind student, knowing that the teacher is nearby (Scott, 1982).

Presentation is the key to introducing every concept. The student should be kept actively involved for the entirety of the lesson through the use of concrete tactile aids (Webster, 1998). These are especially helpful in the area of mathematics, which will be discussed in detail later. The other key to conveying the meaning of difficult concepts is by using elaborate verbal descriptions, explanations, and instructions (Lowenfeld, 1973). Students feel more at ease when something is explicitly diagrammed out for them, and it is hard for a sighted teacher to be sure if and when she has accomplished that. To find out, the visually impaired child should be encouraged to ask questions and discuss concepts in smaller groups with other classmates, sighted or unsighted (Webster, 1998). All verbal descriptions should be specific, but rich and interpretive at the same time, and always link concepts to hands-on experiences (Webster, 1998).

The practice of pre- and post-tutoring is another extremely important routine with which a visually impaired student should become very familiar (Webster, 1998). Either the teacher or the student's personal resource instructor should prepare with the student for a lesson before it is taught. This is the place for new jargon, concepts, or other miscellaneous topics to be introduced and practiced in depth, so that when the lesson is taught in the regular classroom, the visually impaired student can keep up with his or her sighted classmates (Webster, 1998). Post-tutoring is just as important, as it is a chance for the teacher to discuss the lesson with the student. The student can give the teacher immediate feedback, ask questions about unclear concepts, and review key points from the lesson. If necessary, the teacher can go over the lesson again, in more detail, especially if the student expressed confusion on any certain topic.

When assigning homework, the teacher should ask him or herself the following questions: Is it necessary? How much should the student be expected to complete? Should the student be required to show all steps or only the answers (in mathematics)? And does the student have the proper equipment at home to even complete this assignment? (Lowenfeld, 1973).

2.4.2 Social Studies

It should be noted that social studies, and in particular, geography, utilises many tactile tools. In the case of the census, there is plenty of map-related information, such as population density and topography. In the classroom, these concepts are using three-dimensional maps, map puzzles, relief maps, and relief globes (Bishop, 1971). Unfortunately, on the computer screen, these methods are impossible to implement. One of our biggest challenges in this project will be to convey maps and other graphical data to the visually impaired student in a meaningful way.

2.4.3 Mathematical Concepts

In learning new mathematical concepts, concrete examples are of utmost importance. From the simple concept of addition and subtraction to more abstract ideas of plane geometry, the easiest way for a child to grasp the topic is to have something in his or her hand that symbolises the idea (Hanninen, 1982). Early arithmetic is understood best with counting objects as examples, regardless of whether the student is blind or sighted (Bishop, 1971). It is extremely difficult for a blind student to grasp the concept of "three", unless he or she can feel three crayons in hand, or hear three spoons being dropped, one at a time, on a desk. Then three minus one becomes simple to demonstrate: simply remove a crayon from the student's hand and ask how many are left. For slightly more complicated addition and subtraction, playing with money is a great experience. The student can add up how much money he or she has, or the student can practice subtraction by making change for the purchase of fake goods and services (Bishop, 1971).

As far as tactile aids go, Braille flashcards are helpful, but the teacher may also consider making special flashcards, with tangible objects mounted on them (Lowenfeld, 1973). The teacher should also take care to arrange the objects in different ways, so that the student does not always associate the number with the arrangement. For example, three can be arranged as XXX or X
X
X.

Memorisation is stressed for the addition and multiplication tables, because the ability to recall those facts at lightning speed greatly enhances the child's ability to perform mental math (Bishop, 1971). One of the most powerful tools a visually impaired student can master is the ability to do mental math, and the only way to master it is to practice (Scott, 1982). For a blind student, the task of just writing out a problem is very tedious. Something we take for granted is our ability to align the numbers in columns. For the blind student, this is nearly impossible (Lowenfeld, 1973). Mental math eliminates this problem by allowing the student to carry intermediate answers from step to step. There may be more steps involved, but once an intermediate result is obtained, the previous steps need not be retained, so the student only needs to remember one number at a time (Lowenfeld, 1973).

More complicated concepts, such as calculus, trigonometry, and geometry, may be introduced, but always with careful preparation and explanation (Webster, 1998). The teacher should tie each new term to a practical example, and work closely with the **resource teacher** to ensure any necessary Braille codes have been taught (Lowenfeld, 1973).

2.5 The Australia Now Statistics Curriculum

2.5.1 Australia Now Overview

One of the main reasons for making the Australian Bureau of Statistics Website accessible is so that teachers may use the Australia Now curriculum to teach health and physical education, English, mathematics, science, studies of science and the environment, and technology to lower and upper secondary school students who are disabled (ABS, 2000b). The Australia Now curriculum is a set of "lesson plans across a number of Key Learning Areas that meet National and State Curriculum Guidelines" (ABS, 2000b). The plans are designed to have students complete a set of assignments or activities that require research into published ABS statistical reports. Since these reports are all online a student may navigate through the ABS site until it finds data that will allow them to complete the assignments.

The lesson plans are comprised of five main sections. The first section, the strand, is where the theme of the project is described, and where it fits into the National curriculum. Some example themes would be "Chance and Data" or "Physical Activity and Health" (ABS, 2000c). Next is what school level the lesson plan is designed for. The majority of the ABS curriculum is designed for use by lower and upper secondary schools. A purpose is given with each lesson plan and states why a teacher would want to use this in their classroom. The first purpose of each Australia Now lesson plan is "To give students 'real data' to apply to problems" (ABS, 2000c). The rest of the purpose section describes the goal of learning each theme. Such as, "gaining skills in the national initiatives of civics and citizenships" (ABS, 2000c). The learning outcomes section expands upon the purpose and gives a detailed description of each key point that will be learned in the exercise. The materials required section details what tool the teacher will need to provide the student. Sometimes it may be access to the ABS Website, other times it may be that the teacher has to print off copies and give it to their students. The final section is student activities, which is a list of assignments that require a student to go either to an ABS statistical report and extract data to solve questions or problems, or create data of their own through classroom exercises.

Teachers may implement these lesson plans in one of four different ways, depending on the classrooms level of access to technology. First is when a teacher has a classroom full of computers and all students have access to the Internet. If every student can access the Internet then they should be able to go to the appropriate assignment page themselves and perform the student activities without much teacher assistance. If not all students can access the Internet then a teacher can print off the lesson plan and the statistical data from the Web site and distribute it to the students. If there is access to one computer but no Internet access then a teacher can do a data show and project the needed information on a classroom screen. Finally, if there is no Internet access at all then a teacher may request a hard copy of the information from the ABS.

2.6 Current Tools for Visually Impaired Computer Users

2.6.1 Braille Displays

Technology has come a long way from the time of command line interfaces and punch cards. The same is true for accessible hardware and software that is presently available for the numerous visually impaired computer users. The majority of visually impaired users have access to a Braille reader of some type. The purpose of a Braille reader is to convert text to the visually impaired written language of Braille.

> *"The Braille system is a universally used tactile method of writing for the blind. Named for its inventor, Louis Braille, it employs groups of dots to represent printed letters and numbers. The system's basic "Braille cell" consists of six dots grouped in two vertical columns of three dots each. For convenience, the dots in the first column are numbers one through three and the second, four through six. From the basic cell, sixty-three different dot patterns can be formed. These patterns, easily identifiable to the touch, represent letters of the alphabet, numbers, punctuation signs and also certain speech sounds called contractions (such as "ch" and "gh") along with a few common words ("and", "for", "of" and more)" (Canadian Braille Authority, 1999).*

When the Braille display is felt with the fingertips a blind person is able to read what is written on the computer screen. Normally, Braille readers scan the visual output on a computer monitor left to right, top to bottom much like non-visually impaired users do. For the visual computer user, the computer monitor provides continuous feedback on the system's output. For visually impaired users, the Braille reader does the same job but converts this visually displayed information from a visual to a tactile medium.

Such devices are operated by a combination of pins, which are electronically controlled to produce a Braille output of the textual information that is being displayed. Braille displays can show up to 80 characters from the screen and are refreshable, meaning the information communicated to the user is constantly being updated to display any changes. These machines typically cost on the order of several thousand dollars. The more expensive models have the ability to check format, spacing, and spelling (American Foundation for the Blind, 2000, August 1).

2.6.2 Speech Synthesizers

Reading what is written on the screen is a useful way to obtain information, but a visually impaired individual must be an experienced reader of the Braille system to use one of these machines. Braille readers are constantly scanning the information on the screen and the user must also continue to read so that no information is missed. Many Braille readers have speed options, which can be set depending on how fast the individual is in recognising and understanding the information being communicated.

Voice synthesizer machines are another one of the tools currently being used on computers of the visually impaired. Unlike the Braille reader, a voice synthesizer converts the text seen on the screen to speech, which the user is able to listen to. For a long time voice synthesizer systems were separate components, which connected to the computer. The reason for separate components was a result of the state of technology during the late 1970's (Blenkhorn & Evans, 1998). Producing synthetic speech was difficult to do given the sound capabilities of computers during the late 1970's. Most sound cards (electronic components that allow for the production and manipulation of sound) in computers lacked the technology to produce a synthetic human voice and as a result extra hardware was needed. Now, because of the decrease in cost and increase in capabilities, the majority of modern sound cards have little trouble producing the sounds needed for an electronic voice.

2.6.3 Combinations of Hardware/Input Devices

The third main hardware component used by members of the visually impaired community is a combination of the Braille display and synthetic speech synthesizer, which are mentioned above. The combination of both systems is commonly referred to as a Braille display with voice feedback. A Braille displays with voice feedback allows users the choice in how they want information presented to them.

To input commands or text into a computer system, an electronic device known as a Braille Notetaker is used. Electronic Braille Notetaker devices are small, portable and contain Braille keyboards for entering information. Several user options exist depending on the model used. These options include the ability to take notes and then transfer the information to a computer, reviewing the information with a built-in speech synthesizer or Braille display or the ability to print in the input with an ink or Braille printer (American Foundation for the Blind, 2000).

2.7 Current Software

2.7.1 Screen Readers

Without a software component to interface with a computer, the hardware devices such as synthetic speech synthesizers, and Braille displays would be useless. To make use of these assistive hardware technologies a software counterpart know as a screen reader must be used. Screen readers are programs that transfer the computer output, displayed on a monitor, into mediums that are then accessible to visually impaired individuals (American Foundation for the Blind, 2000). For instance, in regards to textual information a screen reader has the ability to output this information, contained in text, into synthetic speech (through a synthetic speech synthesizer) or as tactile Braille on a Braille display. It must be noted however, that different programs will interpret what is displayed on a computer screen differently. It cannot be assumed that everything that is seen on a monitor by a person with vision will be understood the same by a visually impaired user.

Understanding how a screen reader works is of critical importance to understanding how information is interpreted by visually impaired users when using a computer. The American Foundation for the Blind (2000) provides a useful overview of the functionality of screen readers in conjunction with the operating system Microsoft Windows. These characteristics are similar for screen readers, in general, and any graphical user interface (**GUI**) whether it be an operating system, application or a Web site.

2.7.2 Windows-based Screen Readers

As a result of more graphics intensive programs such as the graphical user interface displays of Microsoft Windows or MacOS, screen reader software has had to become much more intelligent about deciding which information is relevant to the user and which is not. Right now there are a variety of screen reading programs in the market. A few names of popular screen reader programs include JAWS (Job Access with Speech) by Henter-Joyce a Division of Freedom Scientific, outSPOKEN by Berkeley Systems, Window-Eyes created by GW Micro and Windows Bridge distributed by Syntha-Voice Computers. Each of these programs varies in their ease of use and ability to scan output information but overall their purpose of transferring the screen output to a Braille or voice output remains the same.

2.7.3 Programs for Low Vision

Not every visually impaired user is blind. The majority of visually impaired users have some degree of sight and we must take this into account when addressing this community of computer users.

Magnification programs are used to make displayed information such as text and graphics, bigger so that it is accessible. The problem with these programs is that the more magnification is used the less information can be viewed and as a result the user is missing a great deal of what is being presented. One of the main items that is lost as a result of magnification is the interrelationship between components. Take for example, a visually impaired individual viewing a flow chart. With magnification and limited screen size they are unable to actually see the system as a whole in which separate pieces are related to one another. Instead, the user must view small fractions separately and put them together mentally to understand what is being shown.

Besides increasing the magnification of text and graphics, colour can also play a significant role in accessibility. Some individuals with low vision also suffer from some type of colour defect. To accommodate for this most operating systems allow users to select certain options in regard to the colour and contrast scheme used. Windows for example, contains several appearance schemes that are high contrast. Depending on an individual's particular colour defect these appearance schemes can be customised to meet individual needs. One important aspect worth noting is that when application programs and Web content are viewed these default colour settings do not necessarily carry over. The application programs and Web browsers might have their own options for accessible colour schemes but it cannot be assumed that just because Windows was properly configured for a certain visual impairment that all settings will remain consistent, no matter what program is used.

Although changing colour is important for accessibility, changing font size is also helpful. Not only does changing font size allow text to be easier to view but this also allows users to navigate their computers without constantly relying on the magnification program.

2.7.4 Internet Browsers

The goal that this project addresses concerns the development of Web-based content for visually impaired students. To interface with the World Wide Web a Web browser program is needed to make the information on the Web accessible on a computer screen. Many visually impaired individuals have acquired this new technology and are active participants in the new on-line community. The project team had to understand how persons with visual impairments connect with this technology in order to create the Web content for these users. To interface with the World Wide Web visually impaired computer users use many of the same the Web browser programs used also by non-visually impaired individuals. Microsoft Internet Explorer, Netscape and Lynx are the three main programs used to interface with the Internet. Internet Explorer and Netscape allow access to text, graphics and other forms of media while the third browser, Lynx, is a text-mode browser. Text-mode means that no graphics or other visual media are displayed when viewed. The advantage of Lynx is that it is a good match with screen readers and blind users because only the accessible information (text) is displayed. Some more current versions of Explorer and Netscape have been fitted with add-ons to allow more compatibility with current screen reader software. The American Federation of the Blind explains how Microsoft Internet Explorer is creating a more accessible browser:

> The Web browser Microsoft Internet Explorer 5.x used in addition to some screen readers has the ability to convey structural information to a screen reader so Web pages can be read "intelligently". For example, if frames are used, many screen reader programs will read each frame in turn, including the title of the frame (American Foundation for the Blind, 2000).

Not only is the information displayed on a Web page important but the page layout is as well. Other Web browsers used in combination with any screen reader will not be able to intelligently communicate layout information to the computer user. When using Netscape Navigator for example, the screen reader will typically scan the information presented left to right, top to bottom and as a result links that might be used for Web page navigation can get mixed together with the text content. In this scenario the entire structure of the page is lost and could lead to very confusing navigation by a visually impaired user.

2.8 Accessibility and the Internet

2.8.1 Current barriers

Due to an overwhelming lack of awareness about accessibility issues, many Web sites have technological barriers that prevent a person with disabilities from accessing all or parts of their site. **Images** without alternative text can cause cognitive information that was to be conveyed through it to be lost. A lack of alternative text for **image map** hot spots can make navigation between **hyperlinks** difficult. Misleading use of structural **elements** on pages can confuse **screen readers**. Uncaptioned audio or un-described video can be totally inaccessible to the blind or deaf. A lack of alternative information for users who cannot access **frames** or **scripts** can cause the screen reader to speak words out of order. Tables that are difficult to decipher when **linearized** will tend to read the information out of order thus losing any information contained in the rows or columns. Finally, sites with poor colour contrast can cause problems with the colour-blind who cannot differentiate between similar colour shades. (W3C, 1999b)

As more and more people flock to the Internet, online classes and educational activities are progressing in both quality and quantity. Online educational programs allow a student to take a class at their own pace, using their own learning styles, and without the need to travel between classrooms. Because the disabled commonly learn at different speeds than their peers the open format of an online class would be a perfect fit for them. They could peruse the text book at their own pace, take extra time on their tests, or have later due dates for homework. The online classes could also offer a disabled person a way to interact in the class more often without the fear of being embarrassed or ashamed of their disability. Finally, a lot of the elderly or physically disabled can find travel to, from, and around schools or campuses difficult, and the ability to take all of their classes online would reduce time lost to travel (Sherer, 2000).

However, Sherer (2000) believes the aforementioned barriers can cause difficulties when using distance-learning tools. Many of the courses provide **streaming video** lectures that have no text transcripts for deaf students. When a teacher writes notes they are often posted to the Web in an inaccessible format such as **PDF**. Finally, a lot of **image maps**, **forms** and tables are labeled incorrectly or **applets** are used that do not allow a user to interact via the keyboard or alternative devices.

2.8.2 About the World Wide Web Consortium and its Web Accessibility initiative

In October 1994 Tim Berners-Lee, inventor of the Web itself, founded the World Wide Web Consortium at the Massachusetts Institute of Technology, Laboratory for Computer Science (MIT/LCS) in collaboration with CERN (European Organization for Nuclear Research), where the Web originated, with support from the United States Defence Advanced Research Projects Agency and the European Commission (W3C, 2000a). The W3C currently has over 400 member organizations, including such well-known names as AT&T, IBM, Cisco Systems, and Sun Microsystems. "By promoting interoperability and encouraging an open forum for discussion,"(W3C, 2000a) the W3C has become the primary Internet standards organization. These standards have created the infrastructure that the entire Internet runs on. One of the W3C's most widely known standards is **Hyper Text Markup Language** (HTML).

The W3C has three major long-term goals.

- Universal Access: To make the Web accessible to all by promoting technologies that take into account the vast differences in culture, education, ability, material resources, and physical limitations of users on all continents.

- Semantic Web: To develop a software environment that permits each user to make the best use of the resources available on the Web.

- Web of Trust: To guide the Web's development with careful consideration for the novel legal, commercial, and social issues raised by this technology.

In order to solve two of its three long-term goals, Universal Access and Semantic Web, the W3C began the Web Accessibility Initiative (WAI) (W3C, 2000a). The WAI, in coordination with organizations around the world, pursues accessibility of the Web through five primary areas of work: technology, guidelines, tools, education, and research and development. The products and guidelines of the WAI enable companies and organizations to evaluate and repair their own sites without the need for expensive contractors or specialists.

2.8.3 The universal design concept

Accessibility issues can be solved with a single design that incorporates the needs of both the general public and the disabled. Universal design is defined by the Center for Universal Design at North Carolina State University as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design" (CUD, 2000). At this center a group of architects, product designers, engineers and environmental design researchers collaborated to establish a set of principles of universal design to provide guidance in the design of environments, communications, and products (Connell et al., 1997).

The general principles of a universal design are as follows.

- Equitable use
- Flexibility in use
- Simple and Intuitive
- Perceptible information
- Tolerance for error
- Low physical effort
- Size and space for approach and use

Each of these principles can be adapted to a Web site with little effort. A Web site should preferably be accessible to all disabled users, and if not then an accessible site with **equivalent** content should be offered. It should be flexible in its use; a user should have the ability to customise it to suit their needs. It should not be cluttered or have confusing interfaces. A user should be able to understand where each **hyperlink** leads and what it does. It should have distinct colours, and large font so that the visually impaired can read the information provided. A Web site should also offer the ability to undo actions or choices; this will cut down on the danger of any erroneous clicks or key presses. A site should also not have any awkward combinations of keys or mouse clicks to perform. These combinations could prove difficult or impossible to perform for a user with physical limitations. Finally, it should not be crowded or congested. If a site has very small buttons or **images** a user may have difficulty selecting one or discerning it from surrounding **elements**.

2.9 Web Accessibility Standards

2.9.1 Validity of the W3C and the WAI

In this day and age when information can be distributed quickly and easily anyone can assume the role of author and publisher. One of the largest features of the Internet lies in its open forum and design, but it is also one of its weaknesses. Since no single company or organization owns the entire Internet, creating rules or laws governing it are nearly impossible. Instead we must rely on trusted sources, their practices, and their opinions.

When two of the largest countries in the world support something, people tend to listen.

> *"The U.S. Government intends to work closely with the World Wide Web Consortium to insure that government information and services are accessible."* (Al Gore, Former Vice President, USA) (W3C, 1999c)

> *"The Treasury Board of Canada, Secretariat recognises and supports the importance of the work of the W3C's WAI and is committed to insuring that Government of Canada Web sites comply with many of the WAI's Web Content Accessibility Guidelines' checkpoints."* (Alan Way, Group Chief, Federal Identity Program, Treasury Board of Canada Secretariat) (W3C, 1999c)

Another supporter of the WAI effort is Marca Bristo of the National Council on Disability in the United States, who stated:

> *""We welcome the W3C accessibility Guidelines as a concrete solution, properly developed through collaboration among industry, government, and the disability community."* (W3C, 1999c)

Not only do influential people and organizations support the WAI, but also some of largest companies in the world are following the WAI's lead. Some of the most recognisable companies and their compliant Websites, per the WAI, are:

- Boeing is one of the largest manufacturers of planes and spacecraft in the world. http://www.boeing.com/
- Bell Atlantic is currently providing local and wireless telephone service to the east coast of the United States. http://www.bellatlantic.com/
- International Business Machines (IBM) is known globally as a leader in computer hardware and software. http://www.ibm.com
- Microsoft is the largest supplier of computer operating systems in the world. They also have the largest market cap in the world making them the most valuable. http://www.microsoft.com
- Sun Microsystems is the creator of the Java programming language and currently is one of the largest manufacturers of computing **servers** that run the Internet. http://www.sun.com

2.9.2 The importance of standards

In order to have a consistent look and feel when creating Web content, guidelines and standards are needed. Web standards are detailed instructions on how to create a site's layout and information in a consistent manner. Commonly a company will have a team of people creating content for a site. When these **content developers** are not on the same track, a site's layout can become inconsistent or confusing. If a visitor comes to a site they recognise the look and feel of it and associate a mental picture of it in their mind. This concept is similar to branding in the retail world. Everyone pictures a Coke bottle as having a wavy line on a red background. If a person were handed a Pepsi bottle and told it was Coke, they would be distrustful, and a little confused as to why Coke is in a Pepsi bottle.

2.9.3 The WAI standards

The WAI has created a set of three specifications that seek to set the standard for all accessible Web content. Each specification contains guidelines, which are general principles to follow in accessible design. Then each guideline is broken into checkpoints. Each checkpoint has a short description of how to apply that guideline to certain **elements** of the Web (W3C, 1999b). Finally, each checkpoint has one of three priorities associated with it. Priority one is for checkpoints that a **developer** *must* satisfy; priority two a **developer** *should* satisfy; priority three a **developer** *may* satisfy otherwise, some people will find it difficult to access information. (W3C, 1999b)

If all priority one checkpoints are satisfied then a Web site can be classified as being in "A" conformance; priority two is "AA" conformance; and priority three is "AAA" conformance. These conformance levels are used by other organizations to reference the accessibility of a site. When a site has reached one of these conformance levels then the developer may attach a special W3C/WAI **logo** to the site signifying compliance.

2.9.4 Web Content Accessibility Guidelines 1.0

The Web Content Accessibility Guidelines 1.0 (WCAG) explain in detail how to make a Web site accessible. It has fourteen checkpoints that must be met for compliance. The WCAG addresses accessibility issues with **images**, **multimedia**, **tables**, **frames**, **forms**, and **scripts**.

2.9.5 Themes of Web Content Accessibility

The first theme of accessible design is graceful transformation (W3C, 1999b). By separating structure from presentation a developer makes it easier to customise how a page is viewed. If a page's content can be presented in an audio, video, or text format without loss of information then a developer's workload is reduced because now he only needs to create one page, and not three different versions. The page should also be **device independent** so that viewers who are blind, deaf, or are using text-only technologies such as **PDAs**, may still access all features.

One of the greatest barriers to traversing the World Wide Web is navigation between and around pages. The WC3's second major theme addresses this problem. By using clear and simple language a **developer** will be targeting the entire population (W3C, 1999b). It is a common practice in the television and marketing world to always write to the lowest common denominator of the audience. This should also be followed in Web design. Finally, by having understandable mechanisms for navigating within and between pages a **developer** is encouraging visitors to stay longer and really explore what the site has to offer. If a visitor comes to a site and is unable to comprehend where the links go or create a mental map of the site, a person may feel like they're lost in a forest and abandon the site completely.

2.9.6 Authoring Tool Accessibility Guidelines 1.0

In order for the WCAG to become widely used, **authoring tools** must include support for them. The Authoring Tool Accessibility Guidelines 1.0 (ATAG) explain how to create **authoring tools** for editing Web content such as **HTML**, **multimedia**, and site and layout management that take into account accessibility issues. The ATAG contains seven checkpoints that allow **content developers** to have flexible editing views, navigation aids, and access to display properties (W3C, 2000b).

2.9.7 The next generation authoring tools

The ATAG is important in order to understand what new tools will be offered in the future to help ease the difficulty in producing accessible Web content. Many current authoring tools lack the ability to have text alternatives for every page **element**, and the ability to create **linearized tables**. A final drawback of current **user agents** is that they use custom **HTML elements** that are not part of the W3C **HTML** 4.0 guidelines (W3C, 2000c). These custom **tags** tend to confuse **screen readers** and will cause words to be spoken out of order, say words that don't exist, or be skipped altogether.

2.9.8 Features for WAI compliant authoring tools

Future authoring tools will include: correct use of **HTML** so as to support WCAG, correct **linearization** of tables, and the ability to modify all values of any **element** on the page.

2.9.9 User Agent Accessibility Guidelines 1.0

All of the correctly formed Web content in the world still will not make a Web site accessible if the **user agent** does not offer support for these features. The User Agent Accessibility Guidelines (UAAG) has ten checkpoints that explain how to create **user agents** that promote accessibility through communication with **assistive technologies** and flexible media players, and how to minimise installation issues (W3C, 2000h).

2.9.10 The next generation of user agents

Since the goal of this project is to make Web content accessible and not to make browser software, the guidelines are not of immediate importance. However, the specifications presented by the UAAG show a glimpse of what features future **user agents** will have, thus allowing us to create **forward compatible content**.

2.9.11 Features for WAI complaint user agents

The major difference between current user agents and WAI compliant user agents is customisability. This customisability will allow users to modify text size, font, foreground and background colour, the presentation rate of audio and video, view built in transcripts of multimedia presentations, use a built in voice synthesizer as a screen reader, have a customisable voice for the synthesizer, and more (W3C, 2000h).

2.9.12 ABS Web content development guidelines

Using a combination of the Guidelines for Commonwealth Information Published in Electronic Formats (AusInfo, 2000) and the Web Content Accessibility Guidelines (W3C, 1999b) the Australian Bureau of Statistics (ABS) has created a set of guidelines to follow when creating content for their Web site. The ABS WWW Site Publishing Standards and Guidelines (SPSG) seek to comply with the single "A" conformance level, or in other words, all priority one checkpoints of the WCAG. Another feature of the SPSG is its step-by-step instructions on how to create accessible documents using IBM's Lotus Notes. This helpful addition allows any employee regardless of technical experience to create accessible content.

2.9.13 ABS Web Content design details

The SPSG contains detailed descriptions of submission policies, font styles to be used, margins and rules, numbering formats, colours, and page structure. Examples are: text should be 10pt font only; italics and underline should not be used, bold is an acceptable alternative; only the ABS branded colours of green and gold should be used, etc. (ABS, 2000)

Although these design guidelines are extensive and give detailed descriptions on how a visually impaired person views the content, they only satisfy the minimum requirements. There are only three references to W3C recommendations, and even though the SPSG strives for single "A" conformance, it barely achieves this. An example of this is in the discussion on tables. Instead of specifying alternate methods for creating correctly linearized tables it simply states, "The current ABS system does not allow for this," (ABS, 2000) and continues to suggest that future "publishing processes" may. However, this does not solve the problem of inaccessible tables, and does not satisfy the W3C guidelines for single "A" compliance.

2.9.14 Approved authoring tools

The ABS currently only approves use of the IBM Lotus software suite. All Web content must be developed using this single software package. As stated in the SPSG, Lotus Notes has many shortcomings when designing accessible Web content. Notes is unable to create linear tables (ABS, 2000) or alternate text tags for some elements, and has a propensity to create excess HTML that can confuse screen readers. When the Notes software development team at IBM was contacted they were unable to give a date for a release of a new Notes software package that would contain these accessibility enhancements. It was stated that those enhancements were not currently in their Notes product plan (Kroesen, 2001).

2.10 Implementation Techniques and Examples

2.10.1 Available sources

Many articles and journals published today offer different examples and techniques for making Web content accessible. Heid (2000) gives an overview of the problem then proceeds to point out areas that need changing. The examples are not very technical and try too much to describe what must be done, rather than providing concrete HTML examples. On the other hand, the HTML Techniques for Web Content Accessibility (HTWCA) (W3C, 2000d) offers an explanation of what must be done, why it must be done, and then gives a detailed HTML example. By combining both, a **content developer** can easily determine why and how to modify their HTML to meet the accessibility guidelines.

2.10.2 Using the HTWCA correctly

The HTWCA is split up into sections for each element type of an HTML page with example sections being **links**, **images**, tables, and **forms**. Each section contains a list of the WCAG checkpoints it pertains to and a **hyperlink** to it. As a content developer goes through each checkpoint of the WCAG he should use these hyperlinks to access the HTWCA. By following these links the developer can quickly learn how to fix the violation and return to his original place in the WCAG. Due to the simplicity of the HTML examples even a novice HTML developer will be able to modify existing HTML and become compliant.

2.10.3 Textual Information

For visually impaired users who are legally blind, text information is the most easily accessible medium with which information can be conveyed. Although it may seem easy to rely on text to communicate information there are several guidelines that can be followed to make the use of text effective in regards to visual display.

Let us look at several examples of how text can be seen by people with the visual impairment of a colour-deficiency.

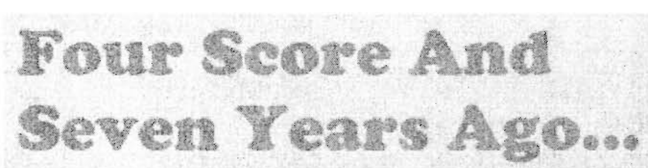


Figure 1: Colour Text Reference

Shows a bright yellow collared rectangle. Inside of the rectangle the quote "Four Score And Seven Years Ago..." is written in the colour turquoise. This figure is considered to be the reference figure in the discussion on textual information and low vision (Hess, 2000).

The above figure (Figure 1) will serve as the reference point (normal view) as a few visual impairments are examined through the eyes a person with a deficiency-deficiency. Although the figure presented above is not one that represents a deficiency scheme used in many Web sites (because of its lack of aesthetic quality) it can help people to understand the different ways text information can be interpreted.

Here is an example of Figure 1 as seen through the eyes of individuals with different deficiencies-deficiencies.

Figure 2: Coloured Text 1

As it can be seen above the particular deficiency-deficiency that a person has will greatly affect the way that information is communicated to them.

Text in the main body of a Web page is one example but what if collared buttons are used for navigation tools on a Web site? Shown below is an example of what a visually impaired users could come across while surfing the Web and the different ways that those navigation links could be visualised.

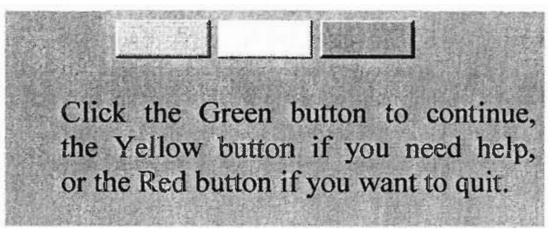


Figure 3: Navigation Buttons

Shows a grey collared rectangle. Inside of the rectangle there are three rectangular buttons, which are positioned side by side. The left-most buttons is coloured green, the middle buttons is coloured yellow and the right-most button is coloured red. Below these buttons the text displayed reads: Click the Green button to continue, the Yellow button if you need help, or the Red button if you want to quit. This figure is considered to be the reference figure in the discussion on Internet navigation buttons and low vision (Hess, 2000).

Here is a view of the same navigation buttons through the eyes of a colour deficient visually impaired user.

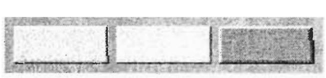


Figure 4: Navigation Buttons 1

Shows a grey coloured rectangle. Inside of the rectangle there are three rectangular buttons, which are positioned side by side. The left-most buttons is coloured light yellow, the middle buttons is coloured yellow and the right-most button is coloured dark grey. The text that was displayed in Figure 5 is implied to be below this figure. This represents the view of Figure 5 as seen through the eyes of an individual with a colour deficiency (Hess, 2000).

As it can be understood from the above demonstration, navigating a page that employs this appearance could be quite difficult for a person who suffers from some form of colour-impairment. When designing content to be used in a Web site it should be taken into account that the visual impairment is a general term. The phrase visual impairment does not limit itself to those that are just legally blind, but also to people with low vision and colour-deficiencies as well.

2.10.4 Web Links

Internet links, although composed and displayed for the most part as text, are considered a separate category when talking about methods in displaying information. When screen readers encounter URL links to other Web sites (depending on the coding techniques used) a number of outputs could result. The reader may output meaningless control characters that correspond directly to Web pages source code. To a visually impaired user this information is complete jargon and will most likely be ignored. Special care must be taken to insure that links are labeled correctly so that all the information contained on a page is accessible and understandable. The American Federation of the Blind has this advice when referencing links in Web page design:

"If a graphic is a link, it absolutely must be labeled meaningfully. But, text links must make sense, too. Many visitors to your site will read only the links, skipping over explanatory text. Others will not be able to see the relationship between the explanation and the link" (American Foundation for the Blind, 2000, December 12). To clarify this explanation consider the following example:

The following is an Internet link as displayed by either a Braille display or a synthetic computer voice:

"For the latest version of our finest software, <a href="/finest/download.html">click here." (American Foundation for the Blind, 2000, December 12).

This is how a visually impaired person may receive graphical link from their screen reader. The order of information is difficult to understand because at first the user is told some information and then a string relating to Web link follows, which is ended by a message saying "click here". As a result of the order of information, most individuals only hear "click here" and ignore the explanation of where this link will take them.

A more meaningful way to convey the information about the link would be the following:

"For the latest version of our finest software, click here." (American Foundation for the Blind, 2000, December 12).

Instead of the meaningless "click here" message a visually impaired computer user would hear/read "For the latest version of our finest software, click here". This is a more effective way of labelling links in Web pages. In considering Web page links correct labelling as well as order must be considered to allow the visually impaired users easy navigation of the content given.

2.10.5 Graphical Information Types

"The move towards graphical user interfaces is widely regarded as an advance in human-computer interaction. However, the abandonment of the old-fashioned text based TTY interface presents new challenges to those computer users who are visually impaired" (Kline& Glinert, 1995, p.1). As computer power has increased so has the use of graphics in every aspect of computer use from Web page design to application program interfaces. To the non-visually impaired community graphics are an excellent way to connect users and computer interfaces because they are much easier to understand at first contact than a program that uses a command line interface. Unfortunately, the trend towards a graphical user environment has pushed aside those users for whom graphics are difficult to access. As a result of the increased use of graphics, methods must be created to make these visual mediums accessible. According to P. Blenkhorn and D.G. Evans graphical information can be classified as one of five types:

- "Real World Images:
    - Photographic images, video sequences and pictures"
- "Maps:
    - Two-dimensional objects where the absolute position, shape and size of each object is important. These graphic types represent a highly abstracted view of the real world that filters out all but the essential detail. Ex. geographical maps, maps of buildings, diagrams of mechanical components, medical drawings."
- "Schematic Diagrams:
    - Similar to maps in that they present abstracted information to a user but what is important in their use is the relationship between parts not the position. Ex. Flow chart."
- "Charts:
    - Data visualisation devices used by sighted people to make reading and comparing data easier. Ex. Pie charts, histograms, data tables."
- "Graphical User Interfaces:
    - Concerns how the user is able to interact with the Web site/program/operating system not the content being displayed" (Blenkhorn & Evans, 1998).

2.10.6 Methods to Make Graphics Accessible

" Regardless of the classification scheme a graphic always has an objective aspect (you could say this is the 'directly visible' part and an intrinsic aspect). The intrinsic aspect is the answer to the question 'why did the artist/designer choose this particular way of painting/drawing?'" (Kurze, 1995)

When making graphics accessible there are two important aspects that have to be taken into account; the physical representation "what the graphic 'looks' like and the implied meaning, "what does this graphic mean".

Alt – Text Method:

The common way to deal with text is through the 'alt-text' coding method, which provides a text output to the visually impaired user when graphics are encountered. Instead of a user hearing/reading the output "c:\windows\Webpage\123abc.gif" they will be given "ACME company logo" instead. This practice makes all graphics easier to understand when encountered because the alt-text descriptions actually provide meaningful identifiers of what the graphics are rather than the source paths to the picture files.

Captions:

Captions are also meaningful identifiers of graphics when properly used. The methods concerning text must be taken into account when creating captions for graphics as well as some extra guidelines that specifically apply to the use of captioning in accessibility design.

There are many methods used for creating captions but in general a caption should contain the following characteristics:

- "Be explicit in the description.
- Describe the function of the image, especially if it is a link.
- Be brief.
- Put the most essential information first.
- Meaningless graphics do not need meaningful text such as spacer lines. Put a space in the quotes of the alt-text so these graphics are skipped over when viewed by a visually impaired user.
- Always use alt-text.
- Use correct spelling.
- Only present essential information.
- Use universal classification of picture contents.
- The use of universal classifications. For example, if describing a type of animal such as a German Shepard remember to first refer to the item by 'dog' " (American Foundation for the Blind, 2000).

2.10.7 Tables:

In many Web pages, tables are used to present data to a visitor because they are an organised and professional looking structure. In statistics, tables are one of the main methods through which data are organised and displayed. Making the information contained in a table accessible to the visually impaired is quite a challenge. According the WGBH National Center for Accessible Media guidelines that concern the design of mathematical and scientific information:

"The best way to provide access is to use the checkpoints and techniques of the User Agent Accessibility Guidelines to create an accessible interface for tables. Include commands for navigating, identifying the current cell in context, and getting an overview of the structure and content of the table" (Rothberg, & Wlodkowski, 2000).

By allowing the users to scan through the data in each cell at their own pace rather than having it read to them through a screen reader allows for a more interactive experience. This method will create a Web site that is much more engaging to the visitor than one that overloads the user with long strings of numerical values. From the WGBH National Center for Accessible Media guidelines there are several techniques that were given in regard to the use of tables. These techniques were chosen because of their usefulness in Web page design and flexibility for visually impaired users running different programs.

- **"Technique 4.3.2**
  Allow users to open tables in another program that provides an accessible interface
  Another approach to making data accessible is to provide the data in a format compatible with common spreadsheet applications. Users can then open the data in their standard spreadsheet and use the accessible interface of that program. Using comma-separated variables (.csv format) will also permit the file to be read sensibly by a user with a screen reader treating it as a text file. The disadvantage of this approach is that users must change context from the data table embedded in instructional materials to another piece of software, which may detract from the educational objectives of an interactive lesson." (Rothberg & Wlodkowski, 2000).

- **"Technique 4.3.3**
  Provide alternative access to static tables
  For tabular data which the user cannot change, pre-produced audio can provide useful access. The entire data table can be read aloud, or the equivalent script can be provided in text" (Rothberg, & Wlodkowski, 2000).

2.10.8 Graphs

To display the information contained in tables, one form of a graph or another is the main method used. Graphs help to 'make sense' of the lists of numbers displayed in tables and are a more effective way of visually explaining what the information 'means'. To allow for access to graphs by visually impaired user there are several techniques that can be used to make sure that the visually impaired user to a Web site will be able to access and understand the information given.

- "Provide a complete description in text for static graphs" (Rothberg, & Wlodkowski, 2000).

- Make sure alt-text is used.

- "Allow all graphs to be printed. If not accessible through vision, visually impaired users may have access to printers that are able to create a tactile version of the graph embossed with Braille. Also using printed graphs allows low vision individuals to create larger versions of the image" (Rothberg, & Wlodkowski, 2000).

- "Allow all graphs to be enlarged on screen" (Rothberg, & Wlodkowski, 2000).

- "Provide an audio equivalent to graphs" (Rothberg, & Wlodkowski, 2000). Programs like Triangle from the Science Access Project at Oregon State University (The Science Access Project: Department of Physics, Oregon State University, 1999, June 28), allow the creation of audible graph representations. These sounds-representations of graphs are an excellent way to allow the visually impaired used a means to visualise the shape of a curve.

2.10.9 Images

One of the key techniques for portraying graphics or images to the visually impaired is through a textual description. However, just because an image has alternate text does not mean the intended meaning will be conveyed. CAST uses the following example (2000):

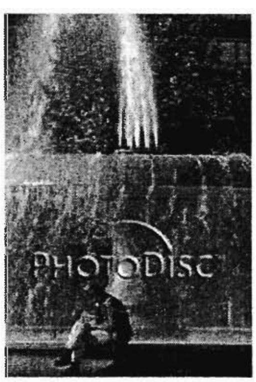


Figure 5: A person beside a cement fountain

(CAST, 2000)

However, this short description could be describing any number of different images or things. Any of the following pictures would fit the above description even though they are quite different:

Figure 6: A person beside a cement fountain

Figure 7: A person beside a cement fountain

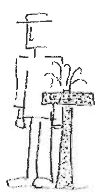


Figure 8: A person beside a cement fountain

(CAST, 2000)

In one picture there is a lady dressed in a fancy old-fashioned dress and wide brimmed hat walking by. The other has a small child who is drinking out of the fountain. Finally, in the last picture, a man is standing next to a small stone fountain.

Even a very lengthy description can be misinterpreted, as evidenced by CAST's description of the following photographs.

> *A person reading a book, facing left, legs crossed, sits on a ledge surrounding a shallow circular cement pool forming the base of a fountain. A curved column supporting a smaller cement pool stands in the center of the larger pool. Water sprays up and to the left out of the center of the upper pool, spilling over the sides and falling into the bottom pool. It spills in small streams spaced equidistantly around the upper pool (2000).*

Figure 9: A person beside a cement fountain

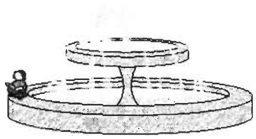


Figure 10: A person beside a cement fountain

(CAST, 2000)

The above description does not detail what the background of the image contains, or what people are wearing, or what side of the image they are centred on etc. What the above description does do is narrow down the possibilities of what the image contains and correctly describes the most important details.

Overall, "for an accurate description, a balance between brevity and complete information must be kept" (CAST, 2000). If the description is not detailed enough then there can be too broad of an interpretation. If the description is too lengthy a user may get bogged down in the details of every image, and it may detract from the rest of a page's content.

2.11 Evaluation and Repair Utilities

2.11.1 Center for Applied Special Technologies and Bobby

Bobby was created by the Center for Applied Special Technologies to be a "Web-based entity that would expose barriers, encourage compliance with existing guidelines and teach Web masters about accessibility."(CAST, 2000) Because CAST knew that many content developers would not want to sit down and read pages upon pages of guidelines and then review their whole site page by page, they invented Bobby. Bobby is one of the most popular tools for determining WAI compliance today. When given a file or program, Bobby will search through the given HTML page, then all of the HTML pages that are linked to it. It will then create a report of what the violations are and how to fix them. Once a site is WAI compliant it may be listed on CAST's site along with hundreds of other accessible Web sites across the globe.

A major benefit of the Bobby program is that it can follow links on the given page and check those for compliance as well. This is a very useful for evaluating a whole site at once, and not just page by page. Once the search is finished an HTML report is created and sorts the results by priority and which ones would be the easiest to fix. A final benefit of Bobby is that it is Java based and can be run on any computer. It even comes with a built in Virtual Machine, so no additional software will need to be installed.

However, Bobby only searches for and displays violations, it does not fix them. Also Bobby will report what the violations are but will not state the exact lines or occasions. This can become tedious when dealing with long or multiple pages.

2.11.2 The A-Prompt Toolkit (Adaptive Technology Resource Centre, 2000)

A-Prompt is a program under construction at the University of Toronto in conjunction with the W3C. A-Prompt is available as a Windows **DLL** or as a **Java Bean**. The Windows DLL version allows A-Prompt to be integrated with any current **authoring tool** and lets them work together when creating a document. The Java Bean program can be run on any machine and is easily integrated into any new Java programs. A-Prompt can work in one of two ways; it can search an entire file for accessibility violations, then prompt for the corrections to be made. Or it can be on whenever the **authoring tool** is being used and when an incorrect element is used it will immediately prompt for a correction to be made. When a violation is encountered A-Prompt will display a dialog to the developer, explain the problem, and then help to fix it.

The benefit of a program like this is that it will not only search for violations, it will also state what priority level and checkpoint it violates and how to repair it. A developer may select a repair option and with a few clicks of the mouse and some additional input A-Prompt will repair the violation. This program uses a convenient graphical interface that is easy to learn and master, and even novice computers users can understand its use.

The only disadvantage to A-Prompt is that it is still in a beta version, as of May 2001. A beta is a version of the software that is almost complete, but still has some bugs. A beta is released to users so that they may test it and find any problems.

2.12 Applications to Web-Based Education

In producing any type of accessible Web-based education system for the visually impaired there are two requirements that must be satisfied. Firstly, the Web-based education system must be accessible to students with visual impairments and secondly, the students should be able to learn from the content. These characteristics must be present in the system in order for it to be termed an "education system". Obtaining the status of "accessible" is the simple and straightforward requirement to satisfy. The accessibility of the Web-based education system can be verified by following the guidelines set forth by the World Wide Web Consortium. Making the content comprehendible and meaningful to visually impaired users is a much more difficult task to complete. To ensure that students can actually learn from the content entails the application of some innovative strategies.

Some of these strategies were derived from the classroom techniques that have been discussed. In order to convey meaning about a particular graph or chart, extensive textual descriptions must be attached to each image. Also, every vocabulary word must be clearly defined in a glossary. The instructions preceding each task should be spelled out as specifically as possible, to avoid any ambiguity within the lesson. To reinforce concepts that were introduced, the inclusion of a review page at the end of every lesson is a useful addition. These are all methods of pre- and post-tutoring that can be applied to electronic content. It is also of importance to note that these applications are not only helpful to the visually impaired audience, but to the sighted students as well (Sticken, 1998).

The major obstacle in this project stemmed from the fact that visually impaired students learn best using concrete examples that they can touch and feel. It is not yet technologically possible to convert images on the Web into tactile objects with which students can work. There is limited technology available to print pictures as raised line drawings, but that technology is extremely expensive.

Finally, since the education system is Web-based, the project team tried to take advantage of as many available technologies as possible. The one thing kept in mind before applying these technologies was how accessible they were to the average visually impaired student, both physically and financially.

3. Methodology

3.1 Overview

This project consisted of five distinct stages. The first stage consisted of the creation of new guidelines for accessible Web content. The second stage was the creation of sample Web content using these newly created guidelines in conjunction with the current ABS Web Site Publishing Standards and Guidelines (SPSG), and lesson plans developed by the National Education Services Unit of the ABS. For the third stage, a usability study was conducted with blind and visually impaired students. The fourth stage consisted of having employees of the ABS create accessible content using the new guidelines and tutorial. The final stage was analysis of the usability study results when using the accessibility guidelines versus the SPSG.

The project team's hypothesis was that by using the new accessibility guidelines, the students' ability to access the Web content and learn from it will increase compared to using the current ABS Web content.

3.2 Methods

3.2.1 Creation of New Guidelines and Tutorials

3.2.1.1 Overview

The first part of the project was to create new guidelines to supplement the existing ABS guidelines, and tutorials for creating accessible Web content. Three documents were created; a collection of addendums to the ABS Web content guidelines to achieve "double A" compliance called the SPSG Accessibility Addendums, a tutorial of how to implement the guidelines using Lotus Notes called the Lotus Notes Accessibility Tutorial, and a handbook of how to best describe graphs and tables to enhance comprehension, called the Graph and Tables Handbook.

3.2.1.2 SPSG Accessibility Addendums

Currently the ABS SPSG only address how to achieve "single A" compliance. In order to fulfill this project's goal of using Web pages to teach the visually impaired, the pages must meet "double A" compliance; otherwise a significant population will not be able to access these Web pages (W3C, 1999b). Addendums to the ABS guidelines have been generated to meet this compliance level and are based upon research described in the Background section above, and in the W3C's Web Content Accessibility Guidelines (W3C, 1999a).

3.2.1.3 Lotus Notes Accessibility Tutorial

Since the ABS' focus is on statistics and not the Internet, the majority of the employees have only minimal experience with content development. Knowledge of HTML is virtually non-existent among employees, and all development is done through Lotus Notes. Notes has the ability to make accessible content, however the options are often hidden in menus and require some knowledge of HTML. Therefore the project team has created a step-by-step tutorial of how to implement the guidelines, hereafter referred to as the Lotus Notes Tutorial. These instructions were generated with assistance from the ABS **Web content developers**, and from information gained when the project team used Lotus Notes.

3.2.1.4 Graph and Tables Handbook

Just because a Web page is accessible, it is not guaranteed to provide meaningful information. A large part of the ABS Web site consists of graphs and large tables of information. These pieces of data must be correctly described textually in order for a visually impaired user to comprehend the information contained in the graph or table. In order to do this a short handbook was created that details how to best describe line graphs, pie charts, bar graphs, scatter plots, geographical maps, and tables. By describing a graph or table correctly a student will understand not only what the graph or table contains, but also be able to make his or her own conclusion regarding what the data actually means. The Graph and Tables Handbook was developed using research discussed in the Background section, and with information received from interviews with teachers and visually impaired students in Australia and the United States.

3.2.2 Creation of Sample Web Content

3.2.2.1 Overview

In order to determine whether content developed using the accessibility guidelines enhanced the education of students using the new content versus the current ABS content, a usability study was performed. Three sets of test content were developed by the project team to show before and after results. The first set was used as a control. This set was retrieved from the ABS Web site. The second set consisted of ABS pages that were repaired using the "single A" compliant SPSG developed by the Electronic Dissemination Services Unit of the ABS. The third set consisted of ABS pages that were repaired using the project team's SPSG Accessibility Addendums, the Lotus Notes Accessibility Tutorial, and the Graph and Tables Handbook.

3.2.2.2 Sample Content Format

Each set of sample content was broken down into two subsections, each with its own theme. The first theme is based upon pages created using the 1996 Australian Census data. The second theme was based on "Statistics: A Powerful Edge (SPE)" (ABS, 2000b) content. SPE is a set of Web pages and lesson plans for secondary school students. SPE is designed to teach statistics and contain combinations of graphs, tables, and written text.

3.2.2.3 Sample Content Theme 1, The 1996 Australian Census

The first sample content theme used data and maps from the 1996 Australian Census. The Census Web pages were chosen because they contain maps of the country represented as **image maps**, a large number of **hyperlinks**, and extensive tables. This theme will be used to test general accessibility, and not focus on educational value.

3.2.2.4 Sample Content Theme 2, "Statistics: A Powerful Edge"

The ABS Web site contains a group of pages called "Statistics: A Powerful Edge", whose purpose is to teach students how to use and interpret graphs and tables. This was chosen as the second theme because it represents the majority of graph and table types that the ABS uses, and also has accompanying lesson plans. By having content that contains established lesson plans, the project team was able to test whether the educational value of a Web page increases with the use of accessibility guidelines and different ways of describing graphs and tables.

3.2.3 Student Usability Study

3.2.3.1 Overview

In order to correctly judge the effectiveness and accessibility of the sample Web content, the project team used both quantitative and qualitative methods. First, visually impaired students were selected from a pool of candidates. Then they were required to complete activities using the sample content. The first section of the activity was used to determine the general accessibility of the content. The second part was to evaluate how well the concepts and themes of the content were understood. Next, the students were gathered together and group interviews were conducted. The aim of this interview process was to gather the students' opinions about the layout, the ease of use, and the descriptions of tables and graphs.

3.2.3.2 Student Selection

The thirteen students were selected out of a pool of about forty-five students. Each student was selected based upon a set of predetermined criteria. First, a student was required to have had experience using the Internet and browsing Web pages. Second a student was required to be enrolled in secondary school, between years seven and twelve. Finally, students were expected not to have a learning disability that may affect test scores.

3.2.3.3 Student Activity

With the assistance of teachers at the National Education Services Unit, the project team created a two-part activity for the students to complete using the sample Web content.

The activity was administered by a project team member acting as a mediator, and consisted of ten multiple-choice activities. The reasoning behind multiple-choice is two-fold. First, it allowed for a consistent evaluation of the results and an empirical way to measure improvement or the lack thereof. Second, it reduced inter-subjectivity between the creator of the activity and the student. If the activity was done in a short answer format the mediator may phrase a question incorrectly and the student may misinterpret what is being asked and give an undesired answer. This multiple-choice format helped to reduce the number of misunderstood questions because the students were able to understand what type of answer was expected.

The first three activities asked the user to navigate through a set of four Web pages using an image map or links. By timing how long it took the student to find a link and tallying how many wrong links were chosen the evaluator can determine how the level of difficulty for navigation through a set of Web pages.

The next two activities inquired about the sample content's accessibility. The questions probed for specific data or information that could be obtained from different

elements in the sample content. By answering correctly, a subject demonstrated that the given **elements** were indeed accessible.

The second part of the activity was used to measure the overall effectiveness, or educational value of the page. The activities were designed to determine not only whether the sample content was accessible, but also if the intended meaning was conveyed clearly, and understood by the student. The questions focused on themes, trends, and concepts that were manifest in the included lesson plan. If the sample content was accessible and aptly described, then these questions were answered correctly.

Finally, by timing how long it took the students to complete each activity, the project team could determine how difficult the content was to navigate.

3.2.3.4 Group interview

Since the usability study removed a student from his or her normal lessons, time spent reviewing and providing feedback needed to be minimised. Therefore, the second method used was group interviews. Group interviews allowed the project team to inquire about the students' thoughts and opinions on the page in a time efficient manner. These group interviews were used to determine if a page was accessible but still hard to use or was inconvenient. The moderator attempted to discover the students' latent thoughts and opinions about the content. If the students could redesign the page, what would they do? How would they order things? How do they best learn and understand graphical or tabular data? Please refer to Appendix H for a complete list of the protocol and questions used. A wide range of feelings and opinions were given, but the project team believe that overriding trends evolved and point to some viable solutions in the development of accessible Web

3.2.4 Employee Usability Study

The study participants consisted of three employees of the Australian Bureau of Statistics Educational Services Unit. Of this group of employees, two individuals were visiting teachers of schools within Victoria and one person was a Web content developer. Each of the participants helping in the activity had varying degrees of experience using Lotus Notes for the creation of Web pages. The people in this group were chosen because of their diversity in technical experience and employment backgrounds. The purpose of a more diverse usability group was to gain a variety of perspectives about the Lotus Notes Accessibility Tutorial thereby allowing more effective changes to be made to the trial version.

In reviewing the modified Web pages created by the participants the goal of the activity was to gain insight into what tutorial instructions were understandable and which ones needed further clarification. By understanding the problems present in the tutorial proper actions could be taken to modify the document. As a result of this a more simple and effective version could then be created.

Initially, all three Web content developers participating in the usability activity were given a copy of the Lotus Notes Accessibility Tutorial, the Graph and Tables Handbook, and access to the ABS SPSG and the Accessibility Addendums. Each participant in the study was given some background information regarding the structure of the documents and asked to take his or her time reading each of the documents. Each participant was told that the order of information present in the Lotus Notes Tutorial was consistent with the headings in the ABS SPSG. This allowed the users to treat the Lotus Notes Tutorial and the ABS WWW Site Publishing Standards and Guidelines references as one document. This uniform structure made the task of researching particular accessibility issues simpler and more efficient.

Along with structure, each participant was told that not all techniques mentioned in the documents needed to be implemented in the activity. They were advised to use their best judgment to determine what techniques were needed, and advised to implement as many techniques as possible.

All of the documents presented to participants combined techniques taken from the W3C Guidelines (both "A" and "AA" compliance) (W3C, 1999b), WGBH-NCAM (techniques chosen by the project team), and comments and suggestions given by visually impaired students and teachers. All participants in the employee usability study volunteered their time from work to help the project team, so minimising the time spent on the activity was a high priority.

3.3 Instruments

3.3.1 Sample content

The following is a breakdown of the three sets of sample content used:

- Set one, containing five pages, using existing non-compliant ABS Web content.
- Set two, containing five pages, created using the "single A" compliant ABS SPSG.
- Set three, containing five pages, created using the project team's SPSG Accessibility Addendums, the Lotus Notes Accessibility Tutorial, and the Graph and Tables Handbook.

Each set of sample content contains the following pages created using the set's criteria.

- 4 pages using 1996 Australian Census data and maps.
- 1 page using the "Statistics: A Powerful Edge" theme for its content.

A total of 15 pages were created and trialed.

3.3.2 Student activity

The first five activities determined the test content's accessibility and used the Census data pages. These activities focused on whether the SPSG were followed correctly and that all **elements** on the page were accessible.

The first, second, and third tasks tested whether links were logical or not. The subject was prompted to find a link to a certain page. If the links had meaningful textual identifiers, the subject should have been able to identify which links led to the requested page.

The first, second, and third tasks also test the accessibility of images, and image maps in particular. The student had the option of following image map links to the requested page or using textual links. If the image map was correctly labeled and described then the student should have been able to use it and navigate to the page.

This type of task was used to determine if a page was navigable and had meaningful links and **image maps**:

> Please find a link that will bring you to tables of statistical information about the Region of Central Highlands.

The fourth and fifth activities tested a student's ability to access tables. The subject was prompted to search through a table of more than twenty rows to find a particular value.

This type of activity was used to determine if a student could traverse a table of census data to find the answer:

> Using information from the 1996 Census of Population and Housing in Gippsland, how many females were employed?
>
> a.) 20,909
>
> b.) 21,725 Correct
>
> c.) 24,162
>
> d.) 27,874
>
> e.) Unable to determine

3.3.3 Sample activities

The last five activities were used to test whether the subject grasped the concept presented on the page and could formulate answers to questions based on the lesson plans and statistical data presented using the "Statistics, A Powerful Edge" pages. The sample content contained a wide range of informational mediums such as a table, line graph, bar graph, pie chart, and images, in order to determine if each were not only accessible but also understandable when viewed as part of a lesson plan. Therefore, the last five activities were extracted from "Statistics: A Powerful Edge", or were created with the help of teachers working with the National Educational Services Unit. These questions dealt with interpreting the data as a whole and making educated decisions on their meaning.

The sixth activity's purpose was to prompt for information that could be found with the least difficulty by using the table. In order to find the requested information a student had to review the complete table, understand the content, and answer the question. Please refer to the Development of Materials section for a complete rationale of the content development.

The purpose of the seventh, eighth, and ninth activities was to prompt for information that could be found with the least difficulty by using information from one of the graphs. Activity seven queried for information that could most easily be obtained by the line graph, activity eight was for the bar graph, and activity nine was for the pie chart. In order to find the requested information, a student had to review the graph or its textual description, understand its meaning, then answer the question.

The tenth activity's purpose was to prompt for either a calculation or a prediction based on the information. This either meant asking the student to average multiple data values or notice trends in current data values and predict similar outcomes.

The second half of the usability study was to inquire about the users' ideas and opinions about the Web page design. The project team conducted thirty-minute group interviews. The subjects were arranged in a semi-circle facing the moderator. The moderator posed approximately seven questions, each pertaining to a different aspect of the page's accessibility.

3.4 Coverage

3.4.1 Coverage

The Australian Bureau of Statistics is aiming its educational curriculum towards students in the lower and upper secondary school levels; therefore the majority of the sample chosen was a subset of these groups.

In order to recruit students for testing the project team contacted the Royal Victorian Institute for the Blind (RVIB) in Melbourne, Australia. The RVIB is a school for students who have multiple disabilities including visual impairment. However, every Friday during the school term and for a four-day span over school vacations, students from mainstream schools visit the RVIB for a special curriculum. It was from these visiting students that we secured our subjects.

In addition to the current RVIB students we were also given the contact information of recent RVIB graduates who might be interested in participating. We used these recent grads to increase our coverage area to include not only lower and upper secondary students, but also the adult population as well.

3.4.2 The Sample

Thirteen students were chosen for the sample. Seven of the students were low vision, and six students were completely blind. The ages ranged from twelve years to nineteen years. The grade levels ranged from year seven to year twelve. Complete profiles follow below.

In addition, one graduate was chosen. He was completely blind, and was twenty-one years old. A complete profile follows below.

The students all had prior experience using the Internet in one form or another. If a student had never used the Internet before, he or she may have biased the results because he or she may not have been familiar with Web accessibility tools such as browsers and screen readers. Some incorrect responses would not have been due to the

Web page's inaccessibility, but instead due to a lack of knowledge in how to browse Web pages in general.

The students also had educational abilities that represented the population the ABS was trying to reach with its Web initiative. There were no students with severe learning disabilities or additional physical disabilities.

3.4.3 Student Profiles

Table 1: Blind Student Profiles

Blind Student Profile						
	1	**2**	**3**	**4**	**5**	**6**
Researcher	RWL	MJM	RWL	JWD	MJM	MJM
Age	21	17	18	17	19	18
School Level	14	11	12	10	12	12
Jaws Exp. Student Eval	10	9	7	7	6	5
Jaws Exp. Researcher Eval	10	8	7	5	5	6
Low Vision Tech Exp. Researcher Eval	N/A	N/A	N/A	N/A	N/A	N/A
Internet Exp. Student Eval	10	10	6	2	2	4
Internet Exp. Researcher Eval	9	9	6	2	2	4

Table 2: Low Vision Student Profiles

Low Vision Student Profiles							
	1	**2**	**3**	**4**	**5**	**6**	**7**
Researcher	JWD	MJM	RWL	RWL	MJM	JWD	RWL
Age	12	12	15	14	13	13	15
School Level	7	7	9	9	8	8	9
Jaws Exp. Student Eval	N/A	N/A	N/A	5	N/A	4	1
Jaws Exp. Researcher Eval	N/A	N/A	N/A	2	N/A	3	1
Low Vision Tech Exp. Student Eval	7	8	8	3	5	5	6
Low Vision Tech Exp. Researcher Eval	5	7	7	4	4	8	6
Internet Exp. Student Eval	8	8	9	5	5	8	3
Internet Exp. Researcher Eval	8	6	9	5	5	9	3

3.4.4 Student Access

The project team was given the following access to the students:

- 90 minutes at a time with each group.
- 3 total meetings with each group.

3.5 Analysis

3.5.1 Student Activity

After all of the activities had been completed, the next step of the methodology included the analysis of the collected data. The multiple-choice section of the study consisted of quantitative data that was analysed through analytical statistics.

First, the students' results were divided into two major groups. The first group consisted of low vision students, and the second consisted of totally blind students. Each of these two major groups was further divided into subgroups based on age, skill using the Internet, and skill using accessible technologies.

In order to correctly judge improvement in the accessibility of the three content sets, each student's results were compared individually. This means that a student's results on the first set of content were only compared to their results on the second and third sets of content. By analysing the data in this manner first, the project team was able to isolate each student's progress. If all of the students' results on the first set of content were averaged together first and compared to the average of the second and third sets, then the project team could have introduced some unknown factors into the data such as the different hardware used for testing and different learning styles and speeds of each student. These different factors could have tainted the results and not offered a clear picture. Also, once each student's results were analysed separately it was be much easier to isolate outliers.

After the individual comparisons were completed, the project team was able to create different views of the data. Examples of this include topics such as how the time to complete the tests dropped for low vision students, or what was the most common source of answers for blind users; a table or a graph description, etc.

3.5.2 Group Interviews

The group interview data constituted the qualitative part of the analysis. From the group interviews, the data consisted of the students' responses to questions asked by the moderators in regards to the students' ideas and opinions about the design of the Web content. For content analysis of the group interview, the project team tracked responses and categorised them.

Some of the categories used were: characteristics that made table navigation difficult or easy, characteristics of a good description, ease of use, navigation problems or aids, etc. The project team then counted the number of responses that fit into each category. These responses played a large part in understanding what improvements needed to be made to the page, above and beyond what could be counted or timed. These topics include such things as how to make a Web page more enjoyable or easier to view for low vision users.

3.6 Presentation

3.6.1 Quantitative Presentation

After analysing the data, two separate presentation methods were used to present the project team's findings. For the data collected from the student activity, numerical data were used. The raw data were represented in tables, which were organised by question, test content, and test subject. The respondent's answers to each question of the student activity were given. In no way were the students' names linked to their responses. That information remained confidential within the project team. To better convey the meaning behind these data, a graphical approach was also used.

3.6.2 Qualitative Presentation

For the group interview section of data collected, the raw form of information presented consisted of the field notes from the group interview sessions. From analysis of these transcripts a list of concepts was created. Then the numbers of students mentioning these concepts were compared graphically against one another.

3.6.3 Deliverables

The deliverables for the Australian government Web masters in Canberra were: the Graph and Tables Handbook, the Lotus Notes Tutorial, the "AA" addendums to the ABS Web Content Guidelines, a set of graphs and charts displaying the changes in accessibility and comprehension as different guidelines were used, and a report detailing the results. Finally, the project team will give a final presentation to the Web masters describing their work as well as the ABS recommendations for future content development.

4. Development of Materials

4.1 Overview - Test Web Content Rationale

In order to test the different levels of accessibility the project team needed to have a distinct version of the content developed using each set of guidelines, yet still keep the same basic structure and content. If each set were the same then after the student tested the first set, he/she would have prior knowledge of what the second and third set contained. This would skew the results, causing the time to complete each assignment to be shorter and not guaranteeing that if a correct answer were given it was because the page was accessible, but possibly due to knowledge from a prior test. However, if the team chose sets of content that were dramatically different then it would be difficult to do comparisons between them. It may have been the fact that one layout was easier to understand than another.

Therefore the project team decided to use the same layout and format for each set of content, change the data values, and also use a slightly different statistical concept each time. By compromising in this manner the students would not be familiar with the content of the test pages, even though the structure would be similar.

4.2 Layout - Test Web Content Rationale

4.2.1 1996 Australian Census Web Content - Theme 1

In order to test accessibility issues with **image maps**, **images**, navigation, and tables, four test content pages were chosen from the ABS Web site's Education Theme area, with a focus on the 1996 Australian Census. These pages were chosen because of their use of image maps, images, different forms of navigation, and large tables. The purpose of the first three pages was to provide navigation to different regions of Australia and their corresponding statistics, and the fourth page contains the statistical content for the given region.

Pages one, two, and three were all laid out in the same manner. The top of the page contains a title, and the ABS logo. The bottom of the page contains a navigation bar. This bar contains links to important ABS Web pages such as the Home page, About page, Site Map etc. The centre area of the page contains the informational content. On the left there is an **image map** that displays regions of Australia and is a **hyperlink** to the given region's statistical page. To the top right of the image map is room for one paragraph of text describing the page and/or its contents. Finally, to the bottom right is an area to list the same hyperlinks contained in the image map, except in textual form. Over all three sets of content this layout remains consistent.

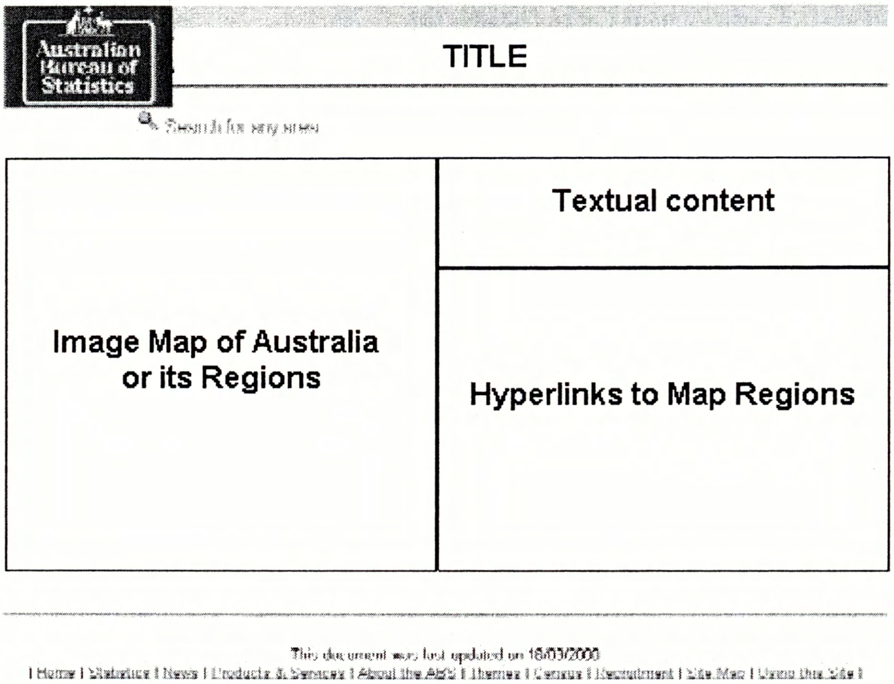


Figure 11: Page 1-3 Layout

The layout of the fourth page differs from the previous three because it contains multiple data tables. The title bar at the top and navigation bar at the bottom are the same as those found on pages 1-3. However, in the middle content section the page is split into two sections. The first section contains a textual title and a large four-column data table. The second section located below the first contains a textual title and a small two-column data table.

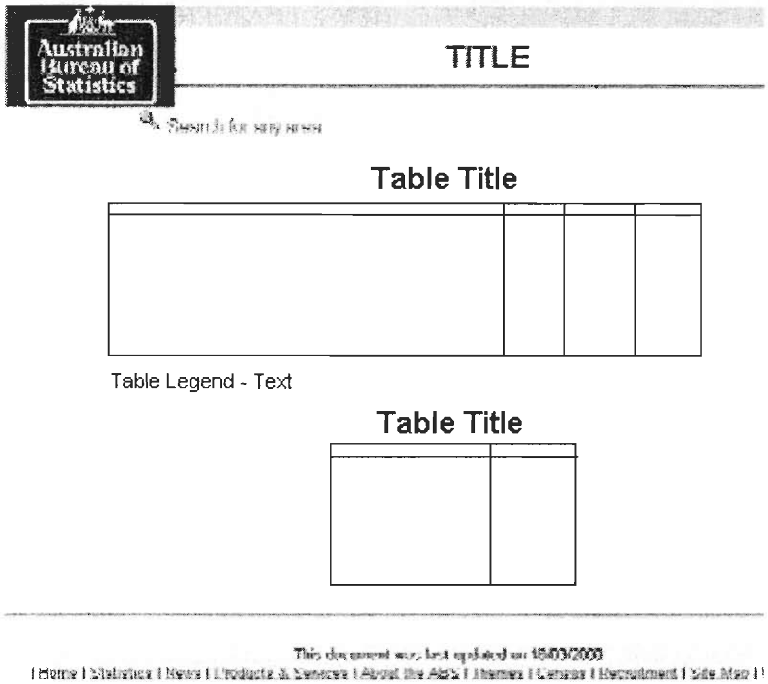


Figure 12: Layout for page 4

4.2.2 Statistics A Powerful Edge Web Content Layout – Theme 2

In order to test a student's ability to learn from a Web based lesson plan the test content page was chosen from the "Statistics, A Powerful Edge" Educational Theme. The page was chosen because it uses a wide variety of graphs, tables, and images that are all interrelated.

This second theme's page contains the usual title bar at the top and navigation bar at the bottom, as seen in previous versions of test content. The middle section consists of the actual content and is split up into three sections. The first section contains a statistical lesson written in text, as well as two images used to denote a title and an example. The middle section contains a data table with a varying number of rows and columns, then a paragraph of text describing it. The bottom section is comprised of three images, each one representing a different type of graph.

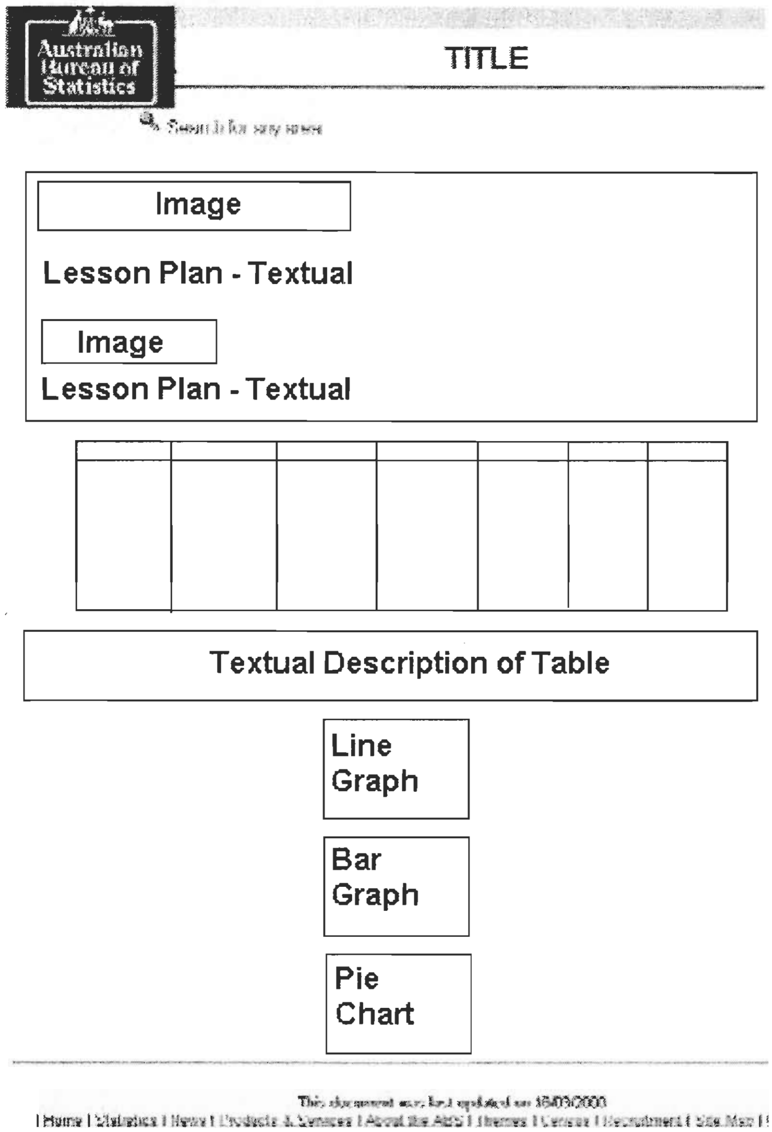


Figure 13: Layout page 5

4.3 Accessibility Violations - Test Web Content Rationale

In order to test improvements in the accessibility of Web content using different guidelines, the project team created three different sets of sample Web pages. Below is a list of improvements between each set. Each set was broken into three groups of pages. First are the pages that contain a map of Australia and its links. Second is the 1996 Census data. The last group is the "Statistics, a Powerful Edge" Web page. Within each group is a list of accessibility guidelines that were violated. With each violating guideline is a table displaying the violating element, and subsequent repairs to that element in the second and third content sets.

4.3.1 1996 Australian Census Web Content – Pages 1-3

Pages one through three are very similar in their layout as discussed above. Each page contains a title bar, a map of Australia, a list of links, then a navigation bar at the bottom. Below is a list of guidelines that were violated on the original page, and the subsequent fixes in following content sets. After the fixes were made, the repair tool A-Prompt was used to verify that each set was indeed either "A" or "Double A" compliant.

W3C Checkpoint 5.3:

Do not use tables for layout unless the table makes sense when linearized:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
A table is used for the Title Bar at the top of the page.	Table cells were set to word wrap, and make sense when **linearized**.	None
Tables are used for the map, list of links, and the description paragraph.	Table cells were set to word wrap, and make sense when **linearized**.	None
A table is used for the Navigation Bar at the bottom of the page.	Table cells were set to word wrap, and make sense when **linearized**.	None

Table 3: W3C Checkpoint 5.3

W3C Checkpoint 1.1:

Provide a text equivalent for every non-text element (e.g., via "alt", "longdesc", or in element content):

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
The ABS logo, located in the title bar.	Added "Australian Bureau of Statistics Logo." Alt text.	None.
A blank image, located in the title bar.	Added "" Alt text.	None.
The Search magnifying glass, located below the title bar.	Added "Magnifying glass" Alt text.	None.
The map of Australia or its Regions.	Added "Map of Australia" Alt text.	None.

Table 4: W3C Checkpoint 1.1

W3C Checkpoint 1.2:

Provide redundant text links for each active region of an **image map**:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
The image map of Australia or its Regions.	None.	Each **hyperlink** contained in the image map has a textual description associated with it.

Table 5: W3C Checkpoint 1.2

Overall Usability issues:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
Hyperlinks are hard to distinguish from normal text for low vision users.	None.	**HTML** code was added to cause a hyperlink to become highlighted when a mouse hovers over it.

Table 6: Overall Usability Issues

4.3.2 1996 Australian Census Web Content – Page 4

Page four contains a title bar, then two tables containing 1996 census data, then a navigation bar at the bottom. Below is a list of guidelines that were violated on the original page, and the subsequent fixes in following content sets.

W3C Checkpoint 5.3:

Do not use tables for layout unless the table makes sense when linearized:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
A table is used for the Title Bar at the top of the page.	Table cells were set to word wrap, and make sense when **linearized**.	None.
A table is used for the Navigation Bar at the bottom of the page.	Table cells were set to word wrap, and make sense when **linearized**.	None.

Table 7: W3C Checkpoint 5.3

W3C Checkpoint 1.1:

Provide a text equivalent for every non-text element (e.g., via "alt", "longdesc", or in element content):

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
The ABS logo, located in the title bar.	Added "Australian Bureau of Statistics Logo." Alt text.	None.
A blank image, located in the title bar.	Added "" Alt text.	None.

Table 8: W3C Checkpoint 1.1

W3C Checkpoint 5.1:

For tables that contain numerical data and are not used for layout purposes, identify row and column headers:

Violating Elements	Set 2 Modifications	Set 3 Modifications
The 01 and 32 data tables.	None.	Added header information. Each column header contains SCOPE="col", and each row header contains SCOPE="row."

Table 9: W3C Checkpoint 5.1

W3C Checkpoint 5.5:

Provide summaries for tables:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
The 01 data table.	None.	
The 32 data table.	None.	

Table 10: W3C Checkpoint 5.5

W3C Checkpoint 5.6:

Provide abbreviations for header labels:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
The 01 data table.	None.	Used the following abbreviations for table headers: Categories=C, Male=M, Female=F, Persons=P.
The 32 data table.	None.	Used the following abbreviations for table headers: Median Individual Income=M individ income, Median Household Income=M household income.

Table 11: W3C Checkpoint 5.6

Overall Usability issues:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
Hyperlinks are hard to distinguish from normal text for low vision users.	None.	**HTML** code was added to cause a hyperlink to become highlighted when a mouse hovers over it.
Colour should be used to mark table column or rows for low vision users.	None.	Alternating columns are white or yellow.
Merged cells in tables cause difficulty for some screen readers.	None.	*Table cells were unmerged, removed, and the horizontal rule was removed.*

Table 12: Overall Usability Issues

4.3.3 Statistics, A Powerful Edge – Page 1

The "Statistics, a Powerful Edge" page contains a title bar at the top, then a section of text containing two images, a stem and leaf table, three graphs, then a navigation bar at the bottom. Below is a list of guidelines that were violated on the original page, and the subsequent fixes in following content sets.

W3C Checkpoint 5.3:

Do not use tables for layout unless the table makes sense when linearized:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
A table is used for the Title Bar at the top of the page.	Table cells were set to word wrap, and make sense when **linearized**.	None.
A table is used for the Navigation Bar at the bottom of the page.	Table cells were set to word wrap, and make sense when **linearized**.	None.
A table is used for the Lesson Plan text.	Table cells were set to word wrap, and make sense when **linearized**.	None.
A table is used for the Data Table description text.	Table cells were set to word wrap, and make sense when **linearized**.	None.

Table 13: W3C Checkpoint 5.3

W3C Checkpoint 1.1:

Provide a text equivalent for every non-text element (e.g., via "alt", "longdesc", or in element content):

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
The ABS logo.	Added "Australian Bureau of Statistics Logo." Alt text.	None.
A blank image, located in the title bar.	Added "" Alt text.	None.
The "Cumulative Frequency and Percentage" image.	Added "Cumulative Frequency and Percentage" Alt text.	None.
The "Example" Image	Added "Example below" Alt text.	None.
The line graph.	Added "Line graph of Snow Depth Frequency at Thredbo" Alt text.	None.
The bar graph.	Added "Bar graph of Snow Depth Frequency at Thredbo" Alt text.	None.
The pie chart.	Added "Pie chart of Snow Depth Frequency at Thredbo" Alt text.	None.

Table 14: W3C Checkpoint 1.1

W3C Checkpoint 5.1:
For data tables, identify row and column headers:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
The stem and leaf table.	None.	Added in header information. Each column header contains SCOPE="col", and each row header contains SCOPE="row."

Table 15: W3C Checkpoint 5.1

W3C Checkpoint 5.5:
Provide summaries for tables:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
The stem and leaf table.	None.	"A table showing six columns of information. Column one, Temperature (°C), lists the different temperature ranges. Column two, Frequency (f), lists the number of days that a temperature fell in the temperature range in Column one. Column three, End-Point, lists the highest temperature that occurred into temperature range in Column one. Column four, Cumulative frequency, is a list showing the sum of all the Frequencies occurring before it. Column five, Cumulative percentage, is a list showing the sum of all the Cumulative percentages before it."

Table 16: W3C Checkpoint 5.5

W3C Checkpoint 5.6:

Provide abbreviations for header labels:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
The stem and leaf table.	None.	Used the following abbreviations for table headers: Temperature (°C) = Temp, Frequency (f) = f, End-Point = End, Cumulative frequency = C frequency, Cumulative percentage = C percentage.

Table 17: W3C Checkpoint 5.5

Overall Usability issues:

Set 1 (Original ABS Page) Violating Element	Set 2 Modifications	Set 3 Modifications
Hyperlinks are hard to distinguish from normal text for low vision users.	None.	HTML code was added to cause a hyperlink to become highlighted when a mouse hovers over it.
Merged cells in tables cause difficulty for some screen readers.	None.	Table cells were unmerged, removed, and the horizontal rule was removed.
Graphs should have hyperlinks to enlarged versions.	None.	Added hyperlinks to enlarged images that will fill a 800x600 screen.
Graphs displayed as images should have titles in text above them, and not be part of the image itself.	None.	Added Text titles above each image.

Table 18: Other Usability Issues

4.4 Graph and Tables Handbook

The goal of the Graph and Tables Handbook was to take one step beyond accessibility and make Web content educationally effective as well. The Handbook is a step-by-step guide detailing the meaningful description of graphs and tables for a Web content developer.

The team chose to focus on tables as well as five major graph types that are used as ABS Web elements. These graph types are line graph, pie chart, bar graph, scatter plot, and geographical map. Although each graph is portrayed as an image on the ABS Web site, there are type-specific instructions that make each graph easier to understand. The general-purpose instructions at the beginning of the Handbook are meant to be very non-specific guidelines to keep in mind when any element of Web content requires a description.

Tables were broken down by complexity. A simple table is not difficult for most users to interpret, provided the appropriate design guidelines are followed (American Foundation for the Blind, 2000b). Web content developers are encouraged to refer to the Lotus Notes Tutorial (also developed in this project) for information on the proper design of tables. More elaborate tables require a well thought out description. An elaborate table may be classified as anything over three columns by three rows, or any table with ten or more cells, not counting headers (World Wide Web Consortium, 1999b). The Tables section of the Graph and Tables Handbook details the procedure of describing elaborate tables to a visually impaired user.

Each graph type was given its own section because every graph type is significantly different in the way that a sighted user views it, so visually impaired users deserve the same courtesy. Line graphs focus on trends, pie charts focus on relative percentages, bar graphs focus on relative data values, and scatter plots focus on concentration densities. Geographical maps are separated further by the fact that they introduce the variable of familiarity with a given location. If the Web content developer believes that his or her target audience has enough familiarity with the area, specific place names may be used.

4.5 Employee Usability Test

To examine the effectiveness and clarity of the Lotus Notes Accessibility Tutorial and the Graph and Tables Handbook, the project team designed a usability activity for ABS employees. The activity asked employees to repair an inaccessible ABS Web page using the project team's developed materials, the Graph and Tables Handbook and Lotus Notes Accessibility Tutorial. The first half of the page was taken from the ABS Census Web Site; the second half of the page was extracted from Statistics: A Powerful Edge. The excerpts selected were identical to Web pages used in the first set of Web content given to students in the research activity. In the student usability activity, these pages were part of Content Set 1; the original ABS Web content. These Web pages were chosen because the project team was well aware of the inaccessibility issues present within them. Content Set 3, the "AA" compliant version that was given to students in the research activity, demonstrated the desired results that could be compared against the employee's finished version.

5. Results

5.1 Student Usability Test Results

5.1.1 Overview

When administering the student usability test five different results were recorded, the time taken to complete each activity, the answers to each activity, whether the answer was correct or not, the source of the answer, and any incorrect links followed. The time in seconds was recorded in order to determine if it became easier for a student to navigate each Web page. The answer to each question was recorded to compare answers between students. If multiple students answered a question wrong, did they all give the same wrong answer? If that was the case then maybe the question was worded incorrectly and caused a misunderstanding. In order to grade the students' success with the lesson contained on the Web page, their answers were recorded as being correct or incorrect. Finally, the incorrect links followed were recorded in order to determine if a pattern would evolve where students consistently chose the same incorrect link.

As stated in the Section 3 - Methodology, the ten activities given to the students were broken up in to categories. The first three activities were navigation, the next two were table accessibility, and the last five were concerned with comprehension. For activities four through ten the students were given four possible answers to choose from. If a student could not answer a question because the information was inaccessible they were given the option of a fifth answer, "Unable to Determine" (UTD).

5.1.2 Time Ranges

Each activity was timed in seconds beginning from when the administrator finished reading the question and ending when the student gave an answer. Below are tables showing the lowest, highest, median, and average times taken to complete each activity. The top row in each table describes whether it contains data for low vision or blind students. The second row denotes what Content Set the times are for. The third row then breaks up each Content Set into low, median, high, and average times. The first column lists the different activities that correspond to the times following it. At the end of each table are row(s) computing the averages for the activities. The first two tables are summaries for low vision and blind students whereas the rest are broken up by topic, navigation, table accessibility, and comprehension.

Low Vision - Time Ranges (Seconds)												
	Content Set 1				Content Set 2				Content Set 3			
Activities	Low	Med	High	Avg	Low	Med	High	Avg	Low	Med	High	Avg
Navigation Activity 1	6	20	34	17	1	4	16	7	1	5	7	5
Navigation Activity 2	6	17	257	55	2	7	30	13	2	4	10	5
Navigation Activity 3	2	30	92	30	1	4	42	9	1	2	8	4
Table Accessibility Activity 4	3	164	260	146	5	38	199	51	6	25	73	26
Table Accessibility Activity 5	6	48	229	93	4	13	148	31	5	7	59	15
Comprehension Activity 6	12	129	365	147	11	30	135	57	5	36	96	47
Comprehension Activity 7	93	144	507	194	5	35	163	57	9	49	81	43
Comprehension Activity 8	20	88	150	96	6	28	105	39	3	23	180	45
Comprehension Activity 9	19	39	179	59	9	75	242	109	20	27	140	48
Comprehension Activity 10	20	121	151	95	15	34	285	84	6	29	83	36
Navigation Averages	5	22	128	34	1	5	29	10	1	4	8	4
Table Accessibility Averages	5	106	245	120	5	26	174	41	6	16	66	20
Comprehension Averages	33	104	270	118	9	40	186	69	9	33	116	44

Table 19: Low Vision - Time Ranges

Blind - Time Ranges (Seconds)												
	Content Set 1				Content Set 2				Content Set 3			
Activities	Low	Med	High	Avg	Low	Med	High	Avg	Low	Med	High	Avg
Navigation Activity 1	8	47	82	45	14	46	64	41	7	17	32	18
Navigation Activity 2	26	32	85	41	32	40	70	44	11	18	36	21
Navigation Activity 3	30	78	130	39	20	28	69	26	14	21	36	23
Table Accessibility Activity 4	46	192	438	221	42	71	182	90	40	52	163	71
Table Accessibility Activity 5	16	28	100	42	7	10	50	17	6	15	61	26
Comprehension Activity 6	221	311	420	316	80	167	342	197	102	171	429	202
Comprehension Activity 7	166	241	504	268	27	152	328	165	39	152	449	191
Comprehension Activity 8	121	134	354	163	51	56	154	73	12	50	192	70
Comprehension Activity 9	130	146	221	137	71	118	188	123	9	85	178	90
Comprehension Activity 10	53	57	163	65	12	105	160	95	8	47	63	42
Navigation Averages	21	52	99	41	22	38	68	37	11	19	35	20
Table Accessibility Averages	31	110	269	132	25	41	116	53	23	33	112	48
Comprehension Averages	138	178	332	190	48	119	234	131	34	101	262	119

Table 20: Blind - Time Ranges

5.1.4 Inaccessible questions

Activities four through ten required the student to choose the correct answer from a list of five possible answers. For every activity the fifth option was "Unable to Determine." If a student selected this answer it was because they felt the page element required to answer the question was inaccessible. The different activities are listed in column one and each Content Set is listed in column two.

Blind - Inaccessible Activities (UTDs)			
	Content Set 1	Content Set 2	Content Set 3
Table Accessibility Activity 4	0	0	0
Table Accessibility Activity 5	1	0	0
Comprehension Activity 6	3	3	1
Comprehension Activity 7	5	2	1
Comprehension Activity 8	4	1	1
Comprehension Activity 9	2	0	0
Comprehension Activity 10	2	0	0
Total	17	6	3
Reduction From Content Set 1	-	65%	82%

Low Vision - Inaccessible Activities (UTDs)			
	Content Set 1	Content Set 2	Content Set 3
Table Accessibility Activity 4	2	1	0
Table Accessibility Activity 5	2	1	1
Comprehension Activity 6	0	0	0
Comprehension Activity 7	2	1	0
Comprehension Activity 8	1	1	0
Comprehension Activity 9	0	2	0
Comprehension Activity 10	0	0	0
Total	7	6	1
Reduction From Content Set 1	-	14%	86%

5.1.5 Activity Scores

Every activity had three possible outcomes: it was completed correctly, it was completed incorrectly, or the activity could not be completed because the Web page was inaccessible. Below is a breakdown of the different outcomes for each Content Set. Each activity is listed in the first column, and each Content Set broken down by inaccessible, incorrect, or correct answers.

Low Vision - Navigation Activity Results									
	Content Set 1			Content Set 2			Content Set 3		
	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct
Navigation Activity 1	0%	0%	100%	0%	0%	100%	14%	0%	86%
Navigation Activity 2	0%	29%	71%	0%	0%	100%	0%	0%	100%
Navigation Activity 3	0%	0%	100%	0%	0%	100%	0%	0%	100%
Activity Averages	0%	10%	90%	0%	0%	100%	5%	0%	95%

Table 21: Low Vision - Navigation Activity Results

Blind - Navigation Activity Results									
	Content Set 1			Content Set 2			Content Set 3		
	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct
Navigation Activity 1	0%	0%	100%	0%	0%	100%	0%	0%	100%
Navigation Activity 2	0%	0%	100%	0%	0%	100%	0%	0%	100%
Navigation Activity 3	0%	0%	100%	0%	0%	100%	0%	0%	100%
Navigation Averages	0%	0%	100%	0%	0%	100%	0%	0%	100%

Table 22: Blind Navigation Activity Results

Low Vision - Table Accessibility Activity Results									
	Content Set 1			Content Set 2			Content Set 3		
	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct
Table Access Activity 4	33%	24%	43%	17%	26%	57%	0%	14%	86%
Table Access Activity 5	33%	24%	43%	17%	26%	57%	0%	43%	57%
Table Access Averages	33%	24%	43%	17%	26%	57%	0%	29%	71%

Table 23: Low Vision Accessibility Activity Results

Blind - Table Accessibility Activity Results									
	Content Set 1			Content Set 2			Content Set 3		
	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct
Table Access Activity 4	0%	0%	100%	0%	0%	100%	0%	0%	100%
Table Access Activity 5	17%	17%	67%	0%	0%	100%	0%	0%	100%
Table Access Averages	8%	8%	83%	0%	0%	100%	0%	0%	100%

Table 24: Blind - Table Accessibility Activity Results

Low Vision - Comprehension Activity Results									
	Content Set 1			Content Set 2			Content Set 3		
	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct
Comprehension Activity 6	0%	0%	100%	0%	29%	71%	0%	43%	57%
Comprehension Activity 7	33%	38%	29%	17%	12%	71%	0%	0%	100%
Comprehension Activity 8	17%	12%	71%	14%	0%	86%	0%	71%	29%
Comprehension Activity 9	0%	0%	100%	33%	10%	57%	0%	43%	57%
Comprehension Activity 10	0%	0%	100%	0%	0%	100%	0%	0%	100%

Comprehension Averages	10%	10%	80%	13%	10%	77%	0%	31%	69%

Table 25: Low Vision - Comprehension Activity Results

Blind - Comprehension Activity Results									
	Content Set 1			Content Set 2			Content Set 3		
	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct	Inaccessible	Incorrect	Correct
Comprehension Activity 6	50%	0%	50%	50%	33%	17%	17%	17%	67%
Comprehension Activity 7	83%	17%	0%	33%	33%	33%	17%	0%	83%
Comprehension Activity 8	67%	17%	17%	17%	0%	83%	17%	17%	67%
Comprehension Activity 9	33%	0%	67%	0%	50%	50%	0%	33%	67%
Comprehension Activity 10	33%	0%	67%	0%	50%	50%	0%	17%	83%
Comprehension Averages	53%	7%	40%	20%	33%	47%	10%	17%	73%

Table 26: Blind - Comprehension Activity Results

5.1.6 Answer Sources

For Content Set 3, the Graph and Tables Handbook was used to provide alternate descriptions for images and tables. Following is a breakdown of where answers were retrieved from when students were given Content Set 3.

Blind Content Set 3 - Answer Sources		
	Table	Graph Descriptions
# of Answers	13	14

5.2 Employee Usability Test Results

For the employee usability test three ABS employees were given the Graph and Tables Handbook, ABS SPSG, ABS SPSG Accessibility Addendums, and the Lotus Notes Accessibility Tutorial and were asked to repair Content Set 1. After modification of the Web pages, each of the participants' work was sent to the activity administrator for review. Each modification was recorded, and then critiqued. Each checkpoint was marked as having been adequately satisfied (yes) or not (no). The quality of each modification was critiqued on a scale using the words "poor", "good" and "excellent". A "poor" rating meant the checkpoint was completed, but did not enhance the accessibility or comprehension of the Web page element. A "good" rating meant the Web element was completed in a manner consistent with the guidelines given. An "excellent" rating meant the Web page element was made accessible in the most efficient manner and satisfied the tutorial guidelines and the standards set forth by the Graph and Tables Handbook.

The following checkpoints were used to grade each modified Web page. Each of the checkpoints was used to evaluate the modified Web pages and determine their accessibility. For each checkpoint two things were checked; first if the checkpoint had been met and second the quality of the modification.

Participants				
Checkpoints	Web Content Developer	Visiting Teacher	Visiting Teacher	
Page 1				
Orientation				
Orientation Information	Yes	No	Yes	
Quality of Orientation Information	Good	N/A	Excellent	
Image Map				
Hot Spot alt-text description	Yes	No	Yes	
Quality of alt-text	Good (repetitive)	N/A	Excellent	
Picture alt-text description	Yes	N/A	No	*
Quality of alt-text	Excellent	N/A	N/A	*
Page 2				
Pictures				
Figure 1 alt-text description	Yes	No	No	*
Quality of alt-text	Excellent	N/A	N/A	
Figure 2 alt-text description	No	No	No	*
Quality of alt-text	N/A	N/A	N/A	
Table				
Column Headers	Yes	Yes	Yes	
Appropriate abbreviations	Yes	Yes	Yes	
Quality of abbreviations	Excellent	Excellent	Excellent	
Excess Rows/Columns Deleted	Yes	Yes	Yes	
Horizontal Rules Moved/Deleted	Yes	Yes	Yes	
Microsoft Excel Version	Yes	Yes	Yes	
Quality of Microsoft Excel Version	Good	Good	Good	*
Table Correctly Formatted	Yes	Yes	Yes	
Graph				
Graph alt-text description	Yes	Yes	No	
Quality of alt-text description	Excellent	Excellent	N/A	*
Extended text description of graph	Yes	Yes	Yes	
Quality of text description	Good	Poor	Excellent	*
Enlarged Version	No	Yes	Yes	
Quality of Enlarged Version	N/A	Excellent	Excellent	

Problem Areas (*)

Table 27: Employee Usability Results

5.2.1 Conclusion

By breaking down the Student Usability Study's results into navigation, table accessibility, and comprehension activities the project team can isolate any problem areas. Also, by analysing the answer sources it can be determined if the Graph and Tables Handbook was a useful tool in describing complex graphs. The results of the Employee Usability aids in determining if the proposed changes to the ABS SPSG will be successful or not.

6. Analysis

6.1 Student Usability Test Analysis

6.1.1 Analysis techniques used

Both blind and low vision students have unique thought processes that are used to interpret information and draw conclusions. In addition, low vision individuals have some degree of sight (although this may vary widely depending on the individual) and their thought process can make use of both visual and audible information. On the other hand, a totally blind student can only use audible information. Because of the different learning styles, combining both low vision and blind students into the single category of "Visually Impaired" for analysis would not be an appropriate comparison. Therefore, the visually impaired individuals participating in the study are separated into two distinct groups, low vision and blind. Within each of these groups are two sections of analysis, numerical analysis and content analysis. The first section of analysis consists of numerical data that was gained through the Web content activities. Each of the activities were timed and marked as a correct or an incorrect answer. For the first three navigation questions, incorrect links were also noted, and for the last seven questions, the sources of answers were marked either table, type of graph, or description. The time taken to complete the activities, the number correct and the number of 'Unable to Determine' responses were all used in the analysis of the Web content activity results. The second section of analysis, content analysis, evaluates the information gained through group interviews. In these interviews the participants were asked to communicate their thoughts, feelings, opinions and recommendations about the Web content they had previously reviewed.

To assess the effectiveness of the three Web pages used in the study the results were broken down into three separate categories. These categories are as follows: navigability, table accessibility and comprehension. These three categories were initially chosen in the web page designs so that various elements of the content could be focused upon when all the data had been gathered. These predetermined areas of the Web content, allowed the project team to gain a more insightful view into the accessibility and comprehendability of the various activities.

6.1.2 Navigability

At the core of the study lies the issue of accessibility. Are visually impaired individuals able to move around a given Web page and find the information they require? The term "moving around" really means "navigability". Was the Web content easy to navigate? The first activities performed with all trial Web pages asked the students to find specific links given on the Web pages. How accurately and how quickly the students were able to perform the three tasks contains a great deal of information about the navigation quality of a Web page.

6.1.2.1 Low Vision

In reviewing the low vision median response times of Figure 15 it can be seen that the overall trend was a decrease for each successive Content Set. The lowest value of the median response time decreased the most from Content Set 1 to 2 with a change of only one second between Content Set 2 and 3.

Judging from Figures 15 and 16, participants in the study were able to complete activities more quickly as they progressed through each set of Web content. This decrease in time may be attributed to the students' learning the layout of the content and being able to predict the type of tasks that would be asked of them. As a result of time and scheduling constraints, Content Sets 1 and 2 were given to the participants within the same day and therefore the page layout may have been fresh in their minds. Since the layout of each set of Web content was similar and the ordering of activities remained the same, the participants may have been able to predict what was going to be asked.

Content Sets 1 and 2 were very similar as far as low vision accessibility issues were concerned, but Content Set 3 included a large number of modified Web content specifically aimed at low vision users. Unfortunately, these added features do not seem to have increased the response times for the participants involved. On the other hand, as can be seen from Figure 15, a median time of 4 seconds was a quick response in itself and would be difficult for even the most experienced users to beat. Testing with sighted students would be necessary to establish standard response times for comparison.

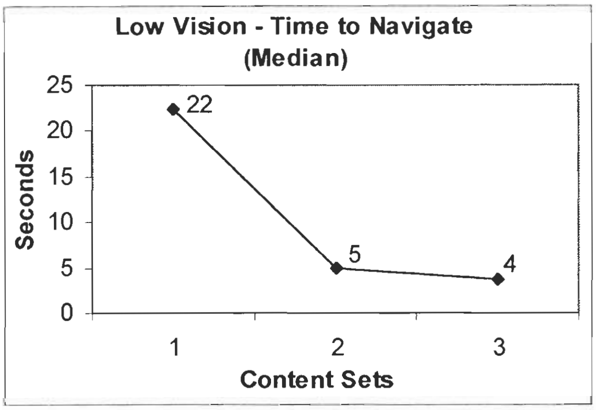
In terms of score for the navigation questions, the percentage of correctly answered questions remained about the same. For Content Set 1, 90 % of the navigation tasks were correctly completed, for Content Set 2 100% and for Content Set 3 95%. While the added accessibility features were previously stated as being helpful for future content, their inclusion did not seem to increase the results for the percentage of correctly chosen links.

6.1.2.2 Blind

Blind users showed a much more gradual decrease in median response time for the navigation section of the project. The greatest change in median response time occurred between Content Sets 2 and 3 with a decrease of 19 seconds compared to the reduction of 14 seconds between Content Sets 1 and 2. Again, like the low vision users, some of the decrease in time between the sets of content can be attributed to the learning curve. These users, in particular, were given all three of the trial Web pages within the same day and as a result the learning curve played a much more significant role in the outcomes of scores. Despite this fact, because there was such a significant time decrease between Content Sets 2 and 3 the medium response time was smaller, which can be attributed to the accessibility features added. In Content Set 3, alternate text was added to the image map and because of this it took less time for the participants to navigate to designated points. This was because the image maps' alternate text allowed these users to hear the links much sooner than they had previously. The users no longer had to wait for the whole page to be read, they could just go to the image map and the list was read to them. Since they were able to hear and select the links sooner the response time decreased.

As for the content's effect on score, it can be seen that the blind participants chose the correct links in every set of trial Web Content.

Figure 14: Blind - Time to Navigate



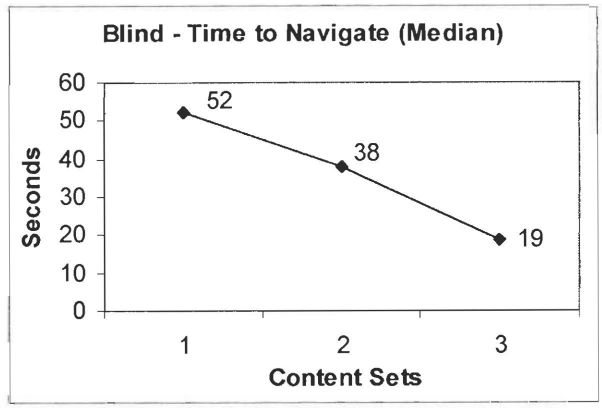


Figure 15: Low Vision – Time to Navigate

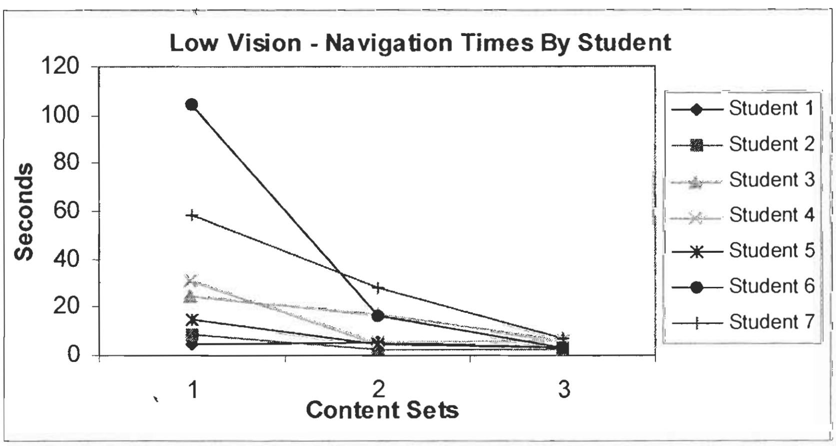


Figure 16: Low Vision - Navigation by Student

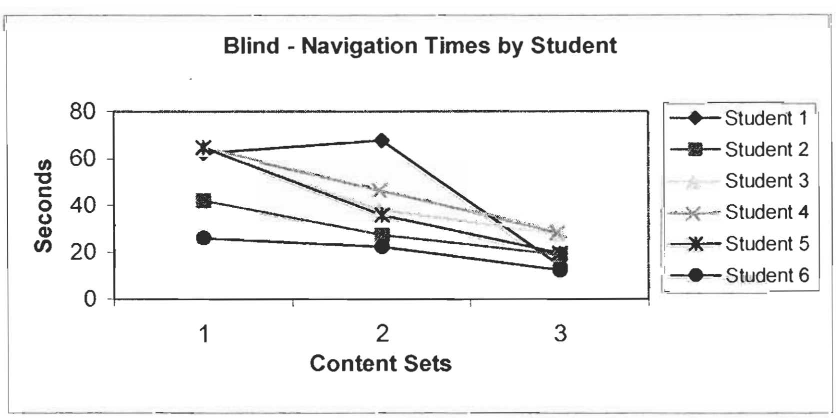
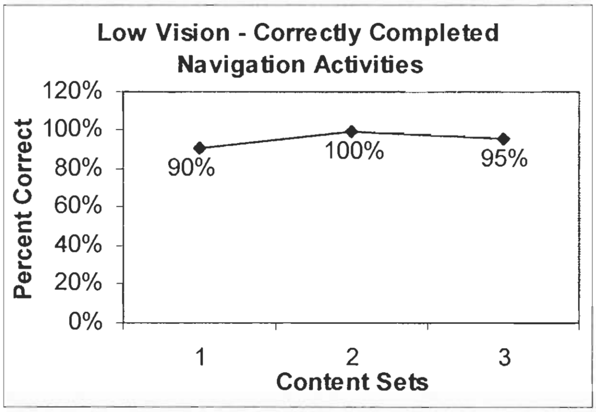


Figure 17: Blind - Navigation by Student

Figure 18: Low Vision Navigation Activities



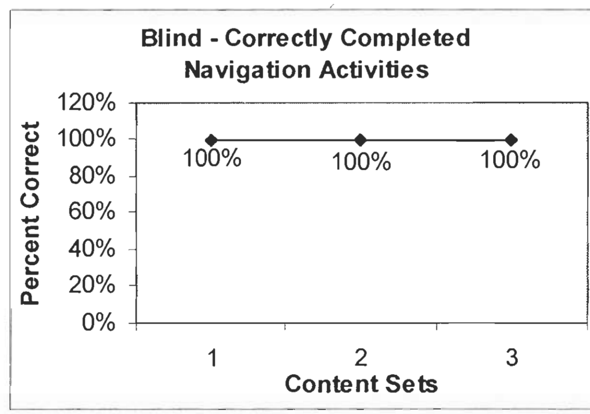


Figure 19: Blind - Correctly Completed Navigation Activities

6.1.3 Table Accessibility

The ABS Web site contains thousands of tables, each with varying layout and content. As a result of their numerous appearances in ABS statistical as well as educational resources, table accessibility is of particular importance in the analysis of the trial web content. After participants in the study completed their navigation tasks they were asked two questions dealing with a table. More specifically, the participants were asked to search through a table and find two particular numerical data values. From the results of these questions, the project team was able to determine the accessibility of the tables given in each Content Set and assess the effectiveness of accessibility features added to the web content.

6.1.3.1 Low Vision

Overall, response times for table accessibility decreased for each sequential set of Web content given to the users. The greatest change in median response time for navigation of the table occurred between Content Sets 1 and 2 with a decrease in median response time of 80 seconds (76% decrease). The decrease between Content Sets 2 and 3 was only 10 seconds. The larger change between Content Sets 1 and 2 can again be attributed to the learning curve.

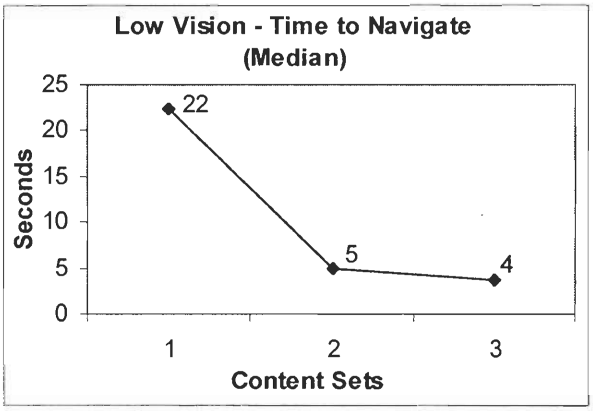
This was the first time participants in the study had been exposed to the information and as a result it took them a longer time to familiarise themselves with the information presented. The tables used in each set of content were exactly the same except for the numerical data that were in each of them. Once the participants had initially gone through the table, the task of finding data values was much simpler because of pervious exposure to the information. The likelihood that a user could reduce their time almost in half in the third set just because of the learning curve is not a strongly supported argument. Most of the learning in respect to the layout of the table took place between Content Sets 1 and 2 and as a result the learning curve seemed to have played a minimal role between Content Sets 2 and 3. Therefore the reduction in response time seems to be more of an effect of the accessibility features added. Examining the scoring results of users will further support this hypothesis.

As seen in Figure 24 the score increase was a constant 14% between all sets of content. This steadily increasing score does not follow the typical learning curve trend that has been previously seen in the data. Because of the decreasing response time and increasing scores it can clearly be recognised that the changes implemented were effective.

6.1.3.2 Blind

The trend present in the low vision students was extremely similar to the trend found for blind students. Blind students in the study experienced the greatest decrease in median time between Content Sets 1 and 2 with a decrease of 69 seconds (63% decrease), while the response time differences between Content Sets 1 and 3 was found to be 77 seconds (70% decrease). Again after becoming accustomed to the Web content (from having viewed Content Set 1) the amount of time needed to respond to questions decreased significantly. Once the learning curve had occurred the response time decrease was less as significant and can be attributed to the accessibility features introduced. This can also be seen through the scores of correctly answered table accessibility questions (Figure 25). There was a 17% increase in the percentage of correctly answered questions between Content Sets 1 and 2, due to the fact that participants needed to time to understand how the table was laid out. Once the table layout was understood scores remained a perfect 100%.

Figure 20: Low Vision -Time to Navigate



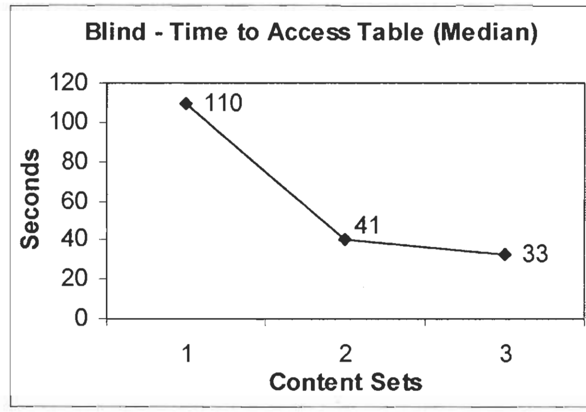


Figure 21: Blind to Access Table

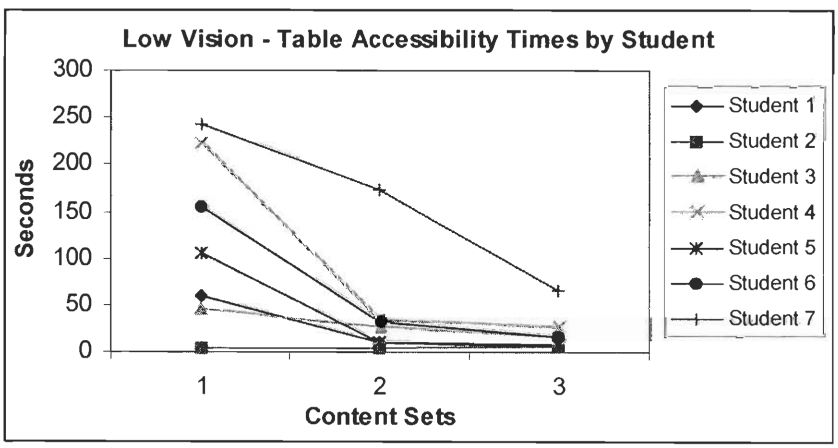


Figure 22: Low Vision -Table Accessibility Time by Student

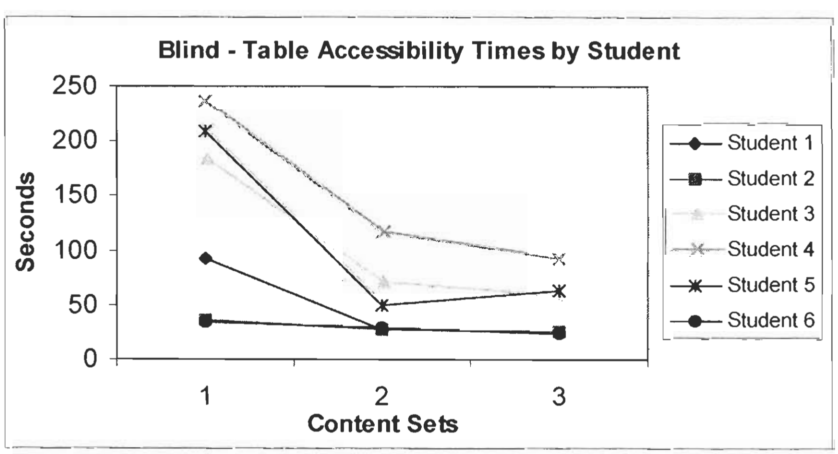
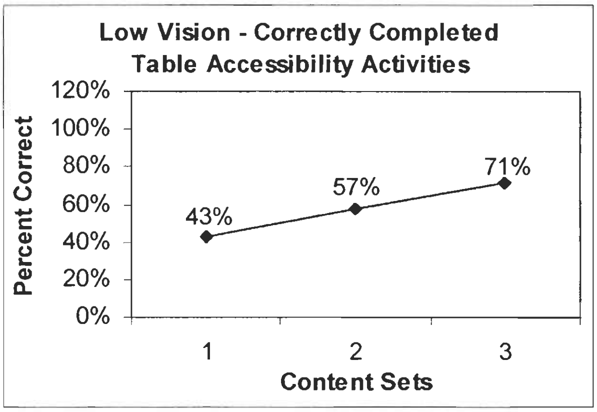


Figure 23: Blind - Table Accessibility Time by Student

Figure 24: Low Vision - Correctly Completed Table Accessibility Activities



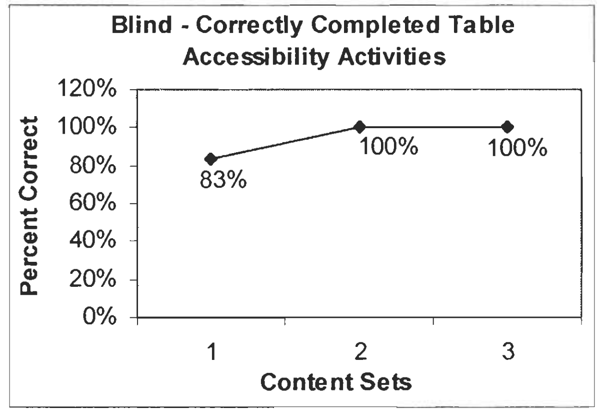


Figure 25: Blind - Correctly Completed Table Accessibilities

6.1.4 Comprehension

One aspect of accessibility that is most often overlooked is comprehension. Current guidelines detail the techniques needed to make their Web content accessible to visually impaired individuals, but they do not help in designing the most comprehendible content for Web page. Being able to access the information available on a Web page is a much simpler issue than being able to understand the information present in a Web page. Five questions were used in the trial Web content to evaluate the participant's comprehension when several techniques were used. The participants were given a variety of sources (i.e. Web elements) to use in completing the activities.

6.1.4.1 Low Vision

Low vision participants experienced the same trend that was present in table accessibility and navigation data. There was a marked decrease in median response time between Content Sets 1 and 2 of 64 seconds (62% decrease) and a slight decrease of 71 seconds (69% decrease) between Content Sets 1 and 3.

The percent of activities completed correctly by low vision participants actually decreased throughout the three sets of content. Since the difficulty of the activities did not dramatically increase between each set of activities, it seems highly unlikely that the content was the cause of the decrease in scores. One reason may be a result of the environment in which the activity was administered. For low vision students, Content Sets 1 and 2 were both administered at RVIB, while Content Set 3 was administered in their homes. At RVIB the setting was more conducive to a testing environment; the students were there to go to classes and approached the Web activity with a much more serious attitude. At the participants' individual homes the atmosphere was much more casual and there were more distractions. From the perspective of the activity administrators the participants seemed more interested in the completion of the activity than answering the questions correctly. To combat this attitude, participants were told to approach the activity as a test or homework assignment, but this did not seem to increase their effort or concentration. This may be the reason why scores dropped the greatest between Content Sets 1 and 3.

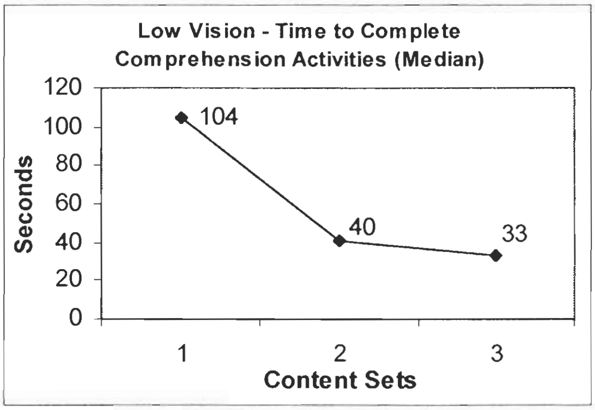
Despite this decrease in percentage of correctly answered questions it can be noted that the percentage of inaccessible questions was 0 for Content Set 3 and 10% for Content Sets 1 and 2. For low vision users, there was very little difference between the accessibility content of 1 and 2 and the fact that the percentage of inaccessible questions remained the same demonstrates this fact. The majority of accessibility elements were added to Content Set 3. The fact that none of the questions were inaccessible further backs up the statements that the accessibility additions were useful in improving the accessibility of the Web page.

6.1.4.2 Blind

Blind vision participants experienced the same trend that was present in table accessibility and navigation data. There was a dramatic decrease in response time between Content Sets 1 and 2 of 59 seconds (33% decrease) and a slight decrease of 77 seconds between Content Sets 1 and 3 (43% decrease). The overall decreasing response time in the comprehension data was less noticeable as it was for the table accessibility data. This information further supports the hypothesis that the decreases were not so much a result of previous exposure to the Web page as they were a result of added elements of accessibility.

The percentage of correctly answered accessibility questions illustrates the profound impact that the added accessibility elements had. Between Content Sets 1 and 2 there was an increase of 7% in comprehension scores and then an increase of 26% between sets 2 and 3. In addition to an increasing percentage of correctly answered questions it was discovered that the number of inaccessible questions was decreasing for sequential content sets. The project team found that a decrease of 33% in the percentage of inaccessible questions occurred between Content Sets 1 and 2 this percentage decreased by an additional 10% from set 2 to 3.

Figure 26: Low Vision - Time to Completed Comprehension Activities



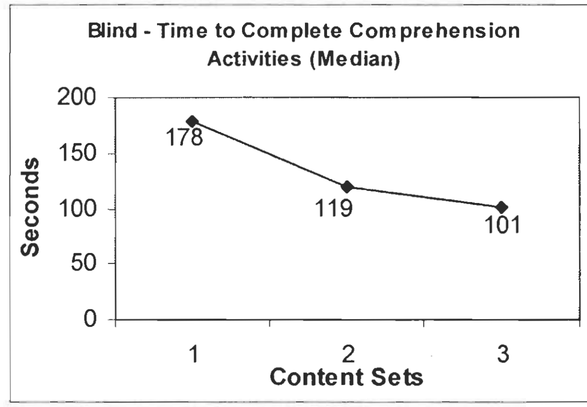


Figure 27: Blind - Time to Complete Comprehension Activities

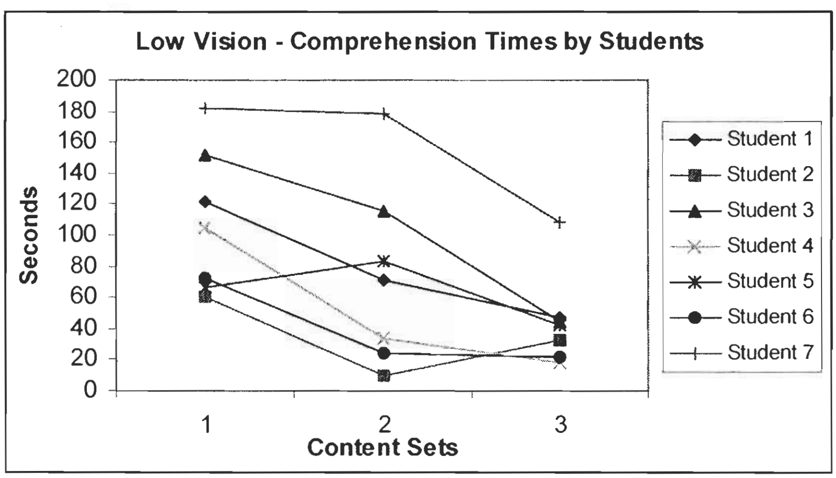
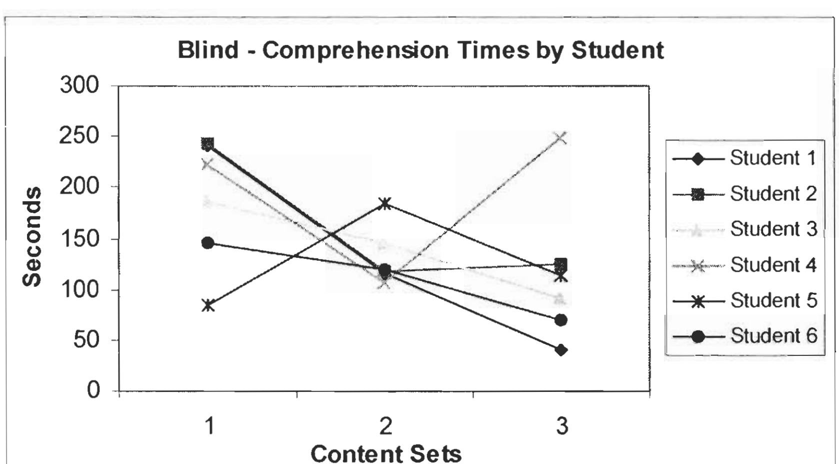


Figure 28: Low Vision - Comprehension times by Student



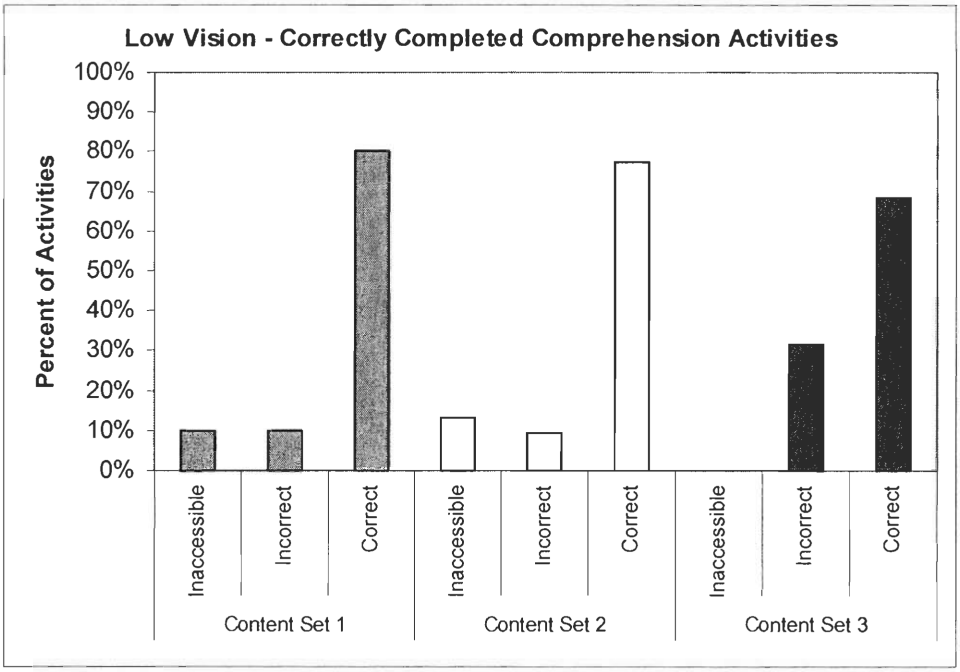


Figure 29: Low Vision - Correctly Completed Comprehension Activities

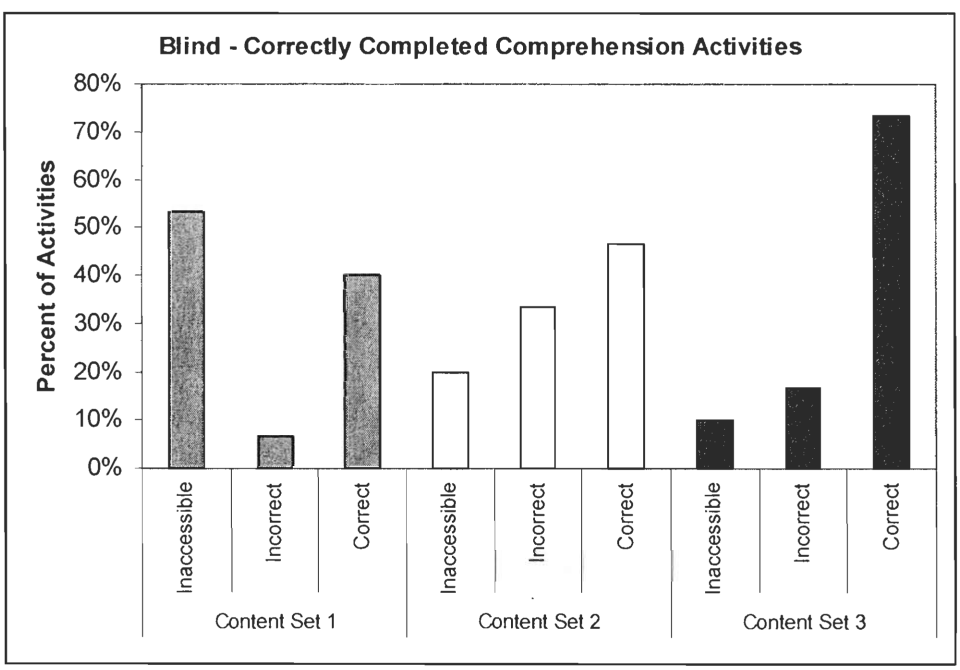


Figure 30: Blind - Correctly Completed Comprehension Activities

6.1.5 Overall

The overall trend observed in the analysis of the low vision participants was that increased accessibility elements added to the Web content do indeed result in a demonstrable increase in the Web pages' accessibility. Although there was an increase in the accessibility of the Web page, a comprehension increase for low vision students was not evident in the results due to the unforeseen effects of the design protocol used in testing. These unforseen effects may be the result of a variety of factors. These factors include the changing testing environment, the learning curve present in the testing protocol, the generally younger age for low vision users and the more limited knowledge base for the majority of the participants in the study. Compared to the blind participants in the study, the majority of low vision users were much younger and as a result had less experience with the Internet and statistical content of the study. Based just on age alone, it should seem reasonable that Blind participants score higher because on average they have had more exposure to Web technologies and statistical information. The project team believes that with a modified testing methodology and more consistent sample group the results for low vision users would be found to be as significant as they were found for blind participants in the study.

For blind students the results confidently show that the inclusion of accessibility elements and the use of the graph and tables handbook were effective changes. These additions increased the accessibility and comprehension of the Web content tested.

6.2 Group Interview Content Analysis

6.2.1 Introduction to Categories

In order to quantify the qualitative data gathered during each focus group session, a suitable method of content analysis was applied. The project team decided to count the major themes and concepts that prevailed. All feedback given by the students in the focus groups could be placed into one of four categories: Difficulties, Suggestions, Useful Features, or Features Overlooked. Each piece of feedback was then further categorised under Navigation, Table Accessibility, or Comprehension. In the Features Overlooked section, students were asked about changes that they may have neglected, and how those changes could have been better pointed out initially. Judging by the positive or negative connotation associated with the feedback and the frequency with which it was mentioned, the project team was able to draw conclusions about the success of the guidelines.

Table of Major Themes

<table>
<tr><th>Major Themes:</th><th>Content Set 1</th><th>Content Set 2</th><th>Content Set 3</th></tr>
<tr><td>Difficulties:</td><td></td><td></td><td></td></tr>
<tr><td>Navigation</td><td></td><td></td><td></td></tr>
<tr><td>Page was ambiguous, not clearly labeled</td><td>||</td><td>||</td><td></td></tr>
<tr><td>Image map was difficult</td><td>||</td><td>||</td><td>|</td></tr>
<tr><td>Mouseover links did not work with high contrast screens</td><td></td><td></td><td>|</td></tr>
<tr><td>Mouseover text wasn't big enough</td><td></td><td>|</td><td></td></tr>
<tr><td>Links blended in too easily with proceeding paragraph</td><td></td><td></td><td>|</td></tr>
<tr><td>Yellow on white was annoying</td><td>||</td><td></td><td></td></tr>
<tr><td>Table Accessibility</td><td></td><td></td><td></td></tr>
<tr><td>Table was too lengthy</td><td>卌
|</td><td>||</td><td>|</td></tr>
<tr><td>Lost orientation within the table</td><td>卌
|</td><td>|||</td><td>||</td></tr>
<tr><td>Scroll bars were difficult to notice</td><td>||</td><td></td><td></td></tr>
<tr><td>Horizontal rules are bad</td><td>|</td><td></td><td></td></tr>
<tr><td>Columns in table were a little off</td><td>|</td><td>||</td><td></td></tr>
<tr><td>Comprehension</td><td></td><td></td><td></td></tr>
<tr><td>Lesson plan was too hard or not useful</td><td>||||</td><td>||</td><td>||||</td></tr>
<tr><td>Graphs were too small</td><td>||</td><td></td><td></td></tr>
<tr><td>ALT-text not enough to describe graphs</td><td></td><td>||||</td><td></td></tr>
<tr><td>Grey background on bar graph made it difficult to read</td><td></td><td></td><td>|</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Suggestions:</td><td></td><td></td><td></td></tr>
<tr><td>Navigation</td><td></td><td></td><td></td></tr>
<tr><td>Make page customisable</td><td>|</td><td></td><td></td></tr>
<tr><td>Have mouseover links*</td><td></td><td>||</td><td></td></tr>
<tr><td>Table Accessibility</td><td></td><td></td><td></td></tr>
<tr><td>Use contrasting colours for table columns*</td><td>|</td><td></td><td></td></tr>
<tr><td>Excel versions of the tables would be nice*</td><td>|</td><td></td><td></td></tr>
<tr><td>Make text and numbers larger</td><td>|</td><td>|</td><td>|</td></tr>
<tr><td>Remove clutter (extra columns) from tables*</td><td>|</td><td>|</td><td></td></tr>
<tr><td>Use lines to separate information in tables*</td><td></td><td>||</td><td></td></tr>
<tr><td>Comprehension</td><td></td><td></td><td></td></tr>
<tr><td>Have links to full-screen images*</td><td>||||</td><td></td><td></td></tr>
<tr><td>Simplify vocabulary or define key words</td><td>|||</td><td>|</td><td></td></tr>
</table>

<table>
<tr><td>Describe graphs in detail*</td><td>|</td><td>|||</td><td></td></tr>
<tr><td>Orient user with the page first</td><td>|</td><td></td><td>||</td></tr>
<tr><td>Include units with each cell of data</td><td>|</td><td>|</td><td>|</td></tr>
<tr><td>Use gridlines to help read values in graphs</td><td></td><td>||</td><td>|</td></tr>
<tr><td>Leave some redundant words out of description for faster reading</td><td></td><td></td><td>||</td></tr>
<tr><td>Keep sentences on one line, JAWS doesn't know word wrap</td><td></td><td></td><td>|</td></tr>
<tr><td>Include fractions in pie chart description</td><td></td><td></td><td>|</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Useful Features:</td><td></td><td></td><td></td></tr>
<tr><td>Navigation</td><td></td><td></td><td></td></tr>
<tr><td>Image map ALT-text was helpful</td><td></td><td></td><td>||||</td></tr>
<tr><td>Fairly easy navigation</td><td>卌</td><td>||||</td><td>|||</td></tr>
<tr><td>Links were easy to follow</td><td>||||</td><td>||</td><td>|||</td></tr>
<tr><td>Mouseover links were helpful</td><td></td><td></td><td>|||</td></tr>
<tr><td>Text was an adequate size</td><td>||</td><td></td><td></td></tr>
<tr><td>Standard ABS links were all grouped at the bottom</td><td>||</td><td></td><td></td></tr>
<tr><td>Table Accessibility</td><td></td><td></td><td></td></tr>
<tr><td>First table was easy, only 3 columns to remember</td><td>|</td><td>|</td><td></td></tr>
<tr><td>Table borders were helpful</td><td></td><td></td><td>||||</td></tr>
<tr><td>Table headers were helpful</td><td></td><td></td><td>|||</td></tr>
<tr><td>Comprehension</td><td></td><td></td><td></td></tr>
<tr><td>Gridlines behind graphs were helpful</td><td></td><td></td><td>|</td></tr>
<tr><td>Graph descriptions were helpful</td><td></td><td></td><td>卌</td></tr>
<tr><td>Enlarged graphs were helpful</td><td></td><td></td><td>|||</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Features Overlooked:</td><td></td><td></td><td></td></tr>
<tr><td>Make links permanently highlighted</td><td></td><td></td><td>|</td></tr>
<tr><td>Use icon to symbolise link to enlarged graph or Excel file</td><td></td><td></td><td>||||</td></tr>
</table>

Table 28: Table of Major Themes

* Implemented before Content Set 3 was frozen.

6.2.1.1 Difficulties

Difficulties, as expressed by the students, ranged from navigation to comprehension, and therefore encompassed all problems with the test content. For most difficulties mentioned there is a corresponding suggested solution. The project team was able to implement some of these solutions before Content Set 3 was frozen. These implementations will be discussed in the "Content Changes" section below. A discussion of some of the recurring difficulties follows, with reference to their relative severity.

There were two interrelated problems that the students had with tables: length and orientation. Most students mentioned both words in the same sentence, indicating a strong correlation between the two variables. The problem was especially manifest in the first two sets of test content, where the headers were less clearly labeled and there was no table summary preceding the actual table. Students were frequently forced to return to the table headers to re-orient themselves with the numbers and corresponding columns for which they were searching. Some students became so frustrated with this inconvenience that they gave up entirely on the question and answered "Unable to Determine". Unfortunately, there is not much that can be done to reduce the length of a table, but certain measures can be taken to ease orientation within a table. The Graph and Tables Handbook includes suggestions on how to improve table accessibility. The reduction in table-related difficulties in Content Set 3 demonstrates the effectiveness of the methods outlined in the Graph and the Tables Handbook.

Another common complaint dealt with the size of various elements on the page, such as text, graphs, and scroll bars. This critique was limited to low vision users, since blind users could not comment on the size of an element. With varying degrees of vision loss, specifying a minimum font or graphic size is difficult. Ultimately, the user would like to be able to alter the size of anything on the screen, but until that technology is perfected, Web content developers should practise reasonable design courtesy by not making any element smaller than necessary.

6.2.1.2 Suggestions

Suggestions made the focus group sessions most successful. Students not only told the project team what was wrong with the page, but also proposed solutions to each problem. Some of these suggestions were simple and easy to implement, but others were far-fetched and would have required an elaborate redesign of the page. The goal of universal design is difficult to keep in mind when listening to the requests of two different subgroups with different wants and needs, so a delicate balance is important to maintain. The project team carefully considered all suggestions, and then chose the ones that adhered to the principles of universal design.

Low vision users suggested making the text and graphs bigger and using bold, contrasting colours. While blind users are indifferent to these settings, they did request that size and colour references be made in the descriptions of various elements, to help them picture the image and mentally map the layout of the page.

Some low vision users suggested making the page completely customisable with a uniform tool bar at the top of each page. The project team believe this to be a potentially worthwhile idea, but at the same time, it would be a considerable project to integrate into each and every page of existing ABS Web content, and as such, will be left up to the ABS.

Another suggestion that applies only to low vision users is having a link to an enlarged version of each graph. The enlarged versions allow low vision users to read data points with less strain on their eyes. The implementation of this feature is fairly simple, and only adds an extra link for totally blind users to listen to.

Graphs were so inaccessible in the first set of content that only one blind user recognised the fact that there were any graphs at all. In the second set, additional blind users noticed the presence of the images, but commented that they were completely useless unless a more detailed description was given. In response to those comments, the group interview administrators probed the users for what specific information was required for a graph description to be useful. Many of these suggestions allowed the project team to improve the Graph and Tables Handbook.

6.2.1.3 Useful Features

The useful features mentioned by the students allowed the project team to gauge the relative success of each Content Set. If a student complained about a certain difficulty in one set and then praised its ease of accessibility in the next set, the change could be deemed a suitable correction. Most of the useful features did not surface until the third set of test content, where many of the changes that the users requested were implemented.

Throughout all three sets of test content, most users noted that navigation was simple. There was nothing so complicated about the page that the user would get lost or not be able to find a link. Most users appreciated this, and made mention of it in the focus group sessions. Other users respected the fact that all of the standard ABS navigation links were placed at the bottom of the page. This kept the clutter out of the way for JAWS users, and did not distract the low vision subjects.

The rest of the useful features were associated with the third set of test content. This showed a considerable improvement from Content Sets 1 and 2, where the only real useful features were in reference to navigation. The students voiced their appreciation for the changes in the third set of content. Low vision users praised the enlarged graphs, highlighted links, and table borders, while blind users commended the descriptions of the graphs, image map ALT-text, and descriptive table headers. These are all encouraging comments because they show that the changes made to the third set of content were worthwhile.

6.2.2 Content Changes

The project team did not have to freeze Content Set 3 until just prior to the first administration of the Content Set 3 Student Usability Study. Because of the spread out testing schedule, this allowed the project team approximately two weeks to implement some of the suggestions made by the students early in the testing process. The following is a summary of what was changed between the dates testing commenced until the time Content Set 3 was frozen. To ensure consistency within each test group, no changes were made to the content after the first group of students had tested it.

The project team made an enlarged version of each graph, which was approximately eighty percent bigger than the original graphs. These enlarged versions were made available through a link directly beneath each original graph. A second link was added below each graph, leading to a text description of the graph. The project team adhered to the guidelines in the Graph and Tables Handbook when writing the descriptions.

The tables underwent a large makeover for the third set of test content. Blank columns were removed, borders were added around all cells, columns were alternately coloured, and an Excel version of each table was made available. The original tables contained extra columns for spacing, but these confused JAWS users. By removing them, JAWS read the appropriate number of columns and rows to the user, avoiding confusion. Contrasting colours in every other column used in combination with table borders helped low vision users to follow down the table to find specific values. Finally, making an Excel version available to users allowed them to fully customise text, font, colours, and shading if necessary.

The last major modification to Content Set 3 involved implementing mouseover links, meaning the link text became highlighted whenever the user passed the mouse over it. Many of the low vision students suggested making links bolder, bigger, or different colours in the first two sets, so the project team utilised JavaScript technology to implement highlighted links.

6.2.2.1 Features Overlooked

After the completion of each Student Usability Study, the test administrators pointed out any changes in the content of which the students had not taken advantage. Most of the students failed to notice all of the differences between Content Sets 2 and 3, and this is one reason that there are only small differences in the results from Content Sets 2 to 3. Since the test administrators could not interrupt the study to point out the accessibility changes, the focus group session immediately following the study was used to inquire about these changes and what made them hard to notice.

The least noticed feature was the links to the enlarged graphs and text descriptions of the graphs. Most of the blind users had become accustomed to relying on the table to answer all questions, and if the answer could not be found in the table, they simply responded “Unable to Determine”. The low vision users had trouble spotting the extra links because they blended in too easily with the preceding paragraph of text. Also, since the links were resident on the test administrator’s laptop computer, they had already been visited and were therefore greyed out. Two solutions were proposed to this problem. The blind users suggested that a description of the layout of the entire page be given at the top of each page. Among other details, this description would include how many graphs were on the page, and mention that below each graph was a link to a text description of the graph. Low vision users requested visual cues, such as icons or different coloured text, to draw attention to each link. While both suggestions are fairly reasonable, they add unnecessary clutter to the Web page. The blind audience would love a description of the page layout at the top, but to partially sighted users who could see the page layout already, it would be an added redundancy. On the other hand, low vision users may benefit from an icon indicating a link to an enlarged graph, but to blind users, it would be just another useless graphic.

The other commonly missed feature, or rather, a requested modification, was having highlighted links. Some of the low vision students complimented them, while others barely noticed. For those who barely noticed, the suggested solution was to make the links permanently highlighted. The project team question the effectiveness of this practise however, because a permanently highlighted link may actually blend in more than a link that only lights up as the mouse passes over it. Mouseover links almost create a blinking sensation for low vision users, giving them immediate feedback that they are indeed hovering over something "clickable". The project team are in favour of mouseover links rather than permanently highlighted links.

7. Conclusions

7.1 Redesign of the Student Usability Study

If the project team could redesign the Student Usability Study, there are several things that would change. The test results should be less biased if each Content Set were tested on a different day preferably spread out over a few weeks to minimise retention of information. The students would trial all three sets of content in the same testing environment.

The questions in the Student Usability Study were too similar from set to set. The students frequently tried to predict the question that was being asked, and were sometimes able to give the answer before the test administrator completed reading the question, resulting in a time of zero seconds. In order to combat this problem, the project team could have asked slightly different questions each time. Instead of asking the student to navigate to the State of Victoria in all three sets or find the number of females employed in each table, the students could have been asked to navigate to three different states, and find three different demographic figures.

Besides varying the questions, the project team could have also varied the location of the answers on each page. By varying the order of categories in a table, the desired cell might be found near the top of the table in the first content set, near the bottom in the next content set, and then near the middle in the third content set. This would prevent the students from memorising the location of the answers in the table. If a follow-up study were to be done, the project team would make all of the aforementioned changes to its design to measure the validity of the original study.

7.2 Student Usability Study

7.2.1 Summary

Both the quantitative and qualitative results of the Student Usability Study show that the newly revised ABS guidelines do provide a level of accessibility, but fail to provide Web content that is educationally valuable to the visually impaired audience. When the project team's Addendums were incorporated into Content Set 3, the test scores and accessibility of the information increased dramatically. Low vision and totally blind students can learn far more effectively when reviewing Web content created using the Addendums. Single 'A' accessibility compliance (as described by the newly revised ABS standards) does not provide a level of accessibility that meets current government standards, because the ABS had not yet found a way to meet some checkpoints regarding tables. The project team has shown that these guidelines can be implemented using the current ABS Web development environment and are beneficial to the visually impaired audience.

7.2 2 Low Vision Results

The greatest percentage of questions answered in the Student Usability Study was in Content Set 2. Many accessibility features were added to Content Set 3, but the participants noticed few of these. The project team feels that these accessibility elements would have been more helpful to the low vision students if more concentration were put into the activity. All elements added to Content Set 3 were continually stated in the group interviews as features that would make Web content more accessible. Unfortunately, due to the testing environment the majority of these elements were not utilised and as a result, scores were poorer than theorised.

7.2.3 Blind Results

Although the response times of participants did not continue to decrease between Content Sets 2 and 3, the number of accessible elements and correct responses increased. There were a greater number of correctly answered questions, and the number of "Unable to Determine" questions decreased for each set of content. From this it can be concluded that the changes made to Content Set 3 were effective. For the blind audience, the project team's Addendums and Graph and Tables Handbook both proved to be extremely useful tools in increasing the accessibility and educational value of the Web content. These tools should be implemented in ABS guidelines to ensure that the visually impaired audience has the most accessible ABS Web navigating experience possible.

7.3 Employee Usability Study

All three of the ABS employees were able to repair the Web content to minimum accessibility as noted in the ABS guidelines. Two out of the three employees were able to go above and beyond the minimum requirements and add every accessibility feature and provide helpful descriptions for page elements. Those results indicate that the project team's Addendums are understandable and able to be implemented through Lotus Notes.

7.4 ABS Web Content Guideline Addendums

The newly revised ABS Guidelines lack sufficient instructions on how to make a Web page accessible. While the guidelines currently have great instructions on how to use alternate text for graphics, they are in need of instructions on how to make tables and graphs accessible. Single 'A' compliance is the minimal form of compliance rating granted by the W3C, but as this project team's data show, it does not necessarily result in a more accessible or comprehendible site. The addition of the project team's addendums into current ABS standards will allow a much larger portion of the visually impaired population to benefit from the ABS Website. These addendums can also serve as a resource to ensure that each guideline (as stated by the W3C and WGBH) has been met, if possible, and that if the ABS is not able to meet a guideline, the justification for this is given. The addendums can be incorporated into the current ABS WWW Site Publishing Standards and Guidelines because they were created in the same format as the newly revised ABS Guidelines document.

7.5 Lotus Notes Accessibility Tutorial

The newly revised ABS Web standards address many of the accessibility guidelines as described by the W3C, but the methods by which they are presented make implementation difficult. If Web content developers cannot implement the accessibility guidelines using Lotus Notes, then the benefits that the guidelines provide to the visually impaired will be nonexistent.

The Accessibility Tutorial was designed to teach the most inexperienced ABS Web developer how to change current content so that it can be accessible to a W3C compliance level of "AA". The Tutorial conforms to the current format used in the ABS WWW Site Publishing Standards and Guidelines and can easily be combined with the documentation that exists now. As shown by the Employee Usability Study, the group of volunteers was able to follow the initial guidelines and make the important changes necessary to create an accessible Web page. Although not all of the changes were completed to perfection, the results of the usability study do show that it was possible for three ABS employees to modify Web content accessible to a compliance level of 'AA'.

7.6 Graph and Tables Handbook Conclusions

The results of the Student Usability Study show some promising figures that back up the effectiveness of the Graph and Tables Handbook. First, fourteen out of twenty-seven sources used for answers in Content Set 3 were from the graph descriptions. The response times did not necessarily decrease because it still took time for the students to navigate to the description page and then listen to the description itself. However, the number of "Unable to Determine" responses dropped by fifty percent from Content Set 2 to Content Set 3. The percentage of correct answers jumped from 47% in the second set to 73% in the third set, a 26% increase. This, above all, demonstrates that the content in the third set was not only accessible, but also comprehendible, mostly due to the text descriptions of the graphs created based on methods described in the Graph and Tables Handbook.

7.7 Summary

The project team's Guideline Addendums, Lotus Notes Accessibility Tutorial, and Graph and Tables Handbook were all proven to be valuable tools in ABS Web content design. The results are evident in the two usability studies performed. In the Student Usability Study, visually impaired students showed a steady improvement in accessibility, navigability, and comprehension from an inaccessible Web page to the project team's revised content set. The Employee Usability Study supported the claim that ABS employees are able to produce accessible Web content. Overall, the project team has given the ABS three tools with which to design accessible content, and supported the usefulness of these tools with two usability studies. A strong recommendation of the project team would be that the ABS adopt the Guideline Addendums not only for educational Web pages, but for all new pages on the ABS website. The benefits of providing that extra level of accessibility to the visually impaired audience, secondary level students in particular, far outweigh the effort that it takes to implement the new guidelines.

8. Glossary

Accessible:

Content is accessible when it may be used by someone with a disability. (W3C, 1999b)

Applet:

A program inserted into a Web page. (W3C, 1999b)

Assistive Technology:

Software or hardware that has been specifically designed to assist people with disabilities in carrying out daily activities. Assistive technology includes wheelchairs, reading machines, devices for grasping, etc. In the area of Web Accessibility, common software-based assistive technologies include screen readers, screen magnifiers, speech synthesizers, and voice input software that operate in conjunction with graphical desktop browsers (among other user agents). Hardware assistive technologies include alternative keyboards and pointing devices. (W3C, 1999b)

Authoring Tool:

HTML editors, document conversion tools, tools that generate Web content from databases are all authoring tools. (W3C, 1999b)

Backwards Compatible:

Design that continues to work with earlier versions of a language, program, etc. (W3C, 1999b)

Braille:

Braille uses six raised dots in different patterns to represent letters and numbers to be read by people who are blind with their fingertips.

A Braille display, commonly referred to as a "dynamic Braille display," raises or lowers dot patterns on command from an electronic device, usually a computer. The result is a line of Braille that can change from moment to moment. Current dynamic Braille displays range in size from one cell (six or eight dots) to an eighty-cell line, most having between twelve and twenty cells per line. (W3C, 1999b)

Check Boxes:

In graphical user interfaces, a box that you can click to turn an option on or off. When the option is on, an X appears in the box. (Internet.com, 2001)

Content Developer:

A person who creates HTML or other documents or information that is to be displayed on the WWW.

Command Line Interfaces:

Refers to programs and operating systems that accept commands in the form of special words or letters. In contrast, programs that allow you to choose from a list of options in a menu are said to be menu driven. Command-driven software is often more flexible than menu-driven software, but it is more difficult to learn. (Internet.com, 2001)

Device Independent:

Users must be able to interact with a user agent (and the document it renders) using the supported input and output devices of their choice and according to their needs. Input devices may include pointing devices, keyboards, Braille devices, head wands, microphones, and others. Output devices may include monitors, speech synthesizers, and Braille devices.

Please note that "device-independent support" does not mean that user agents must support every input or output device. User agents should offer redundant input and output mechanisms for those devices that are supported. For example, if a user agent supports keyboard and mouse input, users should be able to interact with all features using either the keyboard or the mouse. (W3C, 1999b)

DLL:

Short for Dynamic Link Library, a library of executable functions or data that can be used by a Windows application.

A DLL can be used by several applications at the same time. Some DLLs are provided with the Windows operating system and available for any Windows application. Other DLLs are written for a particular application and are loaded with the application.

Document Content, Structure, Presentation:

The content of a document refers to what it says to the user through natural language, images, sounds, movies, animations, etc. The structure of a document is how it is organised logically (e.g., by chapter, with an introduction and table of contents, etc.). An element (e.g., P, STRONG, BLOCKQUOTE in HTML) that specifies document structure is called a structural element. The presentation of a document is how the document is rendered (e.g., as print, as a two-dimensional graphical presentation, as an text-only presentation, as synthesized speech, as Braille, etc.) An element that specifies document presentation (e.g., B, FONT, CENTER) is called a presentation element.

Consider a document header, for example. The content of the header is what the header says (e.g., "Sailboats"). In HTML, the header is a structural element marked up with, for example, an H2 element. Finally, the presentation of the header might be a bold block text in the margin, a centred line of text, a title spoken with a certain voice style (like an aural font), etc. (W3C, 1999b)

Drop Down Lists:

A list of items in a graphical user interface. All but one item in the list are hidden until it is selected. When the visible item is selected the other items in the list will be shown so a new item may be selected.

Element:

This document uses the term "element" both in the strict SGML sense (an element is a syntactic construct) and more generally to mean a type of content (such as video or sound) or a logical construct (such as a header or list). The second sense emphasises that a guideline inspired by HTML could easily apply to another markup language.

Note that some (SGML) elements have content that is rendered (e.g., the P, LI, or TABLE elements in HTML), some are replaced by external content (e.g., IMG), and some affect processing (e.g., STYLE and SCRIPT cause information to be processed by a style sheet or script engine). An element that causes text characters to be part of the document is called a text element. (W3C, 1999b)

Equivalent:

Content is "equivalent" to other content when both fulfill essentially the same function or purpose upon presentation to the user. In the context of this document, the equivalent must fulfill essentially the same function for the person with a disability (at least insofar as is feasible, given the nature of the disability and the state of technology), as the primary content does for the person without any disability. For example, the text "The Full Moon" might convey the same information as an image of a full moon when presented to users. Note that equivalent information focuses on fulfilling the same function. If the image is part of a link and understanding the image is crucial to guessing the link target, an equivalent must also give users an idea of the link target. Providing equivalent information for inaccessible content is one of the primary ways project team can make their documents accessible to people with disabilities.

As part of fulfilling the same function of content an equivalent may involve a description of that content (i.e., what the content looks like or sounds like). For example, in order for users to understand the information conveyed by a complex chart, project team should describe the visual information in the chart.

Since text content can be presented to the user as synthesized speech, Braille, and visually displayed text, these guidelines require text equivalents for graphic and audio information. Text equivalents must be written so that they convey all essential content. Non-text equivalents (e.g., an auditory description of a visual presentation, a video of a person telling a story using sign language as an equivalent for a written story, etc.) also improve accessibility for people who cannot access visual information or written text, including many individuals with blindness, cognitive disabilities, learning disabilities, and deafness.

Equivalent information may be provided in a number of ways, including through attributes (e.g., a text value for the "alt" attribute in HTML and SMIL), as part of element content (e.g., the OBJECT in HTML), as part of the document's prose, or via a linked document (e.g., designated by the "longdesc" attribute in HTML or a description link). Depending on the complexity of the equivalent, it may be necessary to combine techniques (e.g., use "alt" for an abbreviated equivalent, useful to familiar readers, in addition to "longdesc" for a link to more complete information, useful to first-time readers).

A text transcript is a text equivalent of audio information that includes spoken words and non-spoken sounds such as sound effects. A caption is a text transcript for the audio track of a video presentation that is synchronized with the video and audio tracks. Captions are generally rendered visually by being superimposed over the video, which benefits people who are deaf and hard-of-hearing, and anyone who cannot hear the audio (e.g., when in a crowded room). A collated text transcript combines (collates) captions with text descriptions of video information (descriptions of the actions, body language, graphics, and scene changes of the video track). These text equivalents make presentations accessible to people who are deaf-blind and to people who cannot play movies, animations, etc. It also makes the information available to search engines.

One example of a non-text equivalent is an auditory description of the key visual elements of a presentation. The description is either a pre-recorded human voice or a synthesized voice (recorded or generated on the fly). The auditory description is synchronized with the audio track of the presentation, usually during natural pauses in the audio track. Auditory descriptions include information about actions, body language, graphics, and scene changes. (W3C, 1999b)

Forms:

A formatted document containing blank fields that users can fill in with data. The form appears on the user's display screen and the user fills it in by selecting options with a pointing device or typing in text from the computer keyboard. The data is then sent directly to a forms processing application, which enters the information into a database.

Electronic forms are especially common on the World Wide Web because the HTML language has built-in codes for displaying form elements such as text fields and check boxes. (Internet.com, 2001)

Forward Compatible:

Refers to software that runs not only on the computer for which it was designed, but also on newer and more powerful models. Forward compatibility is important because it means you can move to a newer, larger, and more sophisticated computer without converting your data.

Forward compatibility is sometimes called upward compatibility. (Internet.com, 2001)

Frames:

In graphics and desktop publishing applications, a rectangular area in which text or graphics can appear. (Internet.com, 2001)

Graphical User Interface:

A program interface that takes advantage of the computer's graphics capabilities to make the program easier to use. Well-designed graphical user interfaces can free the user from learning complex command languages. On the other hand, many users find that they work more effectively with a command-driven interface, especially if they already know the command language. (Internet.com, 2001)

HTML:

Short for Hyper Text Markup Language, the authoring language used to create documents on the World Wide Web.

HTML defines the structure and layout of a Web document by using a variety of tags and attributes. The correct structure for an HTML document starts with <HTML><HEAD>(enter here what document is about)</HEAD><BODY> and ends with </BODY></HTML>. All the information you'd like to include in your Web page fits in between the <BODY> and </BODY> tags.

There are hundreds of other tags used to format and layout the information in a Web page. For instance, <P> is used to make paragraphs and <I> … </I>is used to italicise fonts. Tags are also used to specify hypertext links. These allow Web developers to direct users to other Web pages with only a click of the mouse on either an image or word(s). (Internet.com, 2001)

Hyperlink:

In hypertext systems, such as the World Wide Web, a hyperlink is a reference to another document. Such links are sometimes called hot links because they take you to other document when you click on them. (Internet.com, 2001)

Image:

A graphical presentation. (W3C, 1999b)

Image Map:

An image that has been divided into regions with associated actions. Clicking on an active region causes an action to occur.

When a user clicks on an active region of a client-side image map, the user agent calculates in which region the click occurred and follows the link associated with that region. Clicking on an active region of a server-side image map causes the coordinates of the click to be sent to a server, which then performs some action.

Content developers can make client-side image maps accessible by providing device-independent access to the same links associated with the image map's regions. Client-side image maps allow the user agent to provide immediate feedback as to whether or not the user's pointer is over an active region. (W3C, 1999b)

Intranet:

A network based on TCP/IP protocols (an internet) belonging to an organization, usually a corporation, accessible only by the organization's members, employees, or others with authorisation. An intranet's Web sites look and act just like any other Web sites, but the firewall surrounding an intranet fends off unauthorised access.

Like the Internet itself, intranets are used to share information. Secure intranets are now the fastest-growing segment of the Internet because they are much less expensive to build and manage than private networks based on proprietary protocols. (Internet.com, 2001)

Java Bean:

A specification developed by Sun Microsystems that defines how Java programs interact. An object that conforms to this specification is called a Java Bean. It can be used by any application that understands the Java Beans format. (Internet.com, 2001)

Linearized Table:

A table rendering process where the contents of the cells become a series of paragraphs (e.g., down the page) one after another. The paragraphs will occur in the same order as the cells are defined in the document source. Cells should make sense when read in order and should include structural elements (that create paragraphs, headers, lists, etc.) so the page makes sense after linearization. (W3C, 1999b)

Link Text:

The rendered text content of a link. (W3C, 1999b)

Logo:

To further promote accessibility on the Web, W3C has introduced the Web Content Accessibility Guidelines (WCAG) Conformance Logos. Content providers can use these logos on their sites to indicate a claim of conformance to a specified conformance level of the Web Content Accessibility Guidelines 1.0. The use of these logos on conformant sites should help raise awareness of accessibility issues. (W3C, 1999b)

Multimedia:

The use of computers to present text, graphics, video, animation, and sound in an integrated way. Long touted as the future revolution in computing, multimedia applications were, until the mid-90s, uncommon due to the expensive hardware required. With increases in performance and decreases in price, however, multimedia is now commonplace. Nearly all PCs are capable of displaying video, though the resolution available depends on the power of the computer's video adapter and CPU. (Internet.com, 2001)

Natural Language:

Spoken, written, or signed human languages such as French, Japanese, American Sign Language, and Braille. The natural language of content may be indicated with the "lang" attribute in HTML ([HTML40], section 8.1) and the "xml:lang" attribute in XML ([XML], section 2.12). (W3C, 1999b)

Navigation Mechanism:

A navigation mechanism is any means by which a user can navigate a page or site. Some typical mechanisms include:

Navigation bars - A navigation bar is a collection of links to the most important parts of a document or site. (W3C, 1999b)

Site maps - A site map provides a global view of the organization of a page or site. (W3C, 1999b)

Tables of contents - A table of contents generally lists (and links to) the most important sections of a document. (W3C, 1999b)

Portable Document Format (PDF):

Short for Portable Document Format, a file format developed by Adobe Systems. PDF captures formatting information from a variety of desktop publishing applications, making it possible to send formatted documents and have them appear on the recipient's monitor or printer as they were intended. However, this causes the document to appear as a graphic and not as a textual document. Because of this graphical representation screen readers cannot decipher its contents. (Internet.com, 2001)

Personal Digital Assistant (PDA):

A PDA is a small, portable computing device. Most PDAs are used to track personal data such as calendars, contacts, and electronic mail. A PDA is generally a handheld device with a small screen that allows input from various sources. (W3C, 1999b)

Screen Magnifier:

A software program that magnifies a portion of the screen, so that it can be more easily viewed. Screen magnifiers are used primarily by individuals with low vision. (W3C, 1999b)

Screen Reader:

A software program that reads the contents of the screen aloud to a user. Screen readers are used primarily by individuals who are blind. Screen readers can usually only read text that is printed, not painted, to the screen. (W3C, 1999b)

Script:

Another term for macro or batch file, a script is a list of commands that can be executed without user interaction. A script language is a simple programming language with which you can write scripts. (Internet.com, 2001)

Server:

A computer or device on a network that manages network resources. For example, a file server is a computer and storage device dedicated to storing files. Any user on the network can store files on the server. A print server is a computer that manages one or more printers, and a network server is a computer that manages network traffic. A database server is a computer system that processes database queries.

Servers are often dedicated, meaning that they perform no other tasks besides their server tasks. On multiprocessing operating systems, however, a single computer can execute several programs at once. A server in this case could refer to the program that is managing resources rather than the entire computer. (Internet.com, 2001)

Sound Card:

An expansion board that enables a computer to manipulate and output sounds. Sound cards are necessary for nearly all CD-ROMs and have become commonplace on modern personal computers. Sound cards enable the computer to output sound through speakers connected to the board, to record sound input from a microphone connected to the computer, and manipulate sound stored on a disk. (Internet.com, 2001)

Streaming Video:

A technique for transferring data such that it can be processed as a steady and continuous stream. Streaming technologies are becoming increasingly important with the growth of the Internet because most users do not have fast enough access to download large multimedia files quickly. With streaming, the client browser or plug-in can start displaying the data before the entire file has been transmitted.

For streaming to work, the client side receiving the data must be able to collect the data and send it as a steady stream to the application that is processing the data and converting it to sound or pictures. This means that if the streaming client receives the data more quickly than required, it needs to save the excess data in a buffer. If the data doesn't come quickly enough, however, the presentation of the data will not be smooth. (Internet.com, 2001)

Tabular Information:

When tables are used to represent logical relationships among data -- text, numbers, images, etc., that information is called "tabular information" and the tables are called "data tables". The relationships expressed by a table may be rendered visually (usually on a two-dimensional grid), aurally (often preceding cells with header information), or in other formats. (W3C, 1999b)

Tag:

A command inserted in a document that specifies how the document, or a portion of the document, should be formatted. Tags are used by all format specifications that store documents as text files. This includes HTML. (Internet.com, 2001)

Text Fields:

A space allocated for a particular item of information. A tax form, for example, contains a number of fields: one for your name, one for your Social Security number, one for your income, and so on.

User Agent:

Software to access Web content, including desktop graphical browsers, text browsers, voice browsers, mobile phones, multimedia players, plug-ins, and some software assistive technologies used in conjunction with browsers such as screen readers, screen magnifiers, and voice recognition software. (W3C, 1999b)

References

Adaptive Technology Resource Centre (2000, November 10). A-Prompt Project: Retrieved January 27, 2001, from the World Wide Web: http://aprompt.snow.utoronto.ca/

American Foundation for the Blind. (2000, August 1). Braille Technology. Retrieved January 28, 2001, from the World Wide Web: http://www.afb.org/info_document_view.asp?documentid=1282

American Foundation for the Blind. (2000, December 12). Designing an Accessible Web Site. Retrieved January 17, 2001, from the World Wide Web: http://www.afb.org/info_document_view.asp?documentid=1449

American Foundation for the Blind. (2000, September 1). Synthetic Speech Systems. Retrieved January 28, 2001, from the World Wide Web: http://www.afb.org/info_document_view.asp?documentid=1284

AusInfo (2000, January). *Guidelines for Commonwealth Information Published in Electronic Formats.* Canberra, Australia: Department of Finance and Administration.

Australian Bureau of Statistics. (2000, December). ABS WWW Site Publishing Standards and Guidelines. Melbourne, Australia: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2000). Statistics a Powerful Edge. Retrieved March 8, 2001, from the World Wide Web: http://www.abs.gov.au/websitedbs/D3310116.NSF/4a255eef008309e44a255eef00061e57/c7e40ae1fa39e31e4a2567ac001ffb61!OpenDocument.

Barraga, Natalie C. and Erin, Jane N. (1982). *Visual Handicaps and Learning.* Austin, TX: Pro-Ed.

Berg, Bruce. (1998). *Qualitative Research Methods for the Social Sciences 3rd Edition.* Boston, MA: Allyn and Bacon.

Beumer, Jenny & Van der Ven, Josine. (2000, July). "Implications of Computer-Mediated Communication for People Who Are Visually Impaired in Dealing with Complex Visualisation Tasks". American Foundation for the Blind. V94 No. 7. 453-456.

Bishop, Virginia E. (1996). *Teaching the Visually Limited Child.* Springfield, IL: Charles C. Thomas.

Blenkhorn, P. & Evans, D. (1998). Using speech and touch to enable blind people to access schematic diagrams. Journal of Network and Computer Applications. 17-29.

Blind Citisens Australia Education Policy (April 1999). Retrieved January 21, 2001, from the World Wide Web: http://www.bca.org.au/educpol.htm

Brewer, Judy. (2000, February 3). Overview of the Web Accessibility Initiative. Cambridge, MA: Retrieved January 25, 2001, from the World Wide Web: http://www.w3.org/Talks/WAI-Intro/slide1-0.html

Canadian Braille Authority. (1999). About Braille. Retrieved January 22, 2001, from the World Wide Web: http://www.langara.bc.ca/cba/aboutbraille.html

Center for Applied Special Technology (2000). Bobby 3.2. Peabody, MA: Retrieved January 20, 2001, from the World Wide Web: http://www.cast.org/bobby/

Center for Universal Design (2000, December 17). Principles of Universal Design. Retrieved from the World Wide Web January 27, 2001: http://www.design.ncsu.edu:8120/cud/univ_design/princ_overview.htm

Dick, Thomas. (1997). "Issues and Aids for Teaching Mathematics To the Blind." *Mathematics Teacher* (May 1997). v90 n5 344-49.

Feuerstein, Reuven. (1999). MLE and IE as a Basis of the Education of the Blind (1999). Retrieved January 21, 2001, from the World Wide Web: http://www.icevi.org/publications/educator_winter00/Educator1.htm

Gibson, William E. (1999). "Teaching Statistics to a Student Who Is Blind." *Teaching of Psychology* (1999). v26 n2 130-31.

Hanninen, Kenneth A. (1979). *Teaching the Visually Handicapped.* Detroit, MI: Blindness Publications.

Hanninen, Kenneth A. (1982). *The Horizons of Blindness.* Detroit, MI: Blindness Publications.

Hayes, Brian. (1996, March-April). Speaking of Mathematics. American Scientist, 1-7.

Heid, J. (2000). "Create a barrier free website." *MacWorld* (August 1, 2000). v17 109-111

Hess, Robert. (2000, October 9). Can Color-Blind Users See Your Site? Retrieved January 20, 2001, from the World Wide Web: http://msdn.microsoft.com/workshop/design/color/hess10092000.asp

Human Right and Equal Opportunity Commission (1999, May) World Wide Web Access: Disability Discrimination Act Advisory Notes v3.1 Retrieved January 27, 2001 from the World Wide Web: http://www.hreoc.gov.au/disability_rights/standards/www_3/www_3.html

Internet.com (2001). Webopedia. Retrieved from the World Wide Web February 3, 2001: http://Webopedia.internet.com

Jones, J. (2000). "Users with Disabilities Push High-tech Limits." *Infoworld* (September 4, 2000). V9 37.

Kline, R. & Glinert, E. (1995). Improving GUI Accessibility for People with Low Vision. Retrieved January 20, 2001, from the World Wide Web: http://www.acm.org/sigchi/chi95/Electronic/documnts/papers/rlk_bdy.htm

Kroesen, Joan. (2001, January 25) IBM Lotus Notes Email and Conversation.

Kurze, Martin. Giving Blind People Access to Graphics (Example: Business Graphics); In: Proc. Software-Ergonomie '95 Workshop "Nicht-visuelle graphische Benutzungsoberflächen"; Darmstadt 22.02.1995 1995 , 17 pages. Retrieved January 16, 2001 from the World Wide Web: http://www.inf.fu-berlin.de/~kurze/publications/se_95/swerg95.htm

Lowenfeld, Berthold. (1973). *The Visually Handicapped Child in School.* New York, NY: The John Day Company.

Mangold, Sally S. (1982). *A Teachers' Guide to the Special Needs of Blind and Visually Handicapped Children.* New York: American Foundation for the Blind.

McNulty, T. (1999) *Accessible libraries on campus: a practical guide for the creation of disability-friendly libraries.* Chicago: Association of College and Research Libraries.

Olmstead, Jean E. (1991). *Itinerant Teaching: Tricks of the Trade for Teachers of Blind and Visually Impaired Students.* New York, NY: American Foundation for the Blind.

Programs at Overbrook School for the Blind (2000). Retrieved January 21, 2001, from the World Wide Web: http://www.icevi.org/publications/educator_winter00/Educator1.htm

Ridpath, Chris. (2000, November 2). A-Prompt Web Accessibility Verifier. Toronto, Canada: Retrieved February 2, 2001, from the World Wide Web: http://aprompt.snow.utoronto.ca/

Rothberg, M., & Wlodkowski, T. (2000, October). Making Educational Software Accessible: Design Guidelines Including Math and Science Solutions. The CD-ROM Access Project [CD-ROM]. The CPB/WGBH National Center for Accessible Media. Retrieved January 20, 2001 from the World Wide Web: http://main.wgbh.org/wgbh/pages/ncam/cdrom/guideline/

Rusalem, Herbert. (1972). *Coping With the Unseen Environment.* New York: Teachers College Press.

Scholl, Geraldine T. (1986). *Foundations of Education for Blind and Visually Handicapped Children and Youth: Theory and Practice.* New York: American Foundation for the Blind.

Scott, Eileen P. (1982). *Your Visually Impaired Student.* Baltimore, MD: University Park Press.

Sevilla, J. (1991). "Physics for Blind Students: A Lecture on Equilibrium." *Physics Education* (July 1991). v26 n4 227-30.

Smithsonian Institution. Smithsonian Guidelines for Accessible Exhibition Design. Retrieved January 25, 2001, from the World Wide Web: http://www.si.edu/opa/accessibility/exdesign/start.htm

Sticken, Jodi. (1998). *Collaborative and Inclusive Strategies for Teaching Mathematics to Blind Children.* Illinois.

Sherer, S. A. (1999). *The Integration of Library Telecommunications, and Computing Services in a University.* Idea Group Publishing.

The Science Access Project: Department of Physics, Oregon State University. (1999, June 28). TRIANGLE: A Mathematics Scratch Pad for the Blind. Retrieved January 30, 2001, from the World Wide Web: http://dots.physics.orst.edu/triangle.html

University of Toronto

Utz, W.R. (1979, June. - July). The Blind Student in the Mathematics Classroom. American Mathematical Monthly. 491-494.

Vanderheiden, G. C. (2000) Thirty Something (Million): should they be exceptions? Madison, WI: Trace R&D Center Reprint Service, 1500 Highland Avenue, Madison, WI 53705.

Webster, Alec and Roe, João. (1998). *Children With Visual Impairments: Social Interaction, Language and Learning.* New York, NY: Routledge.

World Wide Web Consortium. (2000a, February 3). About the World Wide Web Consortium. Cambridge, MA: Retrieved February 7, 2001, from the World Wide Web: http://www.w3.org/Consortium/

World Wide Web Consortium. (2000b, February 3). Authoring Tool Accessibility Guidelines 1.0. Cambridge, MA: Retrieved January 20, 2001, from the World Wide Web: http://www.w3.org/TR/2000/REC-ATAG10-20000203

World Wide Web Consortium. (1999a, May 5). Fact Sheet for "Web Content Accessibility Guidelines 1.0". Cambridge, MA: Retrieved February 7, 2001, from the World Wide Web: http://www.w3.org/1999/05/WCAG-REC-fact

World Wide Web Consortium. (2000c, November 8). HTML 4.0 Accessibility Improvements. Cambridge, MA: Retrieved January 20, 2001, from the World Wide Web: http://www.w3.org/WAI/References/HTML4-access

World Wide Web Consortium. (2000d, November 6). HTML Techniques for Web Content Accessibility Guidelines 1.0. Cambridge, MA: Retrieved January 20, 2001, from the World Wide Web: http://www.w3.org/TR/2000/NOTE-WCAG10-HTML-TECHS-20001106/

World Wide Web Consortium (2000e, October 10). HTML Validation Service. Cambridge, MA: Retrieved January 20, 2001, from the World Wide Web: http://validator.w3.org/

World Wide Web Consortium. (2000f, September 7). Tablin Readme. Cambridge, MA: Retrieved February 2, 2001, from the World Wide Web: http://www.w3.org/WAI/References/Tablin/source/Tablin/Readme.txt

World Wide Web Consortium. (2000g, November 6). Techniques for Web Content Accessibility Guidelines 1.0. Cambridge, MA: Retrieved January 20, 2001, from the World Wide Web: http://www.w3.org/TR/2000/NOTE-WCAG10-TECHS-20001106/

World Wide Web Consortium. (1999c, May 5). Testimonials for "Web Content Accessibility Guidelines 1.0". Cambridge, MA: Retrieved February 7, 2001, from the World Wide Web: http://www.w3.org/1999/05/WCAG-REC-test.html

World Wide Web Consortium. (2000h, October 3). User Agent Accessibility Guidelines 1.0. Cambridge, MA: Retrieved January 20, 2001, from the World Wide Web: http://www.w3.org/TR/2000/WD-UAAG10-20001023

World Wide Web Consortium. (1999b, May 5). Web Content Accessibility Guidelines 1.0. Cambridge, MA: Retrieved January 20, 2001, from the World Wide Web: http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505

Appendix A – Smithsonian Guidelines

The Smithsonian Accessibility Program (which is responsible for making all Smithsonian Museum displays accessible) has these tips for displaying textual information to individuals with low vision:

- "Use typefaces that are readily legible. The typefaces that are easiest for people who have low vision, language problems, or cognitive disabilities are sans serif or simple serif" (Smithsonian Institution).

- "Do not set text in all caps. Type set in all caps is more difficult to read and should be limited to items such as titles and decorative heads" (Smithsonian Institution).

- "Avoid use of script and italic type for essential information. These styles are inaccessible to people with low vision. Oblique type is, however, generally legible. Alternatives to italic type for book citations, artwork titles, foreign words, and quotations such as underlining, bold face, quotation marks, or another colour should be used whenever possible" (Smithsonian Institution).

- "Provide consistent letter spacing and word spacing. Consistent spaces between letters and words facilitate reading of text passages" (Smithsonian Institution).

- "Justify the left margin and keep a ragged right margin. Do not centre more than three lines of label text. A predictable beginning point, line after line, and evenly spaced words are much easier to read for people with low vision and for people with cognitive disabilities. Justified text can work only if normal word and letter spacing can be preserved" (Smithsonian Institution).

- "Provide high contrast between text and background. Contrast is an essential element for people with low vision. Research shows that dark on light works marginally better than light on dark for headlines" (Smithsonian Institution).

- "Print only on a solid background. Overprinting (type on an imaged background) is unreadable for people with low vision and perceptual difficulties" (Smithsonian Institution).

Appendix B – CAST Interview

Interviewer: R. William Lapp
Interviewee: Michael Cooper

Purpose: To inquire about future projects and CAST, and how they will aid Web accessibility.

Can you tell me about what your responsibilities are here at CAST Michael?

What does CAST mean when it says that Bobby will have "more robust page-checking capabilities?"

- ➔ Negatives now?

What does the ability to Manual Check allow a developer to do?

- ➔ What exactly is it?
- ➔ How will it help a developer?

How will the reports be reformatted in the new release?

- ➔ Will they show specific lines?
- ➔ Will they give a complete overview of the site?

Can you describe the new repair tool that CAST is working on in conjunction with the Trace R&D centre?

- ➔ Web based or platform based?
- ➔ How much experience will be needed?

What will set this tool apart from current repair tools such as A-Prompt, and others?

- ➔ New features.
- ➔ Enhancements.

Do you know an approximate release date for the repair tool?

Are there any other future accessibility projects CAST is looking to take on?

Interview Transcript

RWL: Today is February the 13th and this is a meeting with Michael Cooper at CAST. Basically the purpose of the interview is to inquire about future projects and how they will aid Web accessibility. Just for the record can I get what your responsibilities are here at CAST?

MC: Heh… well you can try.

(laughter)

MC: Well, I am the Bobby project manager, and that's probably my biggest responsibility at this time. But then I also work generally on any other project going on. Of course I usually work on the technical things. CAST being mostly educational based people, and doesn't have a lot of people with a technical orientation. You have kind of the hard science and that soft science. So ya, Bobby is important to CAST because of its visibility and because you know it is critical for education materials on the Web to require accessibility.

RWL: The first thing that came out when we first started and were talking to people was "Bobby, you got to look at Bobby over at CAST."

MC: Ya so it was the first thing, and is therefore the best known tool for evaluating Web accessibility. Now it is by no means the only out there, but it strives to be complete. We cover the guidelines 100%. The limitations are there, and others because we have to write our own parser and you know we are a small organization and we parse HTML, and we do our best with that. We create a very flat model so we don't have the ability to parse anything that isn't HTML. So like style sheets, things like that, we know they are there but we can't. Ya we just ask questions about them, and more than that, like applets and such we know they are there, there is just no way. No way for a tool on our side to check. Java does have accessibility features built in so it is theoretically possible to evaluate it for accessibility, but it is not feasible for us to do that.

RWL: I think IBM is big on accessibility with Java too

MC: Ya it is. IBM is and Sun are both funders, and we have a good relationship.

RWL: Definitely.

MC: Definitely we like those two organizations. Um, so ya there are things we could do if we were making a profit, or a small amount of profit. So ya there are other tools out there besides Bobby now that try to fill some of the gaps. One is called the Wave, it tries to guide you a little bit more through some of the manual checks, Bobby just kind of asks questions and Wave kind of tries to step you through. There is another program called A – Prompt out there which has been in Beta for like two years. So eh….

RWL: They say there is supposed to be a new version coming out.

MC: Ya.....

RWL: Ya in January of 2001.

MC: Umm ya I don't know where they are on that. We have worked with them especially on the content specification. Umm. But A-Prompt was intended to help you repair a page. Umm and I think it has some of the same limitations Bobby has in terms of analysis. And those also translate into repairs. It repairs some things and not others. A lot of it is because of the user interface, and again they are a small organization. Umm but you know those are the tools, there are others out there with very focused purposes.

RWL: Ya..your actually going right at what I was looking for. Umm, now speaking of repair tools. I know on the Bobby page you are working on a new repair tool with Trace and the University of Toronto. University of Toronto and A-Prompt, are you, is A-Prompt what is being talked about?

MC: Ah ya the plans for that have kinda changed over time. Ahhh what originally happened we made plans to work on a repair tool, and coincidentally they started working on A-prompt. And then we decided well lets, can we collaborate on this one, but we were already far enough on different tracks. Bobby is Java based, and very thoroughly Java based, and A-Prompt is a Windows DLL. So the code couldn't be reconciled. And so we worked together and we kinda had a vision that we will eventually come up with some joint project. But we never got to the point where we can really realise that vision. So they continue development on A-Prompt and we have been working on a Java based repair tool.

RWL: So you are working on a separate tool?

MC: Ya and it isn't available, its ahh... I can show it to you in here... its not available. We are trying to make it into beta pretty soon. Originally we were gonna work with the .... On this big ol' tool that would try to do everything. We decided since we cant do that we are gonna focus on making our tool and educational tool. So it works on teaching you about accessibility as you are working on the design of your page. Which is what Bobby was intended to be as well, but ahh this tool would be more interactive.

RWL: Uh huh...

MC: Even bobby is easier then reading guidelines.... Maybe not by much.

(laughter)

MC: Umm.. I will show it to you so you can get an idea of it. Ya know it takes a very different tack then A-Prompt. One thing we think that will be more successful than A-Prompt is that while it will repair a page. That's not its main function. Its main function is to teach. The repairing that it does allows you to come up with a model that is relevant to your entire site, but it is so hard to make a meaningful repair ah without even writing an authoring tool, which we are nowhere close to doing. Umm or ahh and dealing with the fact that a lot of pages are dynamically generated. And repairing those are a big job. You know you have to repair what is in the database or what's in your template files or whatever. And a tool that can do that is inconceivable, it is just way beyond what…

RWL: Ya….

MC: Ya it is a Microsoft level project

RWL: Well your making, right now you are making, well it says you are making a module that people could use for the authoring tool. Is that a project that is going forward?

MC: Well the modules aren't intended to be used with authoring tools. They are intended to be a modular design of Bobby. So its kind of a redesign. Ummm for really how much of the technology we can do, the core technology. We are planning to make Bobby accessible to the degree… it wont be fully plug ably modular. Like … we need to update the website….

RWL: Ya..

MC: So right now we are not envisioning in the near future making a fully plug able set of modules. I would love to be able to do that. Ahh.. it is there and it is elegant its just a matter of…

RWL: Ya….

MC: But ya but we do want to have the capacity to,… one kind of modules would be internationalisation. So we might actually switch it around and evaluate multiple sets of guidelines. Umm and the infrastructure is almost there now for that. You know we just don't have any sets of guidelines besides the Web Access Initiatives right now. Except for section 508, which we are working on. Ya…. Fortunately it intersects heavily with the way it has. So ya we will be building in the ability to switch em off. For now those two sets and any other sets we've been wanting too. We been working on a third set and as I understand it ergonomic in this context is like layout.

RWL: Ya….

MC: You need the …

RWL: Ya if you have things to close together and the contrast…

MC: Ya right things like that. There are a set of ISO guidelines… I forget what they are but anyway…

RWL: ya….

MC: Ya so there is a potential for lots of sets of guidelines I think. Maybe that is going beyond what CAST probably can do. But we will have that flexibility as far as we can take it and ahh.... High level is like really the user interface thing. And the fact that Bobby itself needs to be. Right now we provide three interfaces. There is the server, there is the graphical user interface, and you got the command line there. And the graphical user interface is probably the most commonly used. Both within the interface to make it more flexible, and then there is the command line interface used in batch mode by someone to generate a whole bunch of bobby reports.

RWL: Kinda funny a lot of the companies you see I think that talk about accessibility like IBM. Like IBM lotus. I called em up and talked to the project lead. I don't know how I ended up getting around to her. And somehow... I think it was my email, since it was Cisco. They have no future plans to fix any accessibility issues. It is not in the project roadmap.

MC: Ya well section 508 is gonna change their tone because the government wont be eyeing them.

RWL: Ya...

MC: We know lotus notes wont be around if they don't fix it.

RWL: Definitely. IBM likes the government, big purchases. You were saying manual checks. Now is that when Bobby will bring you through and ask you questions? Like if it can fix it or determine it?

MC: Ya it depends on the check. Ahhh and maybe I can show you best. But right now Bobby just asks the question and will say. Do any images on this page need long descriptions, or you know are tables used for layout and if so have you blah...

RWL: uh huh...

MC: And ahh so the more interactive version could say check off the images that need long descriptions, and then it could say here, and we will save them for you. For tables it could say how are tables being used? And umm kinda textualise the questions. You know the beta of the repair tool only has priority one guidelines. So it you only...

RWL: So how small is your development team?

MC: Well umm we have zero full time programmers on Bobby. Normally we had one full time programmer working on the project. When our last programmer left we decided to hold off on replacing him until we focused what the next step would be. We are in the next stage right now determining what that would be.

RWL: Ya a lot of work has been done already.

MC: Ya a lot of work has been done for the one. I do tweaking and we have a consultant who does a little bit of tweaking on the side. It is being worked on now by .. actually the original programmer of Bobby who left for a couple of years to England for Zen.

(laughter)

MC: Interesting guy, then came back two years later and is working three quarters time on the repair tool. Umm that's our development staff and then we have other people working on strategy and trying figure out educational things.

RWL: You ever think of having students help?

MC: Well ya I thought about that but I wasn't sure that students would want to get involved in a project like that.

RWL: At WPI umm.. they will either do it for free or for some corporations they charge 5000 dollars. Seven, no you can get a team of three to seven computer science majors to work like umm 21 weeks. It is called the MQP, their senior project. You become a sponsor and they will do the project. And WPI will do it for free.

MC: I didn't think of doing it as a senior project or something. We actually have a student working on internationalisation.

RWL: Ya they will design it, do the specifications, and the project report write up.

MC: Management of that could be hairy with that amount of time.

RWL: No actually what happens is they actually have an advisor, a computer science PHD.

MC: Hopefully good for you because you are known in the field.

RWL: Ya I am doing mine at work, I will get credit for it for the summer so I am not gonna complain. Do you have any approximate release date for the umm repair tool.

MC: We are trying to get a Beta out and one… a public beta, and then it is kinda hard to really when a release date will follow that. Depends on the response to the beta. Its definitely something we want to consider more as an education tool then a repair tool.

RWL: So ya then you get more understanding of how and what you have to do.

MC: We are gonna want people to use it. We are trying to we are spending a lot of energy right now to think about how do we really teach people this. You know a technical person can understand these issues by reading a little bit. If you give them a tool that just doesn't do everything just repair, repair, repairs everything they aren't going to know it. But if you give em a tool like this work with they understand it. That way when they develop the pages they will try to follow the guidelines. Rather then have to go through a bunch of repair tools to try to fix them when they can actually make it. Both written, verbal and visual.

RWL: This is pretty much it, because we just covered every question I had and I didn't even need to ask them.

MC: The usual schpiel just kinda covers it I guess

RWL: Pretty much it is great. Umm, ya we hit pretty much everything.

Appendix C – Larry Raymond Interview

Interview Subject: Larry Raymond
Assistant Director
Human Resources
Address: City Hall - Room 109
455 Main Street
Worcester, MA 01608
Phone:(508) 799-1031
Email: raymondl@ci.worcester.ma.us
FAX: (508) 799 - 1040
Hours: Monday thru Friday - 8:30 am - 5:00 pm

Interview Conducted by: Jim Deloge

Tape Speed: 1.2cm

Date: 2/8/01

Time: 11:30am-12:25pm

Place: The subject's office in Human Resources at Worcester City Hall.

Goal of Interview: Informational interview, to better learn how visually impaired individuals interact with technology (secondary goal) and think about statistical information (primary goal).

Schedule of Questions:

Background Information:

What types of computer accessibility hardware do you use?

What screen reader are you currently using?

When did your visual impairment begin?

What is your degree of blindness (aka total, partial...how partial)?

Educational Information:

Were the schools you attended growing up specialty schools or public schools?

What kind of accommodations did the schools provide for you in the classroom?

What methods used to teach you were the most effective.

What was your favourite subject/concept that you learned in school?

Can you describe to me how you visualise that concept?

Goal Information:

What has experience regarding mathematics like in school?

If he has taken Statistics or a similar math course:

> How do you visualise a table (by rows or columns)?
>
> What kinds of graphs have you been exposed to?

Are there some that are easier for you to grasp than others?

If yes, which one types of graphs?

What is the most difficult type of graph for you to visualise?

When the teacher put a slide up on the overhead projector and says, "This is a diagram of such and such...", how do you obtain its meaning?

Secondary Goal Information:
(Used if statistics questions yield too little information)
Talk about graph to audio programs.

Were you aware that such programs existed?

Does a program like this sound like it would be useful in regards to displaying graphical information?

Do you think it would be advantageous to have a mix of both an audio component and maybe a printable (physical) component on a web page?

Describe your experience like with the Internet?

What types of things do you think are important to say about a graphic?

Are you aware about the W3C guidelines regarding accessibility and web content?

Interview Transcript

Key: JD= Jim Deloge
LR = Larry Raymond

Note: Questions in italics refer to questions from interview the schedule.

JD: Now I talked to you about the project I'm involved in at WPI regarding the accessible web site for visually impaired students, teaching them about statistics. Basically, the questions that I'm going to be going over have to do with methods that you have learned in teaching visually impaired persons and how you go about thinking about different concepts. I just want to start off with some background stuff.

JD: *What types of computer accessibility hardware do you use?*

LR: Hardware well…I'll just describe my entire system.

JD: Ok.

LR: I have a general PC that has JAWS for Windows, which is a screen reader. It has a software voice 'Eloquence' that I use for the voice. I use to have a Desktop speech card, which is a superior card but when I got a new computer I just decided to go with the software voice the Eloquence voice and then I use Open Book-Ruby Addition as the software for the scanner and I have a scanner that I use for reading. Those are the main assistive technology stuff that I have for my computer.

JD: Do you have a Braille embosser?

LR: No

JD: But you use the scanner to put printer material on and it will get those characters and put them on your screen so you can read it with JAWS?

LR: Yes

JD: *When did you visual impairment begin?*

LR: Thirty-Five years ago in 1966.

JD: *To what degree is your blindness (total, partial...how partial)?*

JD: Total? Partial?

LR: Total blindness.

JD: *Will you describe were the school you attended growing up specialty schools or public school?*

LR: I had an accident that happened April of the 8th grade. I was out of school for two weeks I went back to the public school finished the 8th grade. During that summer, I received training in mobility and orientation, Braille training and then I started regular public school in the fall. Went through four years of high school. After graduating from high school I want to a one-week program at the Carroll Center in Watertown to develop some skills about college life and then I attended Assumption College. So I never went to any real specialty schools, I didn't go to any school special Ed., there was no anything back in late sixties and seventies there was no disabilities services centre, we just individually worked with faculty and arranged for our own readers. There was not assistive technology back then. We had tape recorders and typewriters to bring to lecture.

JD: So the school would not go out and find people that specialised in that and bring them to the school or would the professors have to do that?

LR: I'd have to.

JD: You'd have to do that?

LR: Yes.

JD: There was no help in providing any of those services?

LR: Very little. The faculty were very supportive, the college was somewhat supportive. All the cost were picked up by…I was from New Hampshire so the state of New Hampshire picked up the cost of readers they'd gave me like $300 dollars a semester for readers, back then it was about $2 and hour you could pay for recorders, it was $1.85 an hour for readers. We would also work with the professors to get the books as soon as possible so that you could find out weather they were on tape and order them so that we could have them once the semester started.

JD: What part of New Hampshire are you from?

LR: Outside of Manchester, Goffstown.

JD: Oh ok…I'm from Concord.

LR: What high school did you go to?

JD: Concord High.

LR: Bishop Brady up there, right?

JD: That's right.

JD: So the accommodations that the school provided for you in the classroom consisted of readers and trying to get Braille textbooks when you needed them?

LR: The only Braille textbooks I used were in math. I started off at Assumption as a math major and was a math major for two years. Then didn't see myself in a career in math. I was more [in the] Human Services so I changed from a math major to a psychology major and went into some of the soft stuff. So I did use Braille for math for those all through high school and for two years of college but mostly used tapes for recording materials for reading. I'm a slow Braille reader because of having my blindness later I was never able to develop the speed that a lot of blind people have who have been blind right from the beginning.

JD: Is that a common characteristic? That when you born with the disability that it becomes more natural to learn [Braille].

LR: Or if it is pre-education. I'd say that it is usually before it. Eight, nine, ten years old that if you're blinded before that it seem to me that those folks who then use Braille in particular are pretty fast Braille readers. It is not something I have been able to acquire and some of that is because I never applied myself. I use it for notes but never to do anything significant.

JD: What methods do you believe were the most effective in teaching you, while the schools were trying to adapt to you disability

LR: Well again I think it depends on the subject matter. Certainly for math, I think Braille was the most effective for people who are totally blind. People who have partial vision large print or I actually had some shadow vision back. I had a kid's chalkboard that I used to do most of my calculations on that if I wrote big like four-inch formulas I could see it. I could do a lot of my homework on a 3 by 4 chalkboard, but I also used Braille as well.

JD: In regards to the Braille textbooks, was the Nemeth Code used back then?

LR: Yup.

JD: In these textbooks, when they were displaying graphs were most of the graphs tactile graphs?

LR: Yes.

JD: Would you say that math was you favourite subject that you learned in school?

LR: Before coming to college?

JD: *What was your favourite subject/concept that you learned? I understand that this is a very broad question.*

LR: I don't have any idea…maybe math because at that point it came pretty easy to me. So I was and I was successful in it. So I probably won't mind it.

JD: So your experience regarding math in school has been pretty extensive?

LR: Yes, that is right.

JD: *Have you ever had any experience Statistics in a math course?*

LR: Yes I have.

JD: Excellent. Well as you know our web site relates directly to statistics and from our standpoint this is very difficult to do, it is quite a challenge because statistics relies a lot on "look at the pie charts", "look at these tables", "look at these graphs" to be able to visualise concepts.

JD: *How would professors, when you were at school, attempt to explain a graph to you, like a graph of a circle for instance, how would they convey that information to you?*

LR: I don't remember. I think a lot of the tables and stuff like I would have produced in Braille and was able to do it that way. Graphs and stuff like they have these raised line drawing kits… and you could, you know if you were to draw a circle I could to feel it or angle I could feel the angle by having raised lines. But as far as tables and stuff like that they were Brailed out in columns and rows and stuff like that I was just able to follow.

JD: Was it easy for you to visualise what was being explained in the table through the Braille display?

LR: Yes, and that was because I had visual memory. I would assume that it would be more difficult for someone who had no visual memory, so the language then that teachers or professors used I could relate to from my visual years when I was younger.

JD: So when they said tables you automatically had an experience in your head that said, there's going to be a set of rows a set of columns each relating to a different variable, probably with values in each one?

LR: UmmHumm [Yes].

JD: So because of this you've probably been exposed to different graphs such as bar graphs or pie charts for instance. Were these ever used?

LR: I must have been. We're talking thirty years ago so it's a long time.

JD: Do you deal with any of that type of graphical information now?

LR: No.

JD: Of the different topics in statistics are there some concepts that are easier for you to grasp than others?

LR: You'd have to remind me of some of the example.

JD: For instance, as you said before because you have had visual memory that anything relating to tables was a lot easier to pick up the fly than when you got off college and somebody threw some crazy graph on the board that would probably be much more difficult to recognise because of the visual memory that you had.

LR: Yes, but to come up with specific things at this point I probably wouldn't be very helpful.

JD: *Have you ever head heard of this new technology being used... the graph to audio programs that are out there?*

LR: No

JD: What they do is they take a graph...for instance just a straight line and they'll convert that to an audio signal so when the graph increases the frequency will get higher so people kind of can hear the structure of what is happening in the graph as opposed to like a tactile display, feeling along with it. Do you think that an audio representation like that would be useful?

LR: I think it's an option. I think different blind people have different ways of learning and some people are going to be more active learners and some are going to be more audio learners. If they are taught early enough and adjusted probably that could do that quite well.

JD: For instance in regards to our web page. *Do you think it would be advantageous to have a mix of both an audio component and maybe a component where they are able to print it out and put that in an embosser so they can feel it?*

LR: Yup.

JD: *What's your experience like with the Internet?*

LR: I generally have pretty good luck with the Internet these days most sites that I go to are pretty friendly. When I first started using it...five ...six seven years ago the screen readers were such that they couldn't de-columnise the web pages. So if the web page did not have a text only site, it was very confusing and unusable because it would read across and it might be reading three different things at the same time, like the first sentence of three different articles. Or if I came to a graph I didn't have a clue what was going to come. Program developers have been able to...well first of all they've standardised, their guidelines on accessible web pages now, and if the webmasters use it effectively then it can be pretty helpful. If there's is a text only link then I will normally go to that. The JAWS [program] automatically de-columnises, but it puts all the links on the left hand side of the page, reads the entire subject before it goes on to the next. A lot of the graphics are now labeled so if there is a picture of a tree it will say 'tree' or city seal or you know that kind of thing. It'll describe fairly in short language, but it will describe what the graphic is or picture or image I very seldom have difficulties now there's still some that are difficult in what they use but most of them are pretty friendly.

JD: So do you think the quality has gone up in screen readers whereas the Internet is much more accessible than it has been 5 or 6 years ago.

LR: Yup, Yup.

JD: In regards to what you were saying about captions regarding graphics on web pages, do you feel that's useful that the captions are short and get to the point?

LR: I guess that depends on what we're describing here. I think it depends if the graphics are being…the images and graphics are used to just for prettying up the web pages then I think all I need to know is a couple of words, but if they are used for anything else then maybe a little longer narrative is probably appropriate.

JD: *What types of things do you think are important to say about a graphic?* One for instance, I'll give you an example, a pie chart used on something like our web page. What do you think would be important to say about that when using a caption?

LR: Hmmmm. I' don't know.

JD: Would it be important to convey the shape and the meaning?

LR: Ya, I think so.

JD: Just another quick question. *So you're aware about the accessibility issues regarding web content, the W3C and the guidelines that they have?*

LR: Yes.

JD: When I started this project, I had no idea that such guidelines did exist. I didn't even know that there was such a thing as an accessible web page. I just…I assumed that if the web page wasn't in text that then it wouldn't be accessible at all. So it has been a real eye opener to see that this technology is actually being used by other than the visual population. It's interesting to see that the effects of it are extremely positive. I know, I never would have though that I could email say Mike Gorse asking for an interview and he could get that and reply to me. That's just incredible.

LR: It is amazing. When you just think about computers in general being about 60 years old and you think about assistive technology being only about 15 years old the advancements are just unbelievable. I mean for them to be able to…for me to take a document and put it in a scanner and within 30 seconds having it being read to me by a machine, it just blows me away. I struggle being sympathetic to many of the blind college students these days because I know how my generation and the older generations had to go through college and how much effort it took to get our work approached. Technology made life so much easier and I would not have to feel so guilty partying during college. There were so many times when…I wasn't the most dedicated student around, I did well in school, but I certainly made choices that brought me to being social as opposed to studying. My study time took 2-3 times longer than another student's study time because of having to read it on tape. When you're listening to something on tape it is two to three times slower than reading it to yourself or writing. Having to create something first in an outline form in Braille and putting the words together and typing them, having a reader read it back to you, and then editing it and having it retyped. Where now, I can just go on a word processor and you know it's right there. When I hear someone moaning and groaning like college students…blind college students, about their workload load and stuff like that I'm hardly sympathetic.

Appendix D – Mike Gorse Interview

Interview Subject: Michael Gorse
WPI Box 1122
100 Institute Rd
Worcester, MA 01609
Phone: (508) 831-6644
Email: mgorse@wpi.edu
Date: 2/2/01
Place: WPI-Gompies
Interviewers: Jim Deloge, Melissa Morgan

Interview Transcript

Key: I = Interviewers
MG = Mike Gorse

I: What is your major?

MG: Senior, computer science major.

I: What do you hope to do after receiving your degree?

MG: Software development, maybe a systems administrator.

I: When did your visual impairment begin?

MG: At birth.

I: What is your degree of blindness (aka total, partial...how partial)?

MG: Total blindness. I was born with congenital blindness.

I: Were the schools you attended growing up specialty schools or public schools?

MG: Public schools, where I was given a vision specialist to accommodate my needs. My family spent a year in Phoenix, Arizona where I was taught at a public school. They had a much more structured program.

I: What kind of accommodations did the schools provide for you in the Classroom?

MG: Vision specialist who taught Braille and read textbooks.

I: What does WPI provide for you here?

MG: Joann Van Dyke at the school's Health Services provides help I need. They will provide readers if I need them for classes, but I have to be the one to request any services or materials I need. The school got me a copy of JAWS ($795) and a speech synthesizer for my computer.
I: How long did it take you to learn the layout of campus?

MG: When I first got to the school Health Services provided me with a mobility instructor to teach me how to get to my classes and room at campus.

I: What math and science classes have you taken so far at WPI?

MG: Calculus, differential equations, discrete mathematics and linear algebra.
I have some experience with the Nemeth Code (mathematical Braille code) and use LaTex for equations.

I: What is your favourite concept that you learned in <insert class here>?

MG: Probably, discrete mathematics because of the RSA (software encryption) that we did and CS2005 (Data Structures and Classes in C++) because it was easy.
I: If he has taken Statistics or a similar math course:

MG: I took analysis and probability in high school, but avoided Statistics at WPI because of accessibility to the program SAS (program used in Statistics classes at WPI).

I: What kinds of graphs have you been exposed to?

MG: I can't really seem to remember any.
I: Bar graphs, pie charts, line graphs, for example?

MG: I've probably seen them in Braille in tactile displays or on raised Braille.
I: If given a sequence or numbers how would you go about calculating the mean and median for example?

MG: Depends on the screen reader, but basically I'd go through each numbers add them up and divide by the number of them just like most people would.
I: Do you think it would help to visualise a graph if it was represented as a sound?
MG: Maybe helpful, I'm not aware of anything like that.

I: What do professors do to accommodate you in classes?

MG: I usually ask for exams on disk or I request a reader who can give me the exam orally.
I: What types of recommendations would you give to a person creating an accessible web site?

MG: Use Alt-text with all pictures and include captions. Use table tags for all tables.
I: What types of computer hardware do you use?

MG: Speech synthesizer and a Braille reader.
I: Do you have access to a Braille embosser?

MG: No

I: What screen reader are you currently using?

MG: JAWS for windows.
I: Are you aware of the W3C guidelines regarding accessibility?

MG: Yes.

Appendix E – Connie Raymond Interview

Interview Subject: Connie Raymond
Phone: (603) 669-2140
Notes: Larry Raymond's stepmother.
Retired Math Professor

Interview Conducted by: Jim Deloge

Interview Method: Phone

Date: 2/24/01

Time: 7:50pm-8:20pm

Goal of Interview: Informational interview, to better learn how different forms of graphical information, used in statistics, should best be displayed.

Interview Transcript

Key: JD = Jim Deloge
CR = Connie Raymond

Background Information:

JD: When did your visual impairment begin?

CR: Well in High school I had the beginnings of a visual impairment. I was legally blind in College but not told so, and since the age of 40 I have been totally blind.

JD: Can you describe your educational experience with mathematics?

CR: When I was teaching I taught at West Virginia teaching mathematics to undergrads, mostly freshman and sophomores. I was educated in New Hampshire because that is where I was from, and earned a Bachelors and Masters degree in Mathematics from UNH. The course I usually taught was differential equations to the undergrad engineering students there.

JD: Can you describe your educational experience with statistics?

CR: I have never taught it as a class except for when I was assigned to tutor a visually impaired student.

JD: What kinds of graphs have you been exposed to?

CR: Any of the common statistics graphs such as pie charts and such. Anything graph that you would see in any mathematics course.

JD: Do you have any residual visual memory?

CR: Oh yes, absolutely.

JD: So when I mention things like pie chart, line graph, bar chart you have a visual in your mind about what I am talking about?

CR: Definitely.

Goal Information:

JD: Can you describe the differences in how a person would display graphical information is to the visual impaired?
->For example a pie chart, line graph & bar chart.

CR: Anything that is straight line such, as vertical or horizontal lines are very easy to explain to a visually impaired student. Things that have irregular shapes such as pie charts of graphs with peaks are much more difficult. Normally, these graphs would be displayed using raised lines or Braille. When people read Braille they move their fingers horizontally across the information so anything linear is very easy to understand and convey, but things with angles are much more difficult because they require the student to have some experience with angles, which for most is a difficult concept. Such spatial graphs are very difficult to show. Unless the student has had experience with angular information in Braille such graphs are wasted.

Explain graph to audio programs.

JD: Were you aware that such programs existed?

CR: No.

JD: Does a program like this sound like it would be useful in regards to displaying graphical information?

CR: Yes I think it could be.

JD: What would be the challenges in describing the following graphs to a visually impaired student?

->Graphs taken from Statistics A Powerful Edge.
Australian Bureau of Statistics. (2000). Statistics a Powerful Edge-Displaying Information-Graph Types. Retrieved February 24, 2001, from the World Wide Web: http://www.abs.gov.au/websitedbs/D3310116.NSF/4a255eef008309e44a255eef00061e57/71d5ab08798722164a2567ac001fb355!OpenDocument.

Graph 1:

PERCENTAGE OF SAME SEX AND AGE GROUP EMPLOYED,
AUSTRALIA, 1996 CENSUS

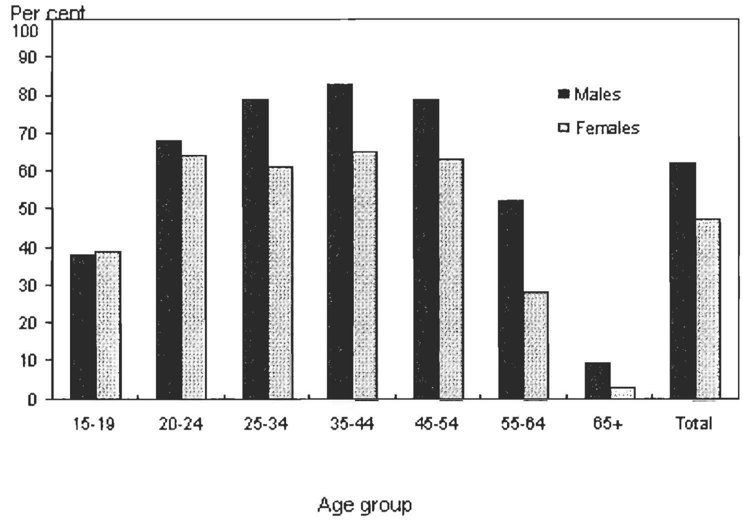


Figure 31: Percentage of Same Sex and Age Group Employed, Australia 1996 Census

CR: To display this in Braille the columns and rows would have to be exaggerated. In Braille everything would have to be bigger which may mean then two pages are needed to fit the information instead of one because when using a Braille display the number of columns and rows is limited.

JD: How would the student orient himself or herself when viewing a graph like this? ->For example where would they find what information is displayed in the columns and rows.

CR: This would be left up to the student to orientate themselves with the information, but because this graphs consists of vertical lines this would particularly not be a problem for most.

JD: Do you think orientation would be easier if the student were initially given a description of the graph, telling them what is being displayed and wheat each axis represents?

CR: Yes, and any information that is available to a sighted person should be described to the visually impaired student.

Graph Two:

EMPLOYED PERSONS BY OCCUPATION AND SEX,AUSTRALIA, 1996
CENSUS

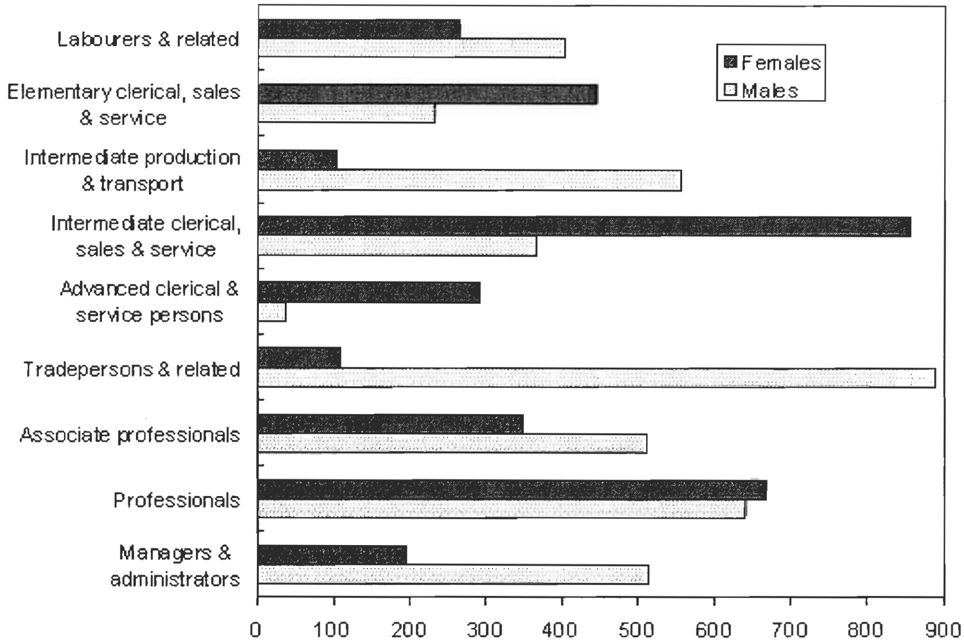


Figure 32: Employed Persons by Occupation and Sex, Australia 1996 Census

CR: This graph would probably be easier to display because it is horizontal, which is how students read Braille. So compared to the previous graph this would fit better with the way Braille is displayed.

Graph Three:

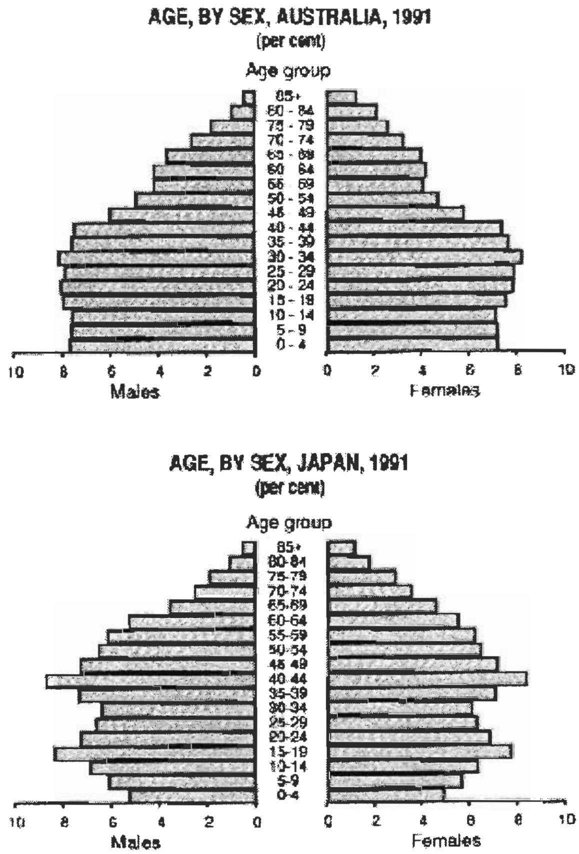


Figure 33: Age by Sex, Australia, 1991

CR: To display this type of graph you might use different line textures if using a raised line display to differentiate between the two parts, males and females. Because this is a horizontally displayed graph it would also be easier to understand for a visually impaired person in a raised line or Braille display.

Graph Four:

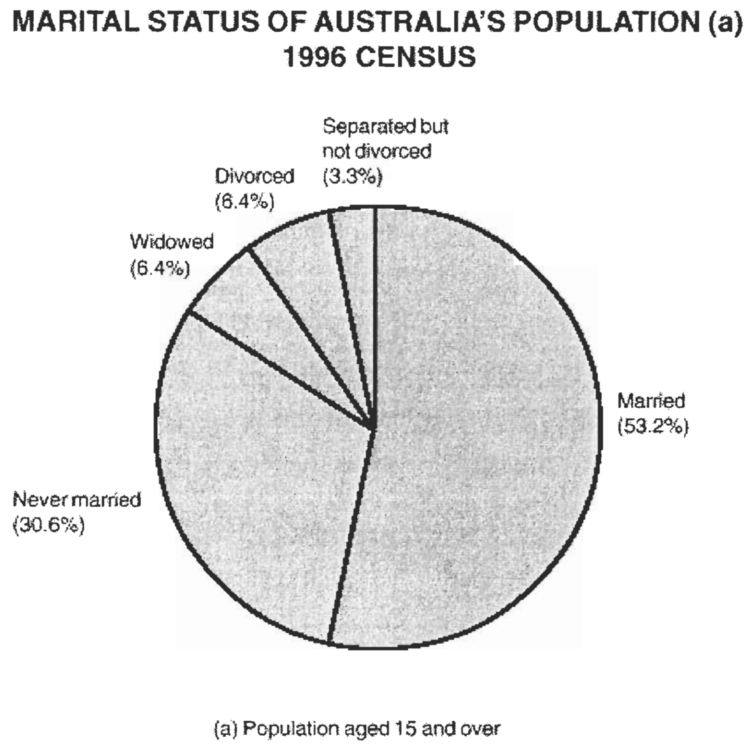


Figure 34: Marital Status of Australia's Population 1996 Census

CR: To show a pie chart you would display it exactly like you would in print but in a raised line format. The only difference being that each section of the pie would have a number next to it instead of information and near the bottom of the chart would be a key showing what each number stood for.

JD: Besides graphical information our web page will contain a great deal of data in tabular form. What methods do you feel are best to use when displaying any data in a table?

CR: Tables like horizontal and vertical graphs are linear and are therefore easier for most [visually impaired] people to understand. In general it is easy to navigate a table because you can follow the rows and columns with your fingers (such as on a Braille display) so I don't think there are any real problems in displaying this type of information.

Appendix F – Sharon Latka-Davis Interview

Interview Subject: Sharon Latka-Davis
Phone: (508) 757-8048
Freelance Reporter for the Worcester Telegram & Gazette

Interview Conducted by: Melissa Morgan

Interview Method: In person

Date: 2/8/01

Time: 9:00am-10:00am

Goal of Interview: Informational interview, to uncover some opinions about technology and the Internet, and how to make both more accessible.

Interview Transcript

MM: I know you told me on the phone that you were only partially blind, um, what is your official degree of blindness?

SL: I am considered legally blind and to be legally blind you have to be 2200 or less in the better eye, with corrective lenses. I know people who wear glasses who say, "When I take my glasses off I'm legally blind", well that's not legally blind. Technically, I only have vision in my left eye. It is a little bit in the peripheral and a little bit in the center, and that's important in terms of functioning because we need our central vision for detail, and I only have a piece of my central vision available to me and I only have part of my peripheral vision, which is mostly what we use for moving around and not bumping into things.

MM: How long have you had that impairment?

SL: Since I was 26, since 1976. I am diabetic and it is a result of diabetic retinopathy.

MM: OK, can you describe what you see as you look around the room right now?

SL: If I look right at you, I can't see much of your face at all. I can see the outline of your head, but I can't see any details at all on your face. If I look at your face, however, I can see the window to my right, your left, and I can see the basket that's at like one o'clock to your head. So I'm looking at you but my peripheral is picking up some of the other stuff, but I can't see the details of those things because that's when you need your central vision. I would need to look at those objects and then they disappear. And to my left, your right, I can see the outline of the door and a little piece of the counter, and to the lower peripheral and can see the edge of the table and the chair. In terms of distance, I think I'm so familiar with what's around; sometimes I think my mind reminds me what's there. If I look out the door, I can see a dark shape that I know happens to be a three-decker house. Sometimes I can identify things a little further away if the object is actually moving. For example, if I look across the street and the car for that house is parked, I can't necessarily distinguish it, but if it's starts to move, my brain, because I was visual, says "A-ha! Here's an object of a general shape and size that can move, i.e. it's probably a car or truck." So my visual brain, which still does function, goes back to those memories I had before I lost my sight.

MM: Had you been through college and everything before you became visually impaired? What was your degree of education?

SL: Both, I got my masters in library science of all things, before my sight loss, and, not the best kind of choice (laughs). But when I started that program, my vision was fine. It was something I had always wanted to do. I got my masters from the University of Rhode Island in library science, and then after my vision loss, after I became legally blind, I got a masters in counselling psychology from Assumption College.

MM: So how did you first get into the reporting business?

SL: Um…I think it was just word of mouth. I had done a lot of um, writing on the various jobs I had, not specifically as a journalist, but just in doing reports and so on, and I was very active in the visibility community, and a woman who was already writing for the newspaper and I met through one of these disability-related groups, and when she was going to leave the area she submitted my name, and I, I, submitted a few items for approval. That's 15 years though; I've been doing the column for 15 years.

MM: So you're a freelance reporter for the Telegram, do you do all of your work from home?

SL: Yes. I have worked out o the house though, so, that's very part-time. I have held other jobs both volunteer and paid employment since my vision loss. I did work full-time, until I had my son, and then I decided I wanted to be mostly an at-home Mom, and I've had 2…3 (?) part-time paid positions, but, I'm very very busy working with the Worcester Public Library's access project, and I'm on the Foothills Theatre access committee helping them to develop audio-described theatre productions, and I am the chairperson of our local Talking Book library program. There's probably a few others, but those are the most time consuming,

MM: How old is your son now?

SL: He's 15, a freshman at St. John's High School.

MM: In your home here, what kinds of specific technologies do you have at your disposal? Anything to help you in your day-to-day life…

SL: (Thinks for a while) In terms of my daily living skills, everything I use is really low-tech. Magnifying glasses, um, I do have a device called a Parrot, which unfortunately I've been having trouble programming otherwise I would demonstrate it to you. (Goes and gets it) What it is it's a name and address file, that records, and then it can talk back to me people's name and addresses, um…But the beauty of it is, besides being able to talk back to me, is if I'm out somewhere and I need to use the telephone, I can ask it to make the phone call. So I can pick up the receiver, ask it to make the phone call, and it would dial by the actual tones that it makes. It's a nice little handy device. In terms of daily living skills, that's probably the highest technology device that I have (laughs at the end). I do have a computer which is state of the art, everything. It does have a lot of accessible stuff on it which I don't use, um, mostly because the problem with Windows based programs is that most of the software that is adaptive software is not completely compatible, so there's this constant trying to make up that difference. So, to make a very long story short, I keep going back to DOS, and it's in very large print on the screen. That's what I use for my articles and reports, and all the other kind of stuff. In terms of newspapers and things, there is an organization called the Massachusetts Radio Reading Service, and they read newspapers and magazines, and the kind of materials we can't get already pre-recorded by the Talking Book program, and that comes over a little receiver. I do use a white cane when I travel out of the house, to help me get around and hopefully not hurt myself, but also for identification purposes so that other people who are around will know.

MM: On a typical workday, what do you do?

SL: I do a lot of thinking before I actually sit down and do any work. Well, today I am probably not going to be writing anything for the paper today but I will be on the computer in preparation for an upcoming Bay State Council of the Blind, I am on 2 resolution committees, so I am developing 2 resolutions having to do with access to cultural facilities, so I'll be sitting and creating…and using the phone, I use the phone A LOT. I mostly do phone interviews, seems to be the easiest for everybody.

MM: Have you ever done an article on Internet accessibility?

SL: No, I haven't, um, for a couple of reasons. I consider myself a technological dummy. I really am. And I feel that I couldn't do a good job on the subject, because I wouldn't necessarily understand what the other person is saying to me. He he, I have a broad understanding of technology and the Internet and that kind of thing, and many of my friends are extremely savvy, and totally blind in some cases, but I just haven't seemed to be able to pick up the knack of this and that. There are some specialty magazines and periodicals for blind people who are using technology and people who are really up on that and want to be *that* well informed tend to subscribe to those publications.

MM: What are those called?

SL: One is called Technology World, and before you leave I can give you a page from that.

MM: When you're on the computer, how often do you go on the Internet?

SL: I don't use the Internet at all myself. Nope, because you have to… be um, Windows/Microsoft savvy enough to be able to do that, you can't use the Internet directly from DOS. If it's possible I haven't learned how to do that. I use my son or my husband, who use it all the time, and I have them look up stuff for me. They'll generally quickly give me an idea of what came up in the search, so if I want it I'll print it out in large print, so then I can look at it. So I still mostly go back and use my vision when it comes to needing to absorb what it is that I'm reading. I do use tape for entertainment and light reading. I've always been a visual learner, and recently I've read some research that actually agrees with me, that this does exist. I realised very soon after I lost my sight, I don't retain information unless I visually see it. I learn with my eyes. Some people can retain beautifully by hearing it. I have many friends, especially people who've been totally blind since birth, and they've had to use their ears a lot, as well as Braille. They can retain it, but I don't seem to be able to retain the details of whatever it is I've been reading or listening to. I have to still kind of look at it. But I guess based on that recent research, it's ok, I'm not unique.

MM: When you come into contact with tables of data, how do you go about interpreting them?

SL: I'll tell you what I had to do when I was taking statistics back in graduate school. I read the textbook on tape just because of the volume of information, but in that statistics course, I used to listen to it, and then put it down in large print with a bold point pen, (which I still use), what it was they said. And that's how I had to learn it. It's just too much information to retain. What I have found, if they're reading statistical information on the Radio Reading Service, readers who repeat frequently where they are in the table, helps tremendously. Say we're talking about mortality. They would say, "The U.S. mortality rate is…", "The German mortality rate is…". So rather than just saying, "I'm going to be listing the mortality rates for the following countries" and then just listing the countries and listing the data, that would make no sense to me at all, because it's too much to remember. So in a sense, they're repeating, what is this table all about? They're giving you both that top line of information and the side again and again. I think that method would help even more if you've got more than one column. A lot of repetition and giving more information than just a number.

MM: What size font is most comfortable for you to use?

SL: Eighteen point. I can read regular print with my glasses (shows to me), and only the left lens has a magnifying lens, which is a 12X magnification, and I can read for a very limited amount of time, normal size, typewritten print. I cannot read things that are scripty. I can't stand variations in fonts. Contrast: black on light is ok, but dark on light is basically the right kind of contrast. Until this last year, I was able to read twenty point without my glasses, but my vision has continued to deteriorate.

MM: Are you at all colour blind?

SL: Yes, I have problems with colours. Reds and greens I have major problems with, and if the colours are kind of pale and close to one another in the colour palette, in the pastels. Contrast is key, along with lighting. Natural daylight is the best, although bright sun can actually be too bright.

MM: Going back to your statistics course, what types of graphs did you come into contact with? For example, bar graphs, pie charts, scatter plots, linear plots…

SL: They were all part of the courses. I think it helped that I was able to visualise in my mind a pie chart or a bar graph, so that if when they were reading it, I was able to visualise it. And fortunately in math I was very good through elementary school and junior high school, so I didn't have too much trouble with those.

MM: How about a population density map?

SL: (Asks for explanation)

MM: Say a map of the country of Australia… (another long pause) You're familiar with the layout of Australia, correct? And how the eastern coast is much more densely populated than the outback. So you would probably understand the meaning of such a map anyway, but suppose it was for a country whose population distribution you weren't familiar with?

SL: If they only were using, say two contrasting colours, and that's all, I wouldn't have any trouble. I have a lot of trouble, as in I can't discriminate at all, if they were using five or six different colours and one tiny little speck is one colour and it's next to another colour that to my vision is very close in hue. I wouldn't be able to tell which is which. If a dark green were next to a dark red, I would probably make that out ok.

MM: Are there any ways that you would say could enhance that understanding for you, say through audio or something like that?

SL: I think audio would be great.

MM: What would make it easy for you?
SL: Just a description of what it is that's being conveyed on that map. Very descriptive and elaborate. And those are the very kinds of things that the organised blind groups have been trying to make happen all along.

MM: Lastly, what would make it easy for you to make that jump to being an Internet user?

SL: Well I'm hoping it's going to happen very soon (laughs). I've received instruction a couple of times, short term, like five-hour kind of thing. I don't have anybody available when I'm sitting down at my computer and then I get stuck. And the two times that I've actually had somebody come out and show me, and actually it wasn't to show me the Internet, it was just trying to get me up to speed on Windows, um, I get stuck and I don't have the patience to want to put in the time, and start at the beginning and spend the *innumerable* number of hours to learn a whole new system, because when I sit down at that machine I want to create what I'm there to do. I don't want to spend a lot of time having to think, "Oh now I have to do this, and now I have to do this..." so I just go back to DOS (frustrated tone). There is a course that I'm going to be involved in through the Carroll Center for the Blind. They offer instruction, but that's on-site in Newton, and I don't want to have to go down there for a week, but they're doing one around here shortly. Supposedly, by the end of that, we will be able to use the Internet (skeptically). So come back at the end of your semester and maybe I'll be able to answer these a little bit differently (laughing).

In terms of my friends who use it they really just have to memorise the procedures. People who can see can get that instruction right on the screen. The rest of us either have to have it told to us what to do next, or we just have to memorise it, and that's where I don't feel I want to put in that amount of time to memorise a new system where I put in an awful lot of time memorising the one I'm using!

MM: You said a couple of times that you've tried to use Windows on your own you've gotten stuck, can you give me specific examples of what's tripped you up?

SL: I'll go through the procedure and the outcome won't be the same as the last time. Just trying to get into Windows itself. I'll get through the first couple of screens and then it will say something..."Find", except it won't come up with the same "Find" screen you had last time, and that's where I say, "I can't deal with this!" With my husband or my son, if they get stuck, they just back out and go through the procedure again in case they've made a mistake somewhere along the line, and I suspect that's what blind people have to do too. Rather than spending a lot of time trying to figure it out, because again, if you're not able to use the visual cues that are there, then you have to fall back on whatever knowledge you already have, and that might mean starting from scratch.

Another thing I know that is being looked at, and some people are finding quite useful, is speech recognition, whereas I could sit down and create by talking into a microphone. I know Dragon has been doing that for a while, and that's neat, but it also has its problems. It assumes that the person can still see the screen, but in terms of the input, they allow the audio input and will read back to you what's on the screen. In terms of whether or not that will interface with the Internet, I have no idea.

MM: That concludes my scheduled questions, but if you'd like to talk more about anything that particularly interests you, go right ahead.

SL: I'll try to describe to you what I would like to see in Internet access. (I say, "Sure, that'd be great.") I'd like to be able to turn on my machine. I don't mind pressing a few buttons. I know the keyboard. But, keep it simple! And once I'm connected, I just want to be able to hit a button that says "search", and then I can type in what it is I'm searching for. I think the classification system for searches needs to be simplified. I'm sorry that the world rejected the idea of using the recognised library classification system. It would've standardised the whole field, and we wouldn't be having this problem of not finding what it is we're looking for, but the world didn't want to do that, so we're stuck looking around. But yup, keeping it as simple as possible, and then have it be audio enhanced, for me, that's the way to go. I think the colours and font customisations should be left up to the user, because each user is different. I have mine set up to white on black background, because black on white usually isn't black on white, it's usually black on grey. But having those options in there is important, because depending on the eye condition, it either helps or doesn't help. Option variability is very important. It's also frustrating to have to learn new standards every couple of years. If a set of standards could be developed so that, when something new comes out, it still conforms to those standards that would be great.

~~~~~~

Sharon then gave me contact info for Jeff McGoslin and Joe Lazarro, and permission to use her name with both contacts. She also provided me with a copy of her JAWS software to try out and see how it actually works. I then thanked her immensely for all of her help and reminded her of my offer to let her interview our group upon completion of our project, in case she wanted to use it for a human-interest story in her column. She said, "Take lots of pictures! My supervisor loves it when I can stick a picture in there."
~~~~~~

Appendix G - Focus Group Transcripts

Date: 3/22/01
Place: Royal Victorian Institute for the Blind (RVIB)
Time: 10:30 am-2:00pm
Attendants: Chris Baillie, former RVIB student, Team 1
Contact Information:
Name: Chris Baillie
Home Phone: (03) 5662 3627 (in Leonagatha)
Email: chrisba@tpgi.com.au

Notes: Chris is a 19 year-old visually impaired student who just completed his final year of High School. He attended RVIB while in Secondary School and will soon be attending university to study computer science. He is extremely knowledgeable about various computer technologies and has worked with various screen reader (e.g. JAWS) programs as well as computer languages (e.g. HTML). With regards to our project, Chris has had pervious experience with spreadsheet programs when he worked as an accountant. As a result, he is well informed about issues regarding accessibility and information presented in tables.

Meeting Summary:

Pre-meeting:

- The team arrived with Soo at 10:00am at RVIB for the meeting with Chris. Chris was still on the road travelling to the school so an informal discussion was held with Garry Stinchombe. The team reviewed the plans for Friday's testing. We arranged to meet with the students once at 9am and once at 2pm for each of the ninety-minute sessions. Garry offered the team his laptop for testing, which we will use. It is fully equipped with the correct version of JAWS and Internet Explorer required for the testing.
- Regarding the home visits to test the last set of content, Garry advised the team to draft up a form for parents which can be distributed as they arrive at the school to drop of their son(s)/daughter(s).

Meeting:

- The team met with Chris Baillie in the Technology Room at RVIB.

- Using the same computer set-up that will be used with the students the team had Chris review two forms of tables (taken from the W3C web page) to find out why the screen reader, JAWS, was not reading the information as the described by the W3C. The problem was found to be a result of how the team was using JAWS and not the code that was used to create the tables. Result = Accessible tables using LOTUS can be created!!! To navigate tables in JAWS the Control and Alt keys must be pressed and navigation can be accomplished using the arrow keys.

- Next we ran through the 1st set of test content (inaccessible set) with Chris and encountered a number of problems with JAWS. JAWS was incorrectly reading information and a number of features in the program were malfunctioning. Problem = Windows 2000 does not appear to be compatible with JAWS. Solution = Only Windows 98 machines will be used in the testing. Bill's laptop was swapped with another (whose OS was Win98) and the problems ceased. The team was only able to get through the first 2 questions with Chris before the computers were switched. The pre-test was started again using the new machine. The following were Chris's times to answer the activity questions:

Content Type: Version 1 (inaccessible test pages)

1st Web page (Navigation and Tables)

Question 1: 8.93 seconds (Site Navigation)
-Correctly answered
Question 2: 7.24 seconds (Site Navigation)
-Correctly answered
Question 3: 5.80 seconds (Site Navigation)
-Correctly answered
Question 4: 2 minutes, 19 seconds (Table Navigation)
-Correct answer on 3rd try.
-Chris initially gave two incorrect answers. The reason behind his mistakes being he rushed through the tables without listening to each row description. He immediately searched for the keyword 'employed' without considering that multiple occurrences of the word could exist the table.
Question 5: 7.00 seconds (Table Navigation)
-Correct answer on first try. He learned from his previous mistake to carefully read through all of the date before selecting an answer

Total Time Set 1: 2 minutes, 47.97 seconds

2nd Web page (Lesson Plan, Tables and Graphs)

Chris took 2 minutes to review the lesson on cumulative frequency and percentage.

Question 6: 2 minutes 30 seconds (answer obtained from the data not the table, calculation question)
-Correctly answered
Question 7: 1 minute 13 seconds (calculation question)
-Correctly answered
Question 8: Question worded incorrectly. Unable to answer because of mistake.
Question 9: 2 minutes 20 seconds
-Unable to answer. Requires pie chart description to answer.
Question 10: 17 seconds
-Correctly answered

Total Time Set 2: 8 minutes 20 seconds

Total Time: 11 minutes 7.97 seconds

Predicted Average Time for RVIB Students:
3*Total Time= 33 minutes 23.91 minutes

-After pre-testing the web content with Chris we discussed various forms of graphs and how to best describe them to a visually impaired audience.

Meeting Outcomes:

-Create Home Visit Form for parents of students being tested.
-Garry's laptop will be used for testing Friday.
-Technical issues with creating accessible tables resolved.
-Increased information about describing various graphs-to use in graph and table handbook.
-Use 'Control' & 'Alt' keys to navigate tables.
-Put 'summary tags' outside of 'table tags' in HTML code.

New Contacts:

-Chris Baillie, former RVIB student.

Date: March 23, 2001
Time: 10:15am
Administrators: James Deloge, Bill Lapp, Melissa Morgan
Participants: Matthew Barker, Jaimee Schultz, Kylie Schultz
Content Set: 1

1.) Can you describe your experience navigating around the first web page today?
- Fairly easy
- Having links on right hand side was good for organization
- Image map was also helpful
- Combination of both is a good idea
- Navigation was good

2.) Were the tables on our pages easy to understand?
- Size of numbers could've been a little larger
- Text was generally ok
- The length of the table made it difficult
- When scrolling down, they forgot which header was which
- Barely even noticed the different colours

3.) What settings do you usually have on your personal computers?
- Mouse trails
- Start menu in bold and slightly larger
- Some small icons, some big
- Customisable screen styles

4.) What would make web pages more accessible for you?
- Have the browser remember settings for individual users
- Make page editable (colours, font size, etc.)
- Utilise thumbnails with links to a full-screen image

Date: March 23, 2001
Time: 2:45pm
Administrators: James Deloge, Bill Lapp, Melissa Morgan
Participants: Matthew Barker, Jaimee Schultz, Kylie Schultz
Content Set: 2

1.) Did you notice any differences in this set of content compared to this morning's set?
- No, not really

2.) What are some ways we could improve the accessibility of these pages?
- Keep titles at top of tables, don't change that
- The ALT tags don't help or hinder us, so keep those for blind students
- If you had different contrasting colours for each column, with a key on the side, it would help in lengthy tables
- Have hover-over hyperlinks, to more easily identify links
- Have hover-over image map links, so that outline lights up when over it
- Lines would be helpful to separate information in tables
- Gridlines might be helpful behind line graphs to line up data

3.) Did you find yourselves using the graphs or tables more to answer the questions?
- Graphs mostly
- Text lesson above wasn't very useful, found answers in graphs quicker

4.) Is there anything else we could do to make the pages more interesting?
- The lack of colour made it boring
- Use pretty colours

Date: March 30, 2001
Time: 10:20am
Administrators: James Deloge, Bill Lapp, Melissa Morgan
Participants: Bridgett Jolley, Jarryd Shakavich, Natasha Paterson
Content Set: 1

1.) Can you describe your experience navigating around the first web page today?
- Table was tough, too much info, too little space
- Links were fairly easy to follow
- Scroll bars were difficult to notice
- Hard to tell there was more content
- Image map was difficult
- Yellow on white was annoying
- Used pie chart a lot to answer questions

2.) Were the tables on our pages easy to understand?
- Table was too big, didn't fit on screen
- Text was an adequate size
- The length of the table made it difficult
- When scrolling down, forgot which header was which

3.) What settings do you usually have on your personal computers?
- High contrast
- Used JAWS at first, but pages were too inaccessible to be read
- In Internet Explorer, changed text size to "Largest"

4.) What would make web pages more accessible for you?
- With high contrast, images not affected, still inaccessible
- Link each image to a high contrast version of it
- Simplify vocabulary or define key words
- Make graphs bigger
- Different colours for table columns
- Cascading style sheets, black on green with yellow underline
- Would be nice to have Excel versions of the tables, customisable

Date: March 30, 2001
Time: 3:00pm
Administrators: James Deloge, Bill Lapp, Melissa Morgan
Participants: Bridgett Jolley, Jarryd Shakavich, Natasha Paterson
Content Set: 2

1.) Did you notice any differences in this set of content compared to this morning's set?
- No, not really
- Seemed easier because page was familiar
- Already knew where everything was

2.) What are some ways we could improve the accessibility of these pages?
- Have hover-over hyperlinks, to more easily identify links
- Have hover-over image map links, so that outline lights up when over it
- Lines would be helpful to separate information in tables
- Gridlines might be helpful behind line graphs to line up data
- Mouseover text isn't big enough

3.) Was the appearance of the page accessible?
- No italics, bold is good
- The yellow/orange colour is tough to see
- Blues and greens are also difficult to distinguish

4.) Is there anything else we could do to make the pages more interesting?
- Designing is more fun, make it look good
- Depends how much visual impairment and Internet experience
- Tough to design for all ages and impairments
- It's too boring, use pretty colours

Date: April 2, 2001
Time: 6:30pm
Administrators: James Deloge, Bill Lapp
Participant: Matt Barker
Content Set: 3

1.) What differences, if any, did you notice in this set of web content?
- Lines on the graphs
- Colours in the table, good for navigation
- Dot points were more pronounced in the line graph
- Liked the mouseover hyperlinks

2.) For the differences you didn't notice, how could we make those stand out more?
- Possibly have links permanently highlighted
- Use icons to symbolise enlarged versions of graphs

3.) What problems, if any, did you still have with the web page?
- Problem with links is linked to text size, hard to make it bigger
- The text lesson was not very helpful, skipped it

4.) What else would make the web page more accessible for you?
- Can't really think of anything else
- Just implement the changes mentioned and it should be fine

Date: April 3, 2001
Time: 4:00pm
Administrators: James Deloge, Melissa Morgan
Participants: Jaimee Schultz, Kylie Schultz
Content Test: 3

1.) What differences, if any, did you notice in this set of web content?
- Yellow and white columns in table were cool
- Mouseover links were helpful
- Borders in tables were also helpful, easier to follow over to data
- Gridlines in graph made it easier to read data points

2.) For the differences you didn't notice, how could we make those stand out more?
- Make links to enlarged version a different colour

3.) What problems, if any, did you still have with the web page?
- Still tough to navigate image map
- Difficult to read graphs that didn't have gridlines

4.) What else would make the web page more accessible for you?
- Make each piece of the image map a different colour
- Put gridlines, horizontal and vertical, on all graphs
- Add a space between the links to make them stand apart

Date: April 4, 2001
Time: 1:30pm
Administrator: Bill Lapp
Participant: Ben Van Poppel
Content Tested: Set 1

1.) Can you describe your experience navigating the first set of content today?
- Not bad
- Text links were good, easy to pick out, different voice

2.) Were the tables easy to understand?
- Not bad, columns were a little off
- Horizontal rules are bad
- Not much obvious clutter
- Headers were descriptive
- Obvious values, good

3.) Do you feel that enough information was given to answer the questions asked?
- Couldn't find graphs
- Probably would've had enough info if graphs were accessible

4.) What else would make the web page more accessible for you?
- Add graph descriptions
- Remove clutter from the table

Date: April 4, 2001
Time: 2:15pm
Administrator: Bill Lapp
Participant: Ben Van Poppel
Content Tested: Set 2

1.) Can you describe your experience navigating the second set of content today?
- Not much difference
- Same navigation as first set

2.) Were the tables and graphs easy to understand?
- Tables were about the same
- Slightly better headers
- Less distance from header to table
- Blank columns are bad
- Graphs were impossible
- Alt-text only said there was a graph, but didn't explain it
- Not helpful at all

3.) Do you feel that enough information was given to answer the questions asked?
- No, because still no explanations of graphs

4.) What else would make the web page more accessible for you?
- Less columns in table (get rid of blank ones)
- Describe graphs!

Date: April 4, 2001
Time: 3:00pm
Administrator: Bill Lapp
Participant: Ben Van Poppel
Content Tested: Set 3

1.) Can you describe your experience navigating the third set of content today?
- Nothing was more difficult
- Image map helped; like single-click access to links all in one place

2.) Were the tables and graphs easy to understand?
- Much better, no extra spaces and columns
- Header labels were helpful
- Screen reader read an extra label at top, but ok
- Example below image was good, it flowed
- Descriptions of graphs helped very much

3.) Do you feel that enough information was given to answer the questions asked?
- Yes

4.) What else would make the web page more accessible for you?
- Orientation can be left our of descriptions for certain types of graphs
- Remove "has" or "with" words, use punctuation instead
- "Rises slightly", "moderately" can be cut
- Allows description to be read quicker
- Raw number values alone help visualise

Date: April 5, 2001
Time: 5:30pm
Administrators: Bill Lapp, Melissa Morgan
Participant: Bridgett Jolley
Content Tested: Set 3

1.) What differences, if any, did you notice in this set of web content?
- Enlarged graphs
- Descriptions of graphs and maps
- Tables had borders
- Could tell there was more to the table because of this
- Alt-text mouseovers in image map were good
- Good wording in the descriptions

2.) For the differences you didn't notice, how could we make those stand out more?
- Long descriptive links are good, harder to ignore or skip over
- Have a gap between the two links
- Icons would be good indicators also
- Didn't realise image map was clickable, now she knows

3.) What problems, if any, did you still have with the web page?
- Still hard to tell where she was in the table
- With smaller text she can see more of it, but harder to read

4.) What else would make the web page more accessible for you?
- Make the mouseover links work with high contrast screens

Date: April 8, 2001
Time: 8:30pm
Administrators: James Deloge, Melissa Morgan
Participant: Jarryd Shakavich
Content Tested: Set 3

1.) What differences, if any, did you notice in this set of web content?
- Yellow background on table makes stuff easier to see
- On table, colours in columns and borders were good

2.) For the differences you didn't notice, how could we make those stand out more?
- For links to Excel file, make the link bold or a different colour
- Make them stand out somehow, too easy to skip over and not notice
- Links blended in too easily with the next paragraph, separate them

3.) What problems, if any, did you still have with the web page?
- Grey background on bar graph made it hard to read

4.) What else would make the web page more accessible for you?
- Make graphs stand out more
- Change background colour of bar graph

Date: April 17, 2001
Time: 10:20am
Administrators: Jim Deloge, Bill Lapp, Melissa Morgan
Participants: Mick Curran, Mathew Christo
Content Tested: Set 1

1.) Can you describe your experience navigating the first set of content today?
- Scrolling through wasn't too bad
- Image map links were bad, all identical, all inaccessible
- Good that all the junk links were at the bottom
- Besides image map, links were properly labeled – no "click here" stuff
- A little tough to orientate themselves with the page

2.) Were the tables easy to understand?
- Hard because they forgot what order the headings were in
- Got lost when skipping through it quickly
- Not really aware of any way to make tables more accessible

3.) Do you feel that enough information was given to answer the questions asked?
- Didn't even notice any graphs
- Tough to work out answers from a stem and leaf table
- Pie charts can say what percentage each data piece represents
- Ample information depends on mathematic experience

4.) What else would make the web page more accessible for you?
- Correct image map links
- Keep it simple
- Should orientate user with where information is going to be

Date: April 17, 2001
Time: 11:30am
Administrators: Jim Deloge, Bill Lapp, Melissa Morgan
Participants: Mick Curran, Mathew Christo
Content Tested: Set 2

1.) Can you describe your experience navigating the second set of content today?
- Noticed Australian Map graphical link
- Nothing much changed
- Intervals were labeled better in 2nd table

2.) Were the tables and graphs easy to understand?
- Graphics descriptions were easy to understand, but didn't say anything
- Size and colour information is useful to put in to aid understanding
- Didn't notice header information
- Nice to know that a graph was there, but text description is necessary also

3.) Do you feel that enough information was given to answer the questions asked?
- No, still guessed on one or two questions
- Pie graph description would've helped
- Explain segments, values, percentages, ranges, axes, etc.

4.) What else would make the web page more accessible for you?
- Need more information about the graphs to be useful tools

Date: April 17, 2001
Time: 12:30pm
Administrators: Jim Deloge, Bill Lapp, Melissa Morgan
Participants: Mick Curran, Mathew Christo
Content Tested: Set 3

1.) Can you describe your experience navigating the third set of content today?
- Better
- Image map links were now useful, and at the beginning
- Much easier with labels

2.) Were the tables and graphs easy to understand?
- Headers were good, no need to cycle through all info
- Excel links are useful for expert Excel users
- Pie chart description was very useful
- Good to have summary, minimum, maximum, then list data
- Some words in data were redundant

3.) Do you feel that enough information was given to answer the questions asked?
- Yes, if you are up to date with maths

4.) What else would make the web page more accessible for you?
- Can't really think of anything
- Good blend of text and graphics, not too much of one or the other

5.)Enlarged version of graphs are good even for blind users, who can call over a sighted assistant and ask about the graph

Date: April 18, 2001
Time: 10:30am
Administrators: Jim Deloge, Bill Lapp, Melissa Morgan
Participants: Deanne Diamandis, Felicity Joyce, Heath McLaghlan
Content Tested: Set 1

1.) Can you describe your experience navigating the first set of content today?
- Easy, not complex finding links
- Tables were difficult to navigate, lots of rows and columns
- Stem and leaf lesson plan was hard, made it difficult to answer questions

2.) Were the tables and graphs easy to understand?
- Graphs were very small, could see colours but couldn't read words
- Too much data, could only see small part of the big picture
- Confusing at first, but after understanding layout, fairly simple
- Difficult having the list as the first column – not traditional
- Couldn't comprehend stem and leaf stuff

3.) Do you feel that enough information was given to answer the questions asked?
- Information was there, just difficult to access

4.) What else would make the web page more accessible for you?
- More descriptive
- Define ranges to understand what you're looking at, not stems
- Need a definite contrast of numbers
- Horizontal row was bad, got stuck in the table

Date: April 18, 2001
Time: 11:30am
Administrators: Jim Deloge, Bill Lapp, Melissa Morgan
Participants: Deanne Diamandis, Felicity Joyce, Heath McLaghlan
Content Tested: Set 2

1.) Can you describe your experience navigating the second set of content today?
- Didn't notice any difference from first set
- Still easy navigation, just arrow up and down to get what was needed

2.) Were the tables and graphs easy to understand?
- First table was ok, very straightforward
- Second table was harder, more numbers and more headers
- Having graph titles is helpful in pointing out what a sighted person would see, but need to be more descriptive to be useful

3.) Do you feel that enough information was given to answer the questions asked?
- Descriptions should have been more detailed
- Yes, info was there, only lack of table experience prevented me from finding answers

4.) What else would make the web page more accessible for you?
- Have labels with each cell, otherwise it's just a set of numbers

Date: April 18, 2001
Time: 12:30pm
Administrators: Jim Deloge, Bill Lapp, Melissa Morgan
Participants: Deanne Diamandis, Felicity Joyce, Heath McLaghlan
Content Tested: Set 3

1.) Can you describe your experience navigating the third set of content today?
- More links to choose from
- Tables were better but too small
- JAWS would stop if a sentence used word wrap, keep on one line

2.) Were the tables and graphs easy to understand?
- Border lines were helpful for knowing more was there
- Graph descriptions were very helpful
- Links to enlarged versions were helpful
- Text on graphs should be bigger
- Different colours are helpful, or have it in bulleted form
- Cumulative percentage concept was not clearly conveyed

3.) Do you feel that enough information was given to answer the questions asked?
- Yes, there was enough info available

4.) What else would make the web page more accessible for you?
- Use fractions on pie chart description
- Still not enough labels, include labels in all cells
- Include a % sign when referring to percentages
- Verbally layout entire page at top of page
- Contrasting colours
- Links must be noticeable, highlighting was good

Date: April 19, 2001
Time: 9:55am
Administrator: Melissa Morgan
Participant: Kushbu Lal
Content Tested: Set 1

1.) Can you describe your experience navigating the first set of content today?
- Fairly simple
- Well laid out

2.) Were the tables easy to understand?
- Would've been easy if familiar with the layout first
- Second table had too many headers – confusing
- Hard to keep track of where you were in second table
- First one was easy, only three column headers to remember

3.) Do you feel that enough information was given to answer the questions asked?
- Probably, but it could've been easier to find
- Not clearly labeled, ambiguous

4.) What else would make the web page more accessible for you?
- Include table headers or units with each cell of data

Date: April 19, 2001
Time: 10:20am
Administrator: Melissa Morgan
Participant: Kushbu Lal
Content Tested: Set 2

1.) Can you describe your experience navigating the second set of content today?
- Really didn't notice any differences

2.) Were the tables and graphs easy to understand?
- Same as first set, headers were still confusing

3.) Do you feel that enough information was given to answer the questions asked?
- Still slightly ambiguous as to layout
- Information was probably there, but not easy to find

4.) What else would make the web page more accessible for you?
- Simplify or explain headers better

Date: April 19, 2001
Time: 10:50am
Administrator: Melissa Morgan
Participant: Kushbu Lal
Content Tested: Set 3

1.) Can you describe your experience navigating the third set of content today?
- Image map alt-text was very helpful
- Links below graphs were also helpful
- Same simple navigation as first two sets

2.) Were the tables and graphs easy to understand?
- Better, but headers were still not adequately explained
- Descriptions of graphs were good, and helpful
- Easier than going through the table

3.) Do you feel that enough information was given to answer the questions asked?
- Having descriptions of graphs made some answers much more accessible
- Yes, enough information was there

4.) What else would make the web page more accessible for you?
- Tables were still confusing
- Explain headers at the top, in context of table meaning

Appendix H – Usability Tests

Student Usability Test Procedures

Usability Test

Directions for Researcher

Step 1:
Set up laptop for activity. This task should be completed before meeting the student.

Interface Requirements:
- **Screen Reader:** JAWS version 3.7 (full or demo)
- **Internet Browser:** Microsoft Internet Explorer version 5.5
- **Hardware:** External Standard QWERTY Keyboard

Step 2:
Introduce yourself to the student and seat them in front of the computer. For Example: "G'Day my name is _____ and I will be administering the review of the web page today. If you would like to take a seat before we get started." Direct the student to the seat and orient him or her to the activity environment. "We are located in the (meeting, technology, etc.) room. In front of you, you will find a computer keyboard, which is attached to a laptop. The browser we will be using during this activity is Internet Explorer 5.5 (IE) and the screen reader we will be using is JAWS version 3.7. Please feel free to move the keyboard and/or laptop into a position that is comfortable for you to use. If you would like to change any settings on JAWS or IE such as the speech and/or keyboard settings please feel free to do so now."

Step 3:
Allow the student to customise any screen reader or browser settings (ex. voice speed, voice style)

Step 4:
Summarise the activity procedure. For Example: "This web page review will take about forty minutes to complete and will consist of 10 multiple-choice questions. After we have completed the activity we will move to a different room where you and other members of your group will be given a group interview. The entire process will take no more than an hour and a half to complete. You (the student) will be given two web pages to browse and will be asked five questions about each page. The answers to all questions can be found using the content provided on the web pages. We will be timing each question but please do not rush through the activity. Feel free to browse through the page as many times as you like in order to answer the questions that I ask. Not all of the web content you will be given will be accessible and as a result you may find it difficult to answer some of the questions. Do not feel like you must answer each question correctly, although we would like you to try your best. This is an activity that

we will use to gain valuable insight into web page accessibility so it is important that you (the student) are honest in your responses to the questions given. Please note that this activity will have no effect on your personal marks and will be used strictly for academic research purposes. All answers given to questions during the activity will be kept confidential within the Research Team. The Research Team consists of James Deloge, Robert Lapp, Melissa Morgan, and research advisors Prof. Holly Ault and Prof. Jonathan Barnett. If you have any questions during the activity, do not hesitate to ask me."

Step 5:

Ask the student if they have any questions regarding the above description.

Step 6:

If the student has questions answer them. If the student does not have questions begin the activity.

Step 7:

Load Test Set 1 onto the computer.

Step 8:

Verbally establish the start of the web page review. For Example: "Ok (student's name), now we are ready to begin. I will begin by asking you some background information and then we will move on to the questions relating to the web page.

Step 9:

Ask preliminary information questions.

Step 10:

Introduction to Test Set 1: Web Navigation Content page. For Example: "Now we will begin the web-based questions. I will begin the web page review by asking you to complete a task/question. Once you have completed/answered this question I will ask you another until we have completed all ten questions."

Step 11:

Ask Test Set 1: Web Navigation Content questions.

Step 12:

Reboot the computer. The demo version of JAWS (version 3.7) has a time out feature, which will deactivate program activity after forty minutes. To make sure this does not happen during the activity a reboot needs to be done after the first web page has been reviewed.

Step 13:

Introduction to Test Set 2: Graphs and Tables Content. For Example: "All right, we have completed the first set of questions. Now we will go on to the second web page. I (the researcher) will need to take the keyboard from you for a moment to open up the new set of material." After taking the keyboard from the student, close the web page Test Set 1 and open up Test Set 2. "The second web page is now open and ready for you to view. The information on this page requires a little background reading so please take the time to read through the information before I ask you the questions."

Step 14:
Ask Test Set 2: Graphs and Tables Content.

Step 15:
Verbally establish the end of the activity. For Example: "(student's name), we have finished the web page review. You are more than welcome to take a quick break before we begin the group interview." Ask the student if they require help navigating to the bathroom and/or water fountain. If help is required lead them by the arm or guide them by walking besides them and giving them verbal cues (turn right, turn left, there are stairs coming up in front of you, etc.). Always ask first before approaching a student to help lead them. The student will best know what method works for them and will tell you what you can do to help. After the break, bring the student to the location where the group interview will take place and get him or her seated.

Step 16:
Move on to Group Interview directions.

Group Interview

Directions for Group Interview Administrators

Note: Continued from Usability Test

Step 17:

Set up the meeting room for group interview administration. This task should be completed before the students are present.

Room Requirements:

- Enough chairs for all Group Interview Administrators and Students
- Entrance door shut during interview time

Step 18:

Group Interview Administrators will introduce themselves to the students and briefly summarise the group interview procedure. For Example: "G'Day my name is _____ and we'd like to ask you some questions about your activity today. This group interview will take about forty-five minutes to complete and will consist of 7 questions. The questions will be asked by ________. There are no right or wrong answers to any of the questions. Overall, we are looking for feedback on the web pages you just viewed. Your responses will be used to help us design more accessible web pages so it is important that you (the student) are honest in your responses to the questions given. And don't worry; your personal responses to questions will be used strictly for academic research purposes. All answers given to questions during the group interview will be kept confidential within the Research Team. The Research Team consists of Robert Lapp, James Deloge, Melissa Morgan, and research advisors Prof. Holly Ault and Prof. Jonathan Barnett. If you have any questions during the activity, do not hesitate to ask us."

Step 19:

Ask the students if they have any questions regarding the above description.

Step 20:

If the students have questions answer them. If the students do not have questions begin the group interview.

Step 21:

Verbally establish the start of the group interview. For Example: "Ok everyone, we are ready to start. We will begin by posing a question to the group and if you would like to volunteer an answer, just raise your hand and we will call on you. We will give everyone a chance to speak their mind, so don't worry if you don't get called on first."

Step 22:

Remind the students about the topic. For Example: "You all just took part in a web page review with each of us. If you remember, the first page given to you to review concerned navigating around a web page as well as retrieving some information from a table. The second web page that you were all shown had a lesson plan about (name of topic used in content viewed) as well as a table and some graphs. In that web page we asked you to complete some calculation questions. Keep this activity in mind when we ask you questions about it because we are going to be discussing the web pages that you just reviewed."

Step 23:

Begin group interview.

Step 24:

Verbally establish the end of the group interview. For Example: "Alright everyone, that concludes our group interview for the ____ set of content. We thank you for all of your help today. Your feedback on the accessibility of our web pages is of great importance to our study. Thanks again for helping us out with our project."

Questions

Question 1:
Can you describe your experience navigating the web pages?

- What content was difficult to navigate?
- What content was easy to navigate?

Question 2:
Were the tables in each page easy to understand?

- What characteristics of the table made it easy to find specific data?
- What characteristics of the table made it difficult to find specific data?

Question 3:
Were the graphic descriptions easily understandable?

- What about the descriptions was helpful?
- What about the descriptions was not helpful?

Question 4:
Did table headers help you in moving around the tables and looking for information?

Question 5:
Did the descriptions help you understand what the graph was portraying?

- What information was ambiguous or hard to grasp?
- Should the descriptions have been more or less detailed?

Question 6:
Do you feel that enough information was given to answer the questions asked?

- What extra information do you feel would be useful?
- What questions in particular were difficult to answer?

Question 7:
Do you have any other comments or suggestions about web page design?

Usability Activity Questions

Preliminary Information: Researcher

Name: First Name ______________, Last Name _____________

Preliminary Information: Student

Name: First Name ______________, Last Name _____________

Age: _____

School Level: _____

Date: _________
Time: _________

Visual Impairment: _______________

Note: Ask if the student uses a screen reader.
On a scale of 1 to 10 with 10 being the most experience and 1 being no experience, how would you rate your experience with JAWS? _____

Note: Ask if the student uses any low vision technologies.
On a scale of 1 to 10 with 10 being the most experience and 1 being no experience, how would you rate your experience with low vision technologies (magnification programs, changing font/colour/resolutions settings)? _____

On a scale of 1 to 10 with 10 being the most experience and 1 being no experience, how would you rate your experience with the Internet? ____

Location
___RVIB
___Student's Home

Content Tested
___Content Version 1 (Control)
___Content Version 2 (ABS Accessibility Guidelines)
___Content Version 3 ('AA' Compliance and Experimental Techniques)

Observations

Test Set 1: Web Navigation Content

Question 1

Number of incorrect links chosen: ________________

Time to complete question: _____________________

Incorrect links chosen: _________________________

____

Question 2

Number of incorrect links chosen: ________________

Time to complete question: _____________________

Incorrect links chosen: _________________________

____

Question 3

Number of incorrect links chosen: ________________

Time to complete question: _____________________

Incorrect links chosen: _________________________

____

Question 4

Answer Given: a___, b___, c___, d___, e___

___Correct

___Incorrect

Time to complete question: ________

Question 5

Answer Given: a___, b___, c___, d___, e___

___Correct

___Incorrect

Time to complete question: ________

Test Set 2: Graphs and Tables Content

Question 6

Answer Given: a___, b___, c___, d___, e___
___Correct
___Incorrect
Time to complete question: ___________
Source of Answer: Table ____Graph ____
If Graph, which one? _________________

Question 7

Answer Given: a___, b___, c___, d___, e___
___Correct
___Incorrect
Time to complete question: ___________
Source of Answer: Table ____Graph ____
If Graph, which one? _________________

Question 8

Answer Given: a___, b___, c___, d___, e___
___Correct
___Incorrect
Time to complete question: ___________
Source of Answer: Table ____Graph ____
If Graph, which one? _________________

Question 9

Answer Given: a___, b___, c___, d___, e___
___Correct
___Incorrect
Time to complete question: ___________
Source of Answer: Table ____Graph ____
If Graph, which one? _________________

Question 10

Answer Given: a___, b___, c___, d___, e___
___Correct
___Incorrect
Time to complete question: ___________
Source of Answer: Table ____Graph ____
If Graph, which one? _________________

Student Usability Test Questions

Questions for Census – Set 1

1.) Please follow a link to the State of Victoria.

2.) Please follow a link to the Region of Barwon.

3.) Please find a link that will bring you to Tables for Barwon (Statistical Division).

4.) Using information from the Selected Characteristics - Barwon, how many females were employed?
   a) 51,342
   b) 43,776
   c) 39,215 Correct
   d) 17,923
   e) Unable to determine

5.) Using the same information, how many people were *not* in the labour force?
   a) 71,716 Correct
   b) 90,557
   c) 78,402
   d) 64,238
   e) Unable to determine

6.) Using any information on the page, what is the largest number of people who climbed Ayers Rock in the thirty-day period?
   a) 60
   b) 65 Correct
   c) 70
   d) 75
   e) Unable to determine

7.) Using the same information, over what three ranges is the cumulative frequency growing at the same pace?
   a) 0-29 people
   b) 10-39 people
   c) 20-49 people Correct
   d) 30-59 people
   e) Unable to determine

8.) Using the same information, what percentage of the thirty days did 30-39 people climb Ayer's Rock?
   a) 10%
   b) 16%

c) 17% Correct
d) 20%
e) Unable to determine

9.) Using the same information, what range of people had the least frequency?
a) 0-9 people Correct
b) 10-19 people
c) 20-30 people
d) 30-40 people
e) Unable to determine

10.) Using the same information, what is the most common range of visitors that can be expected to climb Ayer's Rock each day in following months?
a) 30-39 people
b) 40-49 people
c) 50-59 people Correct
d) 60-69 people
e) Unable to determine

Questions for Census – Set 2

1.) Please follow a link to the State of Victoria.

2.) Please follow a link to the Region of Gippsland.

3.) Please find a link that will bring you to Tables for Gippsland (Statistical Division).

4.) Using information from the 1996 Census of Population and Housing in Gippsland, how many females were employed?
   a) 31,585
   b) 26,386
   c) 23,606 Correct
   d) 9,698
   e) Unable to determine

5.) Using the same information, how many people were *not* in the labour force?
   a) 44,130 Correct
   b) 55,191
   c) 47,714
   d) 39,256
   e) Unable to determine

6.) Using Cumulative Frequency and Percentage information, on how many of the 25 days was there less than 200 centimetres snow depth?
   a) 0 Correct
   b) 2
   c) 3
   d) 5
   e) Unable to determine

7.) Using the same information, what percentage of the total days was there a snow depth of 250-260cm?
   a) 4%
   b) 8%
   c) 12%
   d) 20%
   e) Unable to determine

8.) Using the same information, on how many of the 25 days was there more than 260 centimetres snow depth?
   a) 2 Correct
   b) 6
   c) 8
   d) 10
   e) Unable to determine

9.) Using the same information, what was the average frequency for days under 230cm?
   a) 1
   b) 2 Correct
   c) 3
   d) 4
   e) Unable to determine

10.) Using the same information, what is likely to be the most common snowfall depth for following years?
   a) 230-240
   b) 240-250 Correct
   c) 250-260
   d) 260-270
   e) Unable to determine

Questions for Census – Set 3

1.) Please follow a link to the State of Victoria.

2.) Please follow a link to the Region of Central Highlands.

3.) Please find a link that will bring you to Tables for Central Highlands (Statistical Division).

4.) Using information from the 1996 Census of Population and Housing in Central Highlands, how many females were employed?
   a) 20,909
   b) 21,725 Correct
   c) 24,162
   d) 27,874
   e) Unable to determine

5.) Using the same information, how many people were *not* in the labour force?
   a) 56,071
   b) 49,599
   c) 34,756
   d) 40,999 Correct
   e) Unable to determine

6.) Using Cumulative Frequency and Percentage information, on how many of the 25 days was it below 20 degrees?
   a) 4
   b) 5
   c) 6
   d) 7 Correct
   e) Unable to determine

7.) Using the same information, what percentage of the total days was it between 20 and 25 degrees?
   a) 8%
   b) 16%
   c) 20%
   d) 32%
   e) Unable to determine

8.) Using the same information, on how many of the 25 days was it greater than 30 degrees?
   a) 5 Correct
   b) 12
   c) 8
   d) 4

e) Unable to determine

9.) Using the same information, what ranges occur the least frequently?

a) 5-10 degrees and 10-15 degrees
b) 5-10 degrees
c) 35-40 and 5-10 degrees Correct
d) 35-40 degrees
e) Unable to determine

10.) Using the same information, what is likely to be the most common temperature range for following years?

a) 10-15
b) 15-20
c) 20-25
d) 25-30 Correct
e) Unable to determine

Appendix I – Student Usability Test Data

Low Vision Content Set 1								
		1	2	3	4	5	6	7
1	Links Chosen	0	0	0	0	0	0	0
	Time	7	7	20	34	6	26	22
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Notes							
2	Links Chosen	0	0	0	0	0	5	5
	Time	6	10	20	17	14	257	62
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Notes							
3	Links Chosen	0	0	0	0	0	0	0
	Time	2	8	35	43	24	30	92
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Notes							
4	Answer Given	C	C	C	E	C	C	E
	Incorrect				X		X	X
	Time	73	3	45	220	164	260	254
	Notes							
5	Answer Given	A	A	A	E	B	A	E
	Incorrect				X	X		X
	Time	48	6	48	226	48	49	229
	Notes							
6	Answer Given	B	B	B	B	B	B	B
	Incorrect							
	Time	129	12	365	182	42	49	251
	Source Of Answer	Text	Table	Line	Table	Pie/Bar	Table	Table
	Notes							
7	Answer Given	C	E	D	D	C	A	E
	Incorrect							
	Time	130	180	140	144	163	507	93
	Source Of Answer	Line	Bar	Line	Table	Line	Table	Line
	Notes							
8	Answer Given	A	C	C	C	C	C	E
	Incorrect	X						X
	Time	150	20	80	41	88	145	145
	Source Of Answer	Pie	Pie	Pie	Pie	Pie	Table	Pie
	Notes							
9	Answer Given	A	A	A	A	A	A	A
	Incorrect							
	Time	68	24	32	39	19	55	179
	Source Of Answer	Bar	Table	Pie	Table	Pie	Table	Table
	Notes							
10	Answer Given	C	C	C	C	C	C	C
	Incorrect							
	Time	130	63	141	121	20	41	151
	Source Of Answer	Bar	Bar	Pie	Table	Pie	Table	Table
	Notes							

Low Vision Content Set 2								
		1	2	3	4	5	6	7
1	Links Chosen	0	0	0	0	0	0	0
	Time	1	3	8	4	3	14	16
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Notes							
2	Links Chosen	0	0	0	0	0	0	0
	Time	14	2	5	7	7	30	26
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Notes							
3	Links Chosen	0	0	0	0	0	0	0
	Time	1	1	38	6	4	4	42
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Notes							
4	Answer Given	C	C	C	C	C	C	E
	Incorrect							X
	Time	6	5	38	54	12	44	199
	Notes							
5	Answer Given	A	A	A	A	A	A	E
	Incorrect							X
	Time	12	4	15	13	9	18	148
	Notes							
6	Answer Given	C	A	D	A	A	A	A
	Incorrect	X		X				
	Time	30	11	50	17	135	30	127
	Source Of Answer	Text	Table	Line/Bar	Table	All	Table	Table
	Notes							
7	Answer Given	C	D	D	D	D	D	E
	Incorrect	X						
	Time	163	5	72	12	94	35	19
	Source Of Answer	Pie	Pie	Pie	Pie	Pie	Table	Pie
	Notes							
8	Answer Given	A	E	A	A	A	A	A
	Incorrect		X					
	Time	68	6	46	28	7	15	105
	Source Of Answer	Bar	Table	Bar	Table	Bar	Table	Table
	Notes							
9	Answer Given	C	B	B	E	B	B	E
	Incorrect							
	Time	65	9	242	75	164	10	197
	Source Of Answer	Bar	Table	Table	Table	Bar	Table	Table
	Notes							
10	Answer Given	B	B	B	B	B	B	A
	Incorrect							
	Time	30	15	168	34	16	42	285
	Source Of Answer	Bar	Pie	Pie	Table	Bar	Table	Table
	Notes							

Low Vision Content Set 3								
		1	2	3	4	5	6	7
1	Links Chosen	0	0	0	0	1	0	0
	Time	1	3	7	7	4	5	7
	Incorrect Links Chosen	N/A	N/A	N/A		Last Choic	N/A	N/A
	Notes							
2	Links Chosen	0	0	0	0	0	0	0
	Time	3	2	10	5	3	4	7
	Incorrect Links Chosen	N/A	N/A	N/A		N/A	N/A	N/A
	Notes							
3	Links Chosen	0	0	0	0	0	0	0
	Time	6	1	2	6	2	1	8
	Incorrect Links Chosen	N/A	N/A	N/A		N/A	N/A	N/A
	Notes							
4	Answer Given	B	B	B	B	B	B	B
	Incorrect							
	Time	6	7	25	36	7	25	73
	Notes							
5	Answer Given	D	D	E	A	D	D	D
	Incorrect			X	X			
	Time	5	6	5	14	9	7	59
	Notes							
6	Answer Given	C	B	B	D	A	A	A
	Incorrect	X	X	X				
	Time	29	79	36	5	96	51	30
	Source Of Answer	Table	Table	Bar	Table	Bar	Table	Table
	Notes							
7	Answer Given	C	C	C	C	C	C	C
	Incorrect							
	Time	50	23	81	49	9	21	71
	Source Of Answer	Pie	Table	Pie	Pie Desc	Pie	Table	Pie Desc
	Notes							
8	Answer Given	C	D	D	A	D	A	A
	Incorrect	X	X	X		X		X
	Time	56	23	12	11	30	3	180
	Source Of Answer	Table	Table	Bar	Table	Bar	Table	Bar Big
	Notes							
9	Answer Given	D	C	B	C	B	C	C
	Incorrect							
	Time	60	24	27	22	44	20	140
	Source Of Answer	Bar	Bar	Pie	Table	Pie	Table	Table
	Notes							
10	Answer Given	D	D	D	D	D	D	D
	Incorrect							
	Time	40	12	65	6	29	15	83
	Source Of Answer	Bar	Bar	Bar	Table	Bar	Table	Table
	Notes							

Blind Content Set 1							
		1	**2**	**3**	**4**	**5**	**6**
1	**Links Chosen**	0	0	0	0	0	0
	Time	82	8	55	66	38	20
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A
	Notes						
2	**Links Chosen**	0	0	0	0	0	0
	Time	42	26	85	36	26	28
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A
	Notes						
3	**Links Chosen**	0	0	0	0	0	0
	Time	63	92	53	92	130	30
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A
	Notes						
4	**Answer Given**	C	C	C	C	C	C
	Incorrect						
	Time	84	56	299	438	402	46
	Notes						
5	**Answer Given**	A	A	A	E	A	A
	Incorrect				X		X
	Time	100	16	66	33	17	22
	Notes						
6	**Answer Given**	B	B	B	E	E	E
	Incorrect				X	X	X
	Time	377	293	256	329	420	221
	Source Of Answer	Table	Table	Table			Table
	Notes						
7	**Answer Given**	E	E	E	E	E	A
	Incorrect	X	X	X	X	X	X
	Time	261	504	166	454	0	221
	Source Of Answer	N/A	N/A	N/A	4	N/A	N/A
	Notes						Table
8	**Answer Given**	E	D	E	E	E	C
	Incorrect	X	X	X	X	X	
	Time	354	235	121	146	0	121
	Source Of Answer	N/A	Table	N/A	N/A	N/A	N/A
	Notes						Table
9	**Answer Given**	A	A	A	E	E	A
	Incorrect				X	X	
	Time	156	130	221	136	0	180
	Source Of Answer	Table	Table	Table			Table
	Notes						
10	**Answer Given**	C	C	C	E	E	C
	Incorrect				X	X	
	Time	61	53	163	53	0	62
	Source Of Answer	Table	Table	Table			Table
	Notes						

	Blind Content Set 2						
		1	2	3	4	5	6
1	Links Chosen	0	0	0	0	0	0
	Time	64	22	52	50	42	14
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A
	Notes						
2	Links Chosen	0	0	0	0	0	0
	Time	70	35	32	51	45	33
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A
	Notes						
3	Links Chosen	0	0	0	0	0	0
	Time	69	25	31	39	20	20
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A
	Notes						
4	Answer Given	C	C	C	C	C	C
	Incorrect						
	Time	42	47	127	182	92	50
	Notes						
5	Answer Given	A	A	A	A	A	A
	Incorrect						
	Time	14	8	12	50	8	7
	Notes						
6	Answer Given	E	A	E	E	A	A
	Incorrect	X	X	X	X		X
	Time	342	80	206	100	328	128
	Source Of Answer	N/A	Table	Table		Table	Table
	Notes						
7	Answer Given	E	D	A	E	D	D
	Incorrect	X					
	Time	27	328	264	67	225	78
	Source Of Answer	N/A	Table	Table		Table	Table
	Notes						
8	Answer Given	A	A	A	E	A	A
	Incorrect				X		
	Time	57	51	54	98	22	154
	Source Of Answer	Table	Table	Table		Table	Table
	Notes						
9	Answer Given	B	B	B	C	B	D
	Incorrect						
	Time	144	79	71	165	188	91
	Source Of Answer	Table	Table	Table		Table	Table
	Notes						
10	Answer Given	B	B	B	A	B	C
	Incorrect				X	X	X
	Time	12	54	133	108	160	102
	Source Of Answer	Table	Table	Table		Table	Table
	Notes						

Blind Content Set 3							
		1	2	3	4	5	6
1	Links Chosen	0	0	0	0	0	0
	Time	7	23	22	32	12	12
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A
	Notes						
2	Links Chosen	0	0	0	0	0	0
	Time	14	17	36	19	27	11
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A
	Notes						
3	Links Chosen	0	0	0	0	0	0
	Time	22	17	27	36	20	14
	Incorrect Links Chosen	N/A	N/A	N/A	N/A	N/A	N/A
	Notes						
4	Answer Given	B	B	B	B	B	B
	Incorrect						
	Time	44	47	56	163	75	40
	Notes						
5	Answer Given	D	D	D	D	D	D
	Incorrect						
	Time	6	6	61	22	51	7
	Notes						
6	Answer Given	D	D	D	E	D	D
	Incorrect				X		X
	Time	119	225	102	429	222	116
	Source Of Answer	Bar Desc	Table	Table		Table	Table
	Notes						
7	Answer Given	C	C	C	E	C	C
	Incorrect						
	Time	39	123	241	449	112	180
	Source Of Answer	Pie Desc	Pie Desc	Pie Desc		Table	Pie Desc
	Notes						
8	Answer Given	A	A	A	E	A	A
	Incorrect				X	X	
	Time	30	61	12	192	83	39
	Source Of Answer	Bar Desc	Bar Desc	Table		Table	Table
	Notes						
9	Answer Given	C	C	B	C	C	C
	Incorrect			X		X	
	Time	9	178	67	118	95	74
	Source Of Answer	Bar Desc	Pie Desc	Table	Pie Desc	Table	Table
	Notes						
10	Answer Given	D	D	D	D	D	D
	Incorrect					X	
	Time	8	36	39	54	63	54
	Source Of Answer	Bar Desc	Pie Desc	Table	Pie Desc	Table	Bar Desc
	Notes						

Low Vision – Navigation Time Ranges (Seconds)												
	Content Set 1				Content Set 2				Content Set 3			
Activities	**Low**	**Med**	**High**	**Avg**	**Low**	**Med**	**High**	**Avg**	**Low**	**Med**	**High**	**Avg**
Navigation Activity 1	6	20	34	17	1	4	16	7	1	5	7	5
Navigation Activity 2	6	17	257	55	2	7	30	13	2	4	10	5
Navigation Activity 3	2	30	92	30	1	4	42	9	1	2	8	4
Navigation Average	5	22	128	34	1	5	29	10	1	4	8	4

Table 29: Low Vision Navigation Time Ranges

Blind – Navigation Time Ranges in Seconds												
	Content Set 1				Content Set 2				Content Set 3			
Activities	Low	Med	High	Avg	Low	Med	High	Avg	Low	Med	High	Avg
Navigation Activity 1	8	47	82	45	14	46	64	41	7	17	32	18
Navigation Activity 2	26	32	85	41	32	40	70	44	11	18	36	21
Navigation Activity 3	30	78	130	39	20	28	69	26	14	21	36	23
Navigation Average	21	52	99	41	22	38	68	37	11	19	35	20

Table 30: Blind - Navigation Time Ranges

Low Vision - Table Accessibility Time Ranges (Seconds)												
	Content Set 1				Content Set 2				Content Set 3			
Activities	Low	Med	High	Avg	Low	Med	High	Avg	Low	Med	High	Avg
Table Accessibility Activity 4	3	164	260	146	5	38	199	51	6	25	73	26
Table Accessibility Activity 5	6	48	229	93	4	13	148	31	5	7	59	15
Table Accessibility Averages	5	106	245	120	5	26	174	41	6	16	66	20

Table 31: Low Vision Table Accessibility Time Ranges

Blind - Table Accessibility Time Ranges (Seconds)												
	Content Set 1				Content Set 2				Content Set 3			
Activities	Low	Med	High	Avg	Low	Med	High	Avg	Low	Med	High	Avg
Table Accessibility Activity 4	46	192	438	221	42	71	182	90	40	52	163	71
Table Accessibility Activity 5	16	28	100	42	7	10	50	17	6	15	61	26
Table Accessibility Averages	31	110	269	132	25	41	116	53	23	33	112	48

Table 32: Blind - Table Accessibility Time Ranges

Low Vision - Comprehension Time Ranges (Seconds)												
	Content Set 1				Content Set 2				Content Set 3			
Activities	Low	Med	High	Avg	Low	Med	High	Avg	Low	Med	High	Avg
Comprehension Activity 6	12	129	365	147	11	30	135	57	5	36	96	47
Comprehension Activity 7	93	144	507	194	5	35	163	57	9	49	81	43
Comprehension Activity 8	20	88	150	96	6	28	105	39	3	23	180	45
Comprehension Activity 9	19	39	179	59	9	75	242	109	20	27	140	48
Comprehension Activity 10	20	121	151	95	15	34	285	84	6	29	83	36
Comprehension Averages	33	104	270	118	9	40	186	69	9	33	116	44

Table 33: Low Vision - Comprehension Time Ranges

Blind - Comprehension Time Ranges (Seconds)												
	Content Set 1				Content Set 2				Content Set 3			
Activities	Low	Med	High	Avg	Low	Med	High	Avg	Low	Med	High	Avg
Comprehension Activity 6	221	311	420	316	80	167	342	197	102	171	429	202
Comprehension Activity 7	166	241	504	268	27	152	328	165	39	152	449	191
Comprehension Activity 8	121	134	354	163	51	56	154	73	12	50	192	70
Comprehension Activity 9	130	146	221	137	71	118	188	123	9	85	178	90
Comprehension Activity 10	53	57	163	65	12	105	160	95	8	47	63	42

Comprehension Averages	138	178	332	190	48	119	234	131	34	101	262	119

Table 34: Blind - Comprehension Time Ranges

5.1.3 Times by Student

The times taken to complete each type of activity, navigation, table accessibility, and comprehension were averaged together for each student and are displayed below. Each table shows one type of activity and a group of students, either low vision or blind. The students are listed vertically in the first column, and the three Content Sets are listed across the top.

Low Vision – Average Navigation Times (in seconds)by Student			
	Content Set 1	Content Set 2	Content Set 3
Student 1	5	5	3
Student 2	8	2	2
Student 3	25	17	6
Student 4	31	6	6
Student 5	15	5	3
Student 6	104	16	3
Student 7	59	28	7

Figure 35: Low Vision - Navigation Times by Student

Blind - Navigation Times by Student			
	Content Set 1	Content Set 2	Content Set 3
Student 1	62	68	14
Student 2	42	27	19
Student 3	64	38	28
Student 4	65	47	29
Student 5	65	36	20
Student 6	26	22	12

Table 35: Blind - Navigation Times by Student

Low Vision - Table Accessibility Times by Student			
	Content Set 1	Content Set 2	Content Set 3
Student 1	61	9	6
Student 2	5	5	7
Student 3	47	27	15
Student 4	223	34	25
Student 5	106	11	8
Student 6	155	31	16
Student 7	242	174	66

Table 36: Low Vision Table Accessibility Times by Student

Blind - Table Accessibility Times by Student

	Content Set 1	Content Set 2	Content Set 3
Student 1	92	28	25
Student 2	36	28	27
Student 3	183	70	59
Student 4	236	116	93
Student 5	210	50	63
Student 6	34	29	24

Table 37: Blind - Table Accessibility Time by Student

Low Vision - Comprehension Times by Student			
	Content Set 1	Content Set 2	Content Set 3
Student 1	121	71	47
Student 2	60	9	32
Student 3	152	116	44
Student 4	105	33	19
Student 5	66	83	42
Student 6	73	24	22
Student 7	182	179	108

Table 38: Low vision Comprehension Times by Student

Blind – Comprehension Times by Student			
	Content Set 1	Content Set 2	Content Set 3
Student 1	242	116	41
Student 2	243	118	125
Student 3	185	146	92
Student 4	224	108	248
Student 5	84	185	115
Student 6	146	119	71

Table 39: Blind Comprehension Times by Student

Appendix J - Graph and Tables Handbook

1. Introduction

This handbook is to be used in the development of web content anytime the content contains one or more graphs or tables. The main goal of this handbook is to help the content developer to describe graphs and tables in such a way that visually impaired users may be able to extract the same information as a sighted user. Without giving away too much information, the descriptions derived from this handbook should allow the user to draw his or her own conclusions from the graphs and tables.

2. General Purpose Descriptions

When an element of Web content, or "object", requires a description, independent of the type, there are certain guidelines that the content developer should follow. For more specific instructions for different types of content, refer to the appropriate sections later on in this handbook.

- Decide if the concept should be familiar or unfamiliar to the target audience. If unfamiliar, the object requires a much more detailed introduction.
- Define any obscure terms.
- Give a brief overview of the object, including how it relates to the rest of the page.
- Define the scope of the object (range, size, orientation, etc.).
- Note any trends that a sighted user would be able to observe.

3. Tables

In order to understand the structure of a table, a visually impaired or blind user will usually traverse the entire table once to read through the row and column headers and subsequent data values. Then depending on the task at hand, he or she will go through subsequent traversals to find the desired information.

Simple tables are accessible to any user as long as column headers are applied appropriately. Long descriptions are usually not necessary, as it would take the user as much time to read a description of the table as it would to traverse the entire table two or three times.

Elaborate tables are more easily interpreted when preceded by a meaningful description of the contents. If the user is given a verbal description of the table layout before traversing it for the first time, each traversal will be much more efficient.

- Avoid the use of horizontal rules to separate table headers from table data. Screen readers cannot detect these, and therefore cause confusion to visually impaired users.
- For the table caption:
  - Give a very brief overview of what the table shows.
- For the table summary (long description):
  - Start by stating the number of columns and rows.
  - Define column headers and state units, if applicable.

- Define row headers and state units, if applicable.
- When stating units, spell them out (e.g. “degrees Celsius” not °C).

4. Images

The following types of graphs are all portrayed as images, and for that reason, can all be described in detail using a long description. Images must always have an “ALT” text description as well, which should say enough about the image for the user to decide whether or not he or she wants to read the long description. Refer to the Lotus Notes Tutorial for more information on how to add “ALT” text and long descriptions. For information on how to describe specific graphs in the long description page, refer to the appropriate sections below.

A. Line Graphs

- State that it is a line graph.
- Describe axes, horizontal then vertical, with labels and units.
- Include the range of numbers for each axis.
- To describe the line, state the starting point, then direction and pitch to next point (e.g. rises slightly, declines moderately), then state the coordinates and repeat until the end of the line is reached.
  - If the line is curved, state so in the description. For example, “curves slightly upward” or “curves moderately downward”.
  - If there are no points on the line, estimate points that are near major tick-marks, and describe trends in between.
  - For multiple lines on one set of axes, describe each line individually, but if the lines cross at any points, state so in the description.
  - Ex: Line begins at 0% at 5 degrees, then rises slightly to cross Graph 1 at 2% at 7 degrees.
  - Example description of Figure 1: In the line graph shown in Figure 1, the horizontal axis represents the temperature in degrees Celsius, and going from left to right, the axis ranges from 0 degrees Celsius to 40 degrees Celsius. The vertical axis represents the cumulative percentage, and from bottom to top, ranges from 0 to 100 percent. The data points are as follows:

    Line begins at 0% at 5 degrees,
    then rises slightly to 4% at 10 degrees,
    then rises slightly to 12% at 15 degrees,
    then rises moderately to 28% at 20 degrees,
    then rises moderately to 48% at 25 degrees,
    then rises greatly to 80% at 30 degrees,
    then rises moderately to 96% at 35 degrees,
    then rises slightly to end at 100% at 40 degrees.

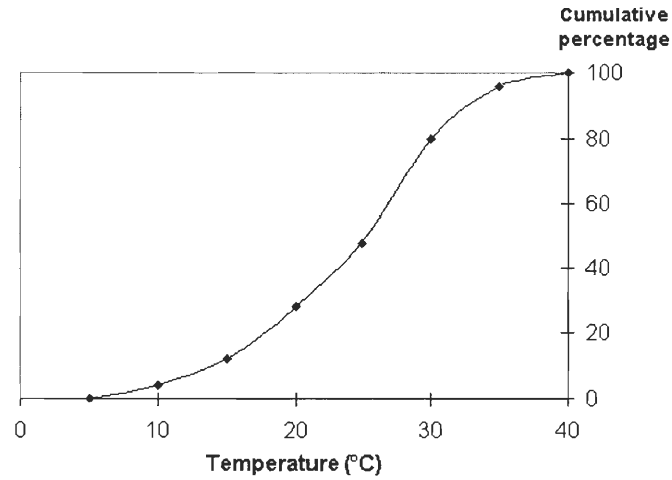


Figure 36 - Sample Line Graph

B. Pie Charts

- State that it is a pie chart.
- State what the whole pie represents.
- State the number of segments, or pieces of the pie.
- [Optional] State the biggest and smallest pieces of the pie.
- State what each piece represents, what percentage of the pie that encompasses, or approximately what fraction of the pie that encompasses.
    - *Note: This can be done in order of percentage, from lowest to highest or highest to lowest, or in order of data, clockwise or counter-clockwise. This is at the content developer's discretion, by which method would be most conceptually beneficial for that particular pie chart.*
    - *Note: Fractions should only be used if the pieces can be expressed as evenly divisible fractional parts.*
    - Example description of Figure 2: The pie chart shown in Figure 2 represents the percentage of temperatures in Melbourne over a 25 day period. There are seven segments, each representing what percentage of the time the temperature fell within a certain temperature range. The pieces in order of increasing temperature are as follows:

        Piece one for the range from 5 to 10 degrees is 4%.
        Piece two for the range from 10 to 15 degrees is 8%.
        Piece three for the range from 15 to 20 degrees is 16%.
        Piece four for the range from 20 to 25 degrees is 20%.
        Piece five for the range from 25 to 30 degrees is 32%.
        Piece six for the range from 30 to 35 degrees is 16%.
        Piece seven for the range from 35 to 40 degrees is 4%.

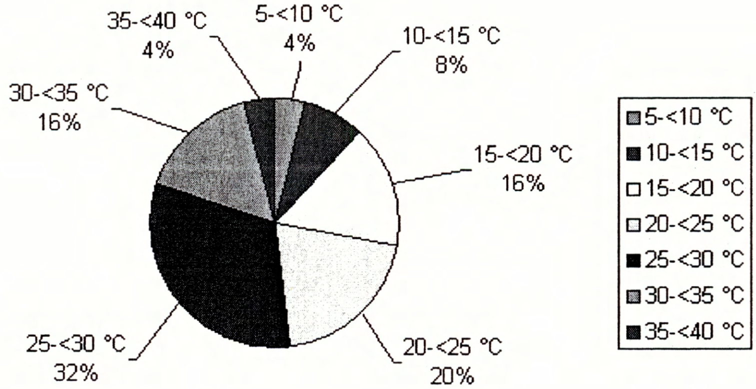


Figure 37 - Sample Pie Chart

C. Bar Graphs

- State that it is a bar graph.
- State what the entire bar graph represents.
- State the number of bars and what each bar represents.
- Describe the axis that runs parallel to the bars and state its range and units.
- [Optional] State the biggest and smallest bars in the group.
- For each bar, state its label and value.
    - *Note: This can be done from left to right, top to bottom, or in order by value, at the content developer's discretion. The best method will be specific to each graph, depending on which method would be most conceptually beneficial for that particular bar graph.*
    - Example description of Figure 3: The bar graph shown in Figure 3 represents the frequency of temperatures in Melbourne over a 25 day period. There are seven bars, each representing the number of days the temperature fell within a certain temperature range. The bars in order of increasing temperature are as follows:
      Bar one for 5 to 10 degrees is one day.
      Bar two for 10 to 15 degrees is two days.
      Bar three for 15 to 20 degrees is four days.
      Bar four for 20 to 25 degrees is five days.
      Bar five for 25 to 30 degrees is eight days.
      Bar six for 30 to 35 degrees is four days.
      Bar seven for 35 to 40 degrees is one day.

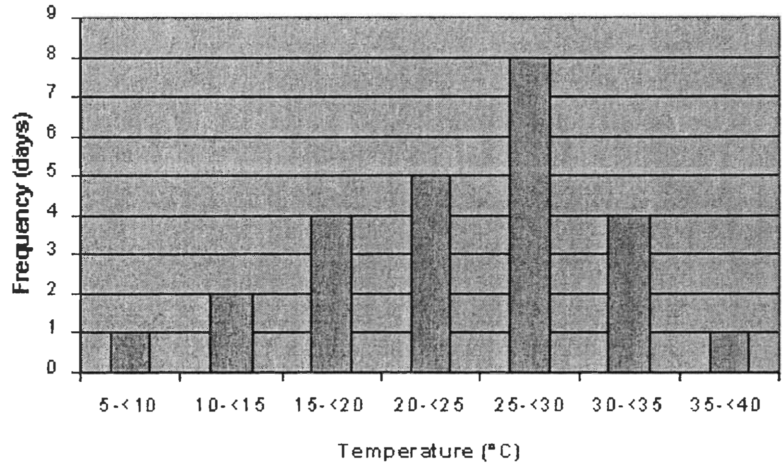


Figure 38 - Sample Bar Graph

D. Scatter Plots

- State that it is a scatter plot.
- Describe axes, horizontal then vertical, with labels and units.
- Include range of numbers for each axis, and intervals between ticks.
- If there are relatively few points in the plot, name each point with its coordinates, following the procedure for a simple line graph. If feasible, name the points in a logical order, perhaps in the order in which they appear on the graph (e.g. left to right, bottom to top).
    - Example description of Figure 4: This is a scatter plot. The horizontal axis represents the diameter of a metal cylinder in centimetres, and ranges from 0 to 10. The vertical axis represents the weight of each cylinder in grams, and ranges from 0 to 12. There are 10 points dispersed throughout the graph, representing 10 different cylinders. The heaviest cylinder is 5 centimetres in diameter and weighs 11 grams. The lightest cylinder is 1 centimetre in diameter and weighs 2 grams. From left to right the cylinders are:
    1 centimetre in diameter weighing 2 grams, then 2 centimetres in diameter weighing 3 grams, then 2 centimetres in diameter weighing 5 grams, then 3 centimetres in diameter weighing 4 grams, then 3 centimetres in diameter weighing 5 grams, then 4 centimetres in diameter weighing 3 grams, then 5 centimetres in diameter weighing 7 grams, then 5 centimetres in diameter weighing 11 grams, then 6 centimetres in diameter weighing 10 grams, and finally 8 centimetres in diameter weighing 6 grams.

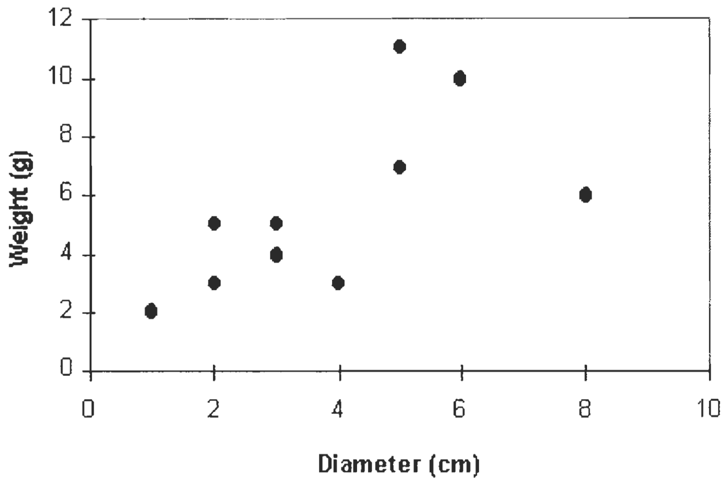


Figure 39 - Sample Scatter Plot

- If there are too many points in the scatter plot to describe, then describe trends by breaking the plot into a conceptual grid as follows:
  - The grid's size may vary, from 2x2 to 8x8 depending on how much detail is desired and the mental ability of the target audience.
  - Establish the size of the grid and numbering scheme (e.g. "An 8 by 8 grid with Row 1, Column 1 in the upper left hand corner").
  - From highest density to lowest, state the location of squares with significant numbers of points in them, and where in the grid those clusters are located (e.g. "In Row 1, Column 3 there is a very high density cluster in the center of the square").
  - If there are squares with no points at all, make that observation, but try to break the grid into big enough squares so that this does not happen.
    - Example grid description of Figure 4: This is a scatter plot. The horizontal axis represents the diameter of a metal cylinder in centimetres, and ranges from 0 to 10. The vertical axis represents the weight of each cylinder in grams, and ranges from 0 to 12. There are points dispersed throughout the graph, each representing a different cylinder. Visualise this plot as a two-by-two grid. The lower left quadrant has the most points, with the highest concentration being from 2 to 4 centimetres in diameter and weighing between 3 and 5 grams. The imaginary vertical line at 5 centimetres in diameter separating the left and right halves of the graph has 2 points on it, one at 7 grams and the other at 11 grams. The upper right quadrant contains 2 points, one in the upper left and the other in the lower center. The upper left and lower right quadrants do not contain any points.

E. Geographical Maps

Geographical maps can be considered a subset of scatter plots, but they are special enough that they require their own tailored description. Since most geographical maps are complex, they can be treated as complicated scatter plots. The only difference the content developer must take into account is whether or not the region described in the map is familiar to the subject. If the target audience is known to be familiar with the area, then specific cities or regions may be referred to by name.

For example, a Melbourne native should be familiar with the city of Melbourne, so the content developer may use specific places such as Port Melbourne, St. Kilda and Swanston Street. However, if the region is completely foreign to the audience, the traditional scatter plot grid breakdown method must be utilised. When referring to different regions on the map, describe each area using common geometric shapes. Consider the following map, Figure 5, describing the proportion of rented dwellings in the Geelong and Bellarine Peninsula:

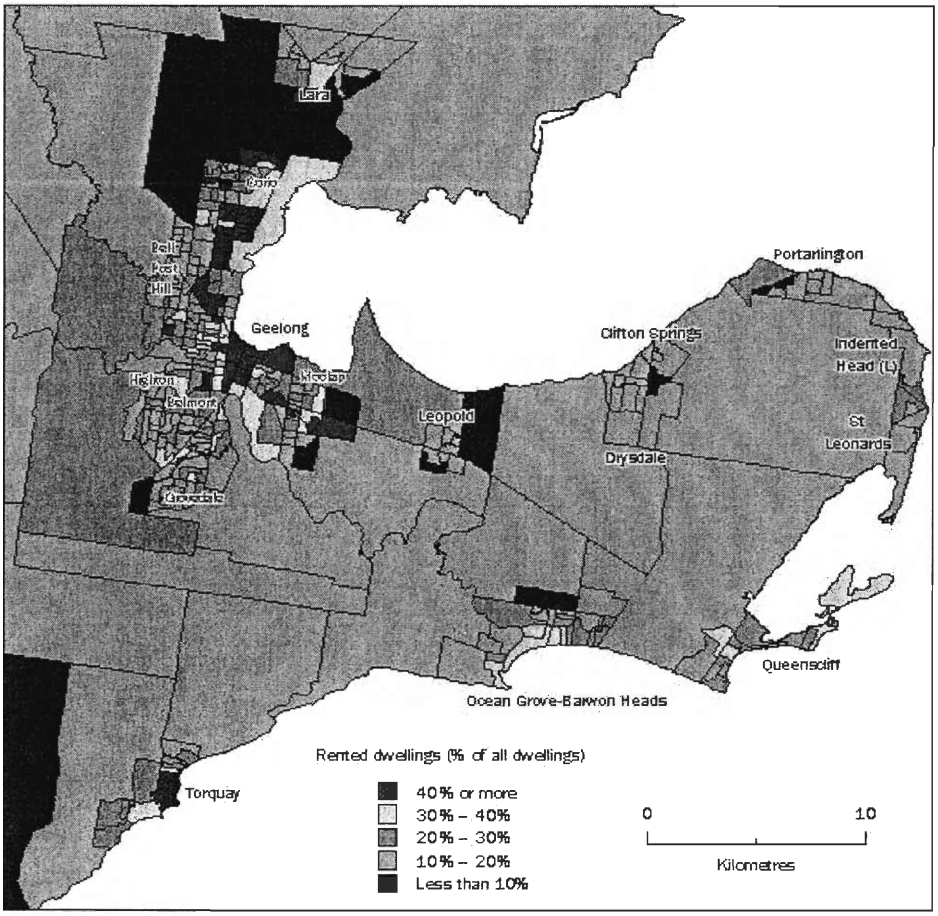


Figure 40 - Proportion of Rented Dwellings in the Geelong and Bellarine Peninsula

- Obviously not all of the details can be logically conveyed or the reader would become bored before he or she had a chance to finish reading.
- Pick out the most important aspects and features, and describe those first.
- Generalisations may be necessary to give the reader an overview.
  - Example description of Figure 5: This is a map of the Geelong and Bellarine Peninsula, showing the proportion of rented dwellings in an area. The map is broken into various-sized suburbs, each associated with one of five different categories. Each category corresponds to a percentage range describing what proportion of the dwellings in that area are rented. Category 1 means less than 10 percent, category 2 is from 10 to 20 percent, category 3 is from 20 to 30 percent, category 4 is from 30 to 40 percent, and category 5 is 40 percent or higher. The majority of the map is category 2, indicating a 10 to 20 percent range. The geographic area is shaped like a thick letter "C" where the land surrounds Port Phillip Bay. The highest percentage of rented dwellings is concentrated on the western side of the "C", where central Geelong is located. This area is mostly category 4 and 5. There is also a small dense area in the bottom left corner where the city of Torquay is located. It has a category 5 section on the

coastline, then a small category 4 semi-circle surrounding that, and a larger category 3 semi-circle further inland. The bottom right hand portion of the "C" where, from east to west, Ocean Grove, Barwon Heads, and Queenscliff are located, has areas of category 3 and 4 intermixed. The top of the "C" has a large category 1 area just above the Geelong outskirts. There are also large category 3 areas to the southeast and west of central Geelong. For all areas not specifically mentioned, most are category 2.

Appendix K – ABS Guideline Addendums and Tutorial

ABS WWW Site Publishing Standards and Guidelines:
Accessibility Addendums

Note: For Electronic Dissemination Services

Sources of the Accessibility Guidelines:

This document consists of guidelines that have been taken from the following sources: the World Wide Web Consortium's-Web Accessibility Initiative (W3C-WAI), the WGBH National Center for Accessible Media (WGBH-NCAM) and the comments and suggestions learned from all visually impaired participants helping in this study.

Accessibility Guidelines:

In the following content the phrase “accessibility guideline(s)” will be used to signify guidelines extracted from the W3C-WAI, which are required to obtain the status of an accessible web site (single “A” compliance). Below each heading are the guidelines pertaining to accessibility in that area, as well as the method for implementation each guideline with Lotus Notes. Each ***required*** guideline is followed by the reference note (W3C, #of the guideline / # of the checkpoint) so that it may be easily referenced in the current W3C-WAI guidelines.

Example:

This is a guideline from the W3C (W3C, 1.2).

As seen above the topic sentence taken from the W3C has been written followed by the source (W3C) and guideline number (1.2) in parentheses.

Additional Useful Techniques:

The term “Additional Useful Techniques” will be used to represent additional addendums to the current ABS Web Content Guidelines. These addendums are not ***required*** by the government in order to meet a compliant level of accessibility (single “A” level). These addendums will enhance the content's accessibility as well as the ease of comprehension of information presented to a visually impaired audience. The “Additional Useful Techniques” constitute certain techniques that have been extracted from the WGBH National Center for Accessible Media (WGBH-NCAM) as well as from personal recommendations and insights of the visually impaired students participating in this usability study. These “Additional Useful Techniques” will be presented below each of the ***required*** accessibility guidelines in this document. It will be clear to the web content developers which guidelines are ***required*** by law, and which are ***recommended*** by the research team.

Format of the Accessibility Cookbook:

In creating a useful and meaningful document for the creation of accessible web content it is important to understand the formatting that is used in this document. This "Accessibility Cookbook" follows the same format as the current ABS Web Content Guidelines. Each Accessibility Guideline and Additional Useful Technique is displayed in a logical order that fits in with the structure of the ABS guidelines. The paragraph number and position (before/after) that this research team recommends for the placement of the Accessibility Cookbook information is included in each item covered. For example, every addition concerning graphics would be appropriately positioned near the paragraphs 38, 39 or 40, which concern the use of images in web content.

Certain guidelines for accessibility cited in this document are not needed in the current ABS guidelines because they have been previously addressed or are not allowed by current ABS standards. For such guidelines, it will be noted that they are not applicable and a justification will be clearly addressed. The following categories are used in the organization of accessibility techniques:

Required: Practices that must be followed in order to meet the minimum accessibility standards as defined by the W3C. These guidelines are all Priority 1 and when used will create a page that meets single 'A' accessibility standards.

Additional Useful Techniques: Techniques that when implemented into a web page further increases the accessibility of that web content presented. These guidelines are extracted from teacher/student recommendations, W3C Priority 2 Guidelines and WGBH-NCAM techniques for educational scientific and mathematical material.

Not Applicable: Guidelines extracted from W3C Priority 1 and 2 standards, which are not needed for implementation by current ABS web developers. Techniques in the 'Not Applicable' section consist of techniques/guidelines that cannot be implemented due to current ABS web content restrictions or are already implemented with the standard practices.

Justification for Format of the Accessibility Cookbook:

If these guidelines are accepted for inclusion in the current ABS Web Content Guidelines, they will be easier to incorporate if a similar format is used. Such a format would ensure that the merging of this team's work with the documents of the ABS is a smooth transition. The format of the ABS Web Content Guidelines has been mimicked in the Accessibility Cookbook to ensure this smooth transition. Stating the most appropriate positions for inclusion of this team's work will lead to a quick transition in merging the two documents so that implementation of the guidelines can go into effect as soon as possible. This quick transition would best benefit the ABS, as they are now seeking to meet government accessibility compliancy standards.

Accessibility Standards

Required

Use W3C technologies and guidelines (W3C, 11.0):

Use W3C technologies (according to specification) and follow accessibility guidelines. Where it is not possible to use a W3C technology, or doing so results in material that does not transform gracefully, provide an alternative version of the content that is accessible.

If, after best efforts, you cannot create an accessible page, provide a link to an alternative page that uses W3C technologies, is accessible, has equivalent information (or functionality), and is updated as often as the inaccessible (original) page (W3C, 11.4):

If content is created that is inaccessible but is deemed appropriate for web publication by EDS, then an alternate page following the guidelines must be created. This alternate page should be linked to the original page and explicitly and clearly stated for users. For example: "This web page contains elements that are currently inaccessible to the visually impaired. Please click on the following link to be redirected to an alternate page containing the same information in an accessible format". The link to the accessible page should be stated at the top of the fist page that is inaccessible (ex: the "Home Page").

Use interim solutions (W3C, 10.0):

Since not all users have access to the latest assistive technologies, use the solutions that are most effective for the widest variety of assistive technologies.

Design for device-independence (W3C, 9.0):

Use features that enable activation of page elements via a variety of input devices (i.e. keyboard, mouse, etc...).

Following the guidelines presented in this document will result in a web page whose content can be accessed via both a mouse and keyboard. ABS does not use any dynamic content or embedded user interfaces in any of its web content, therefore many of the issues of designing for device-independence have been ignored. The only items whose content may lead to some device-independence issues are tables and web links, but these issues have already been addressed within the context of this document.

Additional Useful Techniques

Ensure that any element that has its own interface can be operated in a device-independent manner (W3C, 9.2):

Scripts and applets are not used in current ABS web content. As a result of this, all elements on web pages are accessible through the use of a mouse or keyboard. If the guidelines regarding web accessibility are correctly followed, device-independence will not be a problem. Refer to the explanation in guideline W3C, 9.0.

Use W3C technologies when they are available and appropriate for a task and use the latest versions when supported (W3C, 11.1):

This document will explain how to use available W3C technologies in the creation of accessible web content. Electronic Dissemination Services is responsible for ensuring that these guidelines are current and therefore it can be assumed by the content developer that this document is in accordance with the latest version of supported W3C technologies.

Not Applicable

Avoid deprecated features of W3C technologies:

For example, in HTML, don't use the **deprecated** FONT element; use style sheets instead (e.g. the "font" property in CSS) (W3C, 11.2). Whenever possible use the most recent rendering technologies (ex: the latest version of Lotus Domino). Do not depend on outdated technologies for the creation of accessible web content.

Ensure that all actions can be completed from the keyboard (WGBH-NCAM, 3.1):

Blind or low vision users rely on the keyboard for input and interaction. Actions that require the use of a mouse but have no alternative method of input are almost impossible for blind or low vision users to complete. An example of this is "drag and drop", where users must move items from one place to another using the mouse. Always provide users with an alternate method to complete a task using only the keyboard. Refer to the explanation in guideline W3C, 9.0.

Document Structure and Standards

Required

Ensure that documents are clear and simple (W3C, 14.0):

Ensure that documents are clear and simple so they may be more easily understood.

Use the clearest and simplest language appropriate for a site's content (W3C, 14.1):

How to Use the Clearest and Simplest Language Appropriate for a Site's Content:

1) Start by reading the Current ABS publishing standards for a reference on clear and appropriate language use to effectively communicate with the ABS audience. Principles to good writing can be found in the Publishing Manual - Editorial. The principles outlined in the manual are an extract from the AGPS Style Manual "Principles of good writing", and are covered in far more detail in the chapter.

Tips

The following techniques apply more directly to captions but are also very effective when used in the language of the main body of any web content.

- Be explicit in the description.
- All-important information that is available to a sighted individual should be accessible to a visually impaired person.
- Be concise.
- In regards to information order, place the most essential information first.
- Use correct spelling.
- Use universal classification of picture contents (American Foundation for the Blind, 2000a). For example, if describing a type of animal such as a German Shepard remember to first refer to the item by "dog".

Not Applicable

Use markup and style sheets and do so properly (WGBH-NCAM, 3.0):

The ABS does not currently use style sheets, so the guidelines pertaining to style sheets do not apply.

Organise documents so they may be read without style sheets. For example, when an HTML document is rendered without associated style sheets, it must still be possible to read the document (W3C, 6.1):

Style sheets are not currently used by web content developers at ABS. All rendering of web content is completed through the use of the program Lotus Domino, which takes pages created by web content developers and transforms them into readable HTML documents. These newly rendered pages may then be viewed as web pages. As a result of ABS's practice in not using style sheets, all pages are able to be viewed without the presence of a style sheet.

Title each frame to facilitate frame identification and navigation (W3C, 12.1):

Frames are not supported under Lotus Notes and therefore cannot be created by web content developers.

Describe the purpose of frames and how frames relate to each other if it is not obvious by frame titles alone (W3C, 12.2):

See above explanation with regards to Checkpoint 12.1.

Divide large blocks of information into more manageable groups where natural and appropriate:

For example, in HTML, use OPTGROUP to group OPTION elements inside a SELECT; group form controls with FIELDSET and LEGEND; use nested lists where appropriate; use headings to structure documents, etc (W3C, 12.3). See above explanation with regards to Checkpoint 12.1.

Associate labels explicitly with their controls:

For example, in HTML use LABEL and its "for" attribute (W3C, 12.4). See above explanation with regards to Checkpoint 12.1.

Provide metadata to add semantic information to pages and sites:

For example, use RDF ([RDF]) to indicate the document's author, the type of content, etc. (W3C, 13.2). The HTML web page code is not created by the web developers at ABS and as a result providing metadata cannot be done. This checkpoint can therefore be ignored.

Colour

Required

Placement: Incorporate into Paragraph 15.

Don't rely on colour alone (W3C, 2.0):

For a user with a colour deficiency the information conveyed by coloured graphics and text may be inaccessible, rendering the information presented incomprehensible. As a result of this, web developers should ensure that without the presence of colour all graphics and text presented are understandable.

Ensure that all information conveyed with colour is also available without colour (W3C, 2.1).

> **How to ensure that all information conveyed with colour is also available without colour**
>
> I. For any web context:
>
> A. Make sure that all graphs and images are properly explained in alternative formats such as Alternate Text and Captions. If information is presented in which the use of colour is important to the content being displayed, it is essential that the significance of these colours is explained to the audience. Although colours are inaccessible to many visually impaired people, most of these individuals do understand the concept of colour and should not be deprived of such information.

Additional Useful Techniques

Placement: Include after Paragraph 15.

Ensure that foreground and background colour combinations provide sufficient contrast when viewed by someone having colour deficits or when viewed on a black and white screen (W3C, 2.2):

> *How to change background and foreground contrasts*
>
> I. When colour is not important:
>
> A. According to the current ABS guidelines "colour may only be used when it adds value to the document" and "As a general rule, only corporate colours (Green and gold) are to be used "Fortunately, these corporate colours are only used in the heading and navigation bars in web pages and are not used within the main body of web documents. As a result, the contrast of black text on a white background provides sufficient contrast when viewed by someone with colour impairment or when viewed on a black and white screen. Overall, when colour is not important, following the ABS Web Content guidelines will ensure that checkpoint 2.2 is followed.
>
> II. When colour is important:
>
> A. If colour must be used in the web content displayed, choose from the set of colours that can be seen below. These will provide a sufficient level of

contrast when used in appropriate combinations.

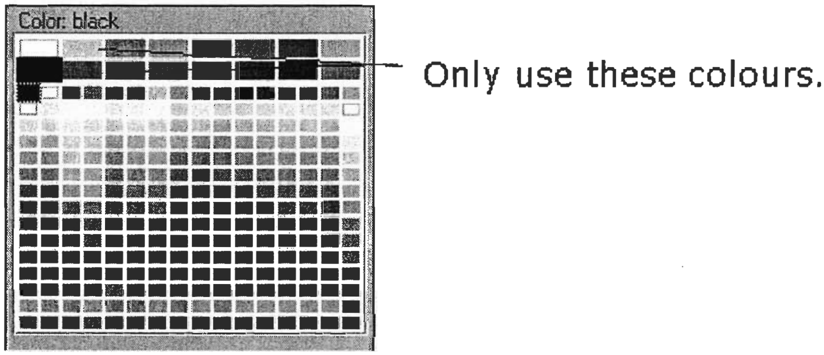


Figure 41:A Colour Palette

A colour palette is shown illustrating the 16 colours (white, black, yellow, brown, light green, dark green, aqua, teal, navy, magenta, purple, red, maroon, light grey & dark grey) that should be used for developing web content because they provide adequate contrast for users with colour deficiencies.

Header

Not Applicable

Use header elements to convey document structure and use them according to specification (W3C, 3.5):

Following the standard web content guidelines for "Headings" as published by the ABS will result in a logical form for heading structures.

Body of the Document

Required

Provide context and orientation information (W3C, 12.0:

Provide context and orientation information to help users understand complex pages or elements. All orientation and context information should be provided above the main body of the document. This will result in the user getting all-important information as soon as they access the page. As a result of obtaining a summary of the context and structure of the document, the users will be better able to navigate through the web content and can avoid browsing material that is not significant to their web search.

Provide information about the general layout of a site (e.g. a site map or table of contents) (W3C, 13.3).

Providing additional information regarding the general layout of a site can help provide useful orientation about the navigation mechanisms of the site. If a consistent site layout is used then information about the site's structure needs only be explained on the main page (ex. home page). It should be stated in the description that all the pages within the web site follow the same layout format. If a complex web page is used, in which web page layouts are varied through out the site, then information about the layout of specific pages needs to be explained. If the layout is not properly explained for each different page then users will assume the structure is consistent with the first description read.

Not Applicable

Clarify natural language usage (W3C, 4.0):

When using multiple languages in a document, utilise the markup features available. Some speech synthesisers and Braille devices are capable of switching to new languages. By using the correct markup tags, the content will be more accessible to these users.

Clearly identify changes in the natural language of a document's text and any text equivalents (e.g. captions) (W3C, 4.1):

Currently, there is no action towards creating multilingual web content. As a result, this checkpoint can be ignored.

Tables

Required

Create tables that transform gracefully (W3C, 5.0).

Ensure that tables have necessary markup to be transformed by accessible browsers and other user agents.

For data tables, identify row and column headers (W3C, 5.1).

Refer to Case Study: Making an Inaccessible Table Accessible

Additional Useful Techniques

Do not use tables for layout unless the table makes sense when linearised. Otherwise, if the table does not make sense, provide an alternative equivalent (which may be a linearised version) (W3C, 5.3).

If a table is used for layout, do not use any structural markup for the purpose of visual formatting (W3C, 5.4).

Allow users to open tables in another program that provides an accessible interface (WGBH-NCAM, 4.3.2).

Giving the users an option of how they wish to have the tabular information presented to them is an effective technique in making tabular data accessible. Allowing the user an option in the presentation of information in tables, such as access to the table in Microsoft Excel or Lotus Notes format, allows them to use the accessibility features of those individual programs. Not all visually impaired computer users access the Internet through the same computer programs. Utilising this technique increases the accessibility as well as flexibility of tabular web content.

How to Make Tables Available in Another Program

Original Table:

NUMBER OF PERSONS EMPLOYED AND UNEMPLOYED
IN THE CITIES OF BARWON AND GIPPSLAND

City	Employed	Unemployed
Barwon	90,557	11,511
Gippsland	55,191	7,761

Figure 42: Number of Person Employed and Unemployed in the Cities of Barwon and Gippsland

I. To save a file in Microsoft Excel format when using Lotus 1-2-3.
   A. Modify the table format so that it is presented correctly.
   B. Select "Save As..." from the "File" menu.

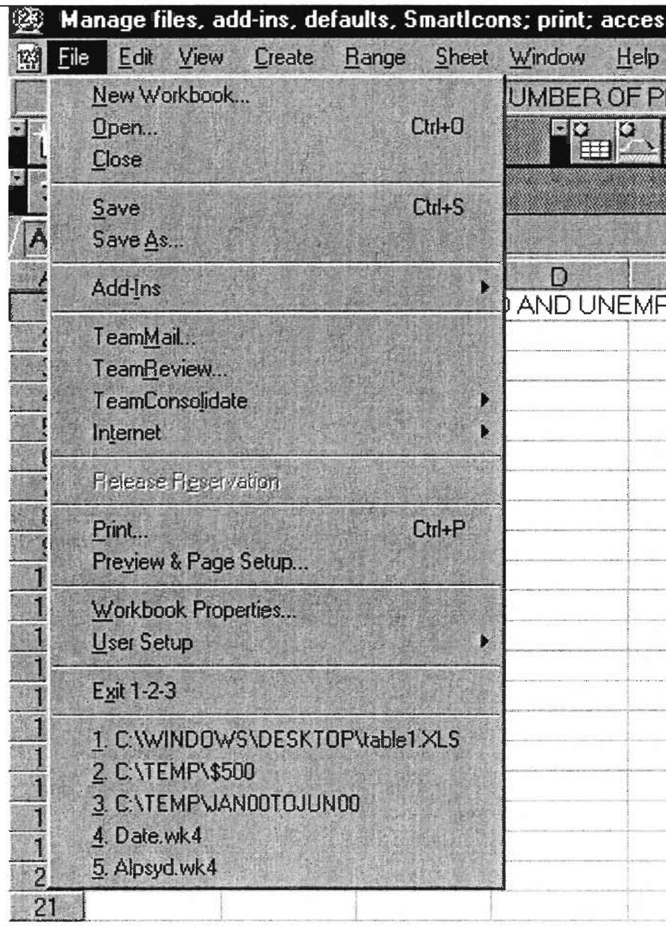


Figure 43: "Save As..." Picture

C. In the "Save As..." window scroll through the list in the field "Save as type:" until you find "Microsoft Excel 97 Workbook (XLS)".

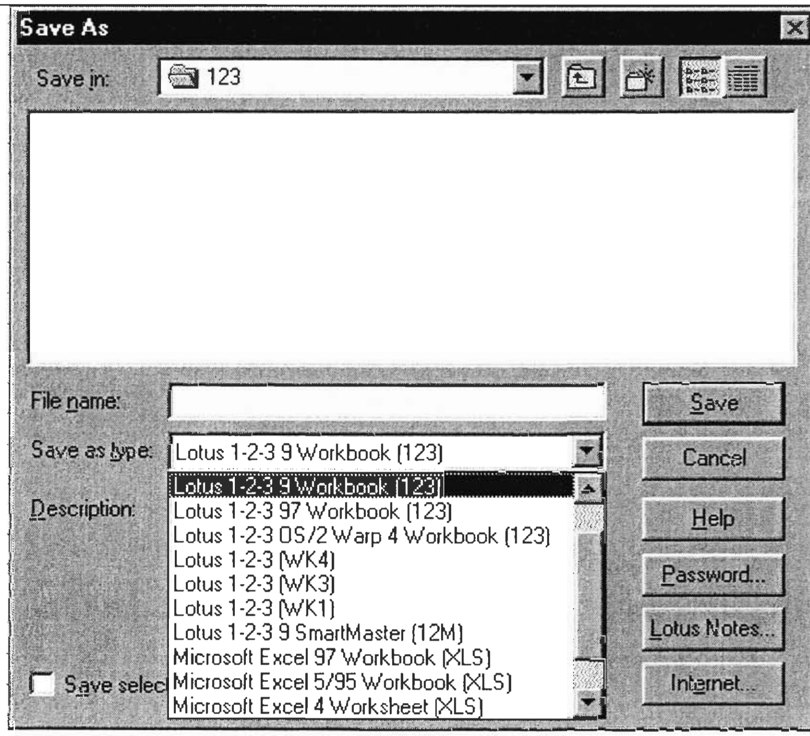


Figure 44: "Save As..." Dialog

i. Type in the name of the document in the "File name:" field.
ii. Select the directory you wish to save the file to.

D. In the original Lotus Notes Web Page create a text link to the file. For example: "Click here for an MS Excel version of this table".

NUMBER OF PERSONS EMPLOYED AND UNEMPLOYED IN THE CITIES OF BARWON AND GIPPSLAND

City	Employed	Unemployed
Barwon	90,557	11,511
Gippsland	55,191	7,761

Click here for an MS Excel version of this table

Figure 45: Number of Persons Employed and Unemployed in the Cities of Barwon and Gippsland

E. When submitting the web page through the ABS Web Content Approval Database, explicitly state the file and text message that you wish to link together.

II. To copy data into a spreadsheet.

A. Select the table.
   i. Highlight all cells of the table using your mouse.

B. Copy the table.

C. Open Lotus 1-2-3

i. When prompted click the "Create a Blank Workbook" button.

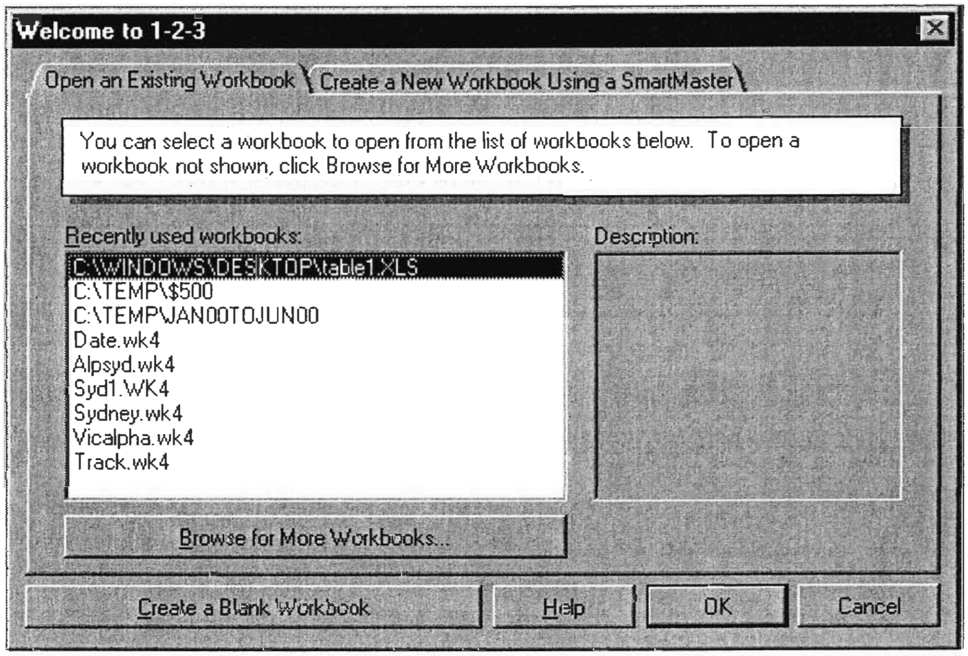


Figure 46: "Welcome to 1-2-3" Picture

D. Paste the table into the Blank Workbook.

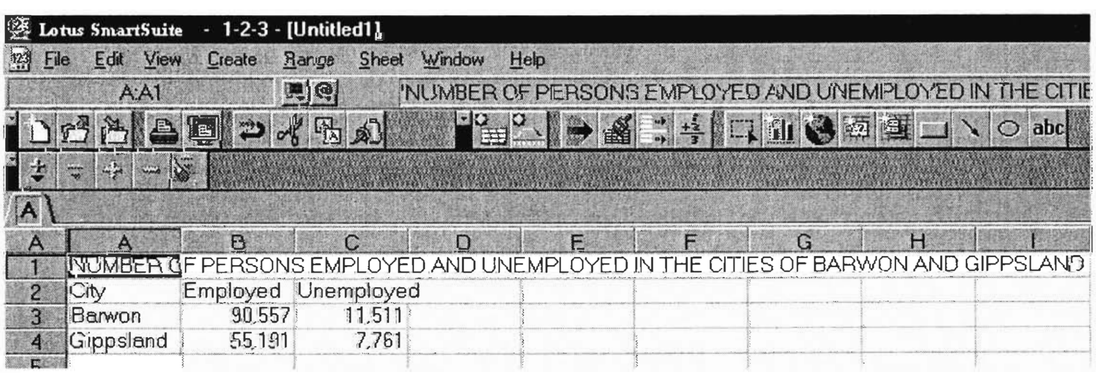


Figure 47: Lotus Notes Workbook Picture

E. Modify the table format so that it is presented correctly.

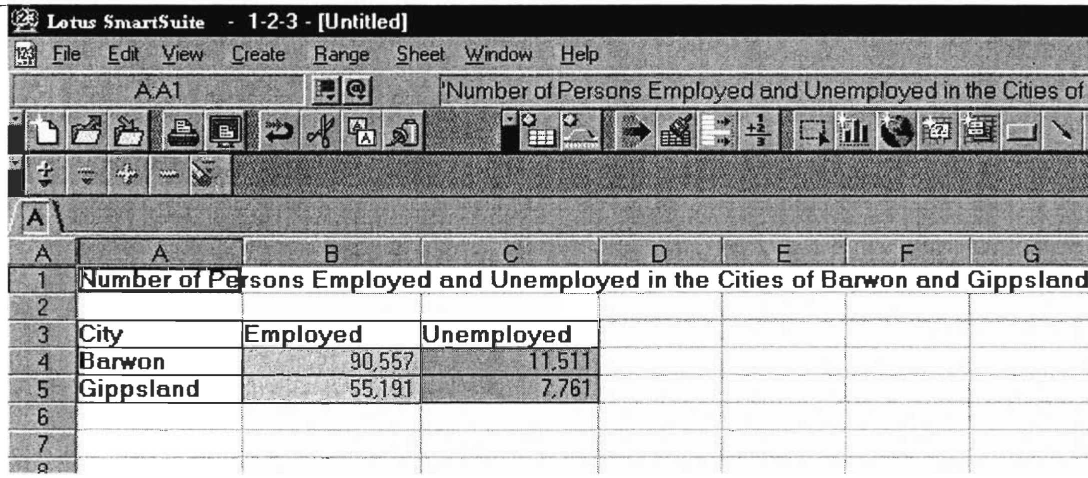


Figure 48: Creating a Lotus Notes Table

F. Select "Save As..." from the "File" menu.
G. In the "Save As..." window scroll through the list in the field "Save as type:" until you find "Microsoft Excel 97 Workbook (XLS)".
  i. Type in the name of the document in the "File name:" field.
  ii. Select the directory you wish to save the file to.
H. In the original Lotus Notes Web Page create a text link to the file. For example: "Click here for an MS Excel version of this table".
I. When submitting the web page through the ABS Web Content Approval Database explicitly state the file and text message that you wish to link together.

How To Make Tables Accessible

Create your table using the current ABS WWW Site Publishing Standards and Guidelines.

For Example: The following table was taken directly from the ABS WWW Site Publishing Standards and Guidelines. This table is inaccessible and the following tutorial will guide you through making this table one that will meet the W3C guidelines for accessibility.

The Inaccessible Table:

10.26 GOVERNMENT AND PRIVATE OUTLAYS ON EDUCATION, By Employer Size **Main table title**

Table headings	**1992-93(a)**	**1993-94**	**1994-95**	**1995-96**	**1996-97**	**1997-98**
	VALUE ($m) **Spanner**					
Government outlays on education **Contents of table**						
Government final consumption expenditure	14,929	15,078	15,589	16,014	17,040	17,707
Gross fixed capital expenditure	1,701	1,663	1,743	1,828	1,960	1,778
Government final expenditure	16,630	16,741	17,332	17,842	19,000	19,485
Grants to non-profit institutions	2,424	2,624	2,842	2,979	3,250	3,631
Grants to persons	1,699	1,760	1,759	1,916	1,865	1,892
Other	110	54	80	26	88	74
Total government outlays on education	20,863	21,179	22,013	22,763	24,203	25,082
Private outlays on education						
Private final consumption expenditure (b)	5,006	5,341	5,679	6,156	6,797	7,569
Gross fixed capital expenditure	449	504	489	559	590	639
Total private outlays on education	5,455	5,845	6,168	6,715	7,387	8,208
Total outlays on education						
Total government outlays	20,863	21,179	22,013	22,763	24,203	25,082
Total private outlays	5,455	5,845	6,168	6,715	7,387	8,208
Less private outlays financed by government	2,424	2,624	2,842	2,979	3,250	3,631
Total outlays on education	**23,894**	**24,400**	**25,339**	**26,499**	**28,340**	**29,659**
Government advances						
Advances to persons and non-profit institutions	17	14	-2	6	5	-
Advances to persons for HECS purposes	584	575	380	532	514	642
Total government advances	601	589	378	538	519	642
Gross Domestic Product(a)	426,985	449,452	474,646	508,806	532,204	565,071

(a) The figures for the expenditure based estimates of Gross Domestic Product (GDP(E)) are obtained from Australian National Accounts: National Income, Expenditure and Product, March Quarter 1999 (5206.0). **Footnote**

Source: Expenditure on Education, Australia, 1997-98 (Cat. no. 5510.0).

Figure 49: An Inaccessible Table Example

Figure : The above image shows a sample table taken from the ABS WWW Site Publishing Standards and Guidelines. The example given is inaccessible. Every element present in the table is part of the table structure including the footnote, title and spanner information.

Problems with this Table:

Problem: Cell borders are not present in the table.

Before any table accessibility violations can be initially be solved it is necessary to view the table with cell border turned on. With the cell borders activated the structure of the table can be determined and individual accessibility issues can then be addressed.

The following table represents the standard ABS table form. Notice that the data values seem to be the only information located in a table. If we turn on the cell borders then it can be seen that every piece of this figure is actually part of the table structure.

Table Title			
Table Headings	Column Header 1	Column Header 2	Column Header 3
Spanner Information			
Contents of Table	Empty Cell	Empty Cell	Empty Cell
Row Header 2	Data Value 2	Data Value 6	Data Value 10
Row Header 3	Data Value 3	Data Value 7	Data Value 11
Row Header 4	Data Value 4	Data Value 8	Data Value 12
Footnote Information			

Figure 50:Layout of an ABS Data Table

Once cell borders are turned on, we can begin to see how the data table was created. From this table with the borders turned on it can be seen that all elements (ex. The Table Title, Spanner Information, Footnote, Data Values, and Table Headers) are all connected within the table structure.

Table Title			
Table Headings	Column Header 1	Column Header 2	Column Header 3
Spanner Information			
Contents of Table	Empty Cell	Empty Cell	Empty Cell
Row Header 2	Data Value 2	Data Value 6	Data Value 10
Row Header 3	Data Value 3	Data Value 7	Data Value 11
Row Header 4	Data Value 4	Data Value 8	Data Value 12
Footnote Information			

Figure 51: Standard ABS Data Table Layout with Cell Borders

The generic layout is useful to understand the ABS standards for table construction, but it is also helpful to see the same form using a real example.

Here is the same data table form that has been modified to include an example that is similar to many of the ABS web pages currently used. This example is typical of many tables currently used in written and Internet ABS publications.

Selected Characteristics of Barwon			
Table Headings	Male	Female	Persons
Taken from the 1996 Census of Population and Housing			
Characteristics			
Total Persons (a)	112,020	116,218	228,238
Overseas visitor	323	493	816
Employed	51,342	39,215	90,557
(a) Overseas visitors are included in these categories. All other categories exclude overseas visitors			

Figure 52: Selected Characteristics of Barwon

Figure : A table of the Selected Characteristics of Barwon. The cell borders have been turned off.

Here is the same data table with the cell borders turned on so that the structure of the table can be easily seen.

Selected Characteristics of Barwon			
Table Headings	Male	Female	Persons
Taken from the 1996 Census of Population and Housing			
Characteristics			
Total Persons (a)	112,020	116,218	228,238
Overseas visitor	323	493	816
Employed	51,342	39,215	90,557
(a) Overseas visitors are included in these categories. All other categories exclude overseas visitors			

Figure 53: Selected Characteristics of Barwon with Cell Borders

Figure : A table of the Selected Characteristics of Barwon. The cell borders have been turned on.

Solution:

I. To make heading part of the table we must first turn on the cell borders so that we can see how the table is created.

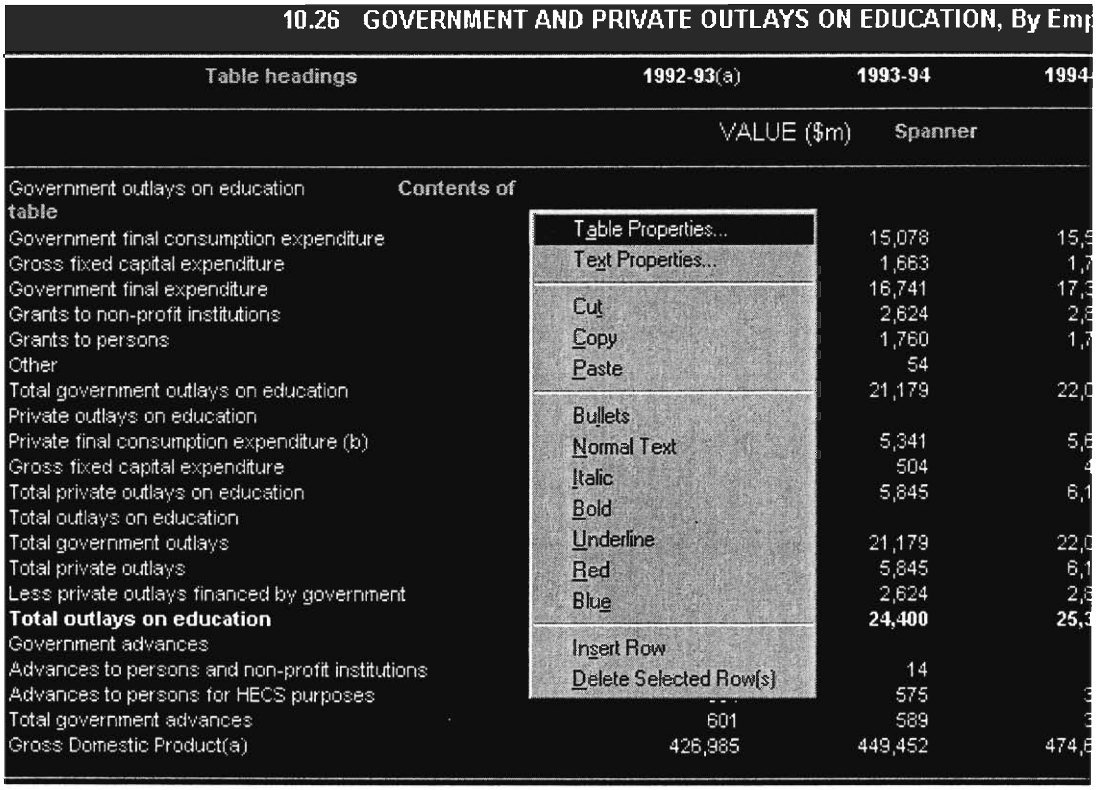
A. If the cell borders are turned on go to step C.

B. If the cell borders are not turned on.

i. Select the entire table using the mouse.

a) Click the mouse on the edge of the table and drag it until every part of it has been highlighted.

b) Right click on the table and select "Table Properties..." from the pop-up menu, or open the "Table" menu from the top of the screen and click on "Table Properties".



10.26 GOVERNMENT AND PRIVATE OUTLAYS ON EDUCATION, By Emp				
Table headings		1992-93(a)	1993-94	1994-
		VALUE ($m)	Spanner	
Government outlays on education	Contents of table			
Government final consumption expenditure			15,078	15,5
Gross fixed capital expenditure			1,663	1,7
Government final expenditure			16,741	17,3
Grants to non-profit institutions			2,624	2,8
Grants to persons			1,760	1,7
Other			54	
Total government outlays on education			21,179	22,0
Private outlays on education				
Private final consumption expenditure (b)			5,341	5,8
Gross fixed capital expenditure			504	4
Total private outlays on education			5,845	6,1
Total outlays on education				
Total government outlays			21,179	22,0
Total private outlays			5,845	6,1
Less private outlays financed by government			2,624	2,8
Total outlays on education			**24,400**	**25,3**
Government advances				
Advances to persons and non-profit institutions			14	
Advances to persons for HECS purposes			575	3
Total government advances		601	589	3
Gross Domestic Product(a)		426,985	449,452	474,8

Figure 54: Lotus Notes Table Properties

Figure : Image of the table example selected. The right mouse button has been clicked to display the pop-up menu from which the "Table Properties…" option can be chosen.

I. In the table options window select the "Cell Borders" tab.

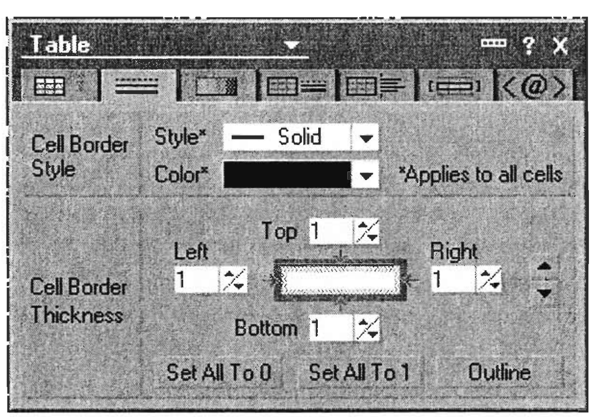


Figure 55: Lotus Notes Table Menu

The above graphic shows the "Table Properties" window with the "Cell Borders" tab selected. All cell borders have been set to one, using the "Set All To 1" option present in the window options.

III. Click the "Set All to 1" button.

Problem: Horizontal Rules are not accessible when included in a table.

Horizontal Rule: To separate headings, titles and footnotes a horizontal rule is used by current ABS standards in the formation of tables. The horizontal rule is used mainly to organise and enhance the appearance of tables. Currently, Horizontal Rules are included within the table structure, which results in inaccessibility of the table by visually impaired users. To correct the problems created by Horizontal Rules, they should be included outside of the table.

The Inaccessible Horizontal Rule: When included in a table Horizontal Rules are currently placed with in table cells. This will lead to an inaccessible table for visually impaired users. The Horizontal Rules may be used, but they must be included outside of the table element.

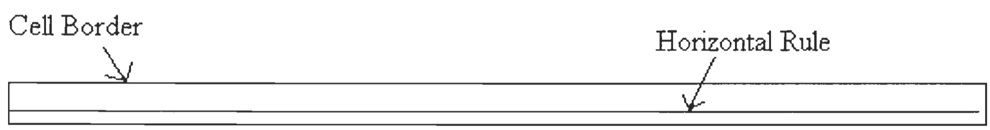


Figure 56: Inaccessible Horizontal Rule

Shown above is an example of an inaccessible Horizontal Rule, which is included in a table cell.

The Accessible Horizontal Rule: When not included in a table Horizontal Rules can still be used for appearance without impairing the accessibility of the table presented.

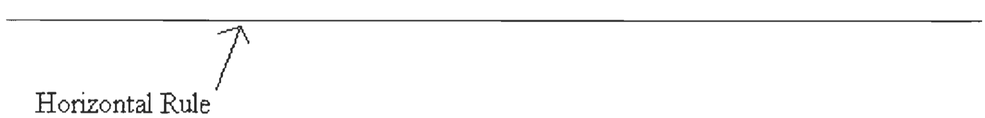


Figure 57: Accessible Horizontal Rule

Shown above is an example of an accessible Horizontal Rule, which is not included in a table cell.

Solution:

I. Select the Horizontal Rule.
II. Delete the Horizontal Rule by pressing the 'Backspace' button.
III. Select the cell that contained the Horizontal Rule.
IV. Select the option "Split Cell" from the "Table" menu in Lotus Notes.
V. Select the row of newly created cells.
VI. Right-click on the selected row and select "Delete Selected Row(s)" from

the pop-up menu.
VII. Create a new Horizontal Rule outside of the table where is needs to be included.

Problem: Spanner are not accessible when included in a table.

Spanners: To place Horizontal Rules and extra information into a table spanner is currently used within the table structure. Spanners are single cells, which 'span' the all of the data columns. They are used to organise the structure and appearance of a table. Currently, Spanners are included within the table structure, which results in inaccessibility of the table by visually impaired users. To correct the problems created by Spanners, the information or Horizontal Rules they contain should be included outside of the table.

Spanners may be included above and below a table. There may be multiple occurrences of a spanner present in a table depending on the information provided in a table.

For example the spanner elements may be included above and/or below the data values present in a table. Or they may be used to contain Horizontal Rules to separate 'Table Titles' and header information.

Spanner			

Figure 58:Table Spanner

Spanner			

Figure 59:Table Spanner

Solution:
I. Select the spanner text/Horizontal Rule and copy it.
II. Paste the copied title outside of the table where appropriate.
III. Select the spanner cell.
IV. Select the option "Split Cell" from the "Table" menu in Lotus Notes.
V. Select the row of newly created cells.
VI. Right-click on the selected row and select "Delete Selected Row(s)" from the pop-up menu.

Problems with this Table

Problem: Column headings are not part of the table

Solution:

I. Select the Table Headings and copy them.

10.26 GOVERNMENT AND PRIVATE OUTLAYS ON EDUCATION, By Employer Size Main table title

Table headings	1992-93(a)	1993-94	1994-95	1995-96	1996-97	1997-98
VALUE ($m) Spanner						
on education Contents of						
ısumption expenditure	14,929	15,078	15,589	16,014	17,040	17,707
xpenditure	1,701	1,663	1,743	1,828	1,960	1,778
enditure	16,630	16,741	17,332	17,842	19,000	19,485

Figure 60: Table Headings

II. Paste the cells into the empty heading cells.

10.26 GOVERNMENT AND PRIVATE OUTLAYS ON EDUCATION, By Employer Size Main table title

headings	1992-93(a)	1993-94	1994-95	1995-96	1996-97	1997-98
VALUE ($m) Spanner						
:ation Contents of	1992-93(a)	1993-94	1994-95	1995-96	1996-97	1997-98
n expenditure	14,929	15,078	15,589	16,014	17,040	17,707
ıre	1,701	1,663	1,743	1,828	1,960	1,778

Figure 61: Empty Heading Cells

Figure :

III. Delete old heading cells.

A. Select old heading cells including all horizontal rules.

10.26 GOVERNMENT AND PRIVATE OUTLAYS ON EDUCATION, By Employer Size Main table title

Table headings	1992-93(a)	1993-94	1994-95	1995-96	1996-97	1997-98
VALUE ($m) Spanner						
Government outlays on education Contents of table	1992-93(a)	1993-94	1994-95	1995-96	1996-97	1997-98

Figure 62:Selecting of Cells

i. Right-Click on the selected items and select "Delete Selected Row(s)" from the pop-up menu.

10.26 GOVERNMENT AND PRIVATE OUTLAYS ON EDUCATION, By Employer Size	Main table title					
VALUE ($m) Spanner						
Government outlays on education Contents of table	1992-93(a)	1993-94	1994-95	1995-96	1996-97	1997-98
Government final consumption expenditure	14,929	15,078	15,589	16,014	17,040	17,707
Gross fixed capital expenditure	1,701	1,663	1,743	1,828	1,960	1,778
Government final expenditure	16,630	16,741	17,332	17,842	19,000	19,485

Figure 63: Right Clicking of Cells

Problem: Table Title should not be part of the table

Solution:

I. Select the title text and copy it.
II. Paste the copied title outside of the table.
III. Delete the old title cells and any horizontal rules used for appearance.
   A. Select all horizontal rules and delete them by pressing the "Backspace" key.
   B. Select the title cell.
      i. Right-click on the selected row and select "Delete Selected Row(s)" from the pop-up menu.

Problem: Table footnotes should not be part of the table.

Solution:

I. Select the Footnote text and copy it.

Total government advances	601	589	378	538	519	642
Gross Domestic Product(a)	426,985	449,452	474,646	508,806	532,204	565,071

(a) The figures for the expenditure based estimates of Gross Domestic Product (GDP(E)) are obtained from Australian National Accounts: National Income, Expenditure and Product, March Quarter 1999 (5206.0). Footnote

Source: Expenditure on Education, Australia, 1997-98 (Cat. no. 5510.0).

Figure 64: Footnote Text

II. Paste the copied footnote outside of the table.

Gross Domestic Product(a)	426,985	449,452	474,646	508,806	532,204	565,071

(a) The figures for the expenditure based estimates of Gross Domestic Product (GDP(E)) are obtained from Australian National Accounts: National Income, Expenditure and Product, March Quarter 1999 (5206.0). Footnote

Source: Expenditure on Education, Australia, 1997-98 (Cat. no. 5510.0).

(a) The figures for the expenditure based estimates of Gross Domestic Product (GDP(E)) are obtained from Australian National Accounts: National Income, Expenditure and Product, March Quarter 1999 (5206.0). Footnote

Source: Expenditure on Education, Australia, 1997-98 (Cat. no. 5510.0).

Figure 65: Footnote Pasting

III. Delete the old footnote cells and any horizontal rules used for appearance.
   A. Select all horizontal rules and delete them by pressing the "Backspace" key.
   B. Select the footnote cell.
   C. Right-click on the selected row and select "Delete Selected Row(s)" from the pop-up menu.

Problem: Table spanner information should be presented outside of the table.

Solution:

I. Select the spanner text and copy it.

II. Paste the spanner text outside of the table underneath the main title.

III. Delete the old title cells and any horizontal rules used for appearance.

A. Select all horizontal rules and delete them by pressing the "Backspace" key.

B. Select the spanner cell.

i. Select the option "Split Cell" from the "Table" menu in Lotus Notes.

ii. Select the row of newly created cells.

a. Right-click on the selected row and select "Delete Selected Row(s)" from the pop-up menu.

Problem: HTML column headers are not present in the data table.

Solution:

I. Select the first column header. For this example "Government outlays on education" would be the cell to select.

II. Right Click on the cell and Select "Table Properties..." from the pop-up menu.

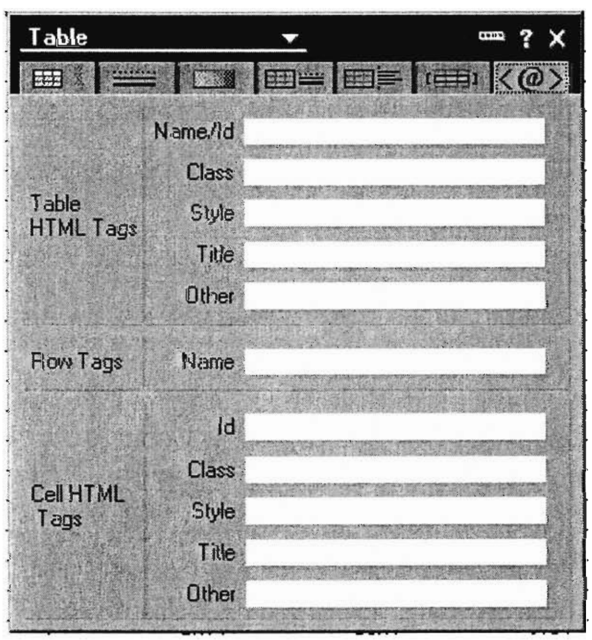


Figure 66:Table Menu

A. In the table options window select the "Table Programming" tab.

i. In the "Other" field of the "Cell HTML Tags" option type: **SCOPE="col" ABBR="Gov Outlay"**

The text **SCOPE="col"** defines this cell as a column header.

The text **ABBR="Gov Outlay"** defines an abbreviation for the column.

When a visually impaired student encounters this table the text "Government outlays on education" will be read in the column header, but when the user is navigating through the Contents of the table the abbreviation will be used.

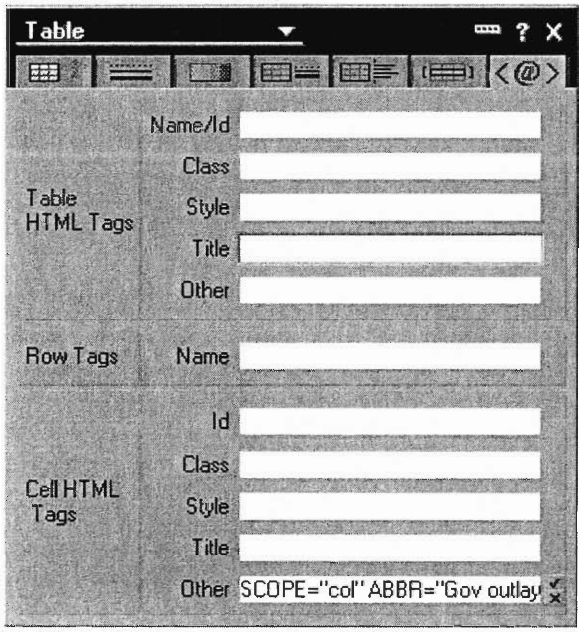


Figure 67: Using Table Menu

B. Repeat the process for each of the year columns such as 1992-93, 1993-94, etc.

Problem: HTML Row headers are not present in the data table.

Solution:

I. Select the first row header. For this example "Government final consumption expenditure" would be the cell to select.

II. Right Click on the cell and Select "Table Properties..." from the pop-up menu.

A. In the table options window select the "Table Programming" tab.

i. In the "Other" field of the "Cell HTML Tags" option type: **SCOPE="row" ABBR="Gov Final Consumption"**

The text **SCOPE="row"** defines this cell as a row header.

The text **ABBR="Gov Final Consumption"** defines an abbreviation for the row.

When a visually impaired student encounters this table the text "Government final consumption expenditure" will be read in the column header, but when the user is navigating through the Contents of the table the abbreviation will be used.

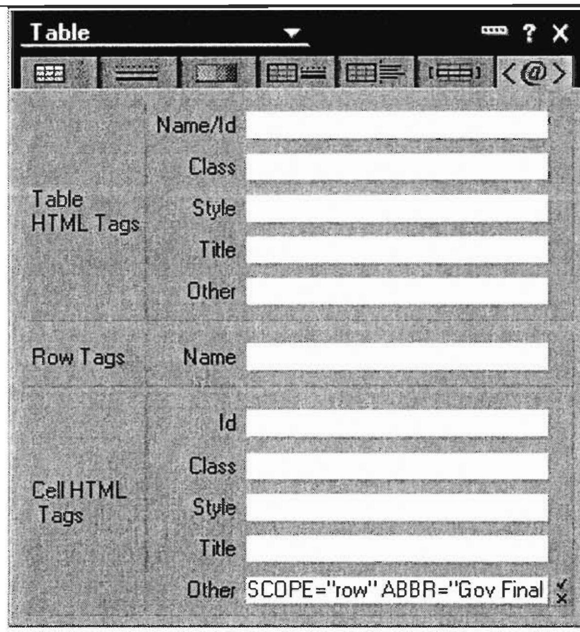


Figure 68: Table Menu Scope

B. Repeat the process for each of the row headers such as “Gross fixed capital expenditure”, “Grants to persons”, “Gross fixed capital expenditure” etc.

The Accessible Table

10.26 GOVERNMENT AND PRIVATE OUTLAYS ON EDUCATION, By Employer Size **Main table title**

VALUE ($m) **Spanner**

Government outlays on education **Contents of table**	**1992-93**(a)	**1993-94**	**1994-95**	**1995-96**	**1996-97**	**1997-98**
Government final consumption expenditure	14,929	15,078	15,589	16,014	17,040	17,707
Gross fixed capital expenditure	1,701	1,663	1,743	1,828	1,960	1,778
Government final expenditure	16,630	16,741	17,332	17,842	19,000	19,485
Grants to non-profit institutions	2,424	2,624	2,842	2,979	3,250	3,631
Grants to persons	1,699	1,760	1,759	1,916	1,865	1,892
Other	110	54	80	26	88	74
Total government outlays on education	20,863	21,179	22,013	22,763	24,203	25,082
Private outlays on education						
Private final consumption expenditure	5,006	5,341	5,679	6,156	6,797	7,569
Gross fixed capital expenditure	449	504	489	559	590	639
Total private outlays on education	5,455	5,845	6,168	6,715	7,387	8,208
Total outlays on education						
Total government outlays	20,863	21,179	22,013	22,763	24,203	25,082
Total private outlays	5,455	5,845	6,168	6,715	7,387	8,208
Less private outlays financed by government	2,424	2,624	2,842	2,979	3,250	3,631
Total outlays on education	**23,894**	**24,400**	**25,339**	**26,499**	**28,340**	**29,659**
Government advances						
Advances to persons and non-profit institutions	17	14	-2	6	5	-
Advances to persons for HECS purposes	584	575	380	532	514	642
Total government advances	601	589	378	538	519	642
Gross Domestic Product(a)	426,985	449,452	474,646	508,806	532,204	565,071

(a) The figures for the expenditure based estimates of Gross Domestic Product (GDP(E)) are obtained from Australian National Accounts: National Income, Expenditure and Product, March Quarter 1999 (5206.0). **Footnote**

Source: Expenditure on Education, Australia, 1997-98 (Cat. no. 5510.0).

Figure 69: Accessible Table

A few tips to remember when making a table accessible:

- Always put the title to a table outside of that table.
- Do not split up column information from the data table.
- Do not put spanners or footnotes into cells of the table.

- If horizontal rules are used, they should be placed outside of the table and not included in a blank cell.
- Always define HTML header and column information.
- Use abbreviations where they are needed, remember their use is optional.
- Always delete any unused rows or columns.
- Do not use rows or columns for spacing or formatting.

Images

Required

Placement: Paragraph 40. Replace with current directions.

Provide equivalent alternatives to auditory and visual content (W3C, 1.0).

When information is presented through the use of a visual medium (i.e. graphics, video, animation, navigation tools etc.) or through an audio medium (i.e. video soundtracks, streaming audio etc.) alternate methods must be used to make sure all information presented can be accessed by alternative means so that the method communicates essentially the same function.

Provide a text equivalent for every non-text element. This includes: images, graphical representations of text (including symbols), image map regions, animations (e.g. animated GIFs), applets and programmatic objects, ascii art, frames, scripts, images used as list bullets, spacers, graphical buttons, sounds (played with or without user interaction), stand-alone audio files, audio tracks of video, and video (W3C, 1.1).

Definition of Simple Graphics: Any graphics whose content can be explained in one or two sentences of text.

If simple graphics are used (such as a company logo, web page link graphic, or other images) simply to enhance the "look" of a web site then not much information needs to be conveyed to the user. The most effective way to describe such graphics is through the use of an alternate text description.

How to Add Alternate Text to Simple Graphics

I. Select the image that needs alternate text.
II. Click the right mouse button on the image and select "Picture Properties..." from the menu.
III. In the picture property menu go to the category labeled "Alternate Text".
IV. Type in the alternate text you wish to be associated with the graphic.

Example:

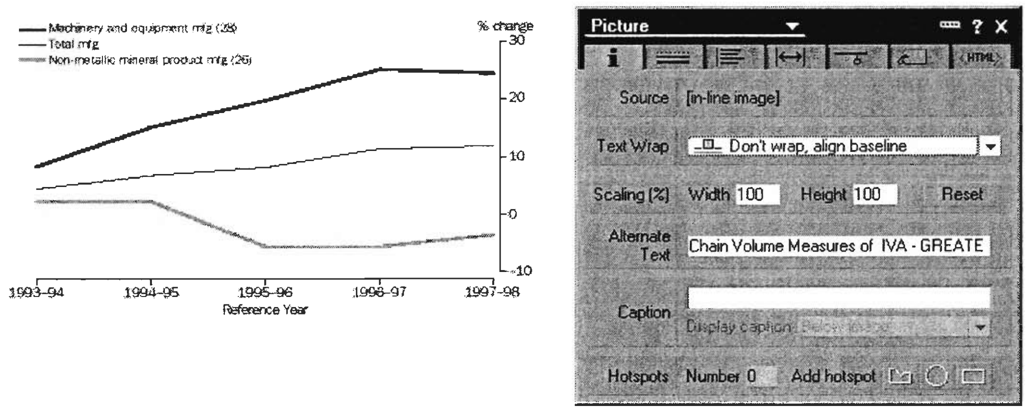


Figure 70: Picture Menu

Figure 1: The above image shows a line graph with the Picture Properties window opened to the right of it. The following text "Chain Volume Measures of IVA - Greatest and Least Growth" is inserted into the Alternate Text field.

How to Add Alternate Text to Complex Graphics

Complex Graphics: Any graphics whose content cannot be summed up in less than two sentences.

In the event that images are displayed whose complexity needs a longer Alternate Text description (ex. table, graph, flow chart) the most effective way to describe such an image is to use a shorter Alt Text description and then add a link to a description page. To create the shorter Alt Text description please refer to the "How to Add Alternate Text to Simple Graphics" section.

I. Next to the graphic create a link to navigate the user to a page with an image description.
   A. In the example below please note that the text link "**Click here for a description of the above graphic**" is not created into a link by the web developer. This text will be created into a link after being submitted to EDS in ABS. Upon submitting the web page to EDS specify what area of the page to link with what other page. In this case we would be explaining to EDS to "link the text, "**Click here for a description of the above graphic**", below the following line graph with the web page containing the written description.

Example:

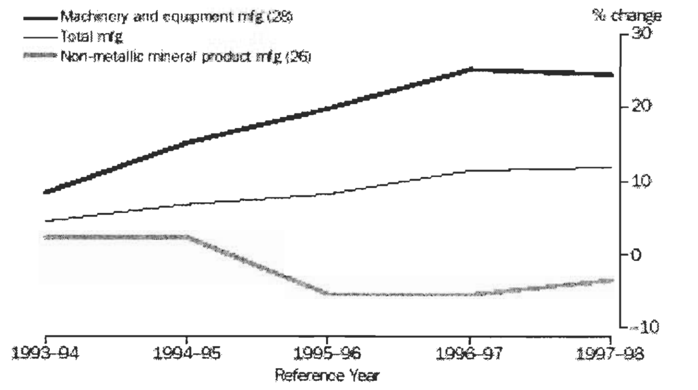


Figure 71: Line Graph

Click here for a description of the above graphic

II. Create a separate page that contains the graphic description.
   A. Open up a new "plain page" under the "Create" menu in Lotus Notes.
   B. Type into the new page a description of the specified graphic.
   C. Refer to the "Graph and Tables Handbook" for useful tips on describing graphical and tabular information.

III. Upon submission to EDS, specify what pages you wish to be linked and how they should be linked.

Provide redundant text links for each active region of a server-side image map (W3C, 1.2):
If image maps are used in the creation of a web page, all active regions must be given their own alternate text.

What is an Image Map?

An image map is a graphic, which has been split up into separate pieces each of which acts like a hyperlink (called a 'hotspot' with respect to an image map) directing the user to a different web page. Presented below is an image map of the country of Australia . Each of the different states within the country have been outlined and point to other pages which contain more information about the individual states. When making an image map accessible alternative text must be added to each 'hotspot' to ensure that that it is accessible.

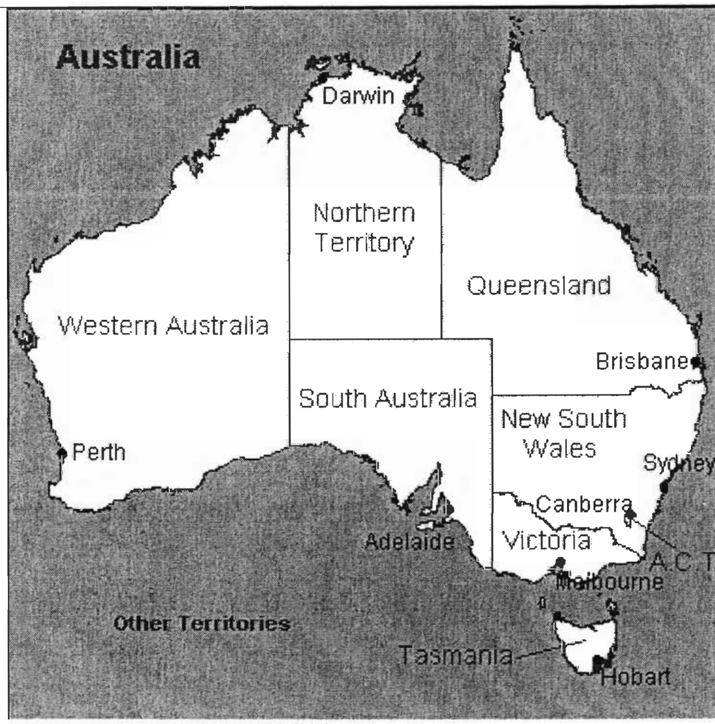


Figure 72: Map of Australia

Figure: An image map of the country of Australia. Each individual state and territory of Australia has been labelled and outlined as a hotspot on the image map.

How to Add Alternate Text to Image Maps

I. Select image map.
II. Select an individual sector of the image map.
III. Double-click on the image sector that needs alternate text.
IV. The Hotspot properties window will pop up.
V. Select the "Advanced" tab. This is the tab with the picture of a beanie on it.
VI. Type in the alternate text you wish to be displayed into the "Alternate Text" Field.
VII. Check the added alternate text following the directions presented below in
VIII. "How to Check Alternate Text".

Additional Useful Techniques

Placement: Paragraph 40. Replace with current directions at end of paragraph.

How to Check Alternate Text

I. Preview the web page in a browser.
   A. If your division has access to a database that will allow the preview of web pages in an Internet browser:
      i. Save the document to the database.

II. Open up Internet Explorer on your personal computer and type in the address to the database where you web page is saved to.
III. Select your document and it will open and can be viewed as it would by any other user on the Internet.
   A. If your division does not have access to a database that will allow the preview of web pages in an Internet browser:
      i. Currently, this option is unavailable for users creating web content using Lotus Notes and submitting through the "ABS Website Content Approvals" database.

I. Move your cursor over the graphic you wish to check.
II. The alternate text will be displayed as a text pop-up box. If no text pop-up appears for images, alternate text is missing.

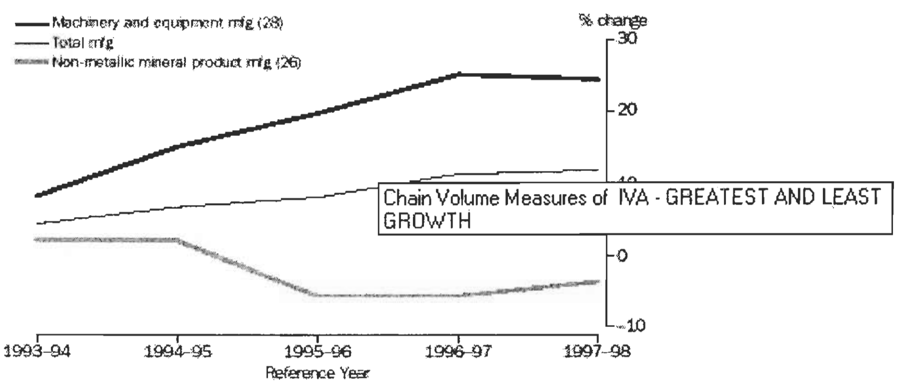


Figure 73: Alternate Text Example

Figure 3: The above image shows a line graph with the alternate text pop-up describing the graphic. The alternate text pop-up box contains the text "Chain Volume Measures of IVA – GREATEST AND LEAST GROWTH".

Tip for Verifying Alternate Text:

Turn off images in your browser. Each image is replaced with its alternative text. It will be obvious which images are not labeled. This testing procedure provides a quick text view of a page.

To Turn Images off

I. Open up Microsoft Internet Explorer.
II. Select the menu "View".
III. In the "View" menu choose the option "Internet Options...".
IV. Click the menu tab labeled "Advanced".
V. Under the "Multimedia" heading uncheck the option to "Show pictures".
VI. To make the changes take effect, click the "Ok" button.

Placement: Include after Paragraph 40 under a subheading of "Representing Mathematical Equations".

Provide access to math equations for all users with disabilities (WGBH-NCAM, 6.0):

"Current interfaces to equations in educational software pose two sets of problems: first, users who are blind cannot read equations (and users with low vision may have trouble reading them at small sizes), and second, both users with visual impairments and those with physical disabilities have difficulty using equation input and editing interfaces that require use of a mouse" (WGBH-NCAM, 6.0).

Allow all equations to be enlarged on screen (WGBH-NCAM, 6.1):

As with graphs and images, equations too should have the added accessibility feature of being able to be enlarged on screen. Creating an alternate enlarged version of an equation makes it much easier for individuals with low vision to access the equation. This added feature would also be beneficial to the totally blind who can then use these enlarged versions to create tactile representations of the equations.

How to Allow Equations to be Enlarged on Screen:

I. If the equation is saved in an image format (meaning the equation file ends with .bmp or .jpg):
   A. Follow steps 2d-2f provided in How to Allow all Graphs to be Enlarged on the Screen.
   B. Preview the enlarged graph in a browser to make sure the equation is both clear and legible.
      i. If these characteristics are clear and legible.
         a. Continue to step 4d.
      ii. If these characteristics are not clear and legible.
         a. Decrease the "Scaling (%)" by following the same steps as described above until a legible version is attained.

Before Scaling:

$$s = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}$$

Figure 74: Equation for Standard Deviation

After Scaling:

$$s = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}$$

Figure 75: Scaled Equation for Standard Deviation

Figure 10: Equation for Standard Deviation scaled to 150% of its original size.

Not Applicable

Allow images and screen layouts to be printed (WGBH-NCAM, 1.1):

Printed images allow low vision users to create enlarged images, and blind users to create tactile images.

How to Allow Images and Screen Layouts to be Printed:

The ABS web site is "read-only" and as a result visitors to the site are allowed to save images as files onto their computers so that enlarged or tactile graphics can be created before printing. How the user wishes to make specific images of graphs accessible is left up to their discretion.

To save images when viewing the ABS web site right-click on an image and select "Save Picture As..." from the pop-up menu. The image can then be saved as a file in the directory of the user's choosing.

To save the screen layout a person should select "Save As..." from the "File" menu within Internet Explorer and save the specified web page with the name and directory of their choosing.

These images and screen layouts (once saved) can then be printed directly by the user.

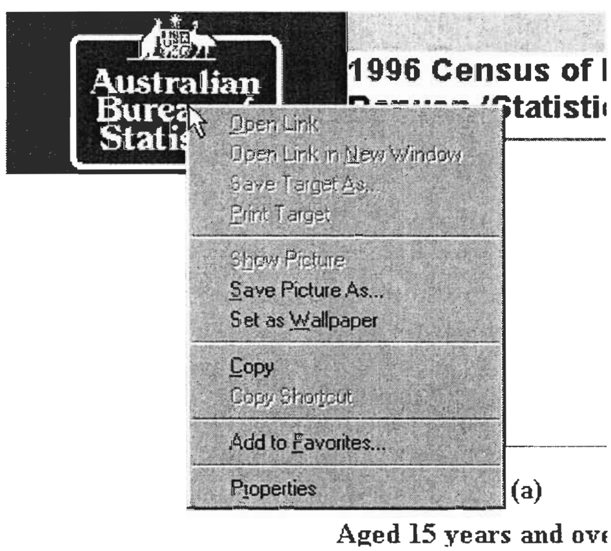


Figure 76: Saving a Graphic

The image above shows a screen shot of one of the web sites used by ABS and the options window that pops-up when a right mouse click is preformed on the image of the ABS logo. This action allows a user to save different images in a web page so that they may be further formatted to provide customised accessibility.

When an appropriate markup language exists, use markup rather than images to convey information (W3C, 3.1):

If you can create your content by coding it in HTML, as opposed to inserting it into a web page via an image format, do so. This will enhance the accessibility of the information presented and cut down on the amount of content needed to make the web page meet W3C guidelines.

Flickering Text/Images

Required

Placement: Include in Paragraph 41.

Ensure user control of time-sensitive content changes (W3C, 7.0):

Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or stopped.

Note: For the majority of users time-sensitive content, such as scrolling marquees or blinking text, are not used in ABS web content. These features cannot be added through Lotus Notes and must be requested through EDS. The bureau has specialised software to create animated images or text and requests to add such effects will be considered on an individual basis. Therefore because these features are created by EDS, the following guideline can ignored by the non-EDS employee developing web content.

Until user agents allow users to control flickering, avoid causing the screen to flicker (W3C, 7.1):

Any content developed for use on an ABS web site that concerns time-sensitive content (as mentioned in W3C, 7.0) must be requested and created by EDS. Therefore, because these features are created by EDS, the following guideline can ignored by the non-EDS employee developing web content.

Additional Useful Techniques

Until user agents allow users to control blinking, avoid causing content to blink (i.e., change presentation at a regular rate, such as turning on and off) (W3C, 7.2):

See above Note concerning guideline W3C, 7.0.

Until user agents allow users to freeze moving content, avoid movement in pages (W3C, 7.3):

See above Note concerning guideline W3C, 7.0.

Until user agents provide the ability to stop the refresh, do not create periodically auto-refreshing pages (W3C, 7.4):

See above Note concerning guideline W3C, 7.0.

Until user agents provide the ability to stop auto-redirect, do not use markup to redirect pages automatically. Instead, configure the server to perform redirects (W3C, 7.5).

See above Note concerning guideline W3C, 7.0.

Additional Useful Techniques

Placement: Include after Paragraph 42.

Provide access to graphs for users who are blind or visually impaired (WGBH-NCAM, 5.0):

Like images graphs convey information visually to their audience. Graphs also contain a great deal of information whose meaning is condensed within their format. Explaining the behaviour of a graph textually can be done and is a necessary step to take in making the content accessible to visually impaired visitors.

Follow the Techniques for Describing Graphical Information in the Graph and Tables Handbook:

Using the Graph and Tables Handbook as a reference in describing graphical information will increase the comprehendability of the material presented. Following the procedures in creating descriptions for graphs

Allow all graphs to be printed (WGBH-NCAM, 5.1).

Giving users access to print graphs as separate files from the web page increases convenience and the accessibility of the material presented". Allowing graphs to be printed ... is a simple and broadly useful adaptation with benefits similar to those of printing other kinds of still images, as discussed in Guideline 1. Using a printed graph, low vision users can create enlarged images. Blind users can print tactile graphs using specialised equipment" (WGBH-NCAM, 5.1).

How to Allow all Graphs to be Printed

Follow the above description in "**How to Allow Images and Screen Layouts to be Printed**".

Allow all graphs to be enlarged on screen (WGBH-NCAM, 5.2):
For individuals with low vision, graphs as well as complex images may be so densely presented that identifying specific pieces within the object can be a daunting task. Many people with low vision have magnification programs that will enlarge images on the computer screen, but giving low vision students the ready-made option to view enlarged graphics/images is another feature that is useful in accessible web content. This method assumes that not every user has access to the same programs/technologies and provides the same benefits/action that these items provide but in a purely web based environment.

How to Allow all Graphs to be Enlarged on the Screen:

I. Select a graph to be enlarged.

II. Procedure for graphs created with the program ABS Graph.

  A. After creating your graph click on the button "Copy to Clipboard" as seen below.

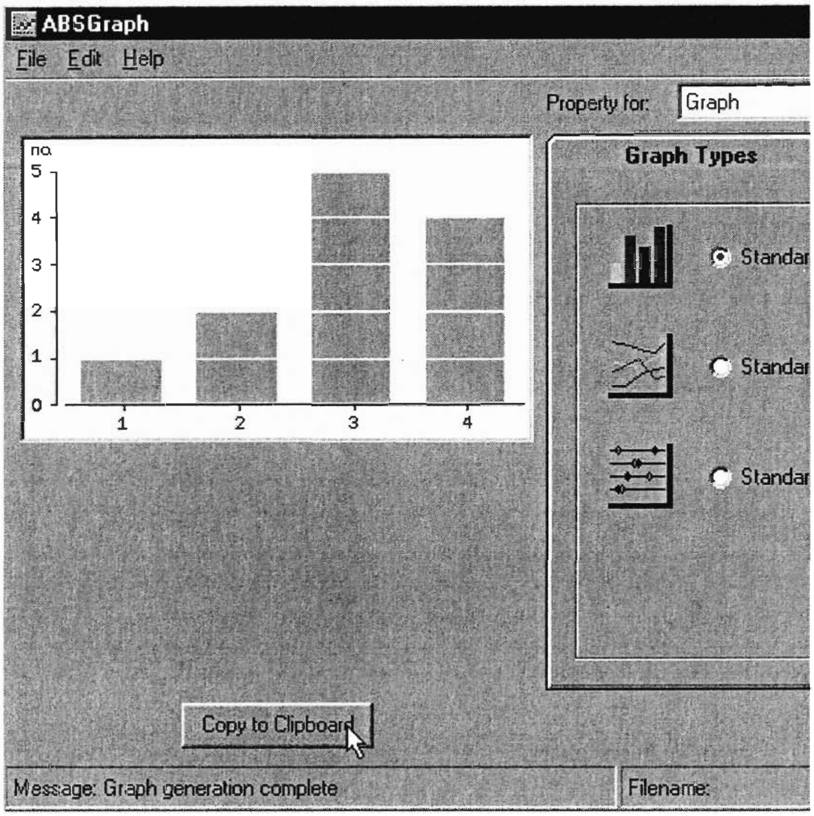


Figure 77: ABS Graph

Figure 5: This image shows a screen shot of the program "ABS Graph" in which the copy action is being demonstrated by clicking the "copying to clipboard" button.

B. Go to the Lotus Notes page where you want the enlarged version of the graph to appear.
C. Select the "Paste" option from the "Edit" menu.
D. Right-Click on the graph you wish to enlarge and choose the option "Picture Properties" from the pop-up menu.

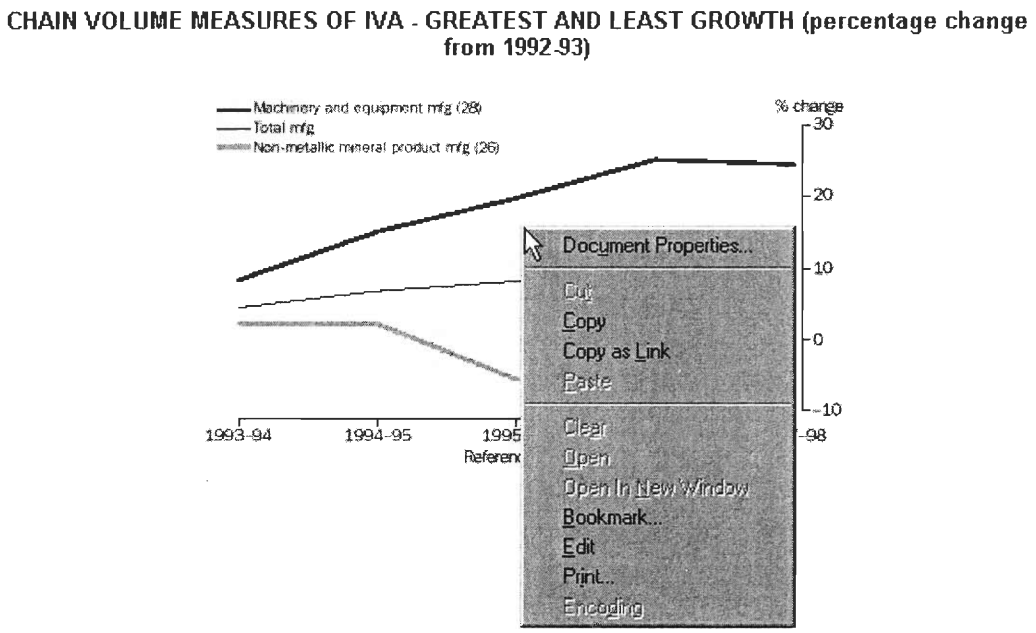


Figure 78: Document Properties

Figure 6: The graphic located above this description shows a graph in which the mouse has performed a right-click to activate a pop-up window in which the option of "Document Properties" feature can be accessed.

E. While in the "Document Properties" window select the tab labeled "i". Once the "Document Properties" window has been opened this tab should be selected by default.

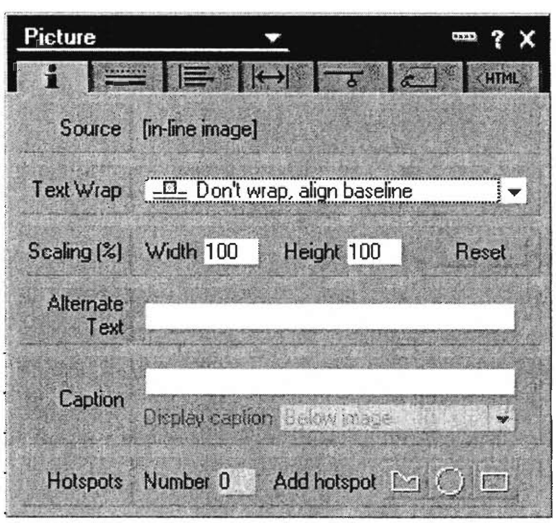


Figure 79: Picture Properties

Figure 7: This image shows the "Picture Properties" window where

scaling features of graphics can be altered to create more accessible graphics for low-vision students.

F. In the field marked "Scaling (%)", increase the "Width" and "Height" scales to about 150% each.

III. Procedure for Acrobat (.pdf) files.
   A. Open the graphic you wish to enlarge.
      i. Goto the "Tools" menu and select the option "Select graphics".
   B. In the "View" menu select the option "Zoom".
      i. Using the "zoom" option enlarge the graph (say to 130% or whatever size makes text of graph easily readable on screen)
   A. Select the newly enlarged graph.
      i. Using the selection tool draw a box around the graph (not including the title).
      ii. Go to the Edit menu and select the option "Copy".
   B. Go to the Lotus Notes page where you want the enlarged version of the graph to appear.
   C. Select the "Paste" option from the "Edit" menu.

IV. Preview the enlarged graph in a browser to make sure text on the axes and legends are both clear and legible.
   A. If these characteristics are clear and legible.
      i. Continue to step 4d.
   B. If these characteristics are not clear and legible.
      i. For ABS Graph created graphs.
         a. Decrease the "Scaling (%)" by following the same steps as described above until a legible version is attained. If one cannot be obtained try different font types and sizes for the original document, then scale to get an enlarged version.
      ii. For Acrobat (.pdf) files.
         a. Using the "zoom" option under the "View" menu, modify the graph size until one that is easily readable on screen is attained.
         b. Follow the same copy and paste procedure, as described above, to place the graph into Lotus Notes
   C. Add a text link to the page with the original version of the graph. This link will tell users where to go to get an enlarged version of the graph they are viewing.
   D. Follow **"How to Add Alternate Text to Complex Graphics".**

CHAIN VOLUME MEASURES OF IVA - GREATEST AND LEAST GROWTH (percentage change from 1992-93)

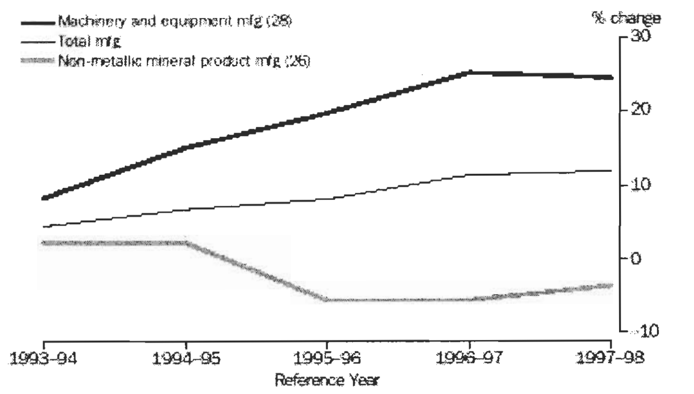


Figure 80: Chain Volume Measures of IVA

Click here for an enlarged version of the above graph.

Multimedia Attachments

Required

Ensure direct accessibility of embedded user interfaces (W3C, 8.0):

Ensure that the user interface follows principles of accessible design: device-independent access to functionality, keyboard operability, self-voicing, etc.

See description for W3C, 9.0.

Additional Useful Techniques

Use pre-recorded audio to read static equations (WGBH-NCAM, 6.2.3):

"A human narrator can pre-record all text including static equations. This audio file allows the user to hear entire equations on command, as well as smaller chunks. Use of the DAISY talking book specification provides a synchronised and controlled audio presentation. (More information on DAISY is available at: http://www.daisy.org/). This technique, unfortunately, does not provide access for all users. For example, deaf-blind students. Consider using audio files as a supplement to one of the other techniques to ensure that your content is universally accessible" (WGBH-NCAM, 6.2.3).

Not Applicable

Make programmatic elements such as scripts and applets directly accessible or compatible with assistive technologies [Priority1 if functionality is important and not presented elsewhere, otherwise Priority2] (W3C, 8.1):

Programmatic elements such as scripts and applets are not currently allowed by ABS Web Content Standards and can therefore be ignored as far as accessibility issues are concerned.

Until user agents can automatically read aloud the text equivalent of a visual track, provide an auditory description of the important information of the visual track of a multimedia presentation (W3C, 1.3):

Note: According to current ABS Web Content guidelines multimedia presentations are not currently allowed in ABS web content. As a result, extra steps do not have to be taken by the web page developer to comply with the above W3C checkpoint.

For any time-based multimedia presentation (e.g. a movie or animation), synchronise equivalent alternatives (e.g. captions or auditory descriptions of the visual track) with the presentation (W3C, 1.3).

See above Note concerning checkpoint 1.3.

Ensure that equivalents for dynamic content are updated when the dynamic content changes (W3C, 6.2):

According to current ABS WWW Site Publishing Standards and Guidelines, dynamic content is not used or supported. Therefore because dynamic content is not used equivalents for updated dynamic content need not be created for ABS web site content.

Ensure that pages are usable when scripts, applets, or other programmatic objects are turned off or not supported. If this is not possible, provide equivalent information on an alternative accessible page (W3C, 6.3):

Material and technologies such as scripts, applets and other programmatic objects are not supported for ABS web content, therefore the usability issues of these items can be ignored.

For scripts and applets, ensure that event handlers are input device-independent (W3C, 6.4):

Material and technologies such as scripts, applets and other programmatic objects are not supported for ABS web content; therefore the usability issues of these items can be ignored.

Ensure that dynamic content is accessible or provide an alternative presentation or page (W3C, 6.5):

According to current ABS WWW Site Publishing Standards and Guidelines, dynamic content is not used or supported. Therefore because dynamic content is not used equivalents for updated dynamic content need not be created for ABS web site content.

For scripts, specify logical event handlers rather than device-dependent event handlers (W3C, 9.3):

See explanation with regards to Checkpoint 9.2.

Until user agents allow users to turn off spawned windows, do not cause pop-ups or other windows to appear and do not change the current window without informing the user (W3C, 10.1):

This feature cannot be completed through Lotus Notes and can therefore be ignored.

Until user agents support explicit associations between labels and form controls, for all form controls with implicitly associated labels, ensure that the label is properly positioned.

The label must immediately precede its control on the same line (allowing more than one control/label per line) or be in the line preceding the control (with only one label and one control per line) (W3C, 10.2).

Links between Documents

Required

Provide clear navigation mechanisms (W3C, 13.0):

Provide clear and consistent navigation mechanisms to increase the likelihood that a person will find what they are looking for at a site.

Additional Useful Techniques

Clearly identify the target of each link (W3C, 13.1):

Link identifiers should be short and convey the necessary information about the pages they are linked up to within a web site. For instance, saying "click here" as a link is completely useless when taken out of the context it was originally in. Instead identify the target within the textual link itself. For example: "The Latest News", "ABS Homepage", and "File of the Table in Lotus 1-2-3 Format" are all good identifiers. Each identify what the target of the link is and need no extra context is needed to make the link understandable. It is not necessary to add in the word "Link" into URL hyperlinks because the screen reader when scanning a web page will add this word.

Use navigation mechanisms in a consistent manner (W3C, 13.4):

Stay consistent with the manner in which Internet link names and appearances are chosen. For instance, do not use multiple words or phrases to point to the same page.

For example when creating a link to the ABS Homepage, always refer to the page by using a link that is named "ABS Homepage" instead of using various other names. These might include the following substitutions "The Australian Bureau of Statistics Homepage", "Back to Home" and "Click Here to Got to the Homepage".

For More Information

Required

Ensure that pages featuring new technologies transform gracefully (W3C, 6.0):

Before incorporating a new technology into web content ensure that the technology is accessible. Check with EDS to verify that new technologies are accessible and allowed for web publication before submission to "ABS Website Content Approvals" database.

Appendix L – Test Web Content, Web View

If reading an electronic version of this report, please use the following links to view the sample content.

Set 1, Page 1

Set 1, Page 2

Set 1, Page 3

Set 1, Page 4

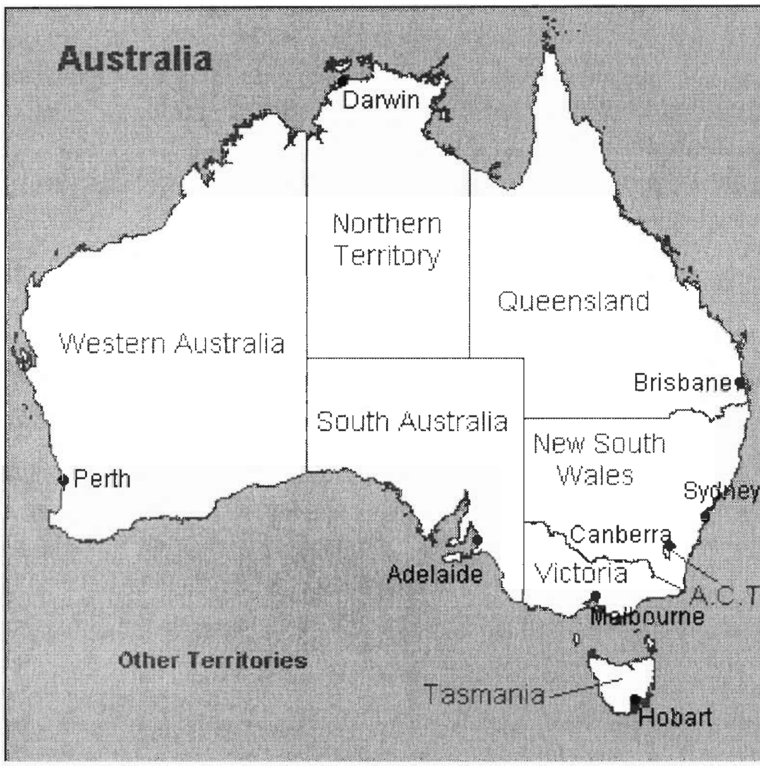
Set 1, Page 5

Employee Usability Test

Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles
Australia

Search for any area



Note: Australia is a convenient division of a Statistical Division for mapping purposes only. Census data are available for the component Statistical Local Areas but not for the total Australia.

Click here to see tables for Australia.

Click on one of the follow areas to select it:

- Australian Capital Territory
- Northern Territory
- Other Territories
- State of New South Wales
- State of Queensland
- State of South Australia
- State of Tasmania
- State of Victoria
- State of Western Australia

This document was last updated on 18/03/2000

| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitment | Site Map | Using this Site |

ABS Website Privacy Statement

Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles
State of Victoria

Search for any area

Note: State of Victoria is a convenient division of a Statistical Division for mapping purposes only. Census data are available for the component Statistical Local Areas but not for the total State of Victoria.

Click here to see tables for State of Victoria.

Click on one of the follow areas to select it:

- **Barwon (Statistical Division)**
- **Central Highlands (Statistical Division)**
- **East Gippsland (Statistical Division)**
- **Gippsland (Statistical Division)**
- **Goulburn (Statistical Division)**
- **Loddon (Statistical Division)**
- **Mallee (Statistical Division)**
- **Melbourne (Statistical Division)**
- **Ovens - Murray (Statistical Division)**
- **Western District (Statistical Division)**
- **Wimmera (Statistical Division)**
- **Off - Shore Areas & Migratory - State of Victoria (Statistical Local Area)**

This document was last updated on 18/03/2000

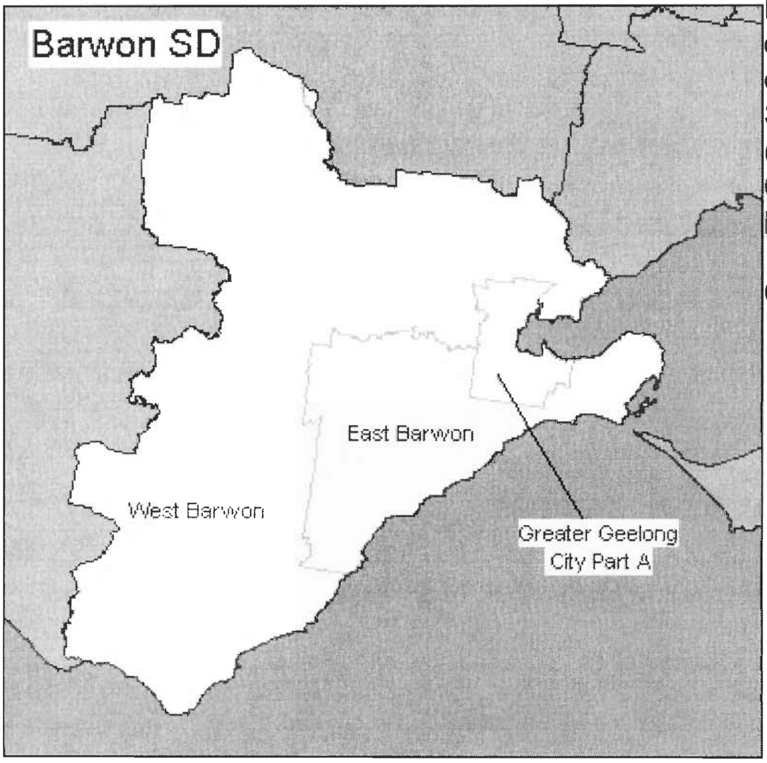
| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitment | Site Map | Using this Site |

 ABS Website Privacy Statement

Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles
Barwon (Statistical Division)

Search for any area



Note: Barwon (Statistical Division) is a coı
division of a Statistical Division for mappir
only. Census data are available for the co
Statistical Local Areas but not for the total
(Statistical Division).
Click here to see tables for Barwon (St
Division).

Click on one of the follow areas to select i

East Barwon (Statistical Subdivision)
Greater Geelong City Part A (Statistical
West Barwon (Statistical Subdivision)

This document was last updated on 18/03/2000

| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitment | Site Map | Using this Site |

Australian Bureau of Statistics

1996 Census of Population and Housing
Barwon (Statistical Division) - Victoria

B01 Selected Characteristics

Barwon (SD)

	Male	Female	Persons
Total persons (a)	112,020	116,218	228,238
Aged 15 years and over (a)	86,080	91,703	177,783
Aboriginal	462	533	995
Torres Strait Islander	63	71	134
Both Aboriginal and Torres Strait Islander (b)	18	8	26
Australian born	90,469	94,102	184,571
Born overseas: Canada, Ireland, NZ, South Africa, UK (c) and USA	7,780	8,077	15,857
Born overseas: Other country (d)	10,087	9,846	19,933
Born overseas: Total	17,867	17,923	35,790
Speaks English only and aged 5 years and over	91,004	94,905	185,909
Speaks language other than English (e) and aged 5 years and over	9,585	9,828	19,413
Australian citizen	103,153	106,658	209,811
Australian citizens aged 18 years and over	73,353	78,402	151,755
Unemployed	6,950	4,561	11,511
Employed	51,342	39,215	90,557
In the labour force	58,292	43,776	102,068
Not in the labour force	25,731	45,985	71,716
Enumerated in private dwelling (a)	109,287	113,282	222,569
Enumerated in non-private dwelling (a)	2,733	2,936	5,669
Persons enumerated same address 5 years ago	61,423	64,238	125,661
Persons enumerated different address 5 years ago	38,644	40,198	78,842
Overseas visitor	323	493	816

Cells in this table have been randomly adjusted to avoid the release of confidential data.

(a) Overseas visitors are included in these categories. All other categories exclude overseas visitors.
(b) Applicable to persons who are of both Aboriginal and Torres Strait Islander origin.
(c) Comprises England, Scotland, Wales, Northern Ireland, Channel Islands, Isle of Man, and United Kingdom and Ireland n.f.d.

(d) Includes 'inadequately described', 'at sea', and 'not elsewhere classified'.
(e) Includes 'non-verbal so described' and 'inadequately described'.

B32 Selected Medians

Barwon (SD)

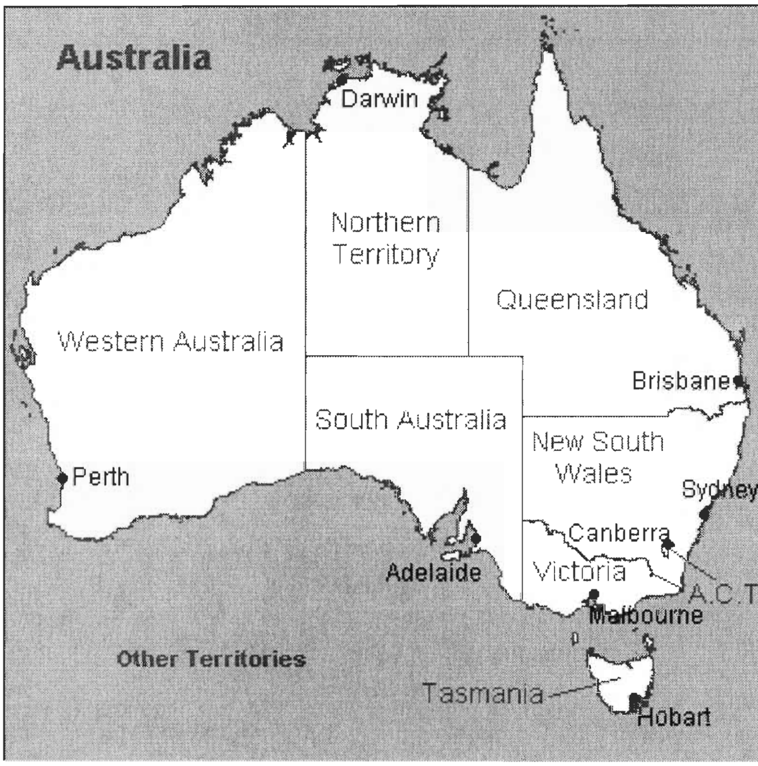
Median age	34
Median individual income	253
Median household income	555
Average household size	2.6

Note: Income figures are weekly income, expressed in $AUS.

Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles
Australia

Search for any area



Note: Australia is a convenient division of a Statistical Division for mapping purposes only. Census data are available for the component Statistical Local Areas but not for the total Australia.
Click here to see tables for Australia.

Click on one of the follow areas to select it:

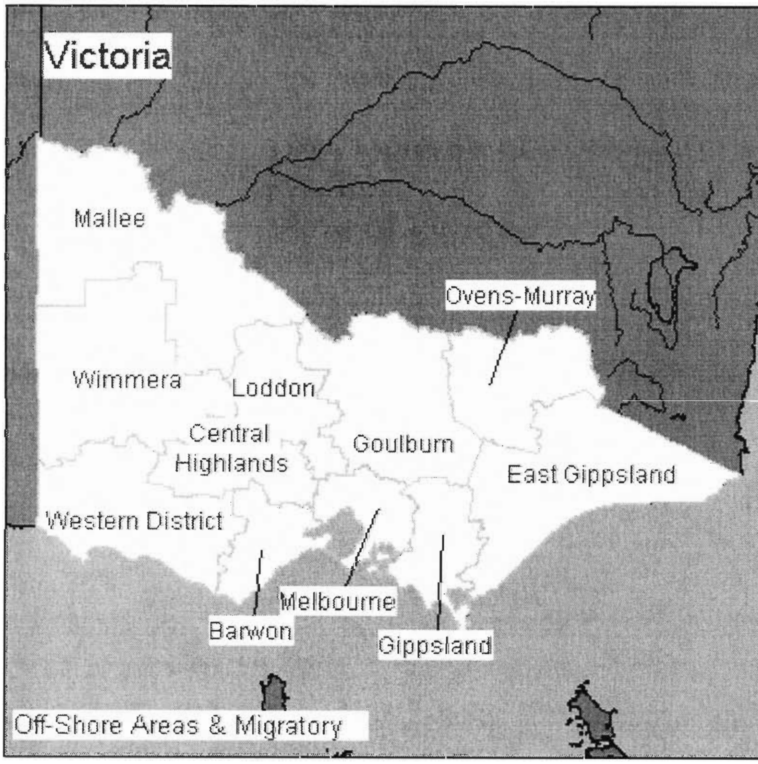
- **Australian Capital Territory**
- **Northern Territory**
- **Other Territories**
- **State of New South Wales**
- **State of Queensland**
- **State of South Australia**
- **State of Tasmania**
- **State of Victoria**
- **State of Western Australia**

This document was last updated on 18/03/2000

Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles
State of Victoria

Search for any area



Note: State of Victoria is a convenient division of a Statistical Division for mapping purposes only. Census data are available for the component Statistical Local Areas but not for the total State of Victoria.
Click here to see tables for State of Victoria.

Click on one of the follow areas to select it:

- **Barwon (Statistical Division)**
- **Central Highlands (Statistical Division)**
- **East Gippsland (Statistical Division)**
- **Gippsland (Statistical Division)**
- **Goulburn (Statistical Division)**
- **Loddon (Statistical Division)**
- **Mallee (Statistical Division)**
- **Melbourne (Statistical Division)**
- **Ovens - Murray (Statistical Division)**
- **Western District (Statistical Division)**
- **Wimmera (Statistical Division)**
- **Off - Shore Areas & Migratory - State of Victoria (Statistical Local Area)**

This document was last updated on 18/03/2000

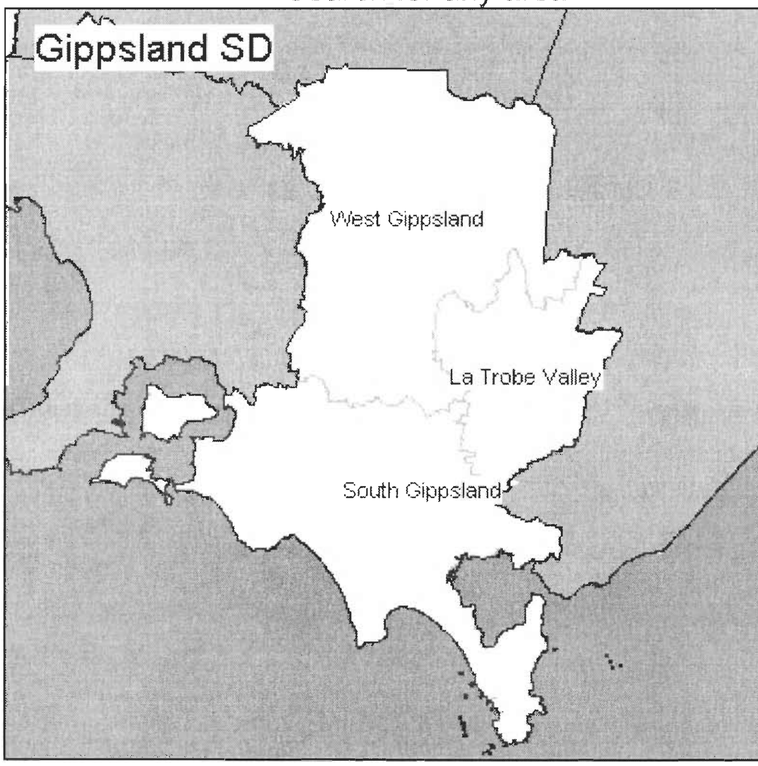
| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitment | Site Map | Using this Site |

 ABS Website Privacy Statement

Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles
Gippsland (Statistical Division)

Search for any area



Note: Gippsland (Statistical Division) is a convenient division of a Statistical Divisioı for mapping purposes only. Census data are available for the component Statistica Local Areas but not for the total Gippslanc (Statistical Division).

Click here to see tables for Gippsland (Statistical Division).

Click on one of the follow areas to select i

La Trobe Valley (Statistical Subdivision
South Gippsland (Statistical Subdivision
West Gippsland (Statistical Subdivision)

This document was last updated on 18/03/2000

| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitment | Site Map | Using this Site |

 ABS Website Privacy Statement

Australian Bureau of Statistics

1996 Census of Population and Housing
Gippsland (Statistical Division) - Victoria

B01 Selected Characteristics

Gippsland (SD)

	Male	Female	Persons
Total persons (a)	71,857	73,742	145,599
Aged 15 years and over (a)	53,677	56,121	109,798
Aboriginal	460	448	908
Torres Strait Islander	36	48	84
Both Aboriginal and Torres Strait Islander (b)	14	14	28
Australian born	59,912	61,228	121,140
Born overseas: Canada, Ireland, NZ, South Africa, UK (c) and USA	4,581	5,012	9,593
Born overseas: Other country (d)	4,864	4,686	9,550
Born overseas: Total	9,445	9,698	19,143
Speaks English only and aged 5 years and over	60,436	62,119	122,555
Speaks language other than English (e) and aged 5 years and over	3,812	4,060	7,872
Australian citizen	66,229	67,631	133,860
Australian citizens aged 18 years and over	45,648	47,714	93,362
Unemployed	4,981	2,780	7,761
Employed	31,585	23,606	55,191
In the labour force	36,566	26,386	62,952
Not in the labour force	15,706	28,424	44,130
Enumerated in private dwelling (a)	70,325	71,984	142,309
Enumerated in non-private dwelling (a)	1,532	1,758	3,290
Persons enumerated same address 5 years ago	38,692	39,256	77,948
Persons enumerated different address 5 years ago	25,101	26,585	51,686
Overseas visitor	143	190	333

Cells in this table have been randomly adjusted to avoid the release of confidential data.

(a) Overseas visitors are included in these categories. All other categories exclude overseas visitors.
(b) Applicable to persons who are of both Aboriginal and Torres Strait Islander origin.
(c) Comprises England, Scotland, Wales, Northern Ireland, Channel Islands, Isle of Man, and United Kingdom and Ireland n.f.d.

(d) Includes 'inadequately described', 'at sea', and 'not elsewhere classified'.
(e) Includes 'non-verbal so described' and 'inadequately described'.

B32 Selected Medians

Gippsland (SD)

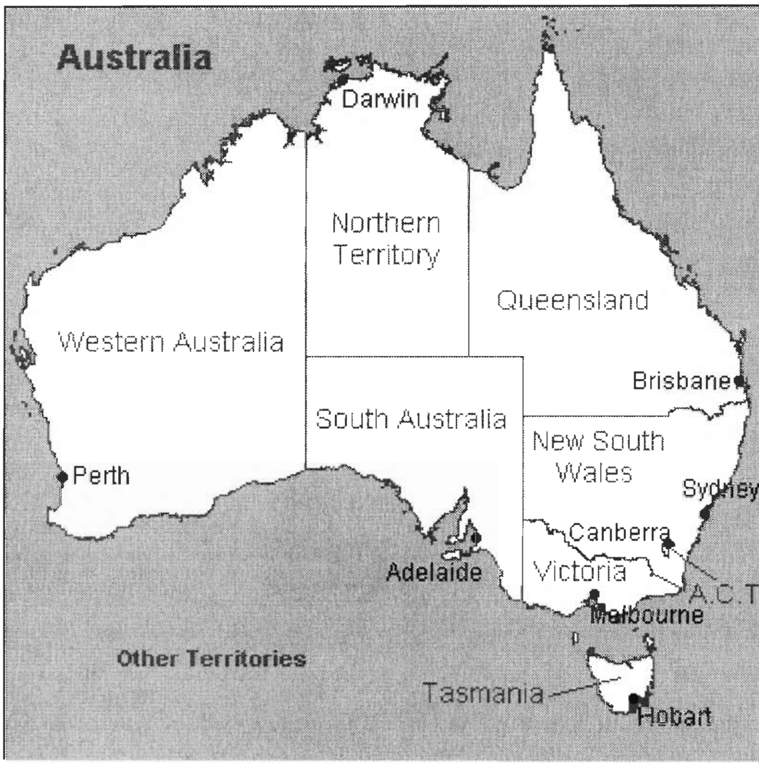
Median age	34
Median individual income	240
Median household income	496
Average household size	2.6

Note: Income figures are weekly income, expressed in $AUS.

Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles
Australia

Search for any area



Note: Australia is a convenient division of a Statistical Division for mapping purposes only. Census data are available for the component Statistical Local Areas but not for the total Australia.
Click here to see tables for Australia.

Click on one of the follow areas to select it:

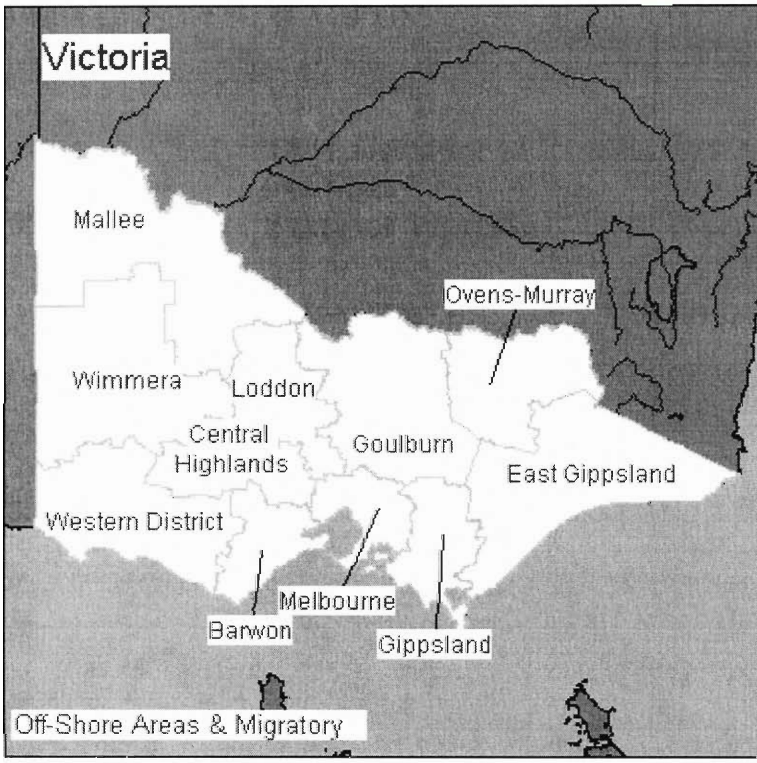
- **Australian Capital Territory**
- **Northern Territory**
- **Other Territories**
- **State of New South Wales**
- **State of Queensland**
- **State of South Australia**
- **State of Tasmania**
- **State of Victoria**
- **State of Western Australia**

This document was last updated on 18/03/2000

Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles
State of Victoria

Search for any area



Note: State of Victoria is a convenient division of a Statistical Division for mapping purposes only. Census data are available for the component Statistical Local Areas but not for the total State of Victoria.

Click here to see tables for State of Victoria.

Click on one of the follow areas to select it:

- **Barwon (Statistical Division)**
- **Central Highlands (Statistical Division)**
- **East Gippsland (Statistical Division)**
- **Gippsland (Statistical Division)**
- **Goulburn (Statistical Division)**
- **Loddon (Statistical Division)**
- **Mallee (Statistical Division)**
- **Melbourne (Statistical Division)**
- **Ovens - Murray (Statistical Division)**
- **Western District (Statistical Division)**
- **Wimmera (Statistical Division)**
- **Off - Shore Areas & Migratory - State of Victoria (Statistical Local Area)**

This document was last updated on 18/03/2000

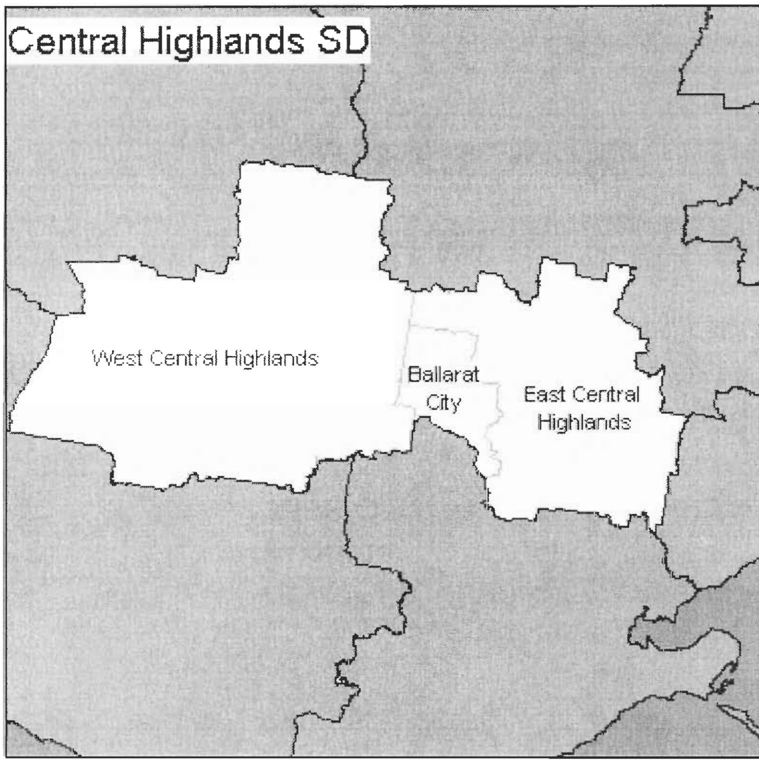
| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitment | Site Map | Using this Site |

 ABS Website Privacy Statement

Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles
Central Highlands (Statistical Division)

Search for any area



Note: Central Highlands (Statistical Divisi convenient division of a Statistical Divisio mapping purposes only. Census data are available for the component Statistical Lo Areas but not for the total Central Highlan (Statistical Division).

Click here to see tables for Central Hig (Statistical Division).

Click on one of the follow areas to select i

- **Ballarat City (Statistical Subdivision)**
- **East Central Highlands (Statistical Subd**
- **West Central Highlands (Statistical Sub**

This document was last updated on 18/03/2000

| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitment | Site Map | Using this Site |

ABS Website Privacy Statement

Australian Bureau of Statistics

1996 Census of Population and Housing
Central Highlands (Statistical Division) - Victoria

B01 Selected Characteristics

Central Highlands (SD)

Click here for an MS Excel spreadsheet of this table

Categories	Male	Female	Persons
Total persons (a)	63,421	66,135	129,556
Aged 15 years and over (a)	47,971	51,505	99,476
Aboriginal	372	350	722
Torres Strait Islander	61	48	109
Both Aboriginal and Torres Strait Islander (b)	8	14	22
Australian born	55,726	58,134	113,860
Born overseas: Canada, Ireland, NZ, South Africa, UK (c) and USA	2,973	3,188	6,161
Born overseas: Other country (d)	2,659	2,526	5,185
Born overseas: Total	5,632	5,714	11,346
Speaks English only and aged 5 years and over	54,581	57,349	111,930
Speaks language other than English (e) and aged 5 years and over	1,863	1,929	3,792
Australian citizen	59,593	62,147	121,740
Australian citizens aged 18 years and over	41,838	45,301	87,139
Unemployed	4,035	2,437	6,472
Employed	27,874	21,725	49,599
In the labour force	31,909	24,162	56,071
Not in the labour force	14,739	26,260	40,999
Enumerated in private dwelling (a)	61,075	63,745	124,820
Enumerated in non-private dwelling (a)	2,346	2,390	4,736
Persons enumerated same address 5 years ago	33,197	34,756	67,953
Persons enumerated different address 5 years ago	23,036	24,518	47,554
Overseas visitor	102	146	248

Cells in this table have been randomly adjusted to avoid the release of confidential data.

(a) Overseas visitors are included in these categories. All other categories exclude overseas visitors.
(b) Applicable to persons who are of both Aboriginal and Torres Strait Islander origin.
(c) Comprises England, Scotland, Wales, Northern Ireland, Channel Islands, Isle of Man, and United Kingdom and Ireland n.f.d.
(d) Includes 'inadequately described', 'at sea', and 'not elsewhere classified'.
(e) Includes 'non-verbal so described' and 'inadequately described'.

B32 Selected Medians

Central Highlands (SD)

Click here for an MS Excel spreadsheet of this table

Median age	33
Median individual income	240
Median household income	516
Average household size	2.6

Note: Income figures are weekly income, expressed in $AUS.

This document was last updated on 18/03/2000

Australian Bureau of Statistics

Education Resources

Statistics - A Powerful Edge
Cumulative Frequency and Percentage

CUMULATIVE FREQUENCY AND PERCENTAGE

Numerical variables can be represented in a variety of ways, including: stem and leaf, frequency distribution, cumulative frequency or cumulative percentage tables. As you will see, the graphs of these are very useful in finding the centres of large data sets.

The use of a stem and leaf plot, or stemplot, is a technique to classify either *discrete* or *continuous* variables.

Each observation may be considered as consisting of two parts: a stem and a leaf. To make a stemplot, each observation must first be separated into its two parts:

- a *stem* is the first digit or digits;
- a *leaf* is the final digit of a value;

- each *stem* can consist of any number of digits; and
- each *leaf* can only have a single digit.

So for example:

- if the value of an observation is 25: the stem is 2 and the leaf is 5; and
- if the value of an observation is 369: the stem is 36 and the leaf is 9.

Where observations are accurate to one or more decimal places, such as 23.7, the stem is 23 and the leaf is 7. (The number 23.7 could be rounded off to 24 to limit the number of stems if the range of values is too great.)

In stemplots, tally marks are not required as the actual data are used.

CUMULATIVE FREQUENCY

Cumulative frequency is used to determine the number of observations that lie above (or below) a particular value.

The cumulative frequency is found from a stem and leaf table or a frequency distribution table by *adding each frequency to the sum of its predecessor.*

The last value will always equal the total for all observations, as all frequencies will have been added.

For *discrete* variables:

- cumulative frequency is calculated from a frequency distribution table. A stem and leaf plot can be used to construct a frequency distribution table.

DISCRETE VARIABLES

EXAMPLE

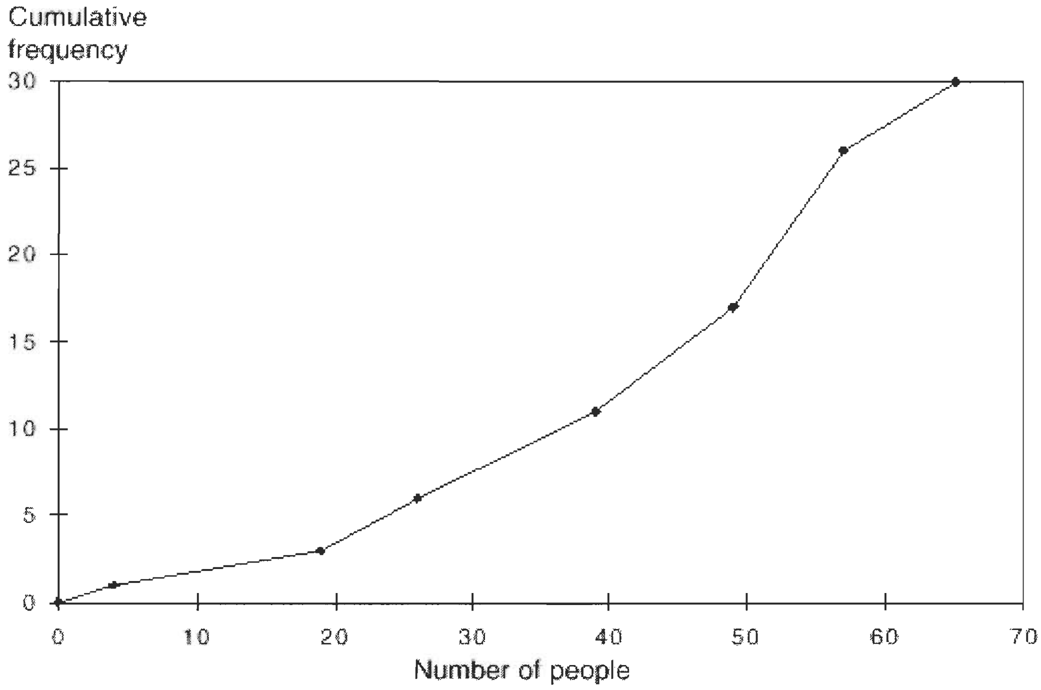
1. The number of people who climbed Ayers Rock over a thirty day period were counted some examples are as follows:

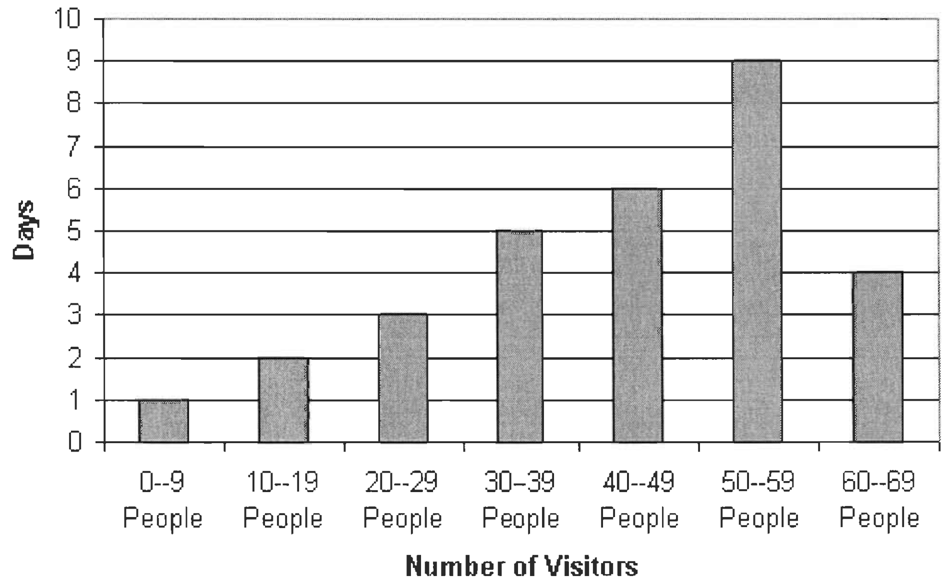
31, 49, 19, etc...

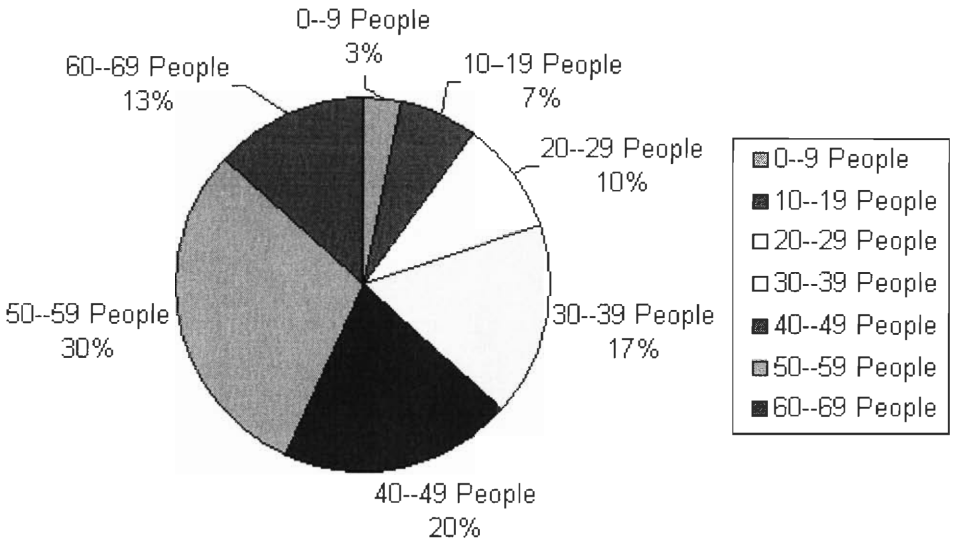
A stem and leaf table follows, and the cumulative frequency was found by adding appropriate columns. The data ranges from 4 to 65, so the data is grouped in class intervals of 10 to produce the following table:

Stem	Leaf	Frequency (f)	Upper value	Cumulative frequency
0	4	1	4	1
1	8 9	2	19	1+2=3
2	3 4 6	3	26	3+3=6
3	1 5 5 7 9	5	39	6+5=11
4	0 1 2 3 5 9	6	49	11+6=17
5	0 1 1 2 4 4 5 6 7	9	57	17+9=26
6	0 2 3 5	4	65	26+4=30

A line graph follows showing the cumulative frequency against number of people.
Because the variable is discrete, the actual upper value recorded in each class interval and used in plotting the graph. Even though the variable is discrete, the plotted points are joined to form a continuous cumulative frequency polygon or curve, known as an *ogive*.
The cumulative frequency is always labeled on the vertical axis and any other variable, in this case the number of people, is labeled on the horizontal axis as shown below
:


Cumulative frequency
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
Number of people


Days
10
9
8
7
6
5
4
3
2
1
0
0--9 People
10--19 People
20--29 People
30--39 People
40--49 People
50--59 People
60--69 People
Number of Visitors



This document was last updated on 18/03/2000

| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitment | Site Map | Using this Site |

Australian Bureau of Statistics

Education Resources

Statistics - A Powerful Edge

Cumulative Frequency and Percentage

CUMULATIVE FREQUENCY AND PERCENTAGE

Numerical variables can be represented in a variety of ways, including: stem and leaf, frequency distribution, cumulative frequency or cumulative percentage tables. As you will see, the graphs of these are very useful in finding the centres of large data sets.

CUMULATIVE FREQUENCY

Cumulative frequency is used to determine the number of observations that lie above (or below) a particular value.

The cumulative frequency is found from a stem and leaf table or a frequency distribution table by *adding each frequency to the sum of its predecessor.*

The last value will always equal the total for all observations, as all frequencies will have been added.

For *continuous* variables:

- cumulative frequency is calculated from a frequency distribution table. A stem and leaf plot can be used to construct a frequency distribution table.

CONTINUOUS VARIABLES

When a continuous variable or variable taking a large number of values is used, plotting the graph requires a different approach to that for a discrete variable.

EXAMPLE

1. The snow depth at Thredbo in the Snowy Mountains was measured (to the nearest centimetre) for twenty-five days and some examples are as follows:

   242, 228, 217, etc...

The data ranges from 209cm to 266cm, so the data are grouped in class intervals of 10 to produce the following table:

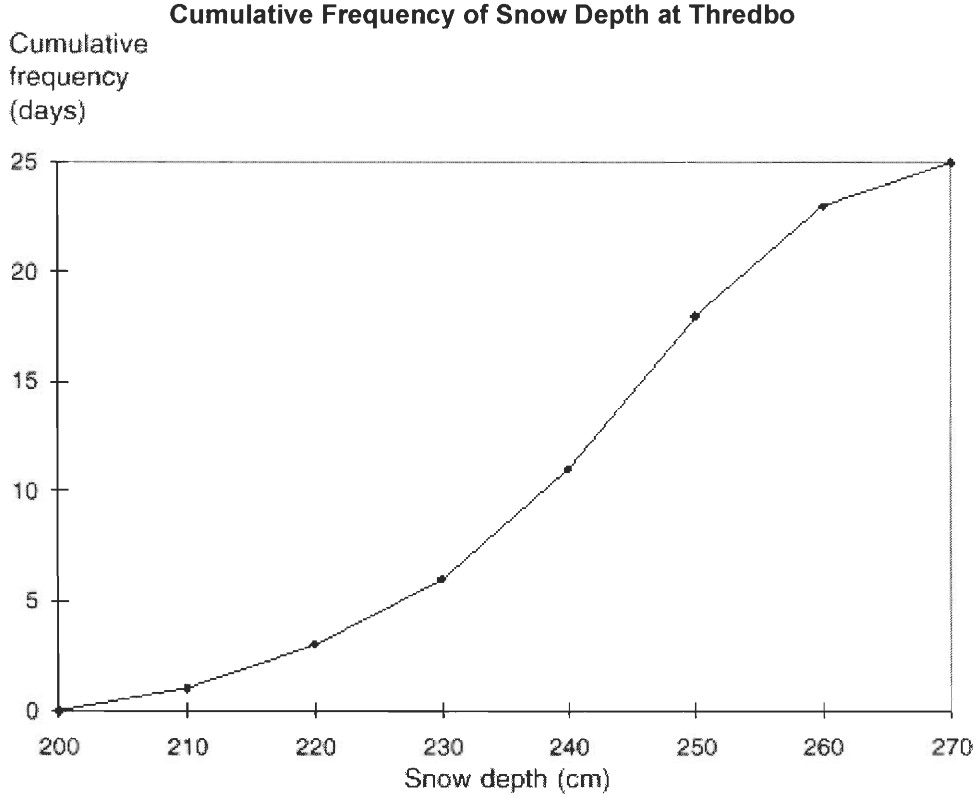
Snow Depth at Thredbo

Snow depth (x)	Tally	Frequency (f)	End-point	Cumulative frequency
			200	0
200-<210	1	1	210	1
210-<220	2	2	220	3
220-<230	3	3	230	6
230-<240	5	5	240	11
240-<250	7	7	250	18
250-<260	5	5	260	23
260-<270	2	2	270	25

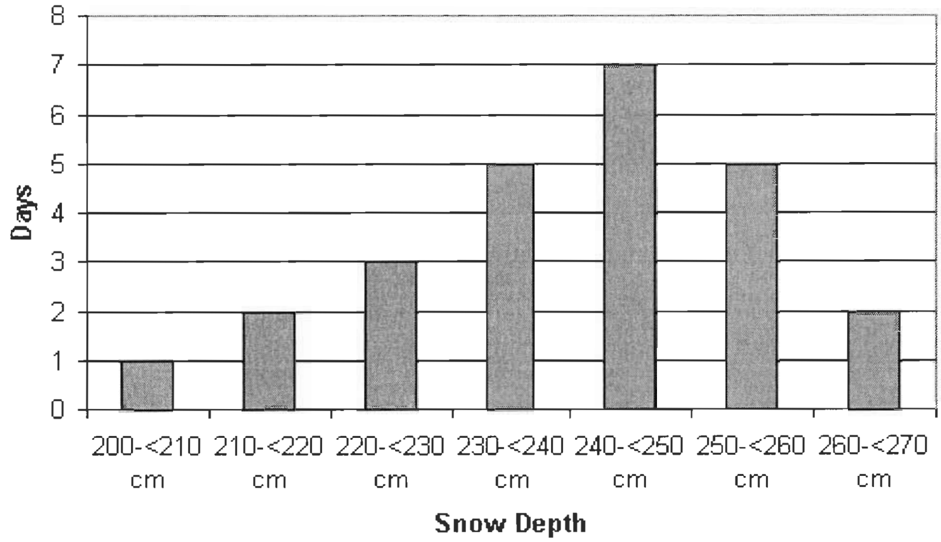
Because the variable is continuous, the end-points of each class interval are used in plotting the graph. The plotted points are joined to form an *ogive.*

Remember that the cumulative frequency is always labeled on the vertical axis and any other variable, in this case snow depth, is labeled on the horizontal axis as shown below:

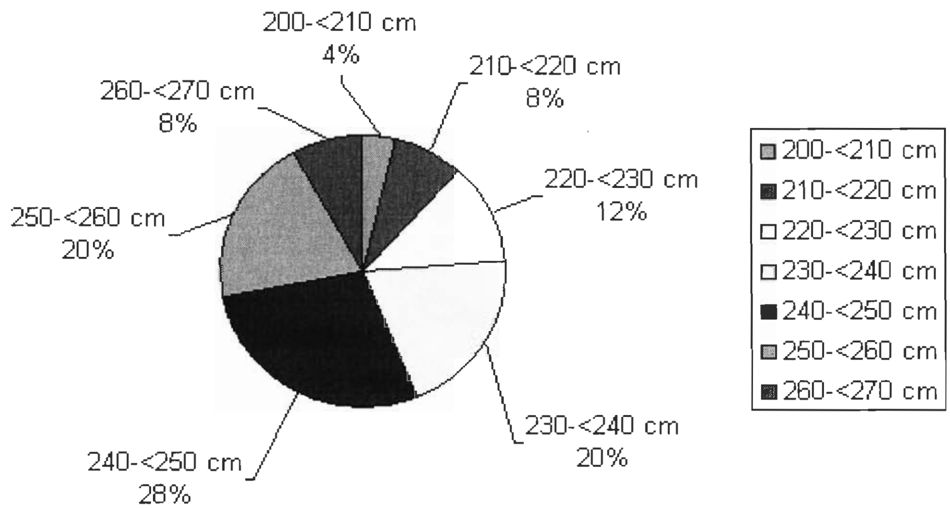
Cumulative Frequency of Snow Depth at Thredbo



Snow Depth Frequency at Thredbo



Frequency Percentages of Snow Depth at Thredbo



Australian Bureau of Statistics

Education Resources

Statistics - A Powerful Edge

Cumulative Frequency and Percentage

CUMULATIVE FREQUENCY AND PERCENTAGE

Numerical variables can be represented in a variety of ways, including: stem and leaf, frequency distribution, cumulative frequency or cumulative percentage tables. As you will see, the graphs of these are very useful in finding the centres of large data sets.

CUMULATIVE FREQUENCY

Cumulative frequency is used to determine the number of observations that lie above (or below) a particular value.

The cumulative frequency is found from a stem and leaf table or a frequency distribution table by *adding each frequency to the sum of its predecessor.*

The last value will always equal the total for all observations, as all frequencies will have been added.

For *continuous* variables:

- cumulative frequency is calculated from a frequency distribution table. A stem and leaf plot can be used to construct a frequency distribution table.

CONTINUOUS VARIABLES

When a continuous variable or variable taking a large number of values is used, plotting the graph requires a different approach to that for a discrete variable.

EXAMPLE

1. The temperatures in Melbourne in Victoria was measured (in Celsius degrees) for twenty-five days and some were as follows:
   28, 14, 6...etc.

   The data ranges from 6 degrees to 35 degrees, so the data are grouped in class intervals of 5 to produce the following table:

Temperatures in Melbourne

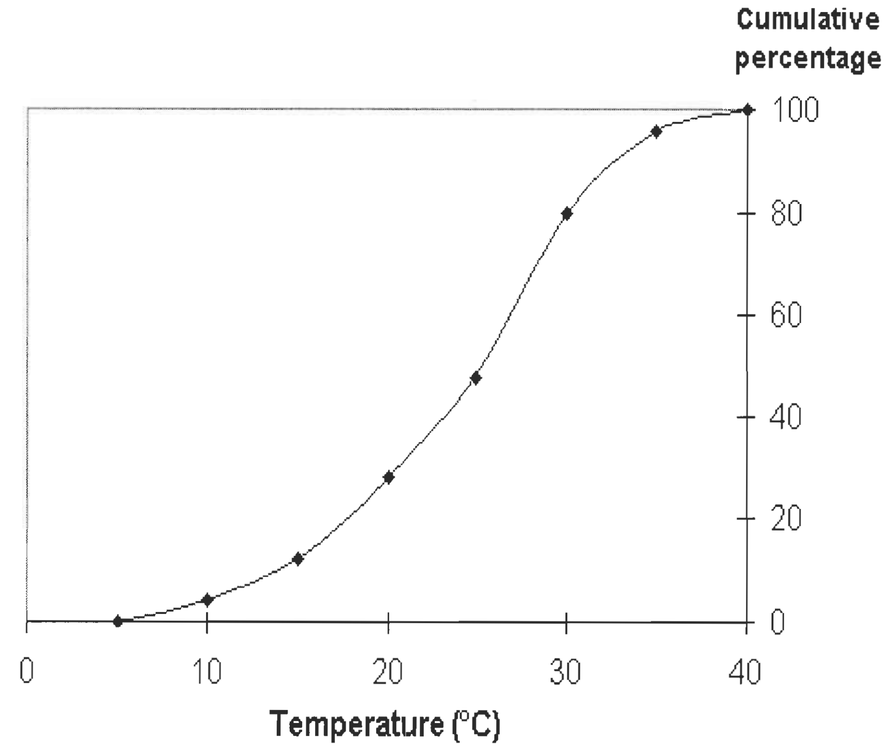
Temperature (°C)	Frequency (f)	End-point	Cumulative frequency	Cumulative percentage
Start		5	0	0
5-<10	1	10	1	4
10-<15	2	15	3	12
15-<20	4	20	7	28
20-<25	5	25	12	48
25-<30	8	30	20	80
30-<35	4	35	24	96
35-<40	1	40	25	100

Click here for a MS Excel Version of this table.

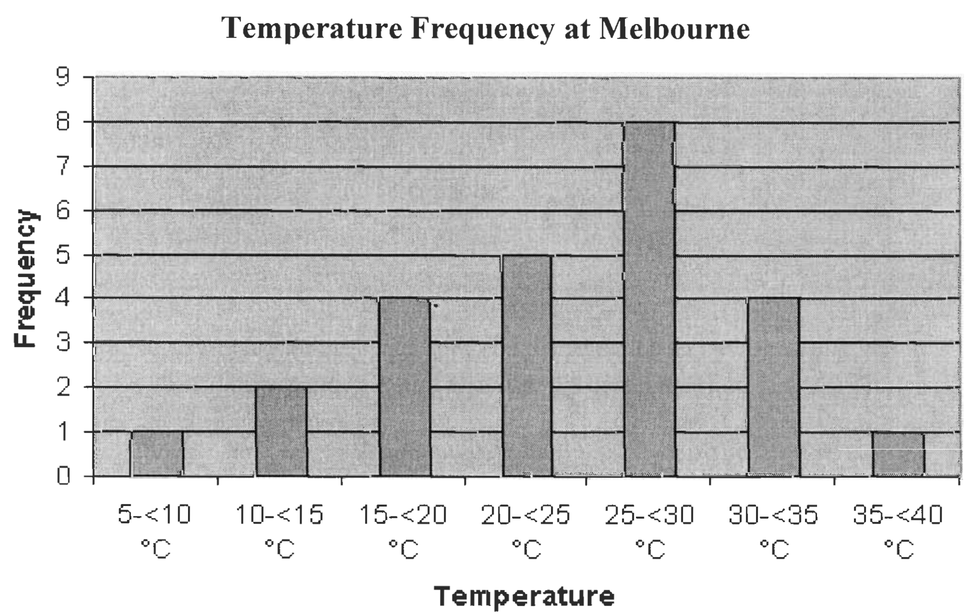
Because the variable is continuous, the end-points of each class interval are used in plotting the graph. The plotted points are joined to form an *ogive.*

Remember that the cumulative frequency is always labeled on the vertical axis and any other variable, in this case temperature, is labeled on the horizontal axis as shown below:

Cumulative Frequency of Temperatures at Melbourne

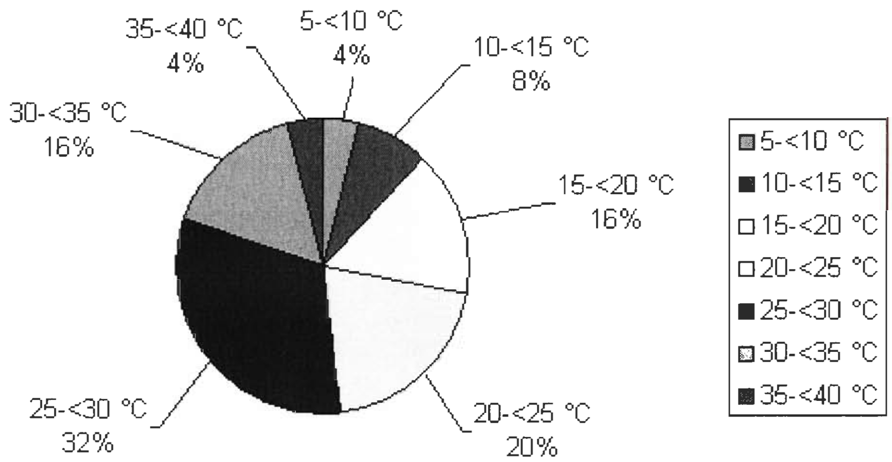


Enlarged version of the "Cumulative Frequency of Temperatures at Melbourne" graph.
Text description of the "Cumulative Frequency of Temperatures at Melbourne" graph.

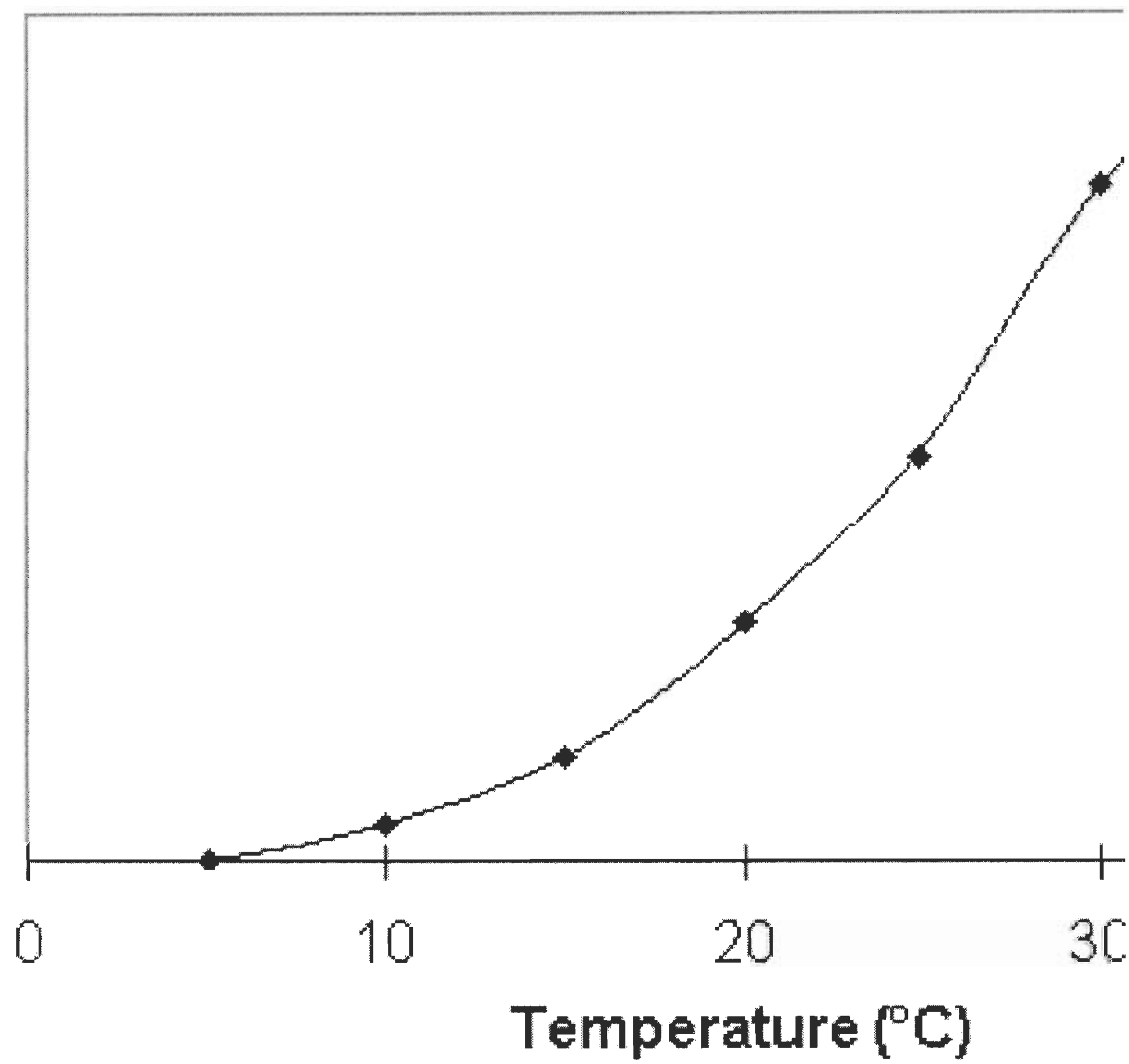


Enlarged version of the "Temperature Frequency at Melbourne" graph.
Text description of the "Temperature Frequency at Melbourne" graph.

Frequency Percentages of Temperatures at Melbourne



Enlarged version of the "Frequency Percentages of Temperatures at Melbourne" graph.
Text description of the "Frequency Percentages of Temperatures at Melbourne" graph.


0
10
20
30
Temperature (°C)

Cumulative Frequency of Temperatures at Melbourne

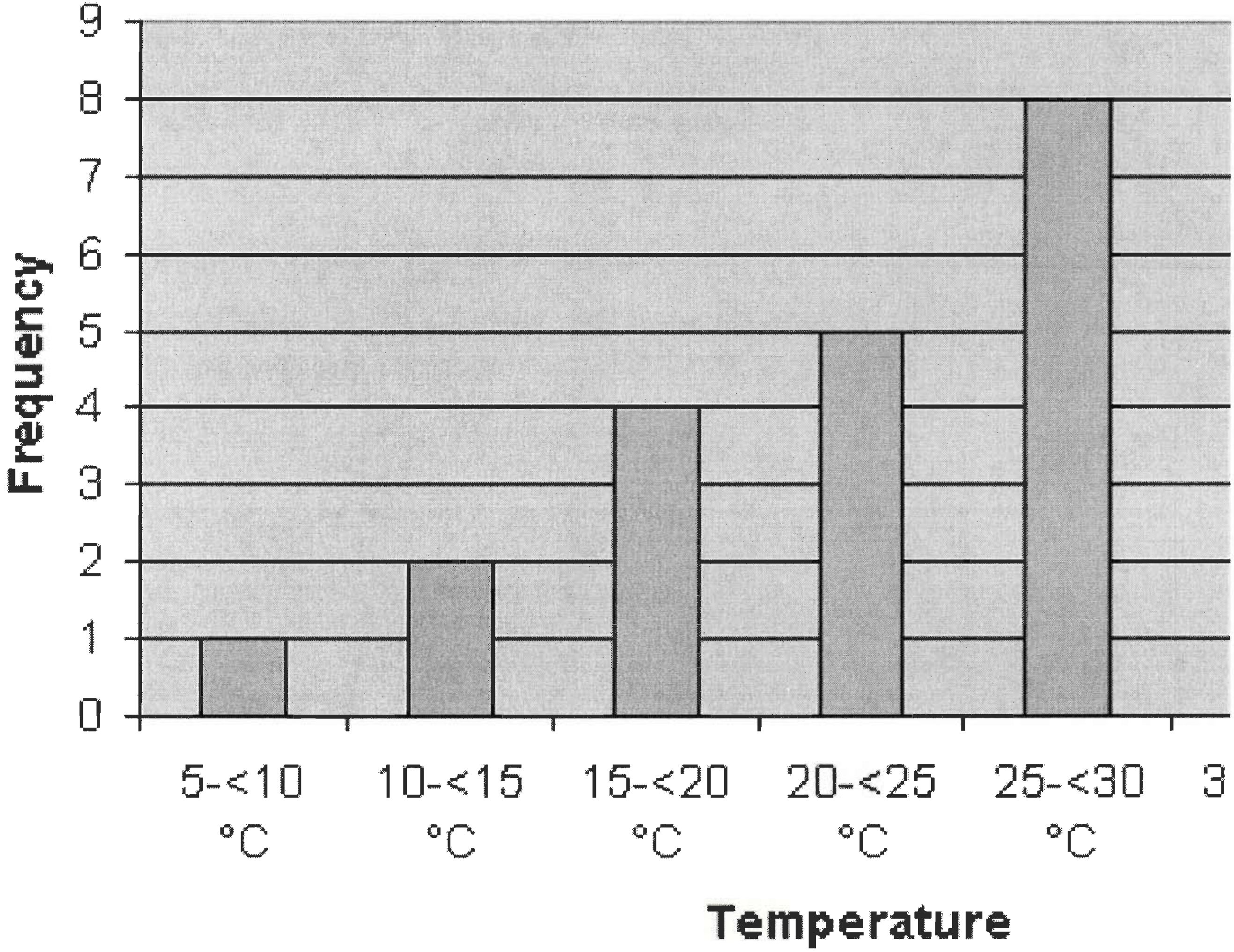
Line Graph Description

Summary: A line graph that at each data point it adds the frequency percentage of all of the ranges before it. So if the range 5-9 was 4% of the 25 days and the range 10-14 was 8% then the cumulative frequency would be 12%.

Horizontal Axis:
Label: Temperature in Celsius.
Range: Begins at the left and ends at the right.
Starts at 0 degrees, ends at 40 degrees.

Vertical Axis:
Label: Cumulative Percentage.
Range: Begins at the bottom ends at the top.
Starts at 0%, ends at 100%.

Data Points:
Line begins at 0% at 5 degrees,
then rises slightly to 4% at 10 degrees,
then rises slightly to 12% at 15 degrees,
then rises moderately to 28% at 20 degrees,
then rises moderately to 48% at 25 degrees,
then rises greatly to 80% at 30 degrees,
then rises moderately to 96% at 35 degrees,
then rises slightly to end at 100% at 40 degrees.


Frequency
9
8
7
6
5
4
3
2
1
0
5-<10 °C
10-<15 °C
15-<20 °C
20-<25 °C
25-<30 °C
3
Temperature

Temperature Frequency at Melbourne

Bar Graph Description

Summary: A bar graph consisting of seven bars, with each representing the number of days that a temperatures was in a given range.

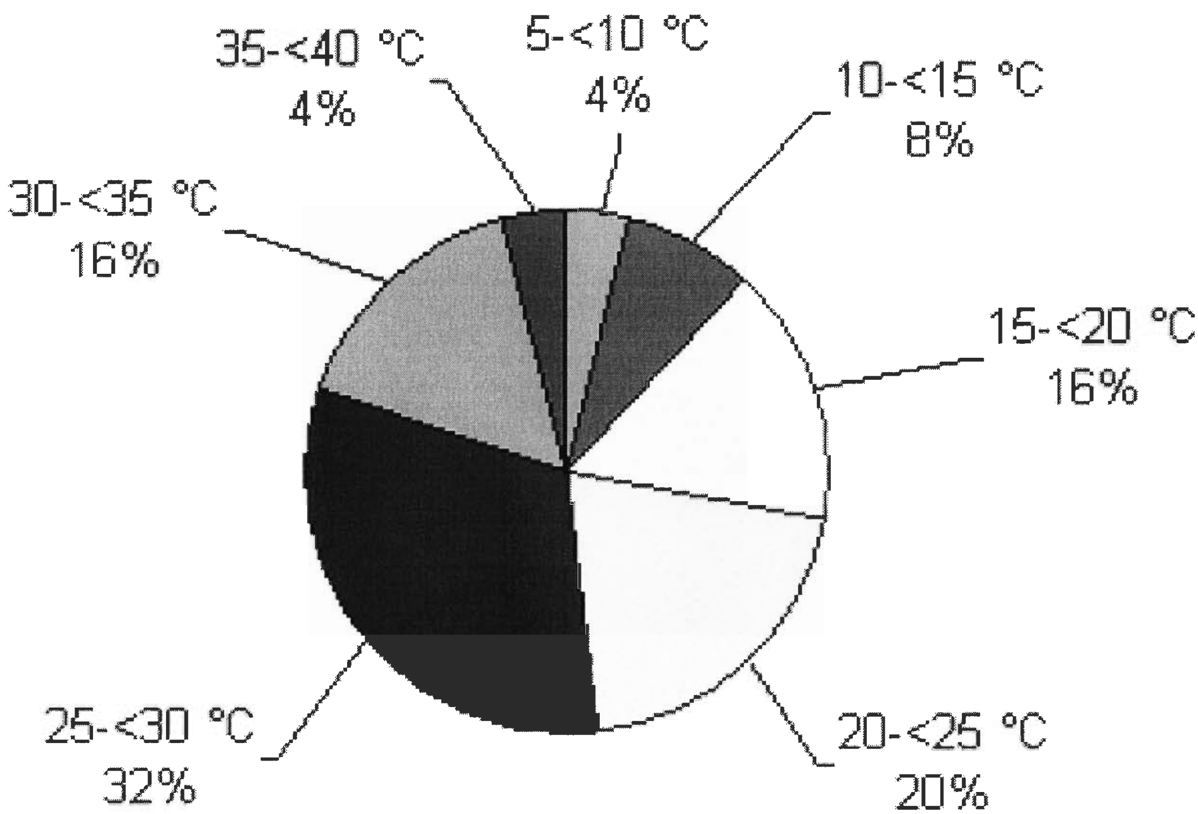
Horizontal Axis:
  Label: Temperature in Celsius.
  Range: Begins at the left and ends at the right.
      Starts at 5 to 9 degrees, ends at 35 to 39 degrees.

Vertical Axis:
  Label: Frequency in Days.
  Range: Begins at the bottom and ends at the top.
      Starts at 0 days, ends at 9days.

Largest Bar: Bar five is eight days at 20-24 degrees.

Smallest Bar: Bar one is one day at 5-9 degrees and,
      Bar seven is one day at 35-39 degrees.

Data Points:
  Bar one is one day at 5 to 9 degrees.
  Bar two is two days at 10 to 14 degrees.
  Bar three is four days at 15 to 19 degrees.
  Bar four is five days at 20 to 24 degrees.
  Bar five is eight days at 25 to 29 degrees.
  Bar six is four days at 30 to 34 degrees.
  Bar seven is one day at 35 to 39 degrees.


5-<10 °C
4%
10-<15 °C
8%
15-<20 °C
16%
20-<25 °C
20%
25-<30 °C
32%
30-<35 °C
16%
35-<40 °C
4%

Frequency Percentages of Temperatures at Melbourne

Pie Chart Description

Summary: This whole pie represents 25 days in Melbourne. The pie is then sliced in to pieces with each one representing a temperature range. The more days the temperature was in the given range, the bigger the piece.

Parts: Seven pieces each representing a temperature range.

Largest piece: 25-29 degrees at 32% of the total pie.

Smallest piece: tied with 5-9 degrees and 35-39 degrees both at 4% of the total pie.

Data Points:

Piece one is 4% for 5 to 9 degrees.
Piece two is 8% for 10 to 14 degrees.
Piece three is 16% for 15 to 19 degrees.
Piece four is 20% for 20 to 24 degrees.
Piece five is 32% for 25 to 29 degrees.
Piece six is 16% for 30 to 34 degrees.
Piece seven is 4% for 35 to 39 degrees.

Accessibility Cookbook/Graph and Tables Handbook Useability Activity

The two web pages presented below contains several accessibility errors.

Using the **Accessibility Cookbook**, **Graph and Tables Handbook**, and the **ABS WWW Site Publishing Standards and Guidelines** please fix any errors present. In the above documentations, when you are instructed to contact **EDS** please instead, explain to the activity administrator what your communications to **EDS** would involve. Explain all information that would be given to **EDS** to the activity administrator. Any extra files that need to be created to make these pages accessible should be saved on you desktop. You do not have to contact **EDS** to link any files/new web pages. Explain to the activity administrator any procedures that would be necessary for linking extra files/web pages.

Please take the time to read through all the documentation before attempting to make the activity web page accessible.

Once you feel that you have made the web page accessible (according to the standards given to you) please inform the activity administrator that you are finished. At the completion of making the page accessible you will be asked a set of questions regarding this activity.

Page 1

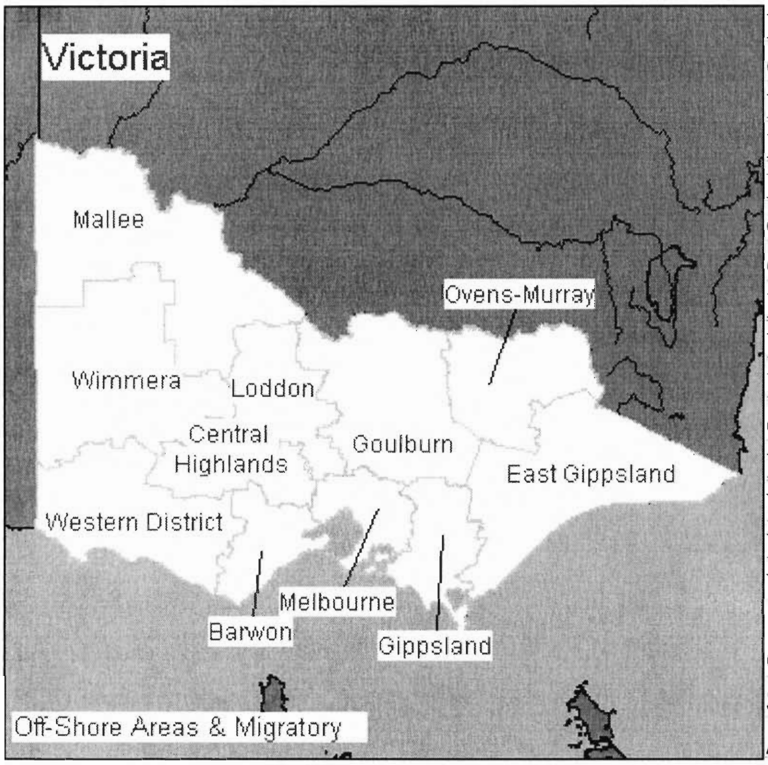
Australian Bureau of Statistics

1996 Census of Population and Housing - Basic Community Profiles State of Victoria

Search for any area

Note: State of Victoria is a convenient division of a Statistical Division for mapping purposes only. Census data are available for the component Statistical Local Areas but not for the total State of Victoria. **Click here to see tables for State of Victoria.**

Click on one of the follow areas to select it:



Barwon (Statistical Division)
Central Highlands (Statistical Division)
East Gippsland (Statistical Division)
Gippsland (Statistical Division)
Goulburn (Statistical Division)
Loddon (Statistical Division)
Mallee (Statistical Division)
Melbourne (Statistical Division)
Ovens - Murray (Statistical Division)
Western District (Statistical Division)
Wimmera (Statistical Division)

Off - Shore Areas & Migratory - State of Victoria (Statistical Local Area)

This document was last updated on 18/03/2000
| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitme nt | Site Map | Using this Site |

Page 2

Australian Bureau of Statistics

Education Resources

Statistics - A Powerful Edge
Cumulative Frequency and Percentage

CUMULATIVE FREQUENCY AND PERCENTAGE

Numerical variables can be represented in a variety of ways, including: stem and leaf, frequency distribution, cumulative frequency or cumulative percentage tables. As you will see, the graphs of these are very useful in finding the centres of large data sets.

The use of a stem and leaf plot, or stemplot, is a technique to classify either *discrete* or *continuous* variables.

Each observation may be considered as consisting of two parts: a stem and a leaf. To make a stemplot, each observation must first be separated into its two parts:

- a *stem* is the first digit or digits;
- a *leaf* is the final digit of a value;
- each *stem* can consist of any number of digits; and
- each *leaf* can only have a single digit.

So for example:

- if the value of an observation is 25: the stem is 2 and the leaf is 5; and
- if the value of an observation is 369: the stem is 36 and the leaf is 9.

Where observations are accurate to one or more decimal places, such as 23.7, the stem is 23 and the leaf is 7. (The number 23.7 could be rounded off to 24 to limit the number of stems if the range of values is too great.)

In stemplots, tally marks are not required as the actual data are used.

CUMULATIVE FREQUENCY

Cumulative frequency is used to determine the number of observations that lie above (or below) a particular value.

The cumulative frequency is found from a stem and leaf table or a frequency distribution table by *adding each frequency to the sum of its predecessor.*

The last value will always equal the total for all observations, as all frequencies will have been added.

For *discrete* variables:

- cumulative frequency is calculated from a frequency distribution table. A stem and leaf plot can be used to construct a frequency distribution table.

DISCRETE VARIABLES

EXAMPLE

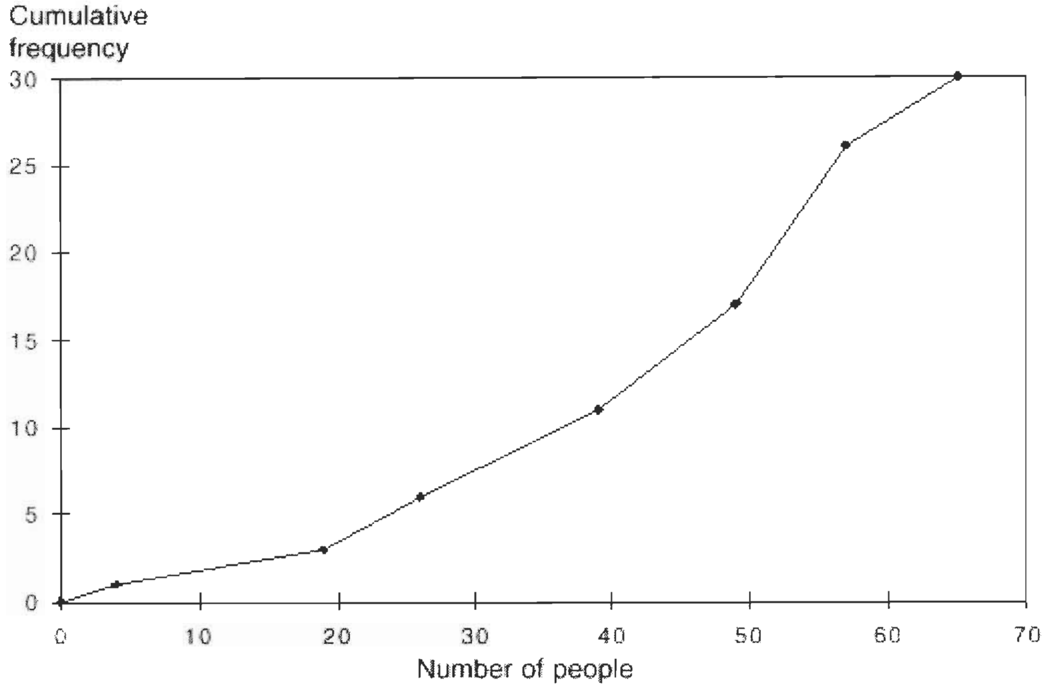
1. The number of people who climbed Ayers Rock over a thirty day period were counted some examples are as follows:

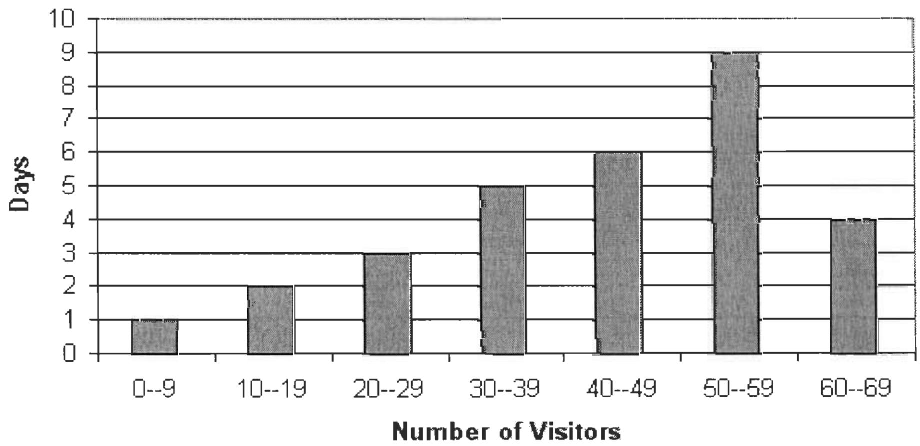
31, 49, 19, etc...

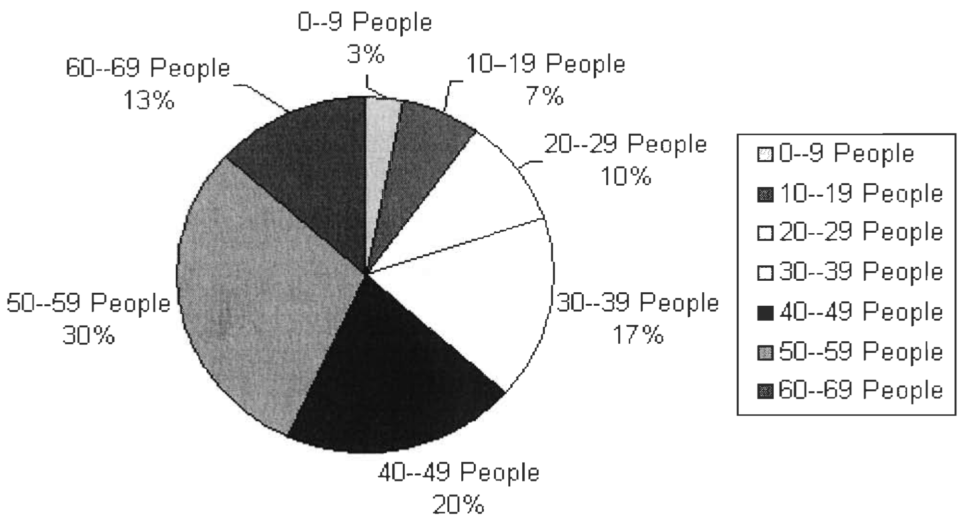
A stem and leaf table follows, and the cumulative frequency was found by adding appropriate columns. The data ranges from 4 to 65, so the data is grouped in class intervals of 10 to produce the following table:

Stem	Leaf	Frequency (f)	Upper value	Cumulative frequency
0	4	1	4	1
1	8 9	2	19	1+2=3
2	3 4 6	3	26	3+3=6
3	1 5 5 7 9	5	39	6+5=11
4	0 1 2 3 5 9	6	49	11+6=17
5	0 1 1 2 4 4 5 6 7	9	57	17+9=26
6	0 2 3 5	4	65	26+4=30

A line graph follows showing the cumulative frequency against number of people.
Because the variable is discrete, the actual upper value recorded in each class interval and used in plotting the graph. Even though the variable is discrete, the plotted points are joined to form a continuous cumulative frequency polygon or curve, known as an *ogive.*
The cumulative frequency is always labeled on the vertical axis and any other variable, in this case the number of people, is labeled on the horizontal axis as shown below
:


Cumulative frequency
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
Number of people


10
9
8
7
6
5
4
3
2
1
0
Days
0--9
10--19
20--29
30--39
40--49
50--59
60--69
Number of Visitors



This document was last updated on 18/03/2000

| Home | Statistics | News | Products & Services | About the ABS | Themes | Census | Recruitme nt | Site Map | Using this Site |

Appendix M - Test Web Content, HTML View

Set 1, Page 1

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310108.NSF/f9996d24c8f22d024a256500001c8576/569af0d
15c2201964a2565010007a32f!OpenDocument -->
<HTML><HEAD><TITLE>1996 Census - Australia</TITLE>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="19%" bgColor=#008000 rowSpan=2>
   <DIV align=center>
   <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
   src="1996 Census - Australia_files/0.gif" width=124></P></DIV></TD>
  <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
   Bureau of Statistics</FONT></TD>
  <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
   src="1996 Census - Australia_files/ecblank.gif" width=1 border=0></TD></TR>
 <TR vAlign=top>
  <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
   Population and Housing - Basic Community Profiles</FONT></B><BR><B><FONT
   face=Arial size=4>Australia</FONT></B><BR><FONT face=Arial size=2>
   <HR noShade>
   </FONT></TD></TR></TBODY></TABLE>
<DIV align=center></DIV>
<DIV align=right></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="16%">
   <DIV align=center><A
   href="..\PleaseGoBack.htm"><IMG
   height=22
   src="1996 Census - Australia_files/0(1).gif"
   width=35 border=0></A><FONT face=Arial> </FONT><A
   href="..\PleaseGoBack.htm"
  ><FONT
   face=Arial>Search for any area</FONT></A><BR><BR><FONT
   face=Arial></FONT></DIV><MAP name=7A6.map><AREA shape=RECT
     coords=205,337,272,356
     href="..\PleaseGoBack.htm"><AREA
     shape=RECT coords=341,288,378,302
     href="..\PleaseGoBack.htm"><AREA
     shape=RECT coords=49,314,159,341
     href="..\PleaseGoBack.htm"><AREA
     shape=POLY coords=326,267,333,271,330,276,326,270,326,266
     href="..\PleaseGoBack.htm"><AREA
     shape=POLY

coords=147,65,148,234,131,242,122,241,112,247,105,248,99,259,67,258,57,265,49,269,34,268,23,261,20,25
0,23,255,29,233,23,220,18,200,13,191,8,176,5,165,15,181,6,156,14,135,15,142,24,131,36,120,45,124,51,118
```

```
,57,115,63,116,77,112,87,97,86,86,91,79,96,84,99,87,100,83,99,75,108,80,108,71,118,57,131,51,137,60,144,
65,148,65
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=321,325,322,343,314,353,303,354,297,347,295,337,290,331,290,322,303,330,312,330,320,322,318,3
15,322,321,320,327,320,325
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=257,256,257,261,257,300,269,300,280,309,294,296,306,308,319,297,339,293,323,284,317,275,295,2
77,289,279,277,265,271,264,268,259,257,257,256,258
      href="1996 Census - State of Victoria.htm"><AREA
      shape=POLY

coords=148,176,256,177,257,300,246,288,246,281,235,272,221,278,217,275,228,273,235,269,235,267,231,2
55,226,263,229,268,219,270,222,264,228,265,230,251,228,244,224,252,212,266,211,269,204,259,202,250,1
96,245,190,239,183,237,173,233,148,232,149,176
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=256,206,328,207,336,200,352,208,356,203,355,199,368,196,370,204,365,218,363,231,349,256,344,2
67,336,294,321,284,316,276,311,278,296,276,291,280,278,269,275,264,270,265,265,257,256,256,256,207,2
56,207
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=148,63,149,177,230,175,231,79,206,60,213,53,219,57,216,51,210,45,220,35,215,24,204,34,183,30,17
8,21,180,26,182,32,170,36,168,30,170,20,161,25,158,30,168,34,158,41,160,47,151,57,154,63,157,68,151,64,
148,65,148,62
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=229,80,229,174,255,176,256,205,326,206,337,200,350,206,354,200,368,195,365,153,365,170,303,96,
294,57,280,55,267,7,256,84,247,95,236,80,229,79,228,80
      href="..\PleaseGoBack.htm"></MAP><A
     href="..\PleaseGoBack.htm"><IMG
     height=379 isMap
     src="1996 Census - Australia_files/0(2).gif"
     width=379 useMap=#7A6.map border=0></A></TD>
    <TD width="2%"><FONT face=Arial></FONT></TD>
    <TD width="82%"><FONT face=Arial><BR></FONT><BR><FONT face=Arial>Note:
     </FONT><FONT face=Arial>Australia</FONT><FONT face=Arial> is a convenient
     division of a Statistical Division for mapping purposes only. Census data
     are available for the component Statistical Local Areas but not for the
     total </FONT><FONT face=Arial>Australia</FONT><FONT
     face=Arial>.</FONT><BR><B><FONT face=Arial><A
     href="..\PleaseGoBack.htm"
    >Click
     here to see tables for Australia.</A></FONT></B><BR><FONT
     face=Arial></FONT><BR><FONT face=Arial>Click on one of the follow areas to
     select it:</FONT><BR>
     <TABLE>
       <TBODY>
       <TR>
         <TH></TH></TR>
       <TR vAlign=top>
```

```
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >Australian
  Capital Territory </A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >Northern
  Territory</A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >Other
  Territories </A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >State
  of New South Wales</A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >State
  of Queensland</A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >State
  of South Australia </A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >State
  of Tasmania </A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="1996 Census - State of Victoria.htm" >State
  of Victoria</A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
```

```
        border=0><B><A
        href="..\PleaseGoBack.htm"
       >State
        of Western Australia </A></B></TD></TR></TBODY></TABLE><FONT
    face=Arial><IMG src="1996 Census - Australia_files/ecblank.gif">
    </FONT><B><FONT face=Arial></FONT></B></TD></TR></TBODY></TABLE>
<DIV align=center><BR><FONT face=Arial>
<HR>
</FONT><BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="50%"><A
      href="..\PleaseGoBack.htm"
     ><B><FONT
      face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
    <TD width="50%">
      <DIV align=right><A
      href="..\PleaseGoBack.htm"
     ><B><FONT
      face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 1, Page 2

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310108.NSF/fead422050fd1dae4a2565130006141f/67ae457
a0f96ae224a256514000cc751!OpenDocument -->
<HTML><HEAD><TITLE>1996 Census - State of Victoria</TITLE>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="19%" bgColor=#008000 rowSpan=2>
      <DIV align=center>
      <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
      src="1996 Census - State of Victoria_files/0.gif" width=124></P></DIV></TD>
    <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
      Bureau of Statistics</FONT></TD>
    <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
      src="1996 Census - State of Victoria_files/ecblank.gif" width=1
    border=0></TD></TR>
  <TR vAlign=top>
    <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
      Population and Housing - Basic Community Profiles</FONT></B><BR><B><FONT
      face=Arial size=4>State of Victoria</FONT></B><BR><FONT face=Arial size=2>
      <HR noShade>
      </FONT></TD></TR></TBODY></TABLE>
<DIV align=center></DIV>
<DIV align=right></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="16%">
      <DIV align=center><A
      href="http://144.53.160.45/websitedbs/d3310108.nsf/Search/$SearchForm?SearchView"><IMG
      height=22
      src="1996 Census - State of Victoria_files\0(1).gif"
      width=35 border=0></A><FONT face=Arial> </FONT><A
      href="..\PleaseGoBack.htm"><FONT
      face=Arial>Search for any area</FONT></A><BR><BR><FONT
      face=Arial></FONT></DIV><MAP name=2F2.map><AREA shape=RECT
        coords=3,354,180,369
        href="..\PleaseGoBack.htm"><AREA
        shape=RECT coords=101,304,144,322
        href="1996 Census - Barwon (Statistical Division).htm"><AREA
        shape=RECT coords=135,289,195,307
        href="..\PleaseGoBack.htm"><AREA
        shape=POLY

coords=195,273,187,284,167,283,163,275,173,273,176,260,170,251,156,259,155,250,155,235,176,234,177,2
28,201,243,203,258,203,271,193,276
        href="..\PleaseGoBack.htm"><AREA
        shape=RECT coords=95,207,133,222
        href="..\PleaseGoBack.htm"><AREA
        shape=POLY
```

coords=155,235,149,223,151,217,143,217,141,221,107,209,107,204,96,206,95,219,81,218,71,241,83,241,91,
249,108,244,113,239,120,241,122,236,135,250,155,250,156,235
href="..\PleaseGoBack.htm"><AREA
shape=POLY

coords=106,294,106,286,112,282,107,276,115,272,110,271,121,263,121,256,111,251,111,240,121,242,121,2
38,131,249,152,251,158,259,150,263,150,267,160,267,160,271,152,274,135,282,116,303,105,291
href="1996 Census - Barwon (Statistical Division).htm"><AREA
shape=POLY

coords=169,234,161,216,156,215,153,210,168,206,163,200,154,197,162,181,150,183,145,181,145,155,136,1
62,130,156,120,161,112,166,116,173,112,187,116,202,107,204,106,210,128,220,137,222,139,218,149,217,1
47,225,155,237,172,234
href="..\PleaseGoBack.htm"><AREA
shape=POLY

coords=16,231,32,231,38,221,49,220,51,214,55,222,61,221,62,215,78,226,71,241,83,242,86,248,108,246,113
,241,113,252,121,258,120,263,114,267,111,271,115,271,110,276,108,276,108,279,110,282,106,285,106,295,
74,276,67,279,50,271,45,272,42,279,14,260,16,226
href="..\PleaseGoBack.htm"><AREA
shape=RECT coords=184,312,242,329
href="..\PleaseGoBack.htm"><AREA
shape=POLY

coords=196,240,219,237,229,241,232,259,238,259,239,267,231,282,225,286,231,289,228,292,220,295,223,3
02,228,298,228,312,222,311,220,300,213,297,210,302,202,290,199,290,193,285,189,282,192,278,202,270,2
03,249,196,238
href="..\PleaseGoBack.htm"><AREA
shape=POLY

coords=14,151,38,151,43,135,61,136,67,128,73,127,80,138,84,148,80,166,86,166,87,184,112,187,116,204,95
,207,93,220,79,218,78,225,62,215,62,221,54,221,52,216,48,220,41,220,36,224,36,229,28,228,30,231,19,231,
18,228,15,150
href="..\PleaseGoBack.htm"><AREA
shape=POLY

coords=150,151,124,130,121,134,117,131,118,123,113,121,109,101,84,93,79,102,70,79,62,72,44,70,37,76,16
,64,15,150,38,150,41,136,61,136,64,130,74,128,79,138,83,138,84,148,82,149,79,170,85,168,85,185,102,183,
108,183,114,187,117,173,113,165,118,159,128,156,136,162,151,151
href="..\PleaseGoBack.htm"><AREA
shape=POLY

coords=219,163,214,161,208,159,206,161,190,152,187,154,168,157,170,165,166,168,150,154,145,158,145,1
79,149,184,161,181,153,196,163,199,168,206,153,211,154,214,160,216,161,220,169,233,172,234,177,229,1
98,241,205,238,218,237,225,241,229,239,236,216,223,207,220,178,217,176,217,172,221,172,217,160
href="..\PleaseGoBack.htm"><AREA
shape=POLY

coords=364,234,296,199,291,193,268,203,264,199,264,213,269,227,237,218,228,240,231,243,231,258,238,2
58,237,265,240,268,233,281,225,287,232,290,227,294,230,297,242,292,258,277,277,260,299,250,348,247,3
55,243,367,234
href="..\PleaseGoBack.htm"><AREA
shape=RECT coords=217,136,293,152
href="..\PleaseGoBack.htm"><AREA
shape=POLY

```
coords=299,191,293,184,292,171,290,165,282,161,280,158,276,163,264,161,263,166,255,163,250,168,233,1
62,225,161,225,163,218,164,220,169,220,172,216,174,216,177,221,181,222,207,238,219,266,227,267,224,2
63,218,265,217,261,213,263,204,263,198,267,202,289,192,297,198,298,187
    href="..\PleaseGoBack.htm">
  <area href="../PleaseGoBack.htm" shape="default">
  <area href="../PleaseGoBack.htm" coords="0, 0, 10000, 10000" shape="rect"></MAP><A
  href="..\PleaseGoBack.htm"><IMG
  height=378 isMap
  src="1996%20Census%20-%20State%20of%20Victoria_files/0(2).gif"
  width=378 useMap=#2F2.map border=0></A></TD>
 <TD width="2%"><FONT face=Arial></FONT></TD>
 <TD width="82%"><FONT face=Arial><BR></FONT><BR><FONT face=Arial>Note:
  </FONT><FONT face=Arial>State of Victoria</FONT><FONT face=Arial> is a
  convenient division of a Statistical Division for mapping purposes only.
  Census data are available for the component Statistical Local Areas but
  not for the total </FONT><FONT face=Arial>State of Victoria</FONT><FONT
  face=Arial>.</FONT><BR><B><FONT face=Arial><A
  href="..\PleaseGoBack.htm">Click
  here to see tables for State of Victoria.</A></FONT></B><BR><FONT
  face=Arial></FONT><BR><FONT face=Arial>Click on one of the follow areas to
  select it:</FONT><BR>
  <TABLE>
   <TBODY>
   <TR>
    <TH></TH></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="1996 Census - Barwon (Statistical Division).htm" >Barwon
     (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">Central
     Highlands (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">East
     Gippsland (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">Gippsland
     (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">Goulburn
     (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
```

```
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">Loddon
     (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">Mallee
     (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">Melbourne
     (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">Ovens
     - Murray (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">Western
     District (Statistical Division)</A></B></TD></TR>
   <TR vAlign=top>
    <TD noWrap><IMG height=1 alt=""
     src="1996 Census - State of Victoria_files/ecblank.gif" width=16
     border=0><B><A
     href="..\PleaseGoBack.htm">Wimmera
     (Statistical Division)</A></B></TD></TR></TBODY></TABLE><FONT
  face=Arial><IMG src="1996 Census - State of Victoria_files/ecblank.gif">
  </FONT><B><FONT face=Arial><A
  href="..\PleaseGoBack.htm">Off
  - Shore Areas &amp; Migratory - State of Victoria (Statistical Local
  Area)</A></FONT></B></TD></TR></TBODY></TABLE>
<DIV align=center><BR><FONT face=Arial>
<HR>
</FONT><BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
```

```
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="50%"><A
   href="..\PleaseGoBack.htm"><B><FONT
   face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
  <TD width="50%">
   <DIV align=right><A
   href="..\PleaseGoBack.htm"><B><FONT
   face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 1, Page 3

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310108.NSF/d0e22b84be3efa5c4a2565070027981З/9ade363
18a4ed696ca25653700lfa3c3!OpenDocument -->
<HTML><HEAD><TITLE>1996 Census - Barwon (Statistical Division)</TITLE>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="19%" bgColor=#008000 rowSpan=2>
   <DIV align=center>
   <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
   src="1996 Census - Barwon (Statistical Division)_files/0.gif"
   width=124></P></DIV></TD>
  <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
   Bureau of Statistics</FONT></TD>
  <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
   src="1996 Census - Barwon (Statistical Division)_files/ecblank.gif"
   width=1 border=0></TD></TR>
 <TR vAlign=top>
  <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
   Population and Housing - Basic Community Profiles</FONT></B><BR><B><FONT
   face=Arial size=4>Barwon (Statistical Division)</FONT></B><BR><FONT
   face=Arial size=2>
   <HR noShade>
   </FONT></TD></TR></TBODY></TABLE>
<DIV align=center></DIV>
<DIV align=right></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="16%">
   <DIV align=center><A
   href="..\PleaseGoBack.htm"><IMG
   height=22
   src="1996 Census - Barwon (Statistical Division)_files\0(1).gif"
   width=35 border=0></A><FONT face=Arial> </FONT><A
   href="..\PleaseGoBack.htm"><FONT
   face=Arial>Search for any area</FONT></A><BR><BR><FONT
   face=Arial></FONT></DIV><MAP name=73E.map><AREA shape=POLY

coords=75,44,111,44,115,23,120,17,156,44,155,53,164,67,159,76,173,91,195,89,195,81,242,86,246,91,250,9
6,254,96,256,86,267,87,271,96,282,107,279,112,285,129,292,129,302,135,293,145,287,147,286,157,267,157
,267,153,267,147,276,137,233,137,233,153,241,155,235,159,235,168,223,174,206,156,183,169,165,161,161,
173,152,168,147,213,158,207,147,267,155,277,145,281,173,286,153,314,115,327,115,335,112,342,107,341,
96,356,82,356,61,337,43,328,30,326,31,311,35,295,39,295,33,281,53,275,56,261,34,250,37,226,37,221,47,2
19,66,226,75,200,62,200,63,188,68,185,75,185,75,167,86,168,94,159,104,169,109,157,104,146,107,139,113,
137,102,124,76,120,67,113,75,43
    href="..\PleaseGoBack.htm"><AREA
    shape=RECT coords=255,258,335,288
    href="..\PleaseGoBack.htm"><AREA
    shape=POLY
```

```
coords=231,194,237,160,242,155,233,152,233,138,239,137,274,139,265,148,265,156,257,162,255,172,267,1
76,269,167,281,179,282,191,276,193,269,204,230,195,232,191
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=170,286,146,281,153,275,148,266,158,207,148,212,154,170,162,173,163,162,181,168,207,159,212,1
63,223,174,235,168,232,195,269,204,275,193,282,189,282,177,299,175,307,162,318,162,326,169,326,190,3
23,201,308,208,306,211,281,210,268,209,231,237,203,258,190,257,178,275,182,277,169,286
      href="..\PleaseGoBack.htm">
    <area href="../PleaseGoBack.htm" shape="default">
    <area href="../PleaseGoBack.htm" coords="0, 0, 10000, 10000" shape="rect"></MAP><A
    href="..\PleaseGoBack.htm"><IMG
    height=378 isMap
    src="file:///C:/Documents%20and%20Settings/blapp/My%20Documents/IQP/Content/C-
BarwonMap/1996%20Census%20-%20Barwon%20(Statistical%20Division)_files/0(2).gif"
    width=378 useMap=#73E.map border=0></A></TD>
   <TD width="2%"><FONT face=Arial></FONT></TD>
   <TD width="82%"><FONT face=Arial><BR></FONT><BR><FONT face=Arial>Note:
    </FONT><FONT face=Arial>Barwon (Statistical Division)</FONT><FONT
    face=Arial> is a convenient division of a Statistical Division for mapping
    purposes only. Census data are available for the component Statistical
    Local Areas but not for the total </FONT><FONT face=Arial>Barwon
    (Statistical Division)</FONT><FONT face=Arial>.</FONT><BR><B><FONT
    face=Arial><A
    href="1996 Census Barwon (Statistical Division).htm"
     >Click
    here to see tables for Barwon (Statistical
    Division).</A></FONT></B><BR><FONT face=Arial></FONT><BR><FONT
    face=Arial>Click on one of the follow areas to select it:</FONT><BR>
    <TABLE>
      <TBODY>
      <TR>
        <TH></TH></TR>
      <TR vAlign=top>
        <TD noWrap><IMG height=1 alt=""
          src="1996 Census - Barwon (Statistical Division)_files/ecblank.gif"
          width=16 border=0><B><A
          href="..\PleaseGoBack.htm">East
          Barwon (Statistical Subdivision)</A></B></TD></TR>
      <TR vAlign=top>
        <TD noWrap><IMG height=1 alt=""
          src="1996 Census - Barwon (Statistical Division)_files/ecblank.gif"
          width=16 border=0><B><A
          href="..\PleaseGoBack.htm">Greater
          Geelong City Part A (Statistical Subdivision)</A></B></TD></TR>
      <TR vAlign=top>
        <TD noWrap><IMG height=1 alt=""
          src="1996 Census - Barwon (Statistical Division)_files/ecblank.gif"
          width=16 border=0><B><A
          href="..\PleaseGoBack.htm">West
          Barwon (Statistical Subdivision)</A></B></TD></TR></TBODY></TABLE><FONT
    face=Arial><IMG
    src="1996 Census - Barwon (Statistical Division)_files/ecblank.gif">
    </FONT><B><FONT face=Arial></FONT></B></TD></TR></TBODY></TABLE>
<DIV align=center><BR><FONT face=Arial>
<HR>
```

```
</FONT><BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="50%"><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
    <TD width="50%">
      <DIV align=right><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 1, Page 4

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0084)http://www.abs.gov.au/websitedbs/d3310108.nsf/ASGC/4B62F383757C2929CA256537001C9887
/ -->
<HTML><HEAD><TITLE>1996 Census Barwon (Statistical Division)</TITLE>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) --><LINK
href="http://www.naa.gov.au/recordkeeping/gov_online/agls/1.1" rel=schema.AGLS>
<META content="corporateName:Australian Bureau of Statistics" name=DC.Creator>
<META content="corporateName:Australian Bureau of Statistics" name=DC.Publisher>
<META
content="Australian Bureau of Statistics is Australia's official statistical organisation. The ABS assists and
encourages informed decision-making, research and discussion within governments and the community, by
providing a high quality, objective and responsive national statistical service"
name=AGLS.Function>
<META
content="corporate name:Australian Bureau of Statistics; address:PO Box 10 Belconnen ACT 2616;
contact:National Information Service; email:client.services@abs.gov.au; telephone: 1300 135 070"
name=AGLS.Availability>
<META content="Basic Community Profile for Barwon (Statistical Division) "
name=DC.Title>
<META content="Census statistical products and services" name=DC.Subject
SCHEME="ABS Classifications">
<META content=1997-10-21 name=DC.Date.created SCHEME="ISO8601">
<META lang=en content="© Commonwealth of Australia, 1997" name=DC.Rights>
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="19%" bgColor=#008000 rowSpan=2>
      <DIV align=center>
      <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
      src="1996 Census Barwon (Statistical Division)_files/0.gif"
      width=124></P></DIV></TD>
    <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
      Bureau of Statistics</FONT></TD>
    <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
      src="1996 Census Barwon (Statistical Division)_files/ecblank.gif" width=1
      border=0></TD></TR>
  <TR vAlign=top>
    <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
      Population and Housing</FONT></B><BR><B><FONT face=Arial size=4>Barwon
      (Statistical Division)</FONT></B><FONT face=Arial> </FONT><B><FONT
      face=Arial size=4>- Victoria</FONT></B><BR><FONT face=Arial size=2>
      <HR noShade>
      </FONT></TD></TR></TBODY></TABLE><BR><BR>
<CENTER>
<H3>B01 Selected Characteristics <BR><BR>Barwon (SD) </H3></CENTER>
<CENTER>
<TABLE cellPadding=2 border=0>
  <TBODY>
  <TR>
    <TH></TH>
    <TH>Male </TH>
```

```
<TH>Female </TH>
<TH>Persons </TH></TR>
<TR>
<TH noWrap align=left colspan="4">
  <hr>
</TH>
</TR>
<TR>
<TH noWrap align=left>Total persons (a)<BR></TH>
<TD align=right>112,020</TD>
<TD align=right>116,218</TD>
<TD align=right>228,238</TD></TR>
<TR>
<TH noWrap align=left>Aged 15 years and over (a)<BR></TH>
<TD align=right>86,080</TD>
<TD align=right>91,703</TD>
<TD align=right>177,783</TD></TR>
<TR>
<TH noWrap align=left>Aboriginal </TH>
<TD align=right>462</TD>
<TD align=right>533</TD>
<TD align=right>995</TD></TR>
<TR>
<TH noWrap align=left>Torres Strait Islander </TH>
<TD align=right>63</TD>
<TD align=right>71</TD>
<TD align=right>134</TD></TR>
<TR>
<TH noWrap align=left>Both Aboriginal and Torres Strait Islander (b) </TH>
<TD align=right>18</TD>
<TD align=right>8</TD>
<TD align=right>26</TD></TR>
<TR>
<TH noWrap align=left>Australian born </TH>
<TD align=right>90,469</TD>
<TD align=right>94,102</TD>
<TD align=right>184,571</TD></TR>
<TR>
<TH noWrap align=left>Born overseas: Canada, Ireland, NZ, South Africa, UK
  (c) and USA </TH>
<TD align=right>7,780</TD>
<TD align=right>8,077</TD>
<TD align=right>15,857</TD></TR>
<TR>
<TH noWrap align=left>Born overseas: Other country (d) </TH>
<TD align=right>10,087</TD>
<TD align=right>9,846</TD>
<TD align=right>19,933</TD></TR>
<TR>
<TH noWrap align=left>Born overseas: Total </TH>
<TD align=right>17,867</TD>
<TD align=right>17,923</TD>
<TD align=right>35,790</TD></TR>
<TR>
<TH noWrap align=left>Speaks English only and aged 5 years and over </TH>
<TD align=right>91,004</TD>
<TD align=right>94,905</TD>
```

<TD align=right>185,909</TD></TR>
<TR>
<TH noWrap align=left>Speaks language other than English (e) and aged 5 years and over </TH>
<TD align=right>9,585</TD>
<TD align=right>9,828</TD>
<TD align=right>19,413</TD></TR>
<TR>
<TH noWrap align=left>Australian citizen
</TH>
<TD align=right>103,153</TD>
<TD align=right>106,658</TD>
<TD align=right>209,811</TD></TR>
<TR>
<TH noWrap align=left>Australian citizens aged 18 years and over
</TH>
<TD align=right>73,353</TD>
<TD align=right>78,402</TD>
<TD align=right>151,755</TD></TR>
<TR>
<TH noWrap align=left>Unemployed </TH>
<TD align=right>6,950</TD>
<TD align=right>4,561</TD>
<TD align=right>11,511</TD></TR>
<TR>
<TH noWrap align=left>Employed </TH>
<TD align=right>51,342</TD>
<TD align=right>39,215</TD>
<TD align=right>90,557</TD></TR>
<TR>
<TH noWrap align=left>In the labour force </TH>
<TD align=right>58,292</TD>
<TD align=right>43,776</TD>
<TD align=right>102,068</TD></TR>
<TR>
<TH noWrap align=left>Not in the labour force </TH>
<TD align=right>25,731</TD>
<TD align=right>45,985</TD>
<TD align=right>71,716</TD></TR>
<TR>
<TH noWrap align=left>Enumerated in private dwelling (a) </TH>
<TD align=right>109,287</TD>
<TD align=right>113,282</TD>
<TD align=right>222,569</TD></TR>
<TR>
<TH noWrap align=left>Enumerated in non-private dwelling (a) </TH>
<TD align=right>2,733</TD>
<TD align=right>2,936</TD>
<TD align=right>5,669</TD></TR>
<TR>
<TH noWrap align=left>Persons enumerated same address 5 years ago </TH>
<TD align=right>61,423</TD>
<TD align=right>64,238</TD>
<TD align=right>125,661</TD></TR>
<TR>
<TH noWrap align=left>Persons enumerated different address 5 years ago </TH>
<TD align=right>38,644</TD>
<TD align=right>40,198</TD>
<TD align=right>78,842</TD></TR>

```
 <TR>
   <TH noWrap align=left>Overseas visitor<BR></TH>
   <TD align=right>323</TD>
   <TD align=right>493</TD>
   <TD align=right>816</TD></TR></TBODY></TABLE></CENTER><BR><BR>Cells in this
table have been randomly adjusted to avoid the release of confidential data.
<BR><FONT size=2><BR>(a) Overseas visitors are included in these categories. All
other categories exclude overseas visitors. <BR>(b) Applicable to persons who
are of both Aboriginal and Torres Strait Islander origin. <BR>(c) Comprises
England, Scotland, Wales, Northern Ireland, Channel Islands, Isle of Man, and
United Kingdom and Ireland n.f.d. <BR>(d) Includes 'inadequately described', 'at
sea', and 'not elsewhere classified'. <BR>(e) Includes 'non-verbal so described'
and 'inadequately described'.<BR></FONT><BR><BR><BR><FONT size=2></FONT><BR>
<CENTER>
<H3>B32 Selected Medians<BR><BR>Barwon (SD) </H3></CENTER>
<CENTER>
<TABLE cellPadding=2 border=0>
 <TBODY>
 <TR>
   <TH></TH>
 <TR>
   <TH noWrap align=left>Median age </TH>
   <TD align=right>34</TD></TR>
 <TR>
   <TH noWrap align=left>Median individual income </TH>
   <TD align=right>253</TD></TR>
 <TR>
   <TH noWrap align=left>Median household income </TH>
   <TD align=right>555</TD></TR>
 <TR>
   <TH noWrap align=left>Average household size </TH>
   <TD align=right>2.6</TD></TR></TBODY></TABLE></CENTER><BR>Note: Income
figures are weekly income, expressed in $AUS.
<DIV align=center>
<HR>
<BR></FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
```

```
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
   <TD width="50%"><A
     href="..\PleaseGoBack.htm"><B><FONT
     face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
   <TD width="50%">
     <DIV align=right><A
     href="..\PleaseGoBack.htm"><B><FONT
     face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 1, Page 5

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML><HEAD>
<META http-equiv=Content-Type content="text/html; charset=unicode">
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY><TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
<TBODY>
<TR vAlign=top>
<TD width="25%" bgColor=#008000 rowSpan=2>
<DIV align=center>
<P><IMG height=92 src="Cumulative Frequency and Percentage_files/0.gif"
width=124></P></DIV></TD>
<TD width="65%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian Bureau
of Statistics</FONT></TD>
<TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD></TR>
<TR vAlign=top>
<TD width="75%" colSpan=2><B><FONT face=Arial color=#008000 size=5>Education
Resources</FONT></B><BR><B><FONT face=Arial size=4>Statistics - A Powerful
Edge</FONT></B><BR><B><FONT face=Arial size=4>Cumulative Frequency and
Percentage</FONT></B><BR><FONT face=Arial size=2>
<HR noShade>
</FONT></TD></TR></TBODY></TABLE>
<P><BR><FONT face=Arial color=#ff0000
size=2><BR></FONT><IMG height=48
src="Cumulative Frequency and Percentage_files\0(1).gif"
width=501><BR><FONT face=Arial color=#ff0000 size=2><BR></FONT><FONT
face=Arial>Numerical variables can be represented in a variety of ways,
including: stem and leaf, frequency distribution, cumulative frequency or
cumulative percentage tables. As you will see, the graphs of these are very
useful in finding the centres of large data sets.</FONT><BR></P>
<P><FONT face=Arial>The use of a stem and leaf plot, or stemplot, is a technique
to classify either <I>discrete </I>or <I>continuous
</I>variables.</FONT><BR><BR><FONT face=Arial>Each observation may be considered
as consisting of two parts: a stem and a leaf. To make a stemplot, each
observation must first be separated into its two parts:</FONT><BR></P>
<UL>
  <LI><FONT face=Arial>a </FONT><I><FONT face=Arial>stem </FONT></I><FONT
  face=Arial>is the first digit or digits;</FONT>
  <LI><FONT face=Arial>a</FONT><I><FONT face=Arial> leaf </FONT></I><FONT
  face=Arial>is</FONT><I><FONT face=Arial> </FONT></I><FONT face=Arial>the final
  digit of a value;</FONT></LI></UL>
<UL>
  <LI><FONT face=Arial>each </FONT><I><FONT face=Arial>stem </FONT></I><FONT
  face=Arial>can consist of any number of digits; and </FONT>
  <LI><FONT face=Arial>each </FONT><I><FONT face=Arial>leaf </FONT></I><FONT
  face=Arial>can</FONT><I><FONT face=Arial> </FONT></I><FONT face=Arial>only
  have a single digit.</FONT></LI></UL>
<P><BR><FONT face=Arial>So  for example:</FONT><BR></P>
<UL>
  <LI><FONT face=Arial>if the value of an observation is 25: the stem is 2 and
  the leaf is 5; and</FONT>
  <LI><FONT face=Arial>if the value of an observation is 369: the stem is 36 and
  the leaf is 9.</FONT></LI></UL>
<P><FONT face=Arial>Where observations are accurate to one or more decimal
```

places, such as 23.7, the stem is 23 and the leaf is 7. (The number 23.7 could
be rounded off to 24 to limit the number of stems if the range of values is too
great.)</FONT>

<FONT face=Arial>In stemplots, tally marks are not
required as the actual data are used.</FONT>

<B><FONT
facc=Arial>CUMULATIVE FREQUENCY</FONT></B>

<FONT face=Arial>Cumulative
frequency is used to determine the number of observations that lie above (or
below) a particular value.</FONT>

<FONT face=Arial>The cumulative
frequency is found from a stem and leaf table or a frequency distribution table
by </FONT><I><FONT face=Arial>adding each frequency to the sum of its
predecessor.</FONT></I>

<FONT face=Arial>The last value will always equal
the total for all observations, as all frequencies will have been
added.</FONT>

<FONT face=Arial>For </FONT><I><FONT face=Arial>
discrete </FONT></I><FONT face=Arial>variables:</FONT> </P>
<UL>
<LI><FONT face=Arial>cumulative frequency is calculated from a frequency
distribution table. A stem and leaf plot can be used to construct a frequency
distribution table.</FONT></LI></UL><FONT face=Arial color=#ff0000
size=2>
</FONT>
<B><FONT face=Arial>DISCRETE VARIABLES </FONT></B><FONT
face=Arial color=#ff0000 size=2>
</FONT>
<IMG height=44
src="Cumulative Frequency and Percentage_files\0(2).gif"
width=119>
<FONT face=Arial color=#ff0000 size=2>
</FONT>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
<TBODY>
<TR vAlign=top>
<TD width="3%"><B><FONT face=Arial>1.</FONT></B><FONT face=Arial> </FONT></TD>
<TD width="97%" colSpan=9>
<UL>
<UL>
<UL><FONT face=Arial>The number of people who climbed Ayers Rock over a thirty
day period were counted some examples are as follows:

31, 49, 19,
etc...
</FONT>
<FONT face=Arial>A stem and leaf
table follows, and the cumulative frequency was found
by adding appropriate columns. The data ranges from 4 to 65, so the data is grouped
in class intervals of 10 to produce the following
table:</FONT><FONT face=Arial color=#ff0000 size=2>
</FONT>
</UL>
</UL></UL></TD></TR></TBODY></TABLE>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
<TBODY>
<TR vAlign=top>
<TD width="4%"><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="82%" colSpan=5>
<DIV align=right><B><FONT face=Arial size=2></FONT></B><B><FONT face=Arial
color=#ff0000 size=2>
<HR noShade>
</FONT></B></DIV></TD>
<TD width="1%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="13%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD></TR>
<TR vAlign=top>
<TD width="4%"><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1

```
border=0></TD>
<TD width="7%">
<DIV align=center><B><FONT face=Arial color=#008000>Stem</FONT></B></DIV></TD>
<TD width="20%">
<UL><B><FONT face=Arial color=#008000>Leaf</FONT></B></UL></TD>
<TD width="19%">
<DIV align=center><B><FONT face=Arial color=#008000>Frequency
(f)</FONT></B></DIV></TD>
<TD width="19%">
<DIV align=center><B><FONT face=Arial color=#008000>Upper</FONT></B><FONT
face=Arial color=#008000> </FONT><B><FONT face=Arial
color=#008000>value</FONT></B></DIV></TD>
<TD width="16%">
<DIV align=right><B><FONT face=Arial color=#008000>Cumulative
frequency</FONT></B></DIV></TD>
<TD width="1%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="13%" bgColor=#ffffff><B><FONT face=Arial size=2></FONT></B></TD></TR>
<TR vAlign=top>
<TD width="4%" bgColor=#ffffff><B><FONT face=Arial></FONT></B></TD>
<TD width="83%" bgColor=#ffffff colSpan=6>
<DIV align=right><B><FONT face=Arial size=2></FONT></B><B><FONT face=Arial
color=#ff0000 size=2>
<HR noShade>
</FONT></B></DIV></TD>
<TD width="13%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD></TR>
<TR vAlign=top>
<TD width="4%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="7%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>0</FONT></DIV></TD>
<TD width="20%" bgColor=#ffffd0>
<UL><FONT face=Arial size=2>4</FONT></UL></TD>
<TD width="19%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>1</FONT></DIV></TD>
<TD width="19%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>4</FONT></DIV></TD>
<TD width="16%" bgColor=#ffffd0>
<DIV align=right><FONT face=Arial size=2>1</FONT></DIV></TD>
<TD width="1%" bgColor=#ffffd0><B><FONT face=Arial size=2></FONT></B></TD>
<TD width="13%" bgColor=#ffffff><B><FONT face=Arial size=2></FONT></B></TD></TR>
<TR vAlign=top>
<TD width="4%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="7%">
<DIV align=center><FONT face=Arial size=2>1</FONT></DIV></TD>
<TD width="20%">
<UL><FONT face=Arial size=2>8 9</FONT></UL></TD>
<TD width="19%">
<DIV align=center><FONT face=Arial size=2>2</FONT></DIV></TD>
<TD width="19%">
<DIV align=center><FONT face=Arial size=2>19</FONT></DIV></TD>
```

```
<TD width="16%">
<DIV align=right><FONT face=Arial size=2>1+2=3</FONT></DIV></TD>
<TD width="1%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="13%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD></TR>
<TR vAlign=top>
<TD width="4%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="7%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>2</FONT></DIV></TD>
<TD width="20%" bgColor=#ffffd0>
<UL><FONT face=Arial size=2>3 4 6</FONT></UL></TD>
<TD width="19%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>3</FONT></DIV></TD>
<TD width="19%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>26</FONT></DIV></TD>
<TD width="16%" bgColor=#ffffd0>
<DIV align=right><FONT face=Arial size=2>3+3=6</FONT></DIV></TD>
<TD width="1%" bgColor=#ffffd0><B><FONT face=Arial size=2></FONT></B></TD>
<TD width="13%" bgColor=#ffffff><B><FONT face=Arial size=2></FONT></B></TD></TR>
<TR vAlign=top>
<TD width="4%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="7%">
<DIV align=center><FONT face=Arial size=2>3</FONT></DIV></TD>
<TD width="20%">
<UL><FONT face=Arial size=2>1 5 5 7 9</FONT></UL></TD>
<TD width="19%">
<DIV align=center><FONT face=Arial size=2>5</FONT></DIV></TD>
<TD width="19%">
<DIV align=center><FONT face=Arial size=2>39</FONT></DIV></TD>
<TD width="16%">
<DIV align=right><FONT face=Arial size=2>6+5=11</FONT></DIV></TD>
<TD width="1%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="13%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD></TR>
<TR vAlign=top>
<TD width="4%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="7%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>4</FONT></DIV></TD>
<TD width="20%" bgColor=#ffffd0>
<UL><FONT face=Arial size=2>0 1 2 3 5 9</FONT></UL></TD>
<TD width="19%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>6</FONT></DIV></TD>
<TD width="19%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>49</FONT></DIV></TD>
<TD width="16%" bgColor=#ffffd0>
```

```
<DIV align=right><FONT face=Arial size=2>11+6=17</FONT></DIV></TD>
<TD width="1%" bgColor=#ffffd0><B><FONT face=Arial size=2></FONT></B></TD>
<TD width="13%" bgColor=#ffffff><B><FONT face=Arial size=2></FONT></B></TD></TR>
<TR vAlign=top>
<TD width="4%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="7%">
<DIV align=center><FONT face=Arial size=2>5</FONT></DIV></TD>
<TD width="20%">
<UL><FONT face=Arial size=2>0 1 1 2 4 4 5 6 7</FONT></UL></TD>
<TD width="19%">
<DIV align=center><FONT face=Arial size=2>9</FONT></DIV></TD>
<TD width="19%">
<DIV align=center><FONT face=Arial size=2>57</FONT></DIV></TD>
<TD width="16%">
<DIV align=right><FONT face=Arial size=2>17+9=26</FONT></DIV></TD>
<TD width="1%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="13%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD></TR>
<TR vAlign=top>
<TD width="4%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="7%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>6</FONT></DIV></TD>
<TD width="20%" bgColor=#ffffd0>
<UL><FONT face=Arial size=2>0 2 3 5</FONT></UL></TD>
<TD width="19%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>4</FONT></DIV></TD>
<TD width="19%" bgColor=#ffffd0>
<DIV align=center><FONT face=Arial size=2>65</FONT></DIV></TD>
<TD width="16%" bgColor=#ffffd0>
<DIV align=right><FONT face=Arial size=2>26+4=30</FONT></DIV></TD>
<TD width="1%" bgColor=#ffffd0><B><FONT face=Arial size=2></FONT></B></TD>
<TD width="13%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD></TR>
<TR vAlign=top>
<TD width="4%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="83%" bgColor=#ffffff colSpan=6>
<DIV align=right><B><FONT face=Arial size=2></FONT></B><B><FONT face=Arial
color=#ff0000 size=2>
<HR noShade>
</FONT></B></DIV></TD>
<TD width="13%" bgColor=#ffffff><IMG height=1 alt=""
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD></TR></TBODY></TABLE><B><FONT face=Arial></FONT></B>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
<TBODY>
<TR vAlign=top>
<TD width="3%"><IMG height=1 alt=""
```

```
src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
border=0></TD>
<TD width="97%" colSpan=9>
<UL>
<UL>
<UL><BR><BR></UL>
    <UL><FONT face=Arial color=#ff0000 size=2></FONT></UL>
    <UL><FONT face=Arial>A line graph follows showing
      the cumulative frequency against number of people.  <BR>
      </FONT></UL>
    <UL><FONT face=Arial>Because the variable is discrete, the actual
      upper value recorded in each class interval and used in
      plotting the graph. Even though the variable is discrete, the
      plotted points are joined to form a continuous cumulative frequency
      polygon or curve, known as an <FONT face=Arial><EM>ogive.<BR>
      </EM></FONT></FONT></UL>
    <UL><FONT face=Arial><FONT face=Arial>The cumulative frequency is
      always labeled on the vertical axis and any other variable, in this
      case the number of people, is labeled on the horizontal axis as
      shown below<BR>:</FONT><FONT color=#ff0000
   size=2><BR></FONT></UL></UL></UL></FONT></TD></TR></TBODY></TABLE>
<DIV align=center><IMG height=366
src="file:///C:/Documents%20and%20Settings/blapp/My%20Documents/IQP/Content/PE-
Variables/Cumulative%20Frequency%20and%20Percentage_files/0(3).gif"
width=534></DIV>
<p align="center"> <B><FONT face=Arial color=#ff0000 size=2>
  <HR noShade>
  </FONT></B>
<p align="center"><BR>
<img border="0" src="PE1bar.bmp" width="496" height="309">
<p align="center"> <B><FONT face=Arial color=#ff0000 size=2>
  <HR noShade>
  </FONT></B>
<p align="center"><img border="0" src="PE1pie.bmp" width="496" height="288"></p>
<DIV align=center>
<HR>
<BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
```

```
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="50%"><A
      href="..\PleaseGoBack.htm"
     ><B><FONT
      face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
    <TD width="50%">
      <DIV align=right><A
      href="..\PleaseGoBack.htm"
     ><B><FONT
      face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 2, Page 1

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310108.NSF/f9996d24c8f22d024a256500001e8576/569af0d
15c2201964a2565010007a32f!OpenDocument -->
<HTML><HEAD><TITLE>1996 Census - Australia</TITLE>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="19%" bgColor=#008000 rowSpan=2>
      <DIV align=center>
      <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
      src="1996 Census - Australia_files/0.gif" width=124></P></DIV></TD>
    <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
      Bureau of Statistics</FONT></TD>
    <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
      src="1996 Census - Australia_files/ecblank.gif" width=1 border=0></TD></TR>
  <TR vAlign=top>
    <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
      Population and Housing - Basic Community Profiles</FONT></B><BR><B><FONT
      face=Arial size=4>Australia</FONT></B><BR><FONT face=Arial size=2>
      <HR noShade>
      </FONT></TD></TR></TBODY></TABLE>
<DIV align=center></DIV>
<DIV align=right></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="16%">
      <DIV align=center><a href="../PleaseGoBack.htm"><IMG
      height=22
      src="1996%20Census%20-%20Australia_files/0(1).gif"
      width=35 border=0 alt="Magnifying glass."></a><FONT face=Arial> </FONT><A
      href="..\PleaseGoBack.htm"
     ><FONT
      face=Arial>Search for any area</FONT></A><BR></DIV><MAP name=7A6.map><AREA
shape=RECT
        coords=205,337,272,356
        href="..\PleaseGoBack.htm"><AREA
        shape=RECT coords=341,288,378,302
        href="..\PleaseGoBack.htm"><AREA
        shape=RECT coords=49,314,159,341
        href="..\PleaseGoBack.htm"><AREA
        shape=POLY coords=326,267,333,271,330,276,326,270,326,266
        href="..\PleaseGoBack.htm"><AREA
        shape=POLY

coords=147,65,148,234,131,242,122,241,112,247,105,248,99,259,67,258,57,265,49,269,34,268,23,261,20,25
0,23,255,29,233,23,220,18,200,13,191,8,176,5,165,15,181,6,156,14,135,15,142,24,131,36,120,45,124,51,118
,57,115,63,116,77,112,87,97,86,86,91,79,96,84,99,87,100,83,99,75,108,80,108,71,118,57,131,51,137,60,144,
65,148,65
        href="..\PleaseGoBack.htm"><AREA
```

```
      shape=POLY

coords=321,325,322,343,314,353,303,354,297,347,295,337,290,331,290,322,303,330,312,330,320,322,318,3
15,322,321,320,327,320,325
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=257,256,257,261,257,300,269,300,280,309,294,296,306,308,319,297,339,293,323,284,317,275,295,2
77,289,279,277,265,271,264,268,259,257,257,256,258
      href="1996 Census - State of Victoria.htm"><AREA
      shape=POLY

coords=148,176,256,177,257,300,246,288,246,281,235,272,221,278,217,275,228,273,235,269,235,267,231,2
55,226,263,229,268,219,270,222,264,228,265,230,251,228,244,224,252,212,266,211,269,204,259,202,250,1
96,245,190,239,183,237,173,233,148,232,149,176
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=256,206,328,207,336,200,352,208,356,203,355,199,368,196,370,204,365,218,363,231,349,256,344,2
67,336,294,321,284,316,276,311,278,296,276,291,280,278,269,275,264,270,265,265,257,256,256,256,207,2
56,207
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=148,63,149,177,230,175,231,79,206,60,213,53,219,57,216,51,210,45,220,35,215,24,204,34,183,30,17
8,21,180,26,182,32,170,36,168,30,170,20,161,25,158,30,168,34,158,41,160,47,151,57,154,63,157,68,151,64,
148,65,148,62
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=229,80,229,174,255,176,256,205,326,206,337,200,350,206,354,200,368,195,365,153,365,170,303,96,
294,57,280,55,267,7,256,84,247,95,236,80,229,79,228,80
      href="..\PleaseGoBack.htm">
     <area href="../PleaseGoBack.htm" shape="default">
     <area href="../PleaseGoBack.htm" coords="0, 0, 10000, 10000" shape="rect"></MAP><A
     href="..\PleaseGoBack.htm"><IMG
     height=379 isMap
     src="1996%20Census%20-%20Australia_files/0(2).gif"
     width=379 useMap=#7A6.map border=0 alt="Map of Australia, divided by State."></A></TD>
    <TD width="2%"><FONT face=Arial></FONT></TD>
    <TD width="82%"><FONT face=Arial><BR></FONT><BR><FONT face=Arial>Note:
     </FONT><FONT face=Arial>Australia</FONT><FONT face=Arial> is a convenient
     division of a Statistical Division for mapping purposes only. Census data
     are available for the component Statistical Local Areas but not for the
     total </FONT><FONT face=Arial>Australia</FONT><FONT
     face=Arial>.</FONT><BR><B><FONT face=Arial><A
     href="..\PleaseGoBack.htm"
    >Click
     here to see tables for Australia.</A></FONT></B><BR><FONT
     face=Arial></FONT><BR><FONT face=Arial>Click on one of the follow areas to
     select it:</FONT><BR>
     <TABLE>
       <TBODY>
       <TR>
         <TH></TH></TR>
       <TR vAlign=top>
         <TD noWrap><IMG height=1 alt=""
```

```
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >Australian
  Capital Territory </A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >Northern
  Territory</A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >Other
  Territories </A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >State
  of New South Wales</A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >State
  of Queensland</A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >State
  of South Australia </A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="..\PleaseGoBack.htm"
 >State
  of Tasmania </A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
  href="1996 Census - State of Victoria.htm" >State
  of Victoria</A></B></TD></TR>
<TR vAlign=top>
 <TD noWrap><IMG height=1 alt=""
  src="1996 Census - Australia_files/ecblank.gif" width=16
  border=0><B><A
```

```
      href="..\PleaseGoBack.htm"
      >State
      of Western Australia </A></B></TD></TR></TBODY></TABLE><FONT
    face=Arial><IMG src="1996 Census - Australia_files/ecblank.gif">
    </FONT><B><FONT face=Arial></FONT></B></TD></TR></TBODY></TABLE>
<DIV align=center><BR><FONT face=Arial>
<HR>
</FONT><BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="50%"><A
      href="..\PleaseGoBack.htm"
      ><B><FONT
      face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
    <TD width="50%">
      <DIV align=right><A
      href="..\PleaseGoBack.htm"
      ><B><FONT
      face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 2, Page 2

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310108.NSF/fead422050fd1dae4a2565130006141f/67ae457
a0f96ae224a256514000cc751!OpenDocument -->
<HTML><HEAD><TITLE>1996 Census - State of Victoria</TITLE>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="19%" bgColor=#008000 rowSpan=2>
      <DIV align=center>
      <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
      src="1996 Census - State of Victoria_files/0.gif" width=124></P></DIV></TD>
    <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
      Bureau of Statistics</FONT></TD>
    <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
      src="1996 Census - State of Victoria_files/ecblank.gif" width=1
    border=0></TD></TR>
  <TR vAlign=top>
    <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
      Population and Housing - Basic Community Profiles</FONT></B><BR><B><FONT
      face=Arial size=4>State of Victoria</FONT></B><BR><FONT face=Arial size=2>
      <HR noShade>
      </FONT></TD></TR></TBODY></TABLE>
<DIV align=center></DIV>
<DIV align=right></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="16%">
      <DIV align=center><a href="1996%20Census%20-%20Australia_files/0(1).gif"><IMG
      height=22
      src="1996%20Census%20-%20State%20of%20Victoria_files/0(1).gif"
      width=35 border=0 alt="Magnifying glass."></a><FONT face=Arial> </FONT><A
      href="..\PleaseGoBack.htm"><FONT
      face=Arial>Search for any area</FONT></A><BR><BR><FONT
      face=Arial></FONT></DIV><MAP name=2F2.map><AREA shape=RECT
        coords=3,354,180,369
        href="..\PleaseGoBack.htm"><AREA
        shape=RECT coords=101,304,144,322
        href="..\PleaseGoBack.htm"><AREA
        shape=RECT coords=135,289,195,307
        href="..\PleaseGoBack.htm"><AREA
        shape=POLY

coords=195,273,187,284,167,283,163,275,173,273,176,260,170,251,156,259,155,250,155,235,176,234,177,2
28,201,243,203,258,203,271,193,276
        href="..\PleaseGoBack.htm"><AREA
        shape=RECT coords=95,207,133,222
        href="..\PleaseGoBack.htm"><AREA
        shape=POLY
```

```
coords=155,235,149,223,151,217,143,217,141,221,107,209,107,204,96,206,95,219,81,218,71,241,83,241,91,
249,108,244,113,239,120,241,122,236,135,250,155,250,156,235
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=106,294,106,286,112,282,107,276,115,272,110,271,121,263,121,256,111,251,111,240,121,242,121,2
38,131,249,152,251,158,259,150,263,150,267,160,267,160,271,152,274,135,282,116,303,105,291
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=169,234,161,216,156,215,153,210,168,206,163,200,154,197,162,181,150,183,145,181,145,155,136,1
62,130,156,120,161,112,166,116,173,112,187,116,202,107,204,106,210,128,220,137,222,139,218,149,217,1
47,225,155,237,172,234
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=16,231,32,231,38,221,49,220,51,214,55,222,61,221,62,215,78,226,71,241,83,242,86,248,108,246,113
,241,113,252,121,258,120,263,114,267,111,271,115,271,110,276,108,276,108,279,110,282,106,285,106,295,
74,276,67,279,50,271,45,272,42,279,14,260,16,226
      href="..\PleaseGoBack.htm"><AREA
      shape=RECT coords=184,312,242,329
      href="1996 Census - Gippsland (Statistical Division).htm"><AREA
      shape=POLY

coords=196,240,219,237,229,241,232,259,238,259,239,267,231,282,225,286,231,289,228,292,220,295,223,3
02,228,298,228,312,222,311,220,300,213,297,210,302,202,290,199,290,193,285,189,282,192,278,202,270,2
03,249,196,238
      href="1996 Census - Gippsland (Statistical Division).htm"><AREA
      shape=POLY

coords=14,151,38,151,43,135,61,136,67,128,73,127,80,138,84,148,80,166,86,166,87,184,112,187,116,204,95
,207,93,220,79,218,78,225,62,215,62,221,54,221,52,216,48,220,41,220,36,224,36,229,28,228,30,231,19,231,
18,228,15,150
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=150,151,124,130,121,134,117,131,118,123,113,121,109,101,84,93,79,102,70,79,62,72,44,70,37,76,16
,64,15,150,38,150,41,136,61,136,64,130,74,128,79,138,83,138,84,148,82,149,79,170,85,168,85,185,102,183,
108,183,114,187,117,173,113,165,118,159,128,156,136,162,151,151
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=219,163,214,161,208,159,206,161,190,152,187,154,168,157,170,165,166,168,150,154,145,158,145,1
79,149,184,161,181,153,196,163,199,168,206,153,211,154,214,160,216,161,220,169,233,172,234,177,229,1
98,241,205,238,218,237,225,241,229,239,236,216,223,207,220,178,217,176,217,172,221,172,217,160
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY

coords=364,234,296,199,291,193,268,203,264,199,264,213,269,227,237,218,228,240,231,243,231,258,238,2
58,237,265,240,268,233,281,225,287,232,290,227,294,230,297,242,292,258,277,277,260,299,250,348,247,3
55,243,367,234
      href="..\PleaseGoBack.htm"><AREA
      shape=RECT coords=217,136,293,152
      href="..\PleaseGoBack.htm"><AREA
      shape=POLY
```

```
coords=299,191,293,184,292,171,290,165,282,161,280,158,276,163,264,161,263,166,255,163,250,168,233,1
62,225,161,225,163,218,164,220,169,220,172,216,174,216,177,221,181,222,207,238,219,266,227,267,224,2
63,218,265,217,261,213,263,204,263,198,267,202,289,192,297,198,298,187
    href="..\PleaseGoBack.htm">
   <area href="../PleaseGoBack.htm" shape="default">
   <area href="../PleaseGoBack.htm" coords="0, 0, 10000, 10000" shape="rect"></MAP><A
   href="..\PleaseGoBack.htm"><IMG
   height=378 isMap
   src="1996%20Census%20-%20State%20of%20Victoria_files/0(2).gif"
   width=378 useMap=#2F2.map border=0 alt="Map of Victoria"></A></TD>
  <TD width="2%"><FONT face=Arial></FONT></TD>
  <TD width="82%"><FONT face=Arial><BR></FONT><BR><FONT face=Arial>Note:
   </FONT><FONT face=Arial>State of Victoria</FONT><FONT face=Arial> is a
   convenient division of a Statistical Division for mapping purposes only.
   Census data are available for the component Statistical Local Areas but
   not for the total </FONT><FONT face=Arial>State of Victoria</FONT><FONT
   face=Arial>.</FONT><BR><B><FONT face=Arial><A
   href="..\PleaseGoBack.htm">Click
   here to see tables for State of Victoria.</A></FONT></B><BR><FONT
   face=Arial></FONT><BR><FONT face=Arial>Click on one of the follow areas to
   select it:</FONT><BR>
   <TABLE>
    <TBODY>
    <TR>
     <TH></TH></TR>
    <TR vAlign=top>
     <TD noWrap><IMG height=1 alt=""
      src="1996 Census - State of Victoria_files/ecblank.gif" width=16
      border=0><B><A
      href="..\PleaseGoBack.htm">Barwon
      (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
     <TD noWrap><IMG height=1 alt=""
      src="1996 Census - State of Victoria_files/ecblank.gif" width=16
      border=0><B><A
      href="..\PleaseGoBack.htm">Central
      Highlands (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
     <TD noWrap><IMG height=1 alt=""
      src="1996 Census - State of Victoria_files/ecblank.gif" width=16
      border=0><B><A
      href="..\PleaseGoBack.htm">East
      Gippsland (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
     <TD noWrap><IMG height=1 alt=""
      src="1996 Census - State of Victoria_files/ecblank.gif" width=16
      border=0><B><A
      href="1996 Census - Gippsland (Statistical Division).htm">Gippsland
      (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
     <TD noWrap><IMG height=1 alt=""
      src="1996 Census - State of Victoria_files/ecblank.gif" width=16
      border=0><B><A
      href="..\PleaseGoBack.htm">Goulburn
      (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
```

```
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Loddon
        (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Mallee
        (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Melbourne
        (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Ovens
        - Murray (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Western
        District (Statistical Division)</A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Wimmera
        (Statistical Division)</A></B></TD></TR></TBODY></TABLE><FONT
  face=Arial><IMG src="1996 Census - State of Victoria_files/ecblank.gif">
  </FONT><B><FONT face=Arial><A
  href="..\PleaseGoBack.htm">Off
  - Shore Areas &amp; Migratory - State of Victoria (Statistical Local
  Area)</A></FONT></B></TD></TR></TBODY></TABLE>
<DIV align=center><BR><FONT face=Arial>
<HR>
</FONT><BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
```

```
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="50%"><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
    <TD width="50%">
      <DIV align=right><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 2, Page 3

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310108.NSF/d0e22b84be3efa5c4a2565070027981З/868836
096b086822ca2565370020580e!OpenDocument -->
<HTML><HEAD><TITLE>1996 Census - Gippsland (Statistical Division)</TITLE>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="19%" bgColor=#008000 rowSpan=2>
   <DIV align=center>
   <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
   src="1996 Census - Gippsland (Statistical Division)_files/0.gif"
   width=124></P></DIV></TD>
  <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
   Bureau of Statistics</FONT></TD>
  <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
   src="1996 Census - Gippsland (Statistical Division)_files/ecblank.gif"
   width=1 border=0></TD></TR>
 <TR vAlign=top>
  <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
   Population and Housing - Basic Community Profiles</FONT></B><BR><B><FONT
   face=Arial size=4>Gippsland (Statistical Division)</FONT></B><BR><FONT
   face=Arial size=2>
   <HR noShade>
   </FONT></TD></TR></TBODY></TABLE>
<DIV align=center></DIV>
<DIV align=right></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="16%">
   <DIV align=center><a href="../PleaseGoBack.htm"><IMG
   height=22
   src="1996%20Census%20-%20Gippsland%20(Statistical%20Division)_files/0(1).gif"
   width=35 border=0 alt="Magnifying glass."></a><FONT face=Arial> </FONT><A
   href="..\PleaseGoBack.htm"><FONT
   face=Arial>Search for any area</FONT></A><BR></DIV><MAP name=692.map><AREA
shape=POLY

coords=153,185,125,188,111,195,71,188,66,217,42,240,65,239,73,236,80,249,97,244,120,274,135,272,147,2
65,175,325,190,312,190,307,201,303,233,338,240,373,264,365,269,350,269,298,255,279,277,275,275,259,2
45,251,245,238,237,238,226,227,233,224,224,221,226,209,227,200,214,204,201,193,198,200,190,193,165,2
01,151,183
     href="..\PleaseGoBack.htm"><AREA
     shape=POLY

coords=118,60,146,45,144,37,148,41,160,35,160,30,222,32,218,41,233,48,240,42,251,50,251,45,256,45,272,
57,268,128,277,119,286,124,282,140,279,140,277,144,268,144,268,150,264,150,253,119,248,123,244,144,2
33,149,226,140,215,145,212,175,226,198,211,204,200,194,196,200,187,194,168,201,164,197,153,185,145,1
89,140,180,140,171,151,154,147,148,148,128,144,121,159,99,141,71,124,68,120,58
     href="..\PleaseGoBack.htm"><AREA
```

```
     shape=POLY

coords=229,196,214,173,217,147,225,140,233,151,245,144,245,137,250,123,253,123,262,150,268,151,268,1
44,275,146,277,141,283,141,289,124,298,128,290,139,297,140,297,143,291,143,283,162,300,158,309,161,2
97,192,291,192,285,221,248,240,236,236,229,226,234,224,228,222,225,208,230,201,227,196
     href="..\PleaseGoBack.htm">
    <area href="../PleaseGoBack.htm" shape="default">
    <area href="../PleaseGoBack.htm" coords="0, 0, 10000, 10000" shape="rect"></MAP><A
    href="..\PleaseGoBack.htm"><IMG
    height=378 isMap
    src="1996%20Census%20-%20Gippsland%20(Statistical%20Division)_files/0(2).gif"
    width=378 useMap=#692.map border=0 alt="Map of Gippsland"></A></TD>
   <TD width="2%"><FONT face=Arial></FONT></TD>
   <TD width="82%"><FONT face=Arial><BR></FONT><BR><FONT face=Arial>Note:
    </FONT><FONT face=Arial>Gippsland (Statistical Division)</FONT><FONT
    face=Arial> is a convenient division of a Statistical Division for mapping
    purposes only. Census data are available for the component Statistical
    Local Areas but not for the total </FONT><FONT face=Arial>Gippsland
    (Statistical Division)</FONT><FONT face=Arial>.</FONT><BR><B><FONT
    face=Arial><A
    href="1996 Census Gippsland (Statistical Division).htm">Click
    here to see tables for Gippsland (Statistical
    Division).</A></FONT></B><BR><FONT face=Arial></FONT><BR><FONT
    face=Arial>Click on one of the follow areas to select it:</FONT><BR>
    <TABLE>
     <TBODY>
     <TR>
      <TH></TH></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
       src="1996 Census - Gippsland (Statistical Division)_files/ecblank.gif"
       width=16 border=0><B><A
       href="..\PleaseGoBack.htm">La
       Trobe Valley (Statistical Subdivision)</A></B></TD></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
       src="1996 Census - Gippsland (Statistical Division)_files/ecblank.gif"
       width=16 border=0><B><A
       href="..\PleaseGoBack.htm">South
       Gippsland (Statistical Subdivision)</A></B></TD></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
       src="1996 Census - Gippsland (Statistical Division)_files/ecblank.gif"
       width=16 border=0><B><A
       href="..\PleaseGoBack.htm">West
       Gippsland (Statistical Subdivision)</A></B></TD></TR></TBODY></TABLE><FONT
    face=Arial><IMG
    src="1996 Census - Gippsland (Statistical Division)_files/ecblank.gif">
    </FONT><B><FONT face=Arial></FONT></B></TD></TR></TBODY></TABLE>
<DIV align=center><BR><FONT face=Arial>
<HR>
</FONT><BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
```

```
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="50%"><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
    <TD width="50%">
      <DIV align=right><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 2, Page 4

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0084)http://www.abs.gov.au/websitedbs/d3310108.nsf/ASGC/F9DB6A9E40850541CA256537001D3B2
2/ -->
<HTML><HEAD><TITLE>1996 Census Gippsland (Statistical Division)</TITLE>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) --><LINK
href="http://www.naa.gov.au/recordkeeping/gov_online/agls/1.1" rel=schema.AGLS>
<META content="corporateName:Australian Bureau of Statistics" name=DC.Creator>
<META content="corporateName:Australian Bureau of Statistics" name=DC.Publisher>
<META
content="Australian Bureau of Statistics is Australia's official statistical organisation. The ABS assists and
encourages informed decision-making, research and discussion within governments and the community, by
providing a high quality, objective and responsive national statistical service"
name=AGLS.Function>
<META
content="corporate name:Australian Bureau of Statistics; address:PO Box 10 Belconnen ACT 2616;
contact:National Information Service; email:client.services@abs.gov.au; telephone: 1300 135 070"
name=AGLS.Availability>
<META content="Basic Community Profile for Gippsland (Statistical Division) "
name=DC.Title>
<META content="Census statistical products and services" name=DC.Subject
SCHEME="ABS Classifications">
<META content=1997-10-21 name=DC.Date.created SCHEME="ISO8601">
<META lang=en content="© Commonwealth of Australia, 1997" name=DC.Rights>
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="19%" bgColor=#008000 rowSpan=2>
      <DIV align=center>
      <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
      src="1996 Census Gippsland (Statistical Division)_files/0.gif"
      width=124></P></DIV></TD>
    <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
      Bureau of Statistics</FONT></TD>
    <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
      src="1996 Census Gippsland (Statistical Division)_files/ecblank.gif"
      width=1 border=0></TD></TR>
  <TR vAlign=top>
    <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
      Population and Housing</FONT></B><BR><B><FONT face=Arial size=4>Gippsland
      (Statistical Division)</FONT></B><FONT face=Arial> </FONT><B><FONT
      face=Arial size=4>- Victoria</FONT></B><BR><FONT face=Arial size=2>
      <HR noShade>
      </FONT></TD></TR></TBODY></TABLE><BR><BR>
<CENTER>
<H3>B01 Selected Characteristics <BR><BR>Gippsland (SD) </H3></CENTER>
<CENTER>
<TABLE cellPadding=2 border=0>
  <TBODY>
  <TR>
    <TH></TH>
    <TH>Male </TH>
```

```
 <TH>Female </TH>
 <TH>Persons </TH></TR>
<TR>
 <TH noWrap align=left colspan="4">
   <hr>
 </TH>
</TR>
<TR>
 <TH noWrap align=left>Total persons (a)<BR></TH>
 <TD align=right>71,857</TD>
 <TD align=right>73,742</TD>
 <TD align=right>145,599</TD></TR>
<TR>
 <TH noWrap align=left>Aged 15 years and over (a)<BR></TH>
 <TD align=right>53,677</TD>
 <TD align=right>56,121</TD>
 <TD align=right>109,798</TD></TR>
<TR>
 <TH noWrap align=left>Aboriginal </TH>
 <TD align=right>460</TD>
 <TD align=right>448</TD>
 <TD align=right>908</TD></TR>
<TR>
 <TH noWrap align=left>Torres Strait Islander </TH>
 <TD align=right>36</TD>
 <TD align=right>48</TD>
 <TD align=right>84</TD></TR>
<TR>
 <TH noWrap align=left>Both Aboriginal and Torres Strait Islander (b) </TH>
 <TD align=right>14</TD>
 <TD align=right>14</TD>
 <TD align=right>28</TD></TR>
<TR>
 <TH noWrap align=left>Australian born </TH>
 <TD align=right>59,912</TD>
 <TD align=right>61,228</TD>
 <TD align=right>121,140</TD></TR>
<TR>
 <TH noWrap align=left>Born overseas: Canada, Ireland, NZ, South Africa, UK
  (c) and USA </TH>
 <TD align=right>4,581</TD>
 <TD align=right>5,012</TD>
 <TD align=right>9,593</TD></TR>
<TR>
 <TH noWrap align=left>Born overseas: Other country (d) </TH>
 <TD align=right>4,864</TD>
 <TD align=right>4,686</TD>
 <TD align=right>9,550</TD></TR>
<TR>
 <TH noWrap align=left>Born overseas: Total </TH>
 <TD align=right>9,445</TD>
 <TD align=right>9,698</TD>
 <TD align=right>19,143</TD></TR>
<TR>
 <TH noWrap align=left>Speaks English only and aged 5 years and over </TH>
 <TD align=right>60,436</TD>
 <TD align=right>62,119</TD>
```

```
<TD align=right>122,555</TD></TR>
<TR>
<TH noWrap align=left>Speaks language other than English (e) and aged 5
years and over </TH>
<TD align=right>3,812</TD>
<TD align=right>4,060</TD>
<TD align=right>7,872</TD></TR>
<TR>
<TH noWrap align=left>Australian citizen<BR></TH>
<TD align=right>66,229</TD>
<TD align=right>67,631</TD>
<TD align=right>133,860</TD></TR>
<TR>
<TH noWrap align=left>Australian citizens aged 18 years and over<BR></TH>
<TD align=right>45,648</TD>
<TD align=right>47,714</TD>
<TD align=right>93,362</TD></TR>
<TR>
<TH noWrap align=left>Unemployed </TH>
<TD align=right>4,981</TD>
<TD align=right>2,780</TD>
<TD align=right>7,761</TD></TR>
<TR>
<TH noWrap align=left>Employed </TH>
<TD align=right>31,585</TD>
<TD align=right>23,606</TD>
<TD align=right>55,191</TD></TR>
<TR>
<TH noWrap align=left>In the labour force </TH>
<TD align=right>36,566</TD>
<TD align=right>26,386</TD>
<TD align=right>62,952</TD></TR>
<TR>
<TH noWrap align=left>Not in the labour force </TH>
<TD align=right>15,706</TD>
<TD align=right>28,424</TD>
<TD align=right>44,130</TD></TR>
<TR>
<TH noWrap align=left>Enumerated in private dwelling (a) </TH>
<TD align=right>70,325</TD>
<TD align=right>71,984</TD>
<TD align=right>142,309</TD></TR>
<TR>
<TH noWrap align=left>Enumerated in non-private dwelling (a) </TH>
<TD align=right>1,532</TD>
<TD align=right>1,758</TD>
<TD align=right>3,290</TD></TR>
<TR>
<TH noWrap align=left>Persons enumerated same address 5 years ago </TH>
<TD align=right>38,692</TD>
<TD align=right>39,256</TD>
<TD align=right>77,948</TD></TR>
<TR>
<TH noWrap align=left>Persons enumerated different address 5 years ago </TH>
<TD align=right>25,101</TD>
<TD align=right>26,585</TD>
<TD align=right>51,686</TD></TR>
```

```
<TR>
  <TH noWrap align=left>Overseas visitor<BR></TH>
  <TD align=right>143</TD>
  <TD align=right>190</TD>
  <TD align=right>333</TD></TR></TBODY></TABLE></CENTER><BR><BR>Cells in this
table have been randomly adjusted to avoid the release of confidential data.
<BR><FONT size=2><BR>(a) Overseas visitors are included in these categories. All
other categories exclude overseas visitors. <BR>(b) Applicable to persons who
are of both Aboriginal and Torres Strait Islander origin. <BR>(c) Comprises
England, Scotland, Wales, Northern Ireland, Channel Islands, Isle of Man, and
United Kingdom and Ireland n.f.d. <BR>(d) Includes 'inadequately described', 'at
sea', and 'not elsewhere classified'. <BR>(e) Includes 'non-verbal so described'
and 'inadequately described'.<BR></FONT><BR><BR><BR><FONT size=2></FONT><BR>
<CENTER>
<H3>B32 Selected Medians<BR><BR>Gippsland (SD) </H3></CENTER>
<CENTER>
<TABLE cellPadding=2 border=0>
 <TBODY>
 <TR>
  <TH></TH>
 <TR>
  <TH noWrap align=left>Median age </TH>
  <TD align=right>34</TD></TR>
 <TR>
  <TH noWrap align=left>Median individual income </TH>
  <TD align=right>240</TD></TR>
 <TR>
  <TH noWrap align=left>Median household income </TH>
  <TD align=right>496</TD></TR>
 <TR>
  <TH noWrap align=left>Average household size </TH>
  <TD align=right>2.6</TD></TR></TBODY></TABLE></CENTER><BR>Note: Income
figures are weekly income, expressed in $AUS.
<DIV align=center>
<HR>
<BR><BR></FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
```

```
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
   <TD width="50%"><A
     href="..\PleaseGoBack.htm"><B><FONT
     face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
   <TD width="50%">
     <DIV align=right><A
     href="..\PleaseGoBack.htm"><B><FONT
     face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 2, Page 5

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310116.NSF/4a255eef008309e44a255eef00061e57/c7e40ae
1fa39e31e4a2567ac001ffb61!OpenDocument -->
<HTML><HEAD><TITLE>Cumulative Frequency and Percentage</TITLE>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="25%" bgColor=#008000 rowSpan=2>
      <DIV align=center>
      <P><IMG height=92 src="Cumulative Frequency and Percentage_files/0.gif"
      width=124 alt="Australian Bureau of Statistics Logo"></P></DIV></TD>
    <TD width="65%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
      Bureau of Statistics</FONT></TD>
    <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
      src="Cumulative Frequency and Percentage_files/ecblank.gif" width=1
      border=0></TD></TR>
  <TR vAlign=top>
    <TD width="75%" colSpan=2><B><FONT face=Arial color=#008000
      size=5>Education Resources</FONT></B><BR><B><FONT face=Arial
      size=4>Statistics - A Powerful Edge</FONT></B><BR><B><FONT face=Arial
      size=4>Cumulative Frequency and Percentage</FONT></B><BR><FONT face=Arial
      size=2>
      <HR noShade>
      </FONT></TD></TR></TBODY></TABLE><BR><FONT face=Arial color=#ff0000
size=2><BR></FONT><IMG height=48
src="file:///C:/Documents%20and%20Settings/blapp/My%20Documents/IQP/Content/PE-
Variables/Cumulative%20Frequency%20and%20Percentage_files/0(1).gif"
width=501 alt="Cumulative Frequency and Percentage"><BR><FONT face=Arial color=#ff0000
size=2><BR></FONT><FONT
face=Arial>Numerical variables can be represented in a variety of ways,
including: stem and leaf, frequency distribution, cumulative frequency or
cumulative percentage tables. As you will see, the graphs of these are very
useful in finding the centres of large data sets.</FONT><BR><BR><BR><B><FONT
face=Arial>CUMULATIVE FREQUENCY</FONT></B><BR><BR><FONT face=Arial>Cumulative
frequency is used to determine the number of observations that lie above (or
below) a particular value.</FONT><BR><BR><FONT face=Arial>The cumulative
frequency is found from a stem and leaf table or a frequency distribution table
by </FONT><I><FONT face=Arial>adding each frequency to the sum of its
predecessor.</FONT></I><BR><BR><FONT face=Arial>The last value will always equal
the total for all observations, as all frequencies will have been
added.</FONT><BR><BR><FONT face=Arial>For </FONT><I><FONT face=Arial>
 continuous </FONT></I><FONT face=Arial>variables:</FONT>
<UL>
  <LI><FONT face=Arial>cumulative frequency is calculated from a frequency
  distribution table. A stem and leaf plot can be used to construct a frequency
  distribution table.</FONT></LI></UL><BR><B><FONT
face=Arial>CONTINUOUS VARIABLES</FONT></B><BR><BR><FONT face=Arial>When a
continuous variable or variable taking a large number of values is used,
plotting the graph requires a different approach to that for a discrete
variable. </FONT><BR><FONT face=Arial color=#ff0000 size=2><BR></FONT><BR><IMG
```

```
height=44
src="file:///C:/Documents%20and%20Settings/blapp/My%20Documents/IQP/Content/PE-
Variables/Cumulative%20Frequency%20and%20Percentage_files/0(4).gif"
width=119 alt="Example below"><BR><FONT face=Arial color=#ff0000 size=2><BR></FONT>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="4%"><FONT face=Arial>1. </FONT></TD>
    <TD width="96%">
      <UL>
        <UL>
          <UL><FONT face=Arial>The snow depth at Thredbo in the Snowy
            Mountains was measured (to the nearest centimetre) for twenty-five
            days and some examples are as follows:</FONT><BR><FONT face=Arial
            color=#ff0000 size=2><BR></FONT><FONT face=Arial>242, 228, 217,
            etc...</FONT></UL></UL></UL></TD></TR>
  </TBODY></TABLE><FONT
face=Arial color=#ff0000 size=2></FONT>
<UL>
  <P><FONT face=Arial> The data ranges from 209cm to 266cm, so the data are
  grouped in class intervals of 10 to produce the following table:</FONT><FONT
  face=Arial color=#ff0000 size=2><BR></FONT></P></UL>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="75%" colSpan=5>
      <p align="center"><b>Snow Depth at Thredbo</b></TD>
  </TR>
  <TR vAlign=top>
    <TD width="75%" colSpan=5>
      <DIV align=center><B><FONT face=Arial color=#ff0000 size=2>
      <HR noShade>
      </FONT></B></DIV></TD>
  </TR>
  <TR vAlign=top>
    <TD width="17%"><B><FONT face=Arial size=2></FONT></B>
      <P><B><FONT face=Arial color=#008000 size=2>Snow depth
    (x)</FONT></B></P></TD>
    <TD width="11%"><B><FONT face=Arial color=#008000
    size=2>Tally</FONT></B></TD>
    <TD width="10%">
      <DIV align=center><B><FONT face=Arial color=#008000 size=2>Frequency
      (f)</FONT></B></DIV></TD>
    <TD width="18%">
      <DIV align=center><B><FONT face=Arial color=#008000
      size=2>End-point</FONT></B></DIV></TD>
    <TD width="18%">
      <DIV align=center><B><FONT face=Arial color=#008000
      size=2>Cumulative</FONT></B><FONT face=Arial color=#008000 size=2>
      </FONT><B><FONT face=Arial color=#008000
    size=2>frequency</FONT></B></DIV></TD>
  </TR>
  <TR vAlign=top>
    <TD width="75%" colSpan=5>
      <DIV align=center><B><FONT face=Arial color=#ff0000 size=2>
      <HR noShade>
      </FONT></B></DIV></TD>
```

```
</TR>
<TR vAlign=top>
 <TD width="39%" colSpan=3>
  <UL><FONT face=Arial size=2></FONT></UL></TD>
 <TD width="18%">
  <DIV align=center><FONT face=Arial size=2>200</FONT></DIV></TD>
 <TD width="18%">
  <DIV align=center><FONT face=Arial size=2>0</FONT></DIV></TD>
</TR>
<TR vAlign=top>
 <TD width="17%" bgColor=#ffffd0><FONT face=Arial
  size=2>200-&lt;210</FONT></TD>
 <TD width="11%" bgColor=#ffffd0><font face="Arial" size="2">1</font></TD>
 <TD width="10%" bgColor=#ffffd0>
  <DIV align=center><FONT face=Arial size=2>1</FONT></DIV></TD>
 <TD width="18%" bgColor=#ffffd0>
  <DIV align=center><FONT face=Arial size=2>210</FONT></DIV></TD>
 <TD width="18%" bgColor=#ffffd0>
  <DIV align=center><FONT face=Arial size=2>1</FONT></DIV></TD>
</TR>
<TR vAlign=top>
 <TD width="17%"><FONT face=Arial size=2>210-&lt;220</FONT></TD>
 <TD width="11%"><font face="Arial" size="2">2</font></TD>
 <TD width="10%">
  <DIV align=center><FONT face=Arial size=2>2</FONT></DIV></TD>
 <TD width="18%">
  <DIV align=center><FONT face=Arial size=2>220</FONT></DIV></TD>
 <TD width="18%">
  <DIV align=center><FONT face=Arial size=2>3</FONT></DIV></TD>
</TR>
<TR vAlign=top>
 <TD width="17%" bgColor=#ffffd0><FONT face=Arial
  size=2>220-&lt;230</FONT></TD>
 <TD width="11%" bgColor=#ffffd0><font face="Arial" size="2">3</font></TD>
 <TD width="10%" bgColor=#ffffd0>
  <DIV align=center><FONT face=Arial size=2>3</FONT></DIV></TD>
 <TD width="18%" bgColor=#ffffd0>
  <DIV align=center><FONT face=Arial size=2>230</FONT></DIV></TD>
 <TD width="18%" bgColor=#ffffd0>
  <DIV align=center><FONT face=Arial size=2>6</FONT></DIV></TD>
</TR>
<TR vAlign=top>
 <TD width="17%"><FONT face=Arial size=2>230-&lt;240</FONT></TD>
 <TD width="11%">5</TD>
 <TD width="10%">
  <DIV align=center><FONT face=Arial size=2>5</FONT></DIV></TD>
 <TD width="18%">
  <DIV align=center><FONT face=Arial size=2>240</FONT></DIV></TD>
 <TD width="18%">
  <DIV align=center><FONT face=Arial size=2>11</FONT></DIV></TD>
</TR>
<TR vAlign=top>
 <TD width="17%" bgColor=#ffffd0><FONT face=Arial
  size=2>240-&lt;250</FONT></TD>
 <TD width="11%" bgColor=#ffffd0>7</TD>
 <TD width="10%" bgColor=#ffffd0>
  <DIV align=center><FONT face=Arial size=2>7</FONT></DIV></TD>
```

```
  <TD width="18%" bgColor=#ffffd0>
    <DIV align=center><FONT face=Arial size=2>250</FONT></DIV></TD>
  <TD width="18%" bgColor=#ffffd0>
    <DIV align=center><FONT face=Arial size=2>18</FONT></DIV></TD>
 </TR>
 <TR vAlign=top>
  <TD width="17%"><FONT face=Arial size=2>250-&lt;260</FONT></TD>
  <TD width="11%">5</TD>
  <TD width="10%">
    <DIV align=center><FONT face=Arial size=2>5</FONT></DIV></TD>
  <TD width="18%">
    <DIV align=center><FONT face=Arial size=2>260</FONT></DIV></TD>
  <TD width="18%">
    <DIV align=center><FONT face=Arial size=2>23</FONT></DIV></TD>
 </TR>
 <TR vAlign=top>
  <TD width="17%" bgColor=#ffffd0><FONT face=Arial
    size=2>260-&lt;270</FONT></TD>
  <TD width="11%" bgColor=#ffffd0><font face="Arial" size="2">2</font></TD>
  <TD width="10%" bgColor=#ffffd0>
    <DIV align=center><FONT face=Arial size=2>2</FONT></DIV></TD>
  <TD width="18%" bgColor=#ffffd0>
    <DIV align=center><FONT face=Arial size=2>270</FONT></DIV></TD>
  <TD width="18%" bgColor=#ffffd0>
    <DIV align=center><FONT face=Arial size=2>25</FONT></DIV></TD>
 </TR>
 <TR vAlign=top>
  <TD width="75%" colSpan=5>
    <DIV align=center><B><FONT face=Arial color=#ff0000 size=2>
    <HR noShade>
    </FONT></B></DIV></TD>
 </TR></TBODY></TABLE><FONT face=Arial color=#ff0000
size=2><BR></FONT>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="4%"><FONT face=Arial></FONT></TD>
  <TD width="96%">
    <UL>
     <UL>
      <UL><FONT face=Arial> Because the variable is continuous, the
       end-points of each class interval are used in plotting the graph.
       The plotted points are joined to form an </FONT><I><FONT
       face=Arial>ogive.</FONT></I><BR><BR><FONT face=Arial>Remember that
       the cumulative frequency is always labeled on the vertical axis and
       any other variable, in this case snow depth, is labeled on the
       horizontal axis as shown below:</FONT></UL></UL></UL></TD></TR></TBODY></TABLE>
<DIV align=center> </DIV>
<DIV align=center><b><font face="Arial" size="2">Cumulative</font></b><b><font face="Arial"
size="2">
 Frequency of Snow Depth at Thredbo</font></b><FONT face=Arial color=#ff0000
size=2><BR></FONT><IMG
height=393 src="Cumulative Frequency and Percentage_files/1.gif"
width=501 alt="Line Graph of Snow Depth at Thredbo"></DIV>
<DIV align=center> </DIV>
<DIV align=center>
 <hr>
```

```
 <p> </DIV>
<DIV align=center> </DIV>
<DIV align=center><b>Snow Depth Frequency at Thredbo</b></DIV>
<DIV align=center><img border="0" src="PE2bar.bmp" width="496" height="290" alt="Bar Graph of Snow
Depth Frequency at Thredbo"></DIV>
<DIV align=center> </DIV>
<DIV align=center><B><FONT face=Arial color=#ff0000 size=2>
    <HR noShade>
    </FONT></B>
 <p> </DIV>
<DIV align=center> </DIV>
<DIV align=center> </DIV>
<DIV align=center><b>Frequency Percentages of Snow Depth at Thredbo</b></DIV>
<DIV align=center><img border="0" src="PE2pie.bmp" width="496" height="288" alt="Pie Chart of
Frequency Percentages pf Snow Depth Frequency at Thredbo"></DIV>
<DIV align=center></DIV>
<HR><BR>
<A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
   <TD width="50%"><A
    href="..\PleaseGoBack.htm"
   ><B><FONT
    face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
   <TD width="50%">
    <DIV align=right><A
    href="..\PleaseGoBack.htm"
   ><B><FONT
    face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 3, Page 1

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310108.NSF/f9996d24c8f22d024a256500001c8576/569af0d
15c2201964a2565010007a32f!OpenDocument -->
<HTML><HEAD><TITLE>1996 Census - Australia</TITLE>
<style type="text/css" media="screen">
        a:hover         { background-color: yellow; }
    </style>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="19%" bgColor=#008000 rowSpan=2>
      <DIV align=center>
      <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
      src="1996 Census - Australia_files/0.gif" width=124
longdesc="AustraliaMapLongDesc.htm"></P></DIV></TD>
    <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
      Bureau of Statistics</FONT></TD>
    <TD width="10%" bgColor=#ffff00><IMG height="1" src="1996 Census - Australia_files/ecblank.gif"
ALT="""" width="1" border="0"></TD></TR>
  <TR vAlign=top>
    <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
      Population and Housing - Basic Community Profiles</FONT></B><BR><B><FONT
      face=Arial size=4>Australia</FONT></B><BR><FONT face=Arial size=2>
      <HR noShade>
      </FONT></TD></TR></TBODY></TABLE>
<DIV align=center></DIV>
<DIV align=right></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="16%">
      <DIV align=center><a href="../PleaseGoBack.htm"><IMG height="22" src="1996%20Census%20-
%20Australia_files/0(1).gif" ALT="Magnifying glass" width="35" border="0" ""></a><FONT face=Arial>
</FONT><A
      href="..\PleaseGoBack.htm"
     ><FONT
      face=Arial>Search for any area</FONT></A><BR><BR><FONT
      face=Arial></FONT></DIV><MAP name=7A6.map>
      <AREA shape="RECT" coords="205, 337, 272, 356" href="../PleaseGoBack.htm" ALT="State of
Tasmania">
      <AREA shape="RECT" coords="341, 288, 378, 302" href="../PleaseGoBack.htm" ALT="Unused">
      <AREA shape="RECT" coords="49, 314, 159, 341" href="../PleaseGoBack.htm" ALT="Other
Territories">
      <AREA shape="POLY" coords="326, 267, 333, 271, 330, 276, 326, 270, 326, 266"
href="../PleaseGoBack.htm" ALT="Australian Capital Territory">
      <AREA shape="POLY" coords="147, 65, 148, 234, 131, 242, 122, 241, 112, 247, 105, 248, 99, 259, 67,
258, 57, 265, 49, 269, 34, 268, 23, 261, 20, 250, 23, 255, 29, 233, 23, 220, 18, 200, 13, 191, 8, 176, 5, 165,
15, 181, 6, 156, 14, 135, 15, 142, 24, 131, 36, 120, 45, 124, 51, 118, 57, 115, 63, 116, 77, 112, 87, 97, 86, 86,
91, 79, 96, 84, 99, 87, 100, 83, 99, 75, 108, 80, 108, 71, 118, 57, 131, 51, 137, 60, 144, 65, 148, 65"
href="../PleaseGoBack.htm" ALT="Western Australia">
```

```
    <AREA shape="POLY" coords="321, 325, 322, 343, 314, 353, 303, 354, 297, 347, 295, 337, 290, 331,
290, 322, 303, 330, 312, 330, 320, 322, 318, 315, 322, 321, 320, 327, 320, 325" href="../PleaseGoBack.htm"
ALT="State of Tasmania">
    <AREA shape="POLY" coords="257, 256, 257, 261, 257, 300, 269, 300, 280, 309, 294, 296, 306, 308,
319, 297, 339, 293, 323, 284, 317, 275, 295, 277, 289, 279, 277, 265, 271, 264, 268, 259, 257, 257, 256, 258"
href="1996 Census - State of Victoria.htm" ALT="State of Victoria">
    <AREA shape="POLY" coords="148, 176, 256, 177, 257, 300, 246, 288, 246, 281, 235, 272, 221, 278,
217, 275, 228, 273, 235, 269, 235, 267, 231, 255, 226, 263, 229, 268, 219, 270, 222, 264, 228, 265, 230, 251,
228, 244, 224, 252, 212, 266, 211, 269, 204, 259, 202, 250, 196, 245, 190, 239, 183, 237, 173, 233, 148, 232,
149, 176" href="../PleaseGoBack.htm" ALT="State of South Australia">
    <AREA shape="POLY" coords="256, 206, 328, 207, 336, 200, 352, 208, 356, 203, 355, 199, 368, 196,
370, 204, 365, 218, 363, 231, 349, 256, 344, 267, 336, 294, 321, 284, 316, 276, 311, 278, 296, 276, 291, 280,
278, 269, 275, 264, 270, 265, 265, 257, 256, 256, 256, 207" href="../PleaseGoBack.htm" ALT="State of New
South Wales">
    <AREA shape="POLY" coords="148, 63, 149, 177, 230, 175, 231, 79, 206, 60, 213, 53, 219, 57, 216, 51,
210, 45, 220, 35, 215, 24, 204, 34, 183, 30, 178, 21, 180, 26, 182, 32, 170, 36, 168, 30, 170, 20, 161, 25, 158,
30, 168, 34, 158, 41, 160, 47, 151, 57, 154, 63, 157, 68, 151, 64, 148, 65, 148, 62"
href="../PleaseGoBack.htm" ALT="Northern Territory">
    <AREA shape="POLY" coords="229, 80, 229, 174, 255, 176, 256, 205, 326, 206, 337, 200, 350, 206,
354, 200, 368, 195, 365, 153, 365, 170, 303, 96, 294, 57, 280, 55, 267, 7, 256, 84, 247, 95, 236, 80, 229, 79,
228, 80" href="../PleaseGoBack.htm" ALT="State of Queensland">
    </MAP>
    <A
    href="..\PleaseGoBack.htm"><IMG height="379" isMap src="1996%20Census%20-
%20Australia_files/0(2).gif" ALT="Map of Australia, divided into states." width="379"
useMap="#7A6.map" border="0" ""></A></TD>
   <TD width="2%"><FONT face=Arial></FONT></TD>
   <TD width="82%"><FONT face=Arial><BR></FONT><BR><FONT face=Arial>Note:
    </FONT><FONT face=Arial>Australia</FONT><FONT face=Arial> is a convenient
    division of a Statistical Division for mapping purposes only. Census data
    are available for the component Statistical Local Areas but not for the
    total </FONT><FONT face=Arial>Australia</FONT><FONT
    face=Arial>.</FONT><BR><B><FONT face=Arial><A
    href="..\PleaseGoBack.htm"
   >Click
    here to see tables for Australia.</A></FONT></B><BR><FONT
    face=Arial></FONT><BR><FONT face=Arial>Click on one of the follow areas to
    select it:</FONT><BR>
    <TABLE>
     <TBODY>
     <TR>
      <TD><CENTER><STRONG></STRONG></CENTER></TD></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - Australia_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm"
       >Australian
        Capital Territory </A></B></TD></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - Australia_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm"
       >Northern
        Territory</A></B></TD></TR>
     <TR vAlign=top>
```

```
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - Australia_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm"
       >Other
        Territories </A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - Australia_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm"
       >State
        of New South Wales</A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - Australia_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm"
       >State
        of Queensland</A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - Australia_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm"
       >State
        of South Australia </A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - Australia_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm"
       >State
        of Tasmania </A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - Australia_files/ecblank.gif" width=16
        border=0><B><A
        href="1996 Census - State of Victoria.htm" >State
        of Victoria</A></B></TD></TR>
    <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - Australia_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm"
       >State
        of Western Australia </A></B></TD></TR></TBODY></TABLE><FONT
   face=Arial><IMG src="1996 Census - Australia_files/ecblank.gif">
   </FONT><B><FONT face=Arial></FONT></B></TD></TR></TBODY></TABLE>
<DIV align=center><BR><FONT face=Arial>
<HR>
</FONT><BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
```

```
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
   <TD width="50%"><A
    href="..\PleaseGoBack.htm"
   ><B><FONT
    face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
   <TD width="50%">
    <DIV align=right><A
    href="..\PleaseGoBack.htm"
   ><B><FONT
    face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 3, Page 2

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310108.NSF/fead422050fd1dae4a25651300061411f/67ae457
a0f96ae224a256514000cc751!OpenDocument -->
<HTML><HEAD><TITLE>1996 Census - State of Victoria</TITLE>
<style type="text/css" media="screen">
		a:hover		{ background-color: yellow; }
	</style>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="19%" bgColor=#008000 rowSpan=2>
      <DIV align=center>
      <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
      src="1996 Census - State of Victoria_files/0.gif" width=124></P></DIV></TD>
    <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
      Bureau of Statistics</FONT></TD>
    <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
      src="1996 Census - State of Victoria_files/ecblank.gif" width=1
    border=0></TD></TR>
  <TR vAlign=top>
    <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
      Population and Housing - Basic Community Profiles</FONT></B><BR><B><FONT
      face=Arial size=4>State of Victoria</FONT></B><BR><FONT face=Arial size=2>
      <HR noShade>
      </FONT></TD></TR></TBODY></TABLE>
<DIV align=center></DIV>
<DIV align=right></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="16%">
      <DIV align=center><a href="../PleaseGoBack.htm"><IMG
      height=22
      src="file:///C:/Documents%20and%20Settings/blapp/My%20Documents/IQP/Content/C-
Victoria/1996%20Census%20-%20State%20of%20Victoria_files/0(1).gif"
      width=35 border=0 alt="Magnifying Glass"></a><FONT face=Arial> </FONT><A
      href="..\PleaseGoBack.htm"><FONT
      face=Arial>Search for any area</FONT></A><BR><BR><FONT
      face=Arial></FONT></DIV><MAP name=2F2.map><AREA shape=RECT
        coords='3, 354, 180, 369'
        href="../PleaseGoBack.htm" ALT="Off-Shore Areas & Migratory"><AREA
        shape=RECT coords='101, 304, 144, 322'
        href="../PleaseGoBack.htm" ALT = "Barwon"><AREA
        shape=RECT coords='135, 289, 195, 307'
        href="../PleaseGoBack.htm" ALT = "Melbourne"><AREA
        shape=POLY
        coords='195, 273, 187, 284, 167, 283, 163, 275, 173, 273, 176, 260, 170, 251, 156, 259, 155, 250, 155,
235, 176, 234, 177, 228, 201, 243, 203, 258, 203, 271, 193, 276'
        href="../PleaseGoBack.htm" ALT = "Melbourne"><AREA
        shape=RECT coords='95, 207, 133, 222'
```

```
href="../PleaseGoBack.htm"><AREA
shape=POLY
coords='155, 235, 149, 223, 151, 217, 143, 217, 141, 221, 107, 209, 107, 204, 96, 206, 95, 219, 81, 218,
71, 241, 83, 241, 91, 249, 108, 244, 113, 239, 120, 241, 122, 236, 135, 250, 155, 250, 156, 235'
href="1996 Census - Central Highlands (Statistical Division).htm" ALT = "Central Highlands"><AREA
shape=POLY
coords='106, 294, 106, 286, 112, 282, 107, 276, 115, 272, 110, 271, 121, 263, 121, 256, 111, 251, 111,
240, 121, 242, 121, 238, 131, 249, 152, 251, 158, 259, 150, 263, 150, 267, 160, 267, 160, 271, 152, 274, 135,
282, 116, 303, 105, 291'
href="../PleaseGoBack.htm" ALT = "Barwon"><AREA
shape=POLY
coords='169, 234, 161, 216, 156, 215, 153, 210, 168, 206, 163, 200, 154, 197, 162, 181, 150, 183, 145,
181, 145, 155, 136, 162, 130, 156, 120, 161, 112, 166, 116, 173, 112, 187, 116, 202, 107, 204, 106, 210, 128,
220, 137, 222, 139, 218, 149, 217, 147, 225, 155, 237, 172, 234'
href="../PleaseGoBack.htm" ALT = "Loddon"><AREA
shape=POLY
coords='16, 231, 32, 231, 38, 221, 49, 220, 51, 214, 55, 222, 61, 221, 62, 215, 78, 226, 71, 241, 83, 242,
86, 248, 108, 246, 113, 241, 113, 252, 121, 258, 120, 263, 114, 267, 111, 271, 115, 271, 110, 276, 108, 276,
108, 279, 110, 282, 106, 285, 106, 295, 74, 276, 67, 279, 50, 271, 45, 272, 42, 279, 14, 260, 16, 226'
href="../PleaseGoBack.htm" ALT = "Western District"><AREA
shape=RECT coords='184, 312, 242, 329'
href="../PleaseGoBack.htm" ALT = "Gippsland"><AREA
shape=POLY
coords='196, 240, 219, 237, 229, 241, 232, 259, 238, 259, 239, 267, 231, 282, 225, 286, 231, 289, 228,
292, 220, 295, 223, 302, 228, 298, 228, 312, 222, 311, 220, 300, 213, 297, 210, 302, 202, 290, 199, 290, 193,
285, 189, 282, 192, 278, 202, 270, 203, 249, 196, 238'
href="../PleaseGoBack.htm" ALT = "Gippsland"><AREA
shape=POLY
coords='14, 151, 38, 151, 43, 135, 61, 136, 67, 128, 73, 127, 80, 138, 84, 148, 80, 166, 86, 166, 87, 184,
112, 187, 116, 204, 95, 207, 93, 220, 79, 218, 78, 225, 62, 215, 62, 221, 54, 221, 52, 216, 48, 220, 41, 220,
36, 224, 36, 229, 28, 228, 30, 231, 19, 231, 18, 228, 15, 150'
href="../PleaseGoBack.htm" ALT = "Wimmera"><AREA
shape=POLY
coords='150, 151, 124, 130, 121, 134, 117, 131, 118, 123, 113, 121, 109, 101, 84, 93, 79, 102, 70, 79, 62,
72, 44, 70, 37, 76, 16, 64, 15, 150, 38, 150, 41, 136, 61, 136, 64, 130, 74, 128, 79, 138, 83, 138, 84, 148, 82,
149, 79, 170, 85, 168, 85, 185, 102, 183, 108, 183, 114, 187, 117, 173, 113, 165, 118, 159, 128, 156, 136,
162, 151, 151'
href="../PleaseGoBack.htm" ALT = "Mallee"><AREA
shape=POLY
coords='219, 163, 214, 161, 208, 159, 206, 161, 190, 152, 187, 154, 168, 157, 170, 165, 166, 168, 150,
154, 145, 158, 145, 179, 149, 184, 161, 181, 153, 196, 163, 199, 168, 206, 153, 211, 154, 214, 160, 216, 161,
220, 169, 233, 172, 234, 177, 229, 198, 241, 205, 238, 218, 237, 225, 241, 229, 239, 236, 216, 223, 207, 220,
178, 217, 176, 217, 172, 221, 172, 217, 160'
href="../PleaseGoBack.htm" ALT="Goulburn"><AREA
shape=POLY
coords='364, 234, 296, 199, 291, 193, 268, 203, 264, 199, 264, 213, 269, 227, 237, 218, 228, 240, 231,
243, 231, 258, 238, 258, 237, 265, 240, 268, 233, 281, 225, 287, 232, 290, 227, 294, 230, 297, 242, 292, 258,
277, 277, 260, 299, 250, 348, 247, 355, 243, 367, 234'
href="../PleaseGoBack.htm" ALT = "East Gippsland"><AREA
shape=RECT coords='217, 136, 293, 152'
href="../PleaseGoBack.htm" ALT="Ovens-Murray"><AREA
shape=POLY
coords='299, 191, 293, 184, 292, 171, 290, 165, 282, 161, 280, 158, 276, 163, 264, 161, 263, 166, 255,
163, 250, 168, 233, 162, 225, 161, 225, 163, 218, 164, 220, 169, 220, 172, 216, 174, 216, 177, 221, 181, 222,
207, 238, 219, 266, 227, 267, 224, 263, 218, 265, 217, 261, 213, 263, 204, 263, 198, 267, 202, 289, 192, 297,
198, 298, 187'
href="../PleaseGoBack.htm" ALT = "Ovens-Murray">
```

```
    <area href="../PleaseGoBack.htm" shape="default">
    <area href="../PleaseGoBack.htm" coords="0, 0, 10000, 10000" shape="rect"></MAP><A
    href="..\PleaseGoBack.htm"><IMG
    height=378 isMap
    src="file:///C:/Documents%20and%20Settings/blapp/My%20Documents/IQP/Content/C-
Victoria/1996%20Census%20-%20State%20of%20Victoria_files/0(2).gif"
    width=378 useMap=#2F2.map border=0 alt="A map of the region of Victoria, divided into its
regions."></A></TD>
   <TD width="2%"><FONT face=Arial></FONT></TD>
   <TD width="82%"><FONT face=Arial><BR></FONT><BR><FONT face=Arial>Note:
    </FONT><FONT face=Arial>State of Victoria</FONT><FONT face=Arial> is a
    convenient division of a Statistical Division for mapping purposes only.
    Census data are available for the component Statistical Local Areas but
    not for the total </FONT><FONT face=Arial>State of Victoria</FONT><FONT
    face=Arial>.</FONT><BR><B><FONT face=Arial><A
    href="..\PleaseGoBack.htm">Click
    here to see tables for State of Victoria.</A></FONT></B><BR><FONT
    face=Arial></FONT><BR><FONT face=Arial>Click on one of the follow areas to
    select it:</FONT><BR>
    <TABLE>
     <TBODY>
     <TR>
      <TH></TH></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Barwon
        (Statistical Division)</A></B></TD></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="1996 Census - Central Highlands (Statistical Division).htm">Central
        Highlands (Statistical Division)</A></B></TD></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">East
        Gippsland (Statistical Division)</A></B></TD></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Gippsland
        (Statistical Division)</A></B></TD></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Goulburn
        (Statistical Division)</A></B></TD></TR>
     <TR vAlign=top>
      <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
```

```
        href="..\PleaseGoBack.htm">Loddon
        (Statistical Division)</A></B></TD></TR>
      <TR vAlign=top>
        <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Mallee
        (Statistical Division)</A></B></TD></TR>
      <TR vAlign=top>
        <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Melbourne
        (Statistical Division)</A></B></TD></TR>
      <TR vAlign=top>
        <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Ovens
        - Murray (Statistical Division)</A></B></TD></TR>
      <TR vAlign=top>
        <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Western
        District (Statistical Division)</A></B></TD></TR>
      <TR vAlign=top>
        <TD noWrap><IMG height=1 alt=""
        src="1996 Census - State of Victoria_files/ecblank.gif" width=16
        border=0><B><A
        href="..\PleaseGoBack.htm">Wimmera
        (Statistical Division)</A></B></TD></TR></TBODY></TABLE><FONT
    face=Arial><IMG src="1996 Census - State of Victoria_files/ecblank.gif">
    </FONT><B><FONT face=Arial><A
    href="..\PleaseGoBack.htm">Off
    - Shore Areas &amp; Migratory - State of Victoria (Statistical Local
    Area)</A></FONT></B></TD></TR></TBODY></TABLE>
<DIV align=center><BR><FONT face=Arial>
<HR>
</FONT><BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
```

```
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="50%"><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
    <TD width="50%">
      <DIV align=right><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 3, Page 3

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0124)http://www.abs.gov.au/websitedbs/D3310108.NSF/d0e22b84be3efa5c4a2565070027981 3/142bf54
0d789c016ca2565370 01fd014!OpenDocument -->
<HTML><HEAD><TITLE>1996 Census - Central Highlands (Statistical Division)</TITLE>
<style type="text/css" media="screen">
        a:hover           { background-color: yellow; }
    </style>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) -->
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="19%" bgColor=#008000 rowSpan=2>
   <DIV align=center>
   <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
   src="1996 Census - Central Highlands (Statistical Division)_files/0.gif"
   width=124></P></DIV></TD>
  <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
   Bureau of Statistics</FONT></TD>
  <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
   src="1996 Census - Central Highlands (Statistical Division)_files/ecblank.gif"
   width=1 border=0></TD></TR>
 <TR vAlign=top>
  <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
   Population and Housing - Basic Community Profiles</FONT></B><BR><B><FONT
   face=Arial size=4>Central Highlands (Statistical
   Division)</FONT></B><BR><FONT face=Arial size=2>
   <HR noShade>
   </FONT></TD></TR></TBODY></TABLE>
<DIV align=center></DIV>
<DIV align=right></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="16%">
   <DIV align=center><a href="../PleaseGoBack.htm"><IMG
   height=22
   src="file:///C:/Documents%20and%20Settings/blapp/My%20Documents/IQP/Content/C-
HighLandsMap/1996%20Census%20-%20Central%20Highlands%20(Statistical%20Division)_files/0(1).gif"
   width=35 border=0 alt="Magnifying Glass"></a><FONT face=Arial> </FONT><A
   href="..\PleaseGoBack.htm"><FONT
   face=Arial>Search for any area</FONT></A><BR><BR><FONT
   face=Arial></FONT></DIV>
   <MAP name=A16.map>
   <AREA shape=POLY
coords=190,86,192,101,185,112,190,121,187,132,203,142,190,201,202,202,202,223,154,228,151,246,94,236,
89,243,52,241,55,227,1,215,3,202,20,177,23,156,40,155,40,141,30,128,64,125,81,136,96,140,95,129,109,13
4,116,116,118,79,192,88
    href="..\PleaseGoBack.htm" alt ="West Central Highlands">
    <AREA shape=POLY
coords=202,142,199,160,237,167,232,174,238,191,244,189,249,207,241,217,248,226,247,234,237,242,239,2
54,252,260,265,259,266,253,299,256,307,265,310,263,310,254,319,254,321,265,325,265,335,233,340,206,3
```

```
27,204,327,177,320,186,312,181,314,174,318,174,320,166,312,161,304,153,316,131,301,128,298,139,282,1
35,282,129,266,124,265,145,261,148,251,142,247,134,237,135,234,143,210,138,202,145
      href="..\PleaseGoBack.htm" alt="East Central Highlands">
      <AREA shape=POLY
coords=201,159,192,200,205,201,202,208,209,206,228,216,234,221,234,229,238,239,246,236,247,229,243,2
20,239,217,249,204,244,189,236,188,231,176,235,165,199,159       href="..\PleaseGoBack.htm"
alt="Ballarat City"></MAP>
      <A
     href="..\PleaseGoBack.htm"><IMG
     height=378 isMap
     src="file:///C:/Documents%20and%20Settings/blapp/My%20Documents/IQP/Content/C-
HighLandsMap/1996%20Census%20-%20Central%20Highlands%20(Statistical%20Division)_files/0(2).gif"
     width=378 useMap=#A16.map alt="Map of Central Highlands, divided into East Central Highlands, West
Central Highlands, and Ballarat." border=0></A></TD>
   <TD width="2%"><FONT face=Arial></FONT></TD>
   <TD width="82%"><FONT face=Arial><BR></FONT><BR><FONT face=Arial>Note:
     </FONT><FONT face=Arial>Central Highlands (Statistical
     Division)</FONT><FONT face=Arial> is a convenient division of a
     Statistical Division for mapping purposes only. Census data are available
     for the component Statistical Local Areas but not for the total
     </FONT><FONT face=Arial>Central Highlands (Statistical
     Division)</FONT><FONT face=Arial>.</FONT><BR><B><FONT face=Arial><A
     href="..\PleaseGoBack.htm">Click
     here to see tables for Central Highlands (Statistical
     Division).</A></FONT></B><BR><FONT face=Arial></FONT><BR><FONT
     face=Arial>Click on one of the follow areas to select it:</FONT><BR>
     <TABLE>
       <TBODY>
       <TR>
         <TH></TH></TR>
       <TR vAlign=top>
         <TD noWrap><IMG height=1 alt=""
           src="1996 Census - Central Highlands (Statistical Division)_files/ecblank.gif"
           width=16 border=0><B><A
           href="..\PleaseGoBack.htm">Ballarat
           City (Statistical Subdivision)</A></B></TD></TR>
       <TR vAlign=top>
         <TD noWrap><IMG height=1 alt=""
           src="1996 Census - Central Highlands (Statistical Division)_files/ecblank.gif"
           width=16 border=0><B><A
           href="..\PleaseGoBack.htm">East
           Central Highlands (Statistical Subdivision)</A></B></TD></TR>
       <TR vAlign=top>
         <TD noWrap><IMG height=1 alt=""
           src="1996 Census - Central Highlands (Statistical Division)_files/ecblank.gif"
           width=16 border=0><B><A
           href="..\PleaseGoBack.htm">West
           Central Highlands (Statistical
     Subdivision)</A></B></TD></TR></TBODY></TABLE><FONT face=Arial><IMG
     src="1996 Census - Central Highlands (Statistical Division)_files/ecblank.gif">
     </FONT><B><FONT face=Arial></FONT></B></TD></TR></TBODY></TABLE>
<DIV align=center><BR><FONT face=Arial>
<HR>
</FONT><BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
```

```
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="50%"><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
    <TD width="50%">
      <DIV align=right><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 3, Page 4

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0084)http://www.abs.gov.au/websitedbs/d3310108.nsf/ASGC/D41DCF95700E5A4BCA256537001CBC
09/ -->
<HTML><HEAD><TITLE>1996 Census Central Highlands (Statistical Division)</TITLE>
<style type="text/css" media="screen">
		a:hover		{ background-color: yellow; }
	</style>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) --><LINK
href="http://www.naa.gov.au/recordkeeping/gov_online/agls/1.1" rel=schema.AGLS>
<META content="corporateName:Australian Bureau of Statistics" name=DC.Creator>
<META content="corporateName:Australian Bureau of Statistics" name=DC.Publisher>
<META
content="Australian Bureau of Statistics is Australia's official statistical organisation. The ABS assists and
encourages informed decision-making, research and discussion within governments and the community, by
providing a high quality, objective and responsive national statistical service"
name=AGLS.Function>
<META
content="corporate name:Australian Bureau of Statistics; address:PO Box 10 Belconnen ACT 2616;
contact:National Information Service; email:client.services@abs.gov.au; telephone: 1300 135 070"
name=AGLS.Availability>
<META
content="Basic Community Profile for Central Highlands (Statistical Division) "
name=DC.Title>
<META content="Census statistical products and services" name=DC.Subject
SCHEME="ABS Classifications">
<META content=1997-10-21 name=DC.Date.created SCHEME="ISO8601">
<META lang=en content="© Commonwealth of Australia, 1997" name=DC.Rights>
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="19%" bgColor=#008000 rowSpan=2>
   <DIV align=center>
   <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
   src="1996 Census Central Highlands (Statistical Division)_files/0.gif"
   width=124></P></DIV></TD>
  <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
   Bureau of Statistics</FONT></TD>
  <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
   src="1996 Census Central Highlands (Statistical Division)_files/ecblank.gif"
   width=1 border=0></TD></TR>
 <TR vAlign=top>
  <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
   Population and Housing</FONT></B><BR><B><FONT face=Arial size=4>Central
   Highlands (Statistical Division)</FONT></B><FONT face=Arial>
   </FONT><B><FONT face=Arial size=4>- Victoria</FONT></B><BR><FONT
   face=Arial size=2>
   <HR noShade>
   </FONT></TD></TR></TBODY></TABLE><BR><BR>
<CENTER>
<H1>B01 Selected Characteristics <BR><BR>Central Highlands (SD) </H1>
<p><a href="CentralHighlads01.xls">Click here for an MS Excel spreadsheet of
```

```
this table</a> </p>
<TABLE cellPadding=2 border=1 summary = "A Table with 4 columns showing statistical data for the
Central Highlands.
                                        Column one is Categories,
                                        Column two is Male,
                                        Column three is Female,
                                        Column four is Persons.
                                    Each row represents a different category such as
Employed and Unemployed citizens.">
 <TBODY>
 <TR>
  <TH SCOPE="col" abbr="C">Categories</TH>
  <TH SCOPE="col" style="background-color: #FFFF99" abbr="M"><font color="#000000">Male</font>
</TH>
  <TH SCOPE="col" abbr="F">Female </TH>
  <TH SCOPE="col" abbr="P" style="background-color: #FFFF99">Persons </TH></TR>
 <TR>
  <TH noWrap align=left>Total persons (a)<BR></TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">63,421</font></TD>
  <TD align=right>66,135</TD>
  <TD align=right bgcolor="#FFFF99">129,556</TD></TR>
 <TR>
  <TH noWrap align=left>Aged 15 years and over (a)<BR></TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">47,971</font></TD>
  <TD align=right>51,505</TD>
  <TD align=right bgcolor="#FFFF99">99,476</TD></TR>
 <TR>
  <TH noWrap align=left>Aboriginal </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">372</font></TD>
  <TD align=right>350</TD>
  <TD align=right bgcolor="#FFFF99">722</TD></TR>
 <TR>
  <TH noWrap align=left>Torres Strait Islander </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">61</font></TD>
  <TD align=right>48</TD>
  <TD align=right bgcolor="#FFFF99">109</TD></TR>
 <TR>
  <TH noWrap align=left>Both Aboriginal and Torres Strait Islander (b) </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">8</font></TD>
  <TD align=right>14</TD>
  <TD align=right bgcolor="#FFFF99">22</TD></TR>
 <TR>
  <TH noWrap align=left>Australian born </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">55,726</font></TD>
  <TD align=right>58,134</TD>
  <TD align=right bgcolor="#FFFF99">113,860</TD></TR>
 <TR>
  <TH noWrap align=left>Born overseas: Canada, Ireland, NZ, South Africa, UK
   (c) and USA </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">2,973</font></TD>
  <TD align=right>3,188</TD>
  <TD align=right bgcolor="#FFFF99">6,161</TD></TR>
 <TR>
  <TH noWrap align=left>Born overseas: Other country (d) </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">2,659</font></TD>
  <TD align=right>2,526</TD>
  <TD align=right bgcolor="#FFFF99">5,185</TD></TR>
```

```
<TR>
 <TH noWrap align=left>Born overseas: Total </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">5,632</font></TD>
 <TD align=right>5,714</TD>
 <TD align=right bgcolor="#FFFF99">11,346</TD></TR>
<TR>
 <TH noWrap align=left>Speaks English only and aged 5 years and over </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">54,581</font></TD>
 <TD align=right>57,349</TD>
 <TD align=right bgcolor="#FFFF99">111,930</TD></TR>
<TR>
 <TH noWrap align=left>Speaks language other than English (e) and aged 5
  years and over </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">1,863</font></TD>
 <TD align=right>1,929</TD>
 <TD align=right bgcolor="#FFFF99">3,792</TD></TR>
<TR>
 <TH noWrap align=left>Australian citizen<BR></TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">59,593</font></TD>
 <TD align=right>62,147</TD>
 <TD align=right bgcolor="#FFFF99">121,740</TD></TR>
<TR>
 <TH noWrap align=left>Australian citizens aged 18 years and over<BR></TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">41,838</font></TD>
 <TD align=right>45,301</TD>
 <TD align=right bgcolor="#FFFF99">87,139</TD></TR>
<TR>
 <TH noWrap align=left>Unemployed </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">4,035</font></TD>
 <TD align=right>2,437</TD>
 <TD align=right bgcolor="#FFFF99">6,472</TD></TR>
<TR>
 <TH noWrap align=left>Employed </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">27,874</font></TD>
 <TD align=right>21,725</TD>
 <TD align=right bgcolor="#FFFF99">49,599</TD></TR>
<TR>
 <TH noWrap align=left>In the labour force </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">31,909</font></TD>
 <TD align=right>24,162</TD>
 <TD align=right bgcolor="#FFFF99">56,071</TD></TR>
<TR>
 <TH noWrap align=left>Not in the labour force </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">14,739</font></TD>
 <TD align=right>26,260</TD>
 <TD align=right bgcolor="#FFFF99">40,999</TD></TR>
<TR>
 <TH noWrap align=left>Enumerated in private dwelling (a) </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">61,075</font></TD>
 <TD align=right>63,745</TD>
 <TD align=right bgcolor="#FFFF99">124,820</TD></TR>
<TR>
 <TH noWrap align=left>Enumerated in non-private dwelling (a) </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">2,346</font></TD>
 <TD align=right>2,390</TD>
 <TD align=right bgcolor="#FFFF99">4,736</TD></TR>
<TR>
```

```
  <TH noWrap align=left>Persons enumerated same address 5 years ago </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">33,197</font></TD>
  <TD align=right>34,756</TD>
  <TD align=right bgcolor="#FFFF99">67,953</TD></TR>
 <TR>
  <TH noWrap align=left>Persons enumerated different address 5 years ago </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">23,036</font></TD>
  <TD align=right>24,518</TD>
  <TD align=right bgcolor="#FFFF99">47,554</TD></TR>
 <TR>
  <TH noWrap align=left>Overseas visitor<BR></TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">102</font></TD>
  <TD align=right>146</TD>
  <TD align=right bgcolor="#FFFF99">248</TD></TR></TBODY></TABLE></CENTER>
<BR><BR>Cells in this
table have been randomly adjusted to avoid the release of confidential data.
<BR><FONT size=2><BR>(a) Overseas visitors are included in these categories. All
other categories exclude overseas visitors. <BR>(b) Applicable to persons who
are of both Aboriginal and Torres Strait Islander origin. <BR>(c) Comprises
England, Scotland, Wales, Northern Ireland, Channel Islands, Isle of Man, and
United Kingdom and Ireland n.f.d. <BR>(d) Includes 'inadequately described', 'at
sea', and 'not elsewhere classified'. <BR>(e) Includes 'non-verbal so described'
and 'inadequately described'.<BR></FONT><BR><BR><BR><FONT size=2></FONT><BR>
<CENTER>
<H2>B32 Selected Medians<BR><BR>Central Highlands (SD) </H2>
<p><a href="CentralHighlads01.xls">Click here for an MS Excel
spreadsheet of this table</a>
 </p></CENTER>
<CENTER>
<TABLE cellPadding=2 border=1 summary="A Table with 2 columns showing statistical data for the Central
Highlands.
                                                                Column one is a list of subjects,
                                                                Column two is the numerical data.">
 <TBODY>
 <TR>
  <TH SCOPE="row" noWrap align=left abbr="M age">Median age </TH>
  <TD align=right>33</TD></TR>
 <TR>
  <TH SCOPE="row" abbr="M individ income" noWrap align=left>Median individual income </TH>
  <TD align=right>240</TD></TR>
 <TR>
  <TH SCOPE="row" abbr="M household income" noWrap align=left>Median household income </TH>
  <TD align=right>516</TD></TR>
 <TR>
  <TH SCOPE="row" noWrap align=left >Average household size </TH>
  <TD align=right>2.6</TD></TR></TBODY></TABLE></CENTER>
<p>Note: Income
figures are weekly income, expressed in $AUS.</p>
<DIV align=center>
<HR>
<BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
```

```
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="50%"><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
    <TD width="50%">
      <DIV align=right><A
      href="..\PleaseGoBack.htm"><B><FONT
      face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

Set 3, Page 5

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from
url=(0084)http://www.abs.gov.au/websitedbs/d3310108.nsf/ASGC/D41DCF95700E5A4BCA256537001CBC
09/ -->
<HTML><HEAD><TITLE>1996 Census Central Highlands (Statistical Division)</TITLE>
<style type="text/css" media="screen">
        a:hover         { background-color: yellow; }
    </style>
<META http-equiv=Content-Type content="text/html; charset=iso-8859-1"><!-- Lotus-Domino (Release
5.0.2a (Intl) - 23 November 1999 on Windows NT/Intel) --><LINK
href="http://www.naa.gov.au/recordkeeping/gov_online/agls/1.1" rel=schema.AGLS>
<META content="corporateName:Australian Bureau of Statistics" name=DC.Creator>
<META content="corporateName:Australian Bureau of Statistics" name=DC.Publisher>
<META
content="Australian Bureau of Statistics is Australia's official statistical organisation. The ABS assists and
encourages informed decision-making, research and discussion within governments and the community, by
providing a high quality, objective and responsive national statistical service"
name=AGLS.Function>
<META
content="corporate name:Australian Bureau of Statistics; address:PO Box 10 Belconnen ACT 2616;
contact:National Information Service; email:client.services@abs.gov.au; telephone: 1300 135 070"
name=AGLS.Availability>
<META
content="Basic Community Profile for Central Highlands (Statistical Division) "
name=DC.Title>
<META content="Census statistical products and services" name=DC.Subject
SCHEME="ABS Classifications">
<META content=1997-10-21 name=DC.Date.created SCHEME="ISO8601">
<META lang=en content="© Commonwealth of Australia, 1997" name=DC.Rights>
<META content="Microsoft FrontPage 4.0" name=GENERATOR></HEAD>
<BODY text=#000000 bgColor=#ffffff>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
  <TBODY>
  <TR vAlign=top>
    <TD width="19%" bgColor=#008000 rowSpan=2>
      <DIV align=center>
      <P><IMG height=92 alt="Australian Bureau of Statistics Logo"
      src="1996 Census Central Highlands (Statistical Division)_files/0.gif"
      width=124></P></DIV></TD>
    <TD width="71%" bgColor=#ffff00><FONT face=Arial color=#ffff00>Australian
      Bureau of Statistics</FONT></TD>
    <TD width="10%" bgColor=#ffff00><IMG height=1 alt=""
      src="1996 Census Central Highlands (Statistical Division)_files/ecblank.gif"
      width=1 border=0></TD></TR>
  <TR vAlign=top>
    <TD width="81%" colSpan=2><B><FONT face=Arial size=4>1996 Census of
      Population and Housing</FONT></B><BR><B><FONT face=Arial size=4>Central
      Highlands (Statistical Division)</FONT></B><FONT face=Arial>
      </FONT><B><FONT face=Arial size=4>- Victoria</FONT></B><BR><FONT
      face=Arial size=2>
      <HR noShade>
      </FONT></TD></TR></TBODY></TABLE><BR><BR>
<CENTER>
<H1>B01 Selected Characteristics <BR><BR>Central Highlands (SD) </H1>
<p><a href="CentralHighlads01.xls">Click here for an MS Excel spreadsheet of
```

```
this table</a> </p>
<TABLE cellPadding=2 border=1 summary = "A Table with 4 columns showing statistical data for the
Central Highlands.
                                                        Column one is Categories,
                                                        Column two is Male,
                                                        Column three is Female,
                                                        Column four is Persons.
                                                    Each row represents a different category such as
Employed and Unemployed citizens.">
 <TBODY>
 <TR>
  <TH SCOPE="col" abbr="C">Categories</TH>
  <TH SCOPE="col" style="background-color: #FFFF99" abbr="M"><font color="#000000">Male</font>
</TH>
  <TH SCOPE="col" abbr="F">Female </TH>
  <TH SCOPE="col" abbr="P" style="background-color: #FFFF99">Persons </TH></TR>
 <TR>
  <TH noWrap align=left>Total persons (a)<BR></TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">63,421</font></TD>
  <TD align=right>66,135</TD>
  <TD align=right bgcolor="#FFFF99">129,556</TD></TR>
 <TR>
  <TH noWrap align=left>Aged 15 years and over (a)<BR></TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">47,971</font></TD>
  <TD align=right>51,505</TD>
  <TD align=right bgcolor="#FFFF99">99,476</TD></TR>
 <TR>
  <TH noWrap align=left>Aboriginal </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">372</font></TD>
  <TD align=right>350</TD>
  <TD align=right bgcolor="#FFFF99">722</TD></TR>
 <TR>
  <TH noWrap align=left>Torres Strait Islander </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">61</font></TD>
  <TD align=right>48</TD>
  <TD align=right bgcolor="#FFFF99">109</TD></TR>
 <TR>
  <TH noWrap align=left>Both Aboriginal and Torres Strait Islander (b) </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">8</font></TD>
  <TD align=right>14</TD>
  <TD align=right bgcolor="#FFFF99">22</TD></TR>
 <TR>
  <TH noWrap align=left>Australian born </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">55,726</font></TD>
  <TD align=right>58,134</TD>
  <TD align=right bgcolor="#FFFF99">113,860</TD></TR>
 <TR>
  <TH noWrap align=left>Born overseas: Canada, Ireland, NZ, South Africa, UK
   (c) and USA </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">2,973</font></TD>
  <TD align=right>3,188</TD>
  <TD align=right bgcolor="#FFFF99">6,161</TD></TR>
 <TR>
  <TH noWrap align=left>Born overseas: Other country (d) </TH>
  <TD align=right bgcolor="#FFFF99"><font color="#000000">2,659</font></TD>
  <TD align=right>2,526</TD>
  <TD align=right bgcolor="#FFFF99">5,185</TD></TR>
```

```
<TR>
 <TH noWrap align=left>Born overseas: Total </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">5,632</font></TD>
 <TD align=right>5,714</TD>
 <TD align=right bgcolor="#FFFF99">11,346</TD></TR>
<TR>
 <TH noWrap align=left>Speaks English only and aged 5 years and over </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">54,581</font></TD>
 <TD align=right>57,349</TD>
 <TD align=right bgcolor="#FFFF99">111,930</TD></TR>
<TR>
 <TH noWrap align=left>Speaks language other than English (e) and aged 5
  years and over </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">1,863</font></TD>
 <TD align=right>1,929</TD>
 <TD align=right bgcolor="#FFFF99">3,792</TD></TR>
<TR>
 <TH noWrap align=left>Australian citizen<BR></TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">59,593</font></TD>
 <TD align=right>62,147</TD>
 <TD align=right bgcolor="#FFFF99">121,740</TD></TR>
<TR>
 <TH noWrap align=left>Australian citizens aged 18 years and over<BR></TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">41,838</font></TD>
 <TD align=right>45,301</TD>
 <TD align=right bgcolor="#FFFF99">87,139</TD></TR>
<TR>
 <TH noWrap align=left>Unemployed </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">4,035</font></TD>
 <TD align=right>2,437</TD>
 <TD align=right bgcolor="#FFFF99">6,472</TD></TR>
<TR>
 <TH noWrap align=left>Employed </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">27,874</font></TD>
 <TD align=right>21,725</TD>
 <TD align=right bgcolor="#FFFF99">49,599</TD></TR>
<TR>
 <TH noWrap align=left>In the labour force </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">31,909</font></TD>
 <TD align=right>24,162</TD>
 <TD align=right bgcolor="#FFFF99">56,071</TD></TR>
<TR>
 <TH noWrap align=left>Not in the labour force </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">14,739</font></TD>
 <TD align=right>26,260</TD>
 <TD align=right bgcolor="#FFFF99">40,999</TD></TR>
<TR>
 <TH noWrap align=left>Enumerated in private dwelling (a) </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">61,075</font></TD>
 <TD align=right>63,745</TD>
 <TD align=right bgcolor="#FFFF99">124,820</TD></TR>
<TR>
 <TH noWrap align=left>Enumerated in non-private dwelling (a) </TH>
 <TD align=right bgcolor="#FFFF99"><font color="#000000">2,346</font></TD>
 <TD align=right>2,390</TD>
 <TD align=right bgcolor="#FFFF99">4,736</TD></TR>
<TR>
```

```html
   <TH noWrap align=left>Persons enumerated same address 5 years ago </TH>
   <TD align=right bgcolor="#FFFF99"><font color="#000000">33,197</font></TD>
   <TD align=right>34,756</TD>
   <TD align=right bgcolor="#FFFF99">67,953</TD></TR>
  <TR>
   <TH noWrap align=left>Persons enumerated different address 5 years ago </TH>
   <TD align=right bgcolor="#FFFF99"><font color="#000000">23,036</font></TD>
   <TD align=right>24,518</TD>
   <TD align=right bgcolor="#FFFF99">47,554</TD></TR>
  <TR>
   <TH noWrap align=left>Overseas visitor<BR></TH>
   <TD align=right bgcolor="#FFFF99"><font color="#000000">102</font></TD>
   <TD align=right>146</TD>
   <TD align=right bgcolor="#FFFF99">248</TD></TR></TBODY></TABLE></CENTER>
<BR><BR>Cells in this
table have been randomly adjusted to avoid the release of confidential data.
<BR><FONT size=2><BR>(a) Overseas visitors are included in these categories. All
other categories exclude overseas visitors. <BR>(b) Applicable to persons who
are of both Aboriginal and Torres Strait Islander origin. <BR>(c) Comprises
England, Scotland, Wales, Northern Ireland, Channel Islands, Isle of Man, and
United Kingdom and Ireland n.f.d. <BR>(d) Includes 'inadequately described', 'at
sea', and 'not elsewhere classified'. <BR>(e) Includes 'non-verbal so described'
and 'inadequately described'.<BR></FONT><BR><BR><BR><FONT size=2></FONT><BR>
<CENTER>
<H2>B32 Selected Medians<BR><BR>Central Highlands (SD) </H2>
<p><a href="CentralHighlads01.xls">Click here for an MS Excel
spreadsheet of this table</a>
 </p></CENTER>
<CENTER>
<TABLE cellPadding=2 border=1 summary="A Table with 2 columns showing statistical data for the Central
Highlands.
                                                    Column one is a list of subjects,
                                                    Column two is the numerical data.">
  <TBODY>
  <TR>
   <TH SCOPE="row" noWrap align=left abbr="M age">Median age </TH>
   <TD align=right>33</TD></TR>
  <TR>
   <TH SCOPE="row" abbr="M individ income" noWrap align=left>Median individual income </TH>
   <TD align=right>240</TD></TR>
  <TR>
   <TH SCOPE="row" abbr="M household income" noWrap align=left>Median household income </TH>
   <TD align=right>516</TD></TR>
  <TR>
   <TH SCOPE="row" noWrap align=left >Average household size </TH>
   <TD align=right>2.6</TD></TR></TBODY></TABLE></CENTER>
<p>Note: Income
figures are weekly income, expressed in $AUS.</p>
<DIV align=center>
<HR>
<BR><FONT face=Arial size=2>This document was last updated on
</FONT><FONT face=Arial size=2>18/03/2000</FONT><BR><FONT face=Arial size=2>|
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Home</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Statistics</FONT></A><FONT face=Arial size=2> | </FONT><A
```

```
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>News</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Products &amp; Services</FONT></A><FONT face=Arial size=2> |
</FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>About the ABS</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Themes</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Census</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Recruitment</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Site Map</FONT></A><FONT face=Arial size=2> | </FONT><A
href="..\PleaseGoBack.htm"><FONT
face=Arial size=2>Using this Site</FONT></A><FONT face=Arial size=2>
|</FONT></DIV>
<TABLE cellSpacing=0 cellPadding=0 width="100%" border=0>
 <TBODY>
 <TR vAlign=top>
  <TD width="50%"><A
   href="..\PleaseGoBack.htm"><B><FONT
   face=Arial>Copyright © Commonwealth of Australia, 2000</FONT></B></A></TD>
  <TD width="50%">
   <DIV align=right><A
   href="..\PleaseGoBack.htm"><B><FONT
   face=Arial>ABS Website Privacy
Statement</FONT></B></A></DIV></TD></TR></TBODY></TABLE></BODY></HTML>
```

All Sets, PleaseGoBack.HTM

<HTML>
<HEAD>
<TITLE>Wrong Page, please go back.</TITLE>
</HEAD>
<BODY>

<P>You have gone to the wrong page, please use the Back button on your browser.</P>

</BODY>
</HTML>

Authorship Page

The following list contains information regarding the authorship of the major sections of the Team 1 project proposal. The flowing tasks were completed while at WPI during the completion of the PQP class.

Introduction...Melissa

Abstract...Melissa

Executive Summary...Melissa & Bill

Background

The Problem...Melissa
Attitudes About Visual Impairment...Melissa
Tools Commonly Used in the Classroom...Melissa
The Blind Student in the Regular Classroom...Melissa
Current Tool for Visually Impaired Users...Jim
Current Hardware...Jim
Current Software...Jim
Accessibility and the Internet...Bill
Web Accessibility Standards...Bill
Implementation Techniques and Examples...Jim
Evaluation and Repair Utilities...Bill
Applications to Web- Based Education...Melissa

Methodology

Methods...Bill
Instruments...Bill
Coverage...Jim
Analysis...Jim
Presentation...Jim

Development of Materials

Overview- Test Web Content Rationale...Bill
Layout- Test Web Content Rationale...Bill
1996 Australian Census Web Content - Theme 1...Bill
Statistics A Powerful Edge Web Content Layout – Theme 2...Bill
Accessibility Violations - Test Web Content Rationale...Bill
1996 Australian Census Web Content – Pages 1-3...Bill
1996 Australian Census Web Content – Page 4...Bill
Statistics, A Powerful Edge – Page 1...Bill
Graph and Tables Handbook...Melissa
Employee Usability Test...Jim

Results

Student Usability Test Results...Jim, Mellisa, Bill

Overview..Bill
Time Ranges...Bill
Time Medians..Bill
Time Averages..Bill
Activity Scores...Bill
Inaccessible questions...Bill
Normalised time differences...Bill
Employee Usability Test Results..Jim

Analysis

Student Usability Test Analysis..Jim
Analysis techniques used...Jim
Response times..Jim
Activity Results: ....Jim
Numerical Analysis: Low Vision Students..................................Jim
Response Times..Jim
Questions Results...Jim
Numerical Analysis: Blind Students..Jim
Response times..Jim
Activity results...Jim
Numerical Analysis: Low Vision and Blind Summary.......................Jim
Group Interview Content Analysis..Melissa
Introduction to Categories...Melissa
Table of Major Themes..Melissa
Difficulties..Melissa
Suggestions..Melissa
Compliments...Melissa
Content Changes...Melissa
Features Overlooked..Melissa

Conclusions

Student Usability Test Summary...Jim
Difficulties...Jim
Low Vision Results..Jim
Blind Results..Jim
Employee Usability Test...Jim
Main Problems...Jim
Additional suggestions..Jim
ABS Web Content Guideline Addendums......................................Jim
Lotus Notes Accessibility Tutorial..Jim
Graph and Tables Handbook Conclusions................................Melissa
Justification of Development..Melissa
Benefits of the Graph and Tables Handbook..............................Melissa

Glossary...Bill (majority), Melissa, Jim

References...Bill, Melissa, Jim

Appendices

A Smithsonian Guidelines....Jim
A-CAST Transcript....Bill
A-Larry Raymond....Jim
A-Mike Gorse....Jim & Melissa
A-Connie Raymond....Jim
A-Sharon Latka Davis....Melissa
A-TestWebContent-HtmlViewv1.0....Bill
A-TestWebContent-WebViewv1.0....Bill
A-AddendumsAndTutorialv1.0....Jim
A-GraphAndTablesHandbookv1.0....Melissa
A-UsabilityTestsv1.0....Bill, Jim& Melissa
A-FocusGroupTranscriptsv1.0....Melissa