

Electronically Aiding Students' Learning

An Interactive Qualifying Project Report:

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Abstract:

The Assistments System was designed by Professor Neil Heffernan to help students learn. We have been enhancing the Assistments system to explore the benefits of scaffolding questions, worked examples, and explanations of individual knowledge components as a means to the main goal. Hopefully, the work we have done these past few terms will translate to more informed middle school students in the subject area of math.

Introduction:

The Massachusetts Comprehensive Assessment System, or MCAS, must be passed by all public high school students in 10th grade in order to graduate. The questions are written by a board of teachers to best represent of the curriculum frameworks designed by the Massachusetts Department of Education. This recently added requirement test students in mathematics, English language arts, science and technology, history, and social sciences. The tests are an array of multiple-choice, short-answer, and open-response questions along with essay sections in the English and language arts portion. Because of the growing concern of students not passing, Professor Neil Heffernan of Worcester Polytechnic Institute has developed a web-based tutoring program for mathematics called Assisments.

Assisments tested two different types of learning methods, hints and scaffolding. A scaffolding problem breaks a problem into smaller, more basic questions or sub-problems that break down the original problem. Each of those basic questions has its own hints guiding them in the correct direction. Hints simply gave hints a sequential order if the student requested them, eventually leading them to the final answer. The sub-problems were designed to be easy to understand for a student, using bright colors to highlight and emphasize areas of importance. Assisments enables each student to essentially receive their own tutor, because the system walks the student through each problem. It also allows the student to work at their own pace without the pressure of

other peers or being put on the spot by the teacher. Assistsments are currently in circulation around Worcester. A key component which is currently of great assistance to the teachers is the knowledge component.

A knowledge component is a way to tag a problem based on the type of math required to solve the problem, for example, geometry, addition, etc. These were written by our group and can accessed through a wikipage. Eventually, there will be a link from the assistsments page to the wikipage to assist the student in that area of concern with a general definition, how it's used, and an example. There are currently 106 knowledge components. Assigning each problem the proper knowledge component is extremely valuable for the teacher, which in turn benefits the student. At any time, the knowledge components aide teachers by allowing them to easily asses what areas need work for individual students or as a whole class. This will help teachers manage their class time and use it more efficiently, directly assessing students needs.

The purpose of this project was to first write hints or scaffolding problems from previous MCAS tests or investigation activities for the 8th grade. After which, all the knowledge components were written by our team on the wikipage.

Previous System

Currently, Assissments is in its second generation. The first generation was quite successful, but did have many bugs and problems, which were constantly being updated. The questions provided by the assistment system were recreated from previous MCAS tests. For the first system, knowledge components were not implemented to the extent of they are now. As questions were designed, the builder tagged what type of knowledge component applied, but most went untagged until after the first system was out of use. Two different types of questions were designed, scaffolding questions and hint questions. The original assistment system was not user friendly compared to the new system. The save time when writing problems took at times up to five minutes, which turned into a large amount wasted time. The MCAS question was written in the main question with an option to upload a picture. The answer section required a response type, for example multiple choice.

One downside to the 1st generation system was that each time any part of the problem was changed, the problem needed to be saved, which equated in too much time spent on save time. The save time problem was later fixed with an autosave feature which was added to the next system.

The first system was designed to determine the effectiveness of the two different type of learning strategies, hints or scaffolding. The data from the answered questions was compiled into an excel file and a method was developed to determine whether learning had occurred. This turned out to be a very tough task because it was tough to determine if the students had actually learned from the help provided. Although

knowledge components were applied to this system, they were not of great importance at the time and most questions went without being tagged to the detail that was required. Although the use of knowledge components was not prominent in the first system, the usefulness was discovered and in the later system applied much more vigorously.

Currently, the knowledge components are separated into 106 different categories based on the type of math required to solve the problem. They are organized by the different categories with the percentage of students who answered each question correctly with the question also available for viewing. The teacher can also browse by class period or student. Having all problems tagged with knowledge components to the new assistance system allows the teacher to easily identify which area the students need help in individually or as a class. The knowledge components also aid the teacher because it allows them to understand what areas they might have trouble teaching in which can allow them to improve their curriculum for the following year.

Hints:

Within the Assistent, there is a feature called hints. Once enabled, the Assistent writer is allowed to give little clues on what they question is asking. They unfold one after another until the last hint, which we usually put as the answer to the question asked.

They are pretty simple to create. A feature in the Assistent builder lets you select whether you want hints in the problem on which you are working. Once the hints are enacted, it is as simple as writing in the box, and saving. In the early system, hints were rudimentary; they gave you no special features like text fonts or colors. One would have to use html coding to implement any fancy writing.

With the new Assistent system, this was changed, to better facilitate the writers of the Assistments. All the text features one could ask for were given on a toolbar above the hint writing space. These features ranged from text font changes, to text color, and, of course, Bold, Italic, and Underline buttons. A table feature was also added, and with it, the ability to line up text, for keeping an equation looking neat or keeping values in place. The biggest addition, however, was the image uploader. It was unthinkable up until now to put an image in a hint; with the new feature, this dream became reality. Hints became much more stylish. We could now indicate things we would want the student to see in color or Bold. We could link those colors to pictures, graphs, tables, anything our imaginations could fathom. The addition of pictures, colors to the text, and all these special features did nothing but add to the feature of the hint.

Hints were extremely useful in the old Assistment system; they were the only way to give help. As the student would do the problem, if they got the question wrong, or didn't want to give an answer, for fear of getting it wrong, they would click "Request Help". This would then bring the hint up in a yellow box, with a suggestion on a way of completing the problem. Hints, however, didn't see their real glory until scaffolding questions were enacted by the Assistment system. As before, you would click on the "Request Help" button, and look at the hints to the problem. However, in the scaffolding questions, hints became a sort of special way of breaking down the problem, simply and elegantly. With each successive scaffold or worked example, the hints within them provided a step by step track, a roadmap, to solving the question. This system is a great way to convey how one can do the problem given, and though it is still utilized, its essence paved the way for the ultimate hint system: The Assistment Knowledge Components.

Scaffolding Questions:

What they are:

Scaffolding breaks down a problem into its component questions. If the problem involves knowing the Order of Operations, a Scaffolding question would first ask the student to come up with what that order would be. From there, it would ask the student knowing that, which part of the problem they should answer first.

Scaffolding questions enable an electronic version of the Socratic method of teaching. In person, the Socratic Method forces a teacher to ask questions rather than giving answers. In *The Socratic Method: Teaching by Asking instead of by Telling* Rick Garlikov describes “the Socratic method in what [he] consider[s] its purest form,” to be “where questions (and only questions) are used to arouse curiosity and at the same time serve as a logical, incremental, step-wise guide that enables students to figure out about a complex topic or issue with their own thinking and insights.” (Garlikov) Scaffolding questions do just that, asking logical, incremental questions that enable students to figure out the more complex original problem.

Students are walked through the problem, answering easier questions. This allows them to see that they've understood the information since the beginning, and teaches them what they didn't already know. Scaffolding questions force students to become involved in the information that they are learning, and

understand how individual pieces fit together, following the same philosophy of Socratic education.

How they relate to Hints:

Oftentimes, the students just can't come up with the proper answers in a timely enough fashion to move the lesson along. This frustrates the students instead of exciting their curiosity and interest. At this point, a live teacher would use verbal hints to give their students more direction. Eventually, the answer would have to come from the teacher if it cannot come from the students. In a similar manner, Assistments does not force a student into endlessly answering a scaffolding question that seems impossible to the student. Assistments also provides the students with hints for each individual scaffolding question; the last of which spells the answer out for the student so that the student can move on to the next question. This mixes all the benefits of hints with the benefits of scaffolding questions. Implementing scaffolding questions compounds the benefits of hints.

Scaffolding questions do have definite advantages over hints alone, however, as proven by a study done by Leena Razzaq using the Assistments program. She discovered that students' performance improved using scaffolding questions a significant amount more than using hints alone. This corresponded to her findings through survey that students who approached questions by trying to

get them done as quickly as possible did not do well. Scaffolding questions force the student to slow down and pay attention to what they are learning. Enforcing a slower learning process rather than a “get this done as quick as I can” process benefits the students.

Scaffolding questions force more investment than hints on the part of the student. A student can click hints, barely read them and find the answer to a question. Scaffolding questions, on the other hand, require the student to interact with what they’re learning while they’re learning it. The famous Chinese proverb applies here: “I hear and I forget. I see and I remember. I do and I understand.” At their bare minimum, hints only cover the “I hear” part. They tell the students something that will hopefully lead to them getting the answer. Oftentimes, we try to put pictures in our hints, illustrating how something works. This covers the “I see and I remember.” Scaffolding questions, on the other hand, have the students “do” something. They answer questions for themselves. Scaffolding questions help the students reach the “I do and I understand” part of the proverb, implementing centuries-old wisdom with technology.

Scaffolding Questions Benefit to teachers:

With computing comes the ability to keep track of more data. Assistments takes full advantage of database technology to keep track of several minute details that teachers can look at to better understand where their students are having

trouble. Using the Assistments program enables teachers to see at a glance which problems individual students got wrong as well as which broader learning areas the greatest percentage of students in a class had trouble with. It also displays how many hints it took in each scaffolding question for a student to discover the answer. This data can be essential for teachers who want to figure out which topics they need to cover in more depth.

Because scaffolding questions are pieces of the original question, looking at how many hints it took students to figure out individual scaffolding questions pinpoints exactly where in the problem students are having trouble. On a problem about Order of operations, for example, the first scaffolding question usually asks “What is the order of operations.” If students seem to get this question right, but then struggle when implementing it, the teacher can focus on working out examples on the board, and reviewing arithmetic. If the students are having trouble with this first scaffolding question, however, the teacher knows that he or she should go back to covering exactly what the order is. This allows more effective use of class time. The teacher does not need to spend class time going over each individual piece of a problem in depth, he or she can spend depth time only on the precise location the student needs it. Scaffolding questions, combined with Assistments power to collect, store, and sort information can be a powerful tool for teachers when planning how to use class time.

Scaffolding Questions Benefit to students:

Oftentimes, a student understands the components of the problem, but is confused when seeing everything at once. Breaking the question down builds confidence, as the students see the pieces of the question that they understand.

Scaffolding questions are also an effective review mechanism. If a student has fallen behind in a particular area, that student can use the scaffolding questions as an in depth review of the topic. The VARK Learning style model created by Fleming explores the fact that different students have different learning styles. The Kinesthetic learning style would benefit from Scaffolding questions especially. Fleming's description of this learning style's intake strategy is "The ideas on this page are only valuable if they sound practical, real, and relevant to you." (Fleming) These students get the least benefit from a traditional read and lecture style, and so need the most attention they can get inside their learning style. It would also seem that a computer program built around asking questions and getting answers from reading material would similarly turn off these students, but scaffolding questions assure that this is not the case. Scaffolding questions put the material its teaching into a relevant context. The student has been asked to answer a question that he or she was unable to understand. The scaffolding questions relate directly back to that question. Kinesthetic learners who need to connect utility with what they're learning will pay more attention, and thus learn more. Visual learners can still benefit from the pictures and pointed colors in our

scaffolding questions. Read/Write learners are reading the scaffolding questions, and their own answers, thus also benefiting from scaffolding questions. While aural learners do not benefit from the silent Assistments program, they are the most likely to have understood directly from the lectures themselves, and thus will probably bypass these scaffolding questions to begin with. Scaffolding questions appeal to almost all learning styles, making them an effective review tool.

Our implementation:

Developing scaffolding questions is an art. As a general rule, we decided each problem should be associated with three scaffolding questions. This allows the student to move through the problems at a reasonable pace, while still looking into depth at each problem.

We did not always follow this rule, however. Sometimes we would come across a question that would bring up an important point in the scaffolding questions themselves. One example of this was a problem where the student using the program was given a fraction of problems correct for each of the problem's students. Each of these fractions should have been easily converted into recognizable percents for the student ($\frac{3}{4}$ by sixth grade should be trivial to convert to 75%). If they had gotten the problem wrong, it might have been because the fraction to percent conversion had not been recognizable. To reinforce these conversions each fraction was given its own scaffolding question.

Had the equivalence been as obvious to the student as it should have been, these would be quick questions that would not eat into the students' time much. If the conversions weren't quick, it was worth the student's time to learn them. Only after these questions was the comparison mentioned. The goal of these scaffolding questions became not only to help the student answer the original problem, but to fix a gap in their knowledge, making it worth the students time to answer more than 3 scaffolding questions.

On the other hand, we would occasionally run into a problem where while the idea behind the original problem was important, less than three scaffolding questions would more than cover the topic. One example includes a problem asking how a made-up student could check her answer to a subtraction problem. The answer the MCAS had been looking for was to check your answer against the reverse operation, using fact families. This is a useful thing for a student to know; even the brightest students make mistakes, and knowing the tricks to catch them could change a student's grade or MCAS score. To slowly egg the answer out of a student in three scaffolding questions, however, would drag the student's time out unnecessarily. We would prefer them spend time on the question described in the previous paragraph. Because of this, we gave the students only one scaffolding question to answer- a similar question using easier numbers where the relations between numbers became more obvious. Three scaffolding questions per problem made for a nice rule, but only when it didn't interfere with assuring the students' spent their time productively.

We have a similar rule for hints per scaffolding question. Our hints start out broad and move until we actually give the students the answer. This circumvents the problem of students getting stuck on one portion, while not immediately giving them an answer when all they want is a hint. See the discussion under scaffolding questions: connection to hints.

The very last scaffolding question in every group restates the initial problem. The hints on this scaffolding question often referred back to the connection between the scaffolding questions they had already been answering to this question, further cementing the ideas into the student's head. This rounds out the scaffolding questions, reminding the students why they had learned the previous material. The scaffolding questions should have hit upon the trouble the student had with the initial problem. Reiterating that problem gives the student a second chance at it, understanding more of the information. Discovering that they now understand the question builds the students' confidence in their newly found knowledge.

To encourage this confidence, we try not to answer the entire question for the student in the scaffolding questions. A question on order of operations, for example, might ask what the order of operations are, and follow it up with a question asking about the first step of the initial problem. We would not, however, continue in that vein until the problem is completely solved. This allows students to continue applying their knowledge to actually solving the problems for

themselves. This builds confidence. It also assures that the student is not merely copying what we've given them but applying it.

Hints for development:

In order for the scaffolding questions to work, they need to keep the students attention. The explanations in the hints must be short and understandable enough that even students whose first language isn't English can follow it. Using colors for certain ideas aid in the ease of following explanations. Pictures illustrate an idea, rather than writing it out in a complicated manner. Keeping individual lines short keeps the students' eyes moving across the page, soaking in the details of individual lines rather than the entire page. We make sure the style of each individual assistment eases the students learning ability, rather than frustrating them.

How the Builder Works:

A teacher who wants to build an assistment logs on to Assistments, and clicks build. They then click "Create new Assistment". From there, they write the original problem and save it. If they want hints and only hints, they enable hints. If they want scaffolding, they enable scaffolding. Only one or the other will work for each individual question. They can then click the type of problem: fill in, algebra (where $\frac{3}{4}$ is the same as 0.75), or multiple choice. After this, they enter in the proper answer, and mark it as correct. Any incorrect answers they plug in can

have “buggy messages” explaining what went wrong. For this first question, however, buggy messages are not necessary, as getting the question wrong will automatically enter the scaffolding questions if scaffolding is enabled. Each of these scaffolding questions work exactly like the original question. One can also click a trash can to delete the section they are looking at.

Suggestions for improvement:

assistment developers:

For now, the people writing “assistments” for the program attend WPI and are receiving IQP credit for doing so. We have the professor who started the program and the Research Assistants and MQP students working on the software available to us to explain things, fix bugs, and aid in writing of individual problems. As the program gets less and less buggy, however, we hope to allow teachers to build their own assistments. Students are getting credit for time spent working on assistments, teachers have responsibilities to run class and grade papers and don’t have the time that students do. More teachers will be convinced to use the Assistments program the easier and faster developing problems can be. Developing for the program for the past few months have led to insights to what might make this easier for teachers.

Several questions a teacher might want to add to Assistments would be similar to each other with different numbers. These questions are called “morphs” of each other. Currently, a teacher’s best option is continual copy and pasting of

each individual scaffolding question for each problem. A form that allowed the teacher to fill out the entire problem including each scaffolding question and hints in one sweep of copy and paste would speed up this process immensely. A form that gives the teacher the option to completely copy an entire assistment with certain words or numbers replaced with words and numbers specified in a particular form would also make the teachers life easier.

When first getting used to the Assistments program, deleting more than was meant to be deleted can be easy to do, for example entire problem when all that needed to be deleted was one particular scaffolding question. People think they know what they are deleting when they hit delete. A dialog box asking “Are you sure you want to permanently delete this item” would not save people from entirely deleting a half an hours worth of work they want to keep. Having that message say exactly what you are deleting – “Are you sure you want to delete scaffolding question one or scaffolding question beginning with the first line of that scaffolding question” vs. “Are you sure you want to delete this assistment” would have be more useful messages.

This problem would not have been so vital if retrieval of deleted items was at all possible. The space this would take up on the server would be worth it. Space could be conserved if Assistments servers only saved the last delete for every user. This deletes the purposeful deletes from the server-if the teacher has moved on to a new question, he/she probably is no longer interested in than replaces it with what might have been an accidental delete.

Students using Assistments

Picture a sunny day, the first time the rain has stopped all week, and a swing set begging to be played upon. Students do not, as a general rule, want to be answering that beg, not working on math problems. The longer students have to be working on something, the less attention they will want to pay to it.

Scaffolding questions take time to complete. If used to gain understanding, this is still time well spent. If the student has accidentally typed the wrong answer, however, this is not time well spent. If the student realizes their mistake on the first scaffolding question, the other two questions are not time well spent.

Continually finding themselves caught answering questions that they actually understood, and knew that they understood will frustrate students, putting them into the mindset of “just get this done as quickly as possible” which we already know detracts their learning rather than the mindset of understanding. If students could return to the original question at any point during the scaffolding question process, it would eliminate time wasting questions so that the student could concentrate on the questions he or she actually has problems with.

Worked Examples:

What they are:

In a worked example, the student first sees a similar question to the one they are currently working on. They then get to see how this problem can be solved. The idea is, they will be able to understand why this method worked and how it did what it did, then be able to translate this to the problem they are working on directly.

Worked examples are based on the “cognitive load theory” suggested by J Sweller. Short term memory can only hold so much information at once. Long term memory puts together “schemas” that make one element out of several, connecting ideas, and thus can hold more. Cognitive overload occurs when too many individual things attempt to enter the short term memory at once. J. Sweller suggests that learning occurs by building schemas as early as possible, so that many concepts can be taken into the short term memory as one concept.

I used this method extensively in person when teaching middle school students robotics. Programming a their LEGO Mindstorm robots to follow a black line required a different way of thinking. As an “expert” programmer, relative to these students at least, I already had several schemas around if statements, while statements, and the usage of sensors by the time I learned the trick. As “novice” programmers, they were still developing these basic schemas. To aid them in the connection, I walked them through each step of the program, doing it myself. I

then deleted this program, and allowed the student to do it on his/her own.

Teaching them the whole thing, then having them teach it back to me, turned the multiple concepts they needed to know in order to implement the line following program into one basic schema, speeding up the learning process for these students.

Worked examples in Assistments bring this idea to a virtual environment. They keep all the information a student needs in one spot, explaining concepts in one problem that allows the students to focus their energies on the learning aspects – structures and applications of rules – rather than on individual questions.

How they relate to Scaffolding questions:

Scaffolding questions focused on making the problem easier for the student by breaking it down. Worked examples make the problem easier by creating a schema for it, connecting the individual broken down pieces. Scaffolding questions built the student's confidence by showing them that they understood the material. Worked examples build confidence by trusting the student to make his/her own connections. Currently, other IQP teams are looking to see whether scaffolding questions or worked examples work better for the students. The results will be used to better aid students in learning.

The information displayed in multiple scaffolding questions are compiled to one spot in a worked example. For a developer, that is the main difference. It

is thus very easy to create a worked example problem from a previously written scaffolding question if one would so desire.

Benefit to Students:

Worked examples engage students in learning by forcing them to take an active approach to making connections. Rather than forcing the student to answer several questions in pieces, worked examples give students the opportunity to understand the applications of the rules. Learning these applications brings the information into long term memory quicker, speeding up the learning process.

Our Implementation:

Worked examples work very similarly to scaffolding questions as far as the Assistments program is concerned. If a student gets a problem wrong, or requests help, we bring up a worked example. The student must click a button saying that they have read and understood the problem before they go on to retry the problem.

When creating these worked examples, we again paid close attention to formatting so that the student was not overwhelmed with black, wordy information. We made sure to continue our use of colors and pictures and carriage returns, as this was even more important when all the information was presented at once than it previously had been.

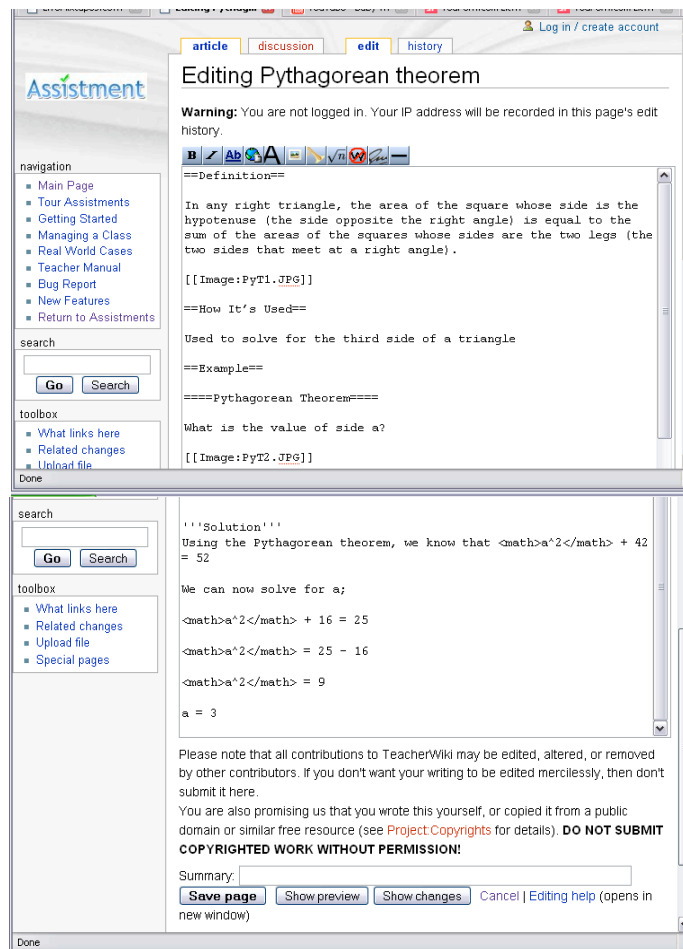
Suggestions for improvement

As with any method of teaching, sometimes even the best worked examples were not all that a student needed. They might not have seen the connection between the worked example and their own problem, to unable to build a schema for themselves. scaffolding questions, we gave the students hints on top of the questions, even for the very last question, if they needed to be pushed along a little further. Our model for worked examples at the current moment, however, does not allow for that little extra push. I think we should include hints for the final question of a worked example the same way we include them for our scaffolding questions. This would cement the ideas we hoped to implement into all students' heads, including those for whom the connection between the rules in the worked example and the rules in the actual question was not as obvious.

Knowledge Components:

The knowledge component system is the final realization of teaching students within the Assistentment pages. Using the wiki format, which was first designed by Google, a website document writing style comparable to a cross between Microsoft word and html, we created tutorials of each component, which would be accessible through a link on relevant Assistentment pages. These components use data collected from classes using the old and new Assistentment system, which were compartmentalized into approximately 90 topics, called Knowledge Components.

It was our task to then take these knowledge component topics, and create these wiki pages, which would explain the topic at hand. After much discussion over a distinct format, we decided to use a simple, clear cut explanation of each topic. Included in this explanation is a definition or process to each component, as well as examples of problems the students would most likely see on an MCAS exam. The following figure is an example of what a finished page would look like from the writers perspective:



The wiki page gave us free reign on what types of interactive material we would want to use. The design we implemented was succinct yet informative, ideal for a student who would need to quickly brush up on the skill they would be using in the

Assistment problem they are working on. Teachers could also utilize this wiki page by creating their own Knowledge Components for whatever suits their class needs.

Currently the wiki page can be accessed by going to the Assistment website then clicking [Teacher Support Pages/Teacher Manual](#) link. Once here, scroll down to the bottom and click 8th grade skills. Here is a list of all the knowledge components available. Professor Heffernan's team is currently working on installing links in the problems for the desired knowledge component pertaining to each problem. An example of a page from the students perspective can be seen in the following figure:

The screenshot shows a web browser window displaying a wiki page for the 'Pythagorean theorem'. The page layout includes a sidebar on the left with navigation links (Main Page, Tour Assistments, Getting Started, Managing a Class, Real World Cases, Teacher Manual, Buy Report, New Features, Return to Assistments), a search bar, and a toolbox. The main content area has tabs for 'article', 'discussion', 'edit', and 'history'. A 'Contents' table of contents is visible, listing '1 Definition', '2 How It's Used', and '3 Example', with a sub-link '3.1 Pythagorean Theorem'. The 'Definition' section explains that in a right triangle, the area of the square on the hypotenuse is equal to the sum of the areas of the squares on the legs, accompanied by a diagram of a right triangle with legs 'a' and 'b', and hypotenuse 'c'. The 'How It's Used' section states it is used to solve for the third side of a triangle. The 'Example' section asks for the value of side 'a' in a right triangle with a hypotenuse of 5 and one leg of 4, accompanied by a diagram. The 'Solution' section shows the algebraic steps: $a^2 + 4^2 = 5^2$, $a^2 + 16 = 25$, and $a^2 = 25 - 16$.

This will be a great way for the students to get a basic knowledge of the material with simple examples, and a definition before they try to approach the problem at hand. Having these links directly in the problems should help the students learn by gaining

knowledge on the topic that is easier to understand, and then enforcing it with the actual MCAS problem provided by the Assistent program.

Works Cited

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Adam:

Old System

15774

15775

15844

15792

Teacher wiki:

Area

Combinatorics

Equilateral triangle

Fractions

Graph Shape

Integers

Least Common Multiple

Measurement Use Ruler

Number Line

Of Means Multiply

Ordering Numbers

Pythagorean Theorem

Rate with Distance and Time

Reduce Fraction

Similar Triangles

Sum of Interior Angles Triangle

Supplementary Angles

Symbolization Articulation

Andrew:

Hints only:

12375

Scaffold:

12327

25874

12347

12330

12376

12395

12358

Teacher Wiki

Stem and Leaf Plot

Mean

Median

Order of Operations

Circle Graph

Sarah:

Scaffold:

25703

25414

25910

25730

25682

25727

25729

Worked Examples:

26255

26151

26153

26161

26150

Teacher wiki:

Adding Decimals

Addition

Divisibility

Equivalent Fractions Decimals Percents

Exponents

Fraction Division

Fraction Multiplication

Making Sense of Expressions and Equations

Multiplication

Multiplying Decimals

Multiplying Positive Negative Numbers

Ordering Decimals

Range

Rounding

Square Root

Subtracting Decimals

Subtraction

Surface Area

Venn Diagram

[Home](#)

Assistent #15774 (Pretty Print)

[Logout](#)[\[FAQ\]](#)

Mr Schwartz

You are currently at: [Assistent Pretty-Print](#)[Edit this Assistent](#) | [Preview this Assistent](#)Hints: On Buggies: On Answers: All KCs: On Refresh

"#2, Comparing and Scaling: Investigation 3 (2007/01/15 17:12:56)" (Problem ID: 15774) RADIO_BUTTON

No knowledge components have been assigned

Ben's dog can eat 5 bags of dog food in 24 days and Sandy's dog can eat 8 bags of dog food in 42 days. Jill's dog eats 3 bags of dog food in 12 days. Bennetts dog eats 11 bags of dog food in 50 days which dog eats the most dog food on average?

Answers: (Interface Type: RADIO_BUTTON)

- Ben's Dog
- Bennett's Dog
- Jill's Dog
- Sandy's Dog

Hint 1:

First figure out the average amount each dog eats in 1 day because it is not easy to compare how much each dog eats right now.

Hint 2:

To do this, divide the amount of bags the dog eats by the number of days it takes to eat those bags.
Bags/Days = Amount of bags per day.

Hint 3:

Ben's Dog - $5/24 = 0.21$ bags/day
Sandy's Dog - $8/42 = 0.19$ bags/day
Jill's Dog - $3/12 = 0.25$ bags/day
Bennet's Dog - $11/50 = 0.22$ bags/day

Hint 4:

Now determine which dog has eaten the most each day.

Hint 5:

Since Jill's dog has eaten .25 bags/day on average and this is larger that the amount eaten by the other dogs on average the answer is Jill's dog. Please select this answer.

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Assistent #15775 (Pretty Print)

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"#3, Comparing and Scaling: Investigation 3 (2007/01/15 17:37:07)" (Problem ID: 15775) TEXT_FIELD

No knowledge components have been assigned

A store has a sale on sox. 3 Pairs of sox for \$6.90 (you can buy one pair of sox for the sale price). If you have \$10, how many pairs of sox can you buy?

Answers: (Interface Type: TEXT_FIELD)

✓ 4

Hint 1:

First you should figure out how much it costs for one pair of sox.

Hint 2:

To do this, divide the cost for 3 pairs of sox by the number of pairs for the price. $\$6.90/3 = \2.30 for each pair of sox.

Hint 3:

Now figure out how many pairs of sox you can buy with \$10 at \$2.30 per pair.

Hint 4:

To do this, divide the amount of money you have by the cost for each pair of sox. $\$10/\2.30 dollars = 4.35 pairs

Hint 5:

Remember that pairs of sox can only be bought in whole amounts, you can't buy .35 pair of sox.

Hint 6:

You can buy 4 pairs of sox for \$10. Please enter 4.

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Assistentment #15844 (Pretty Print)

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"#5, Scaling and Comparing: Investigation 4 (2007/01/17 20:48:33)" (Problem ID: 15844) ALGEBRA_FIELD

No knowledge components have been assigned

Apples are on sale. You can buy 5 apples for \$2. How much will it cost for 36 apples?

Answers: (Interface Type: ALGEBRA_FIELD)

✓ **14.4**

Hint 1:

Set up a proportion to help you solve this problem.

Hint 2:

There are many ways to determine the value of x.

Here are two ways:

1. Find what you multiply by 5 to get 36.

$$\frac{36}{5} = 7.2$$

Then multiply this by 2 to get x.

$$x = 7.2 \times 2$$

$$x = 14.4$$

2. Cross multiply and divide by 5 to find x.

$$\frac{2}{5} * \frac{x}{36} \longrightarrow 5 * x = 2 * 36 \longrightarrow \frac{5(x)}{5} = \frac{72}{5}$$

$$\downarrow$$

$$x = 14.4$$

false

Hint 3:

It will cost 14.40 dollars for 36 apples. please enter 14.4

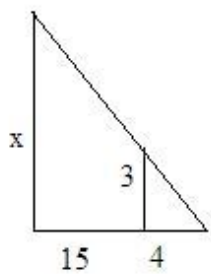
[Home](#)**Assistent #15792 (Pretty Print)**[Logout](#)[\[FAQ\]](#)

Mr Schwartz

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"#3, Comparing and Scaling: Investigation 4 (2007/01/16 18:44:36)" (Problem ID: 15792) RADIO_BUTTON

No knowledge components have been assigned



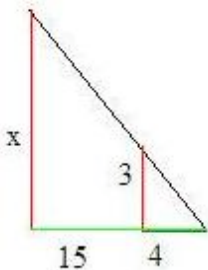
$$A: \frac{x}{15} = \frac{3}{4} \quad C: \frac{x}{3} = \frac{19}{4}$$

$$B: \frac{15}{4} = \frac{3}{x} \quad D: \frac{x}{19} = \frac{4}{3}$$

Which proportion can be used to calculate x?

Answers: (Interface Type: RADIO_BUTTON)

- A
 B
 C
 D

Hint 1:

The red sides correspond and the two different colored green sides correspond.

Hint 2:

Now, set up a proportion to relate the similar triangles.

Hint 3:

$$\frac{\text{Big Red Triangle Side}}{\text{Small Red Triangle Side}} = \frac{\text{Big Green Triangle Side}}{\text{Small Green Triangle Side}}$$

Remember the whole leg is 19.

Hint 4:

$$\frac{x}{3} = \frac{19}{4}$$

Hint 5:

The correct answer is C. Please select C

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Assistment

Assistment #12375

You are previewing content.
There are 11 teachers and 132 students at a middle school.
What is the ratio of teachers to students?

[Comment on this question](#)

A ratio is a comparison of two numbers. We are comparing the number of teachers to the number of students.

[Comment on this hint](#)

The ratio of teachers to students is 11 to 132, but this is not the simplest form.
Since 11 and 132 share a common factor, you should reduce the ratio to its simplest form.

[Comment on this hint](#)

11 and 132 share a common factor: 11. Divide both numbers by 11 to get the simplest form.

[Comment on this hint](#)

$$11/11 = 1$$

$$132/11 = 12$$

[Comment on this hint](#)

The simplest form of the ratio is **1 to 12**. Choose B.

[Comment on this hint](#)

Select one:

- A. 1 to 11
- B. 1 to 12
- C. 11 to 12
- D. 11 to 13

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Appendix B:

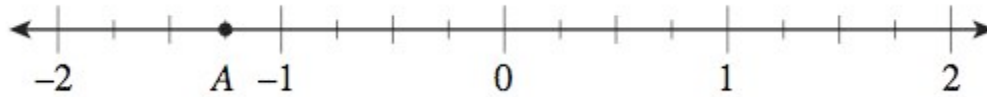
Scaffolding Questions

Assistment

Assistment #25703

You are previewing content.

Which of the following **best** represents the location of point A on the numberline shown below?



A. $-2\frac{3}{4}$

B. $-2\frac{1}{4}$

C. $-1\frac{1}{2}$

D. $-1\frac{1}{4}$

[Comment on this question](#)

Request Help

Select one:

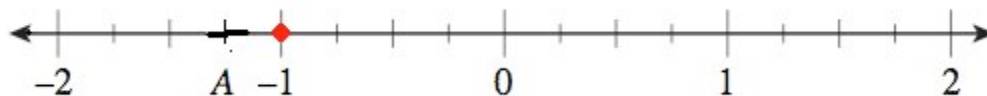
- A
- B
- C
- D

Submit Answer

Let's move on and figure out this problem

First, lets get comfortable with the number line.

What is the value at the red dot?



[Comment on this question](#)

The dot on a number line is placed over the number of its value.

[Comment on this hint](#)

B is placed right over -1

[Comment on this hint](#)

B is placed right over -1.

The answer is -1. Type -1

[Comment on this hint](#)

Type your answer below:

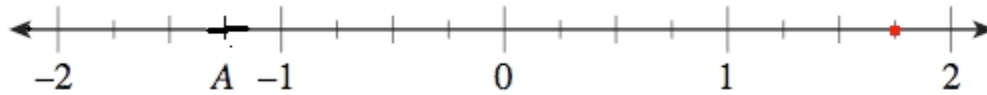
•

Submit Answer

Correct!

Now lets look at place on the number line that is not a whole number

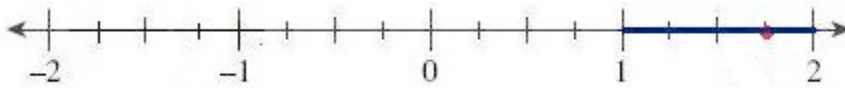
What is the value of the red dot and point C?



A $1\frac{1}{2}$ B $2\frac{1}{4}$ C $1\frac{3}{4}$ D $2\frac{2}{3}$

[Comment on this question](#)

The area in blue is between 1 and 2



[Comment on this hint](#)

Note that the line is broken into fourths.



[Comment on this hint](#)

The correct answer is

C $1\frac{3}{4}$

[Comment on this hint](#)

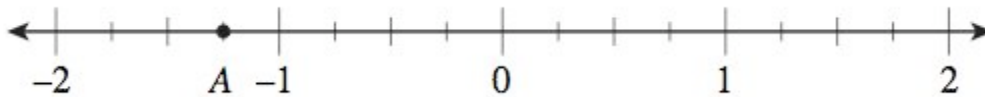
Select one:

- A
- B
- C
- D

Submit Answer

Correct!

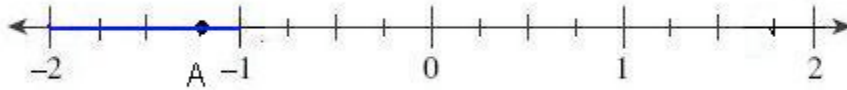
Which of the following **best** represents the location of point A on the numberline shown below?



- A. $-2\frac{3}{4}$
- B. $-2\frac{1}{4}$
- C. $-1\frac{1}{2}$
- D. $-1\frac{1}{4}$

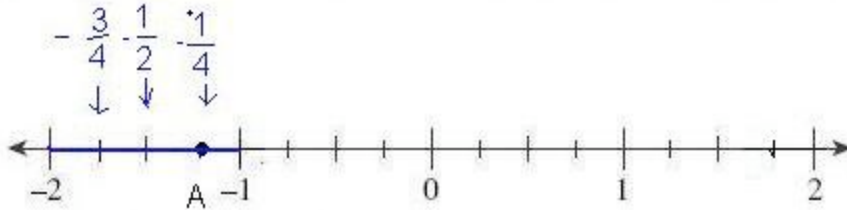
[Comment on this question](#)

The area in blue is between -2 and -1



[Comment on this hint](#)

The following picture shows where each of the fractions on the number line are.



[Comment on this hint](#)

The answer is D

$$-1\frac{1}{4}$$

[Comment on this hint](#)

Select one:

- A
- B
- C
- D

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #12327

You are previewing content.

A sea otter has over 1,000,000 hairs per square inch on its back.

Which of the following equals 1,000,000?

[Comment on this question](#)

Request Help

Select one:

- A. 10^5
- B. 10^6
- C. 10^7
- D. 10^8

Submit Answer

Let's move on and figure out this problem

$$2^3 = 2 * 2 * 2$$

Exponents are a way to show how many times a number is multiplied by itself.

The example above shows 2 with an exponent of 3.

Which of the following equals 100?

[Comment on this question](#)

You are looking for an expression that means $10 * 10$

[Comment on this hint](#)

10^2 means $10 * 10$

[Comment on this hint](#)

Choose C.

[Comment on this hint](#)

Select one:

- A. 10^0
- B. 10^1
- C. 10^2
- D. 10^{10}

Submit Answer

Correct!

Good. Notice that 10 with an exponent of 2 gives you an expression with 2 zeroes at the end: 00.

Now let's try the original question again.

Which of the following equals 1,000,000?

[Comment on this question](#)

Notice the pattern:

$$10^1 = 10$$

$$10^2 = 100$$

$$10^3 = 1000$$

$$10^4 = 10,000$$

[Comment on this hint](#)

1,000,000 has 6 zeroes so the answer should have an exponent of 6

[Comment on this hint](#)

Choose B

[Comment on this hint](#)

Select one:

- A. 10^5
- B. 10^6
- C. 10^7
- D. 10^8

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #25414

You are previewing content.

MS. Patterson divided the students in her class into groups of 6 for a classroom activity. There were 2 students left over. Which of the following could be the number of students in Ms. Patterson's class?

[Comment on this question](#)

Request Help

Select one:

- 11
- 20
- 36
- 45

Submit Answer

Let's move on and figure out this problem

Lets try to make sense of this situation.Lets say Ms Patterson had one group of six, with two extra students.

How many students would be in the class with one group of six and two extra people?

[Comment on this question](#)

There is one group of six students.

$$1 * 6 = 6$$

Now add the two extra students

[Comment on this hint](#)

The total number of students in the class with one group of six and two extras is:

$$\begin{array}{r} 1 * 6 + 2 \\ 6 + 2 \end{array}$$

[Comment on this hint](#)

The total number of students in the class with one group of six and two extras is:

$$\begin{array}{r}
 1 * 6 + 2 \\
 6 + 2 \\
 8
 \end{array}$$

The answer is 8. Type 8.

[Comment on this hint](#)

Type your answer below:

• 8

Submit Answer

Correct!

Remembering how we solved the last question:

$$1 * 6 + 2 = 8$$

Lets try it again for two groups of six.

How many students would be in the class with two groups of six and two extra people?

[Comment on this question](#)

There are **two** groups of **six** students.

$$2 * 6 = 12$$

Now add the other two students

[Comment on this hint](#)

The total number of students in **two** groups of **six** students with **two** extras can be solved by:

$$\begin{array}{r}
 2 * 6 + 2 \\
 12 + 2
 \end{array}$$

[Comment on this hint](#)

The total number of students in **two** groups of **six** students with **two** extras can be solved by:

$$\begin{array}{r} 2 * 6 + 2 \\ 12 + 2 \\ 14 \end{array}$$

The answer is 14. Type 14.

[Comment on this hint](#)

Type your answer below:

• 14

Submit Answer
Correct!

Remembering how we solved the last question:

# of groups	work	# of students in class
1	* $6 + 2 = 8$	
2	* $6 + 2 = 14$	

Use what we did above to solve the intial problem.

Ms. Patterson divided the students in her class into groups of 6 for a classroom activity. There were 2 students left over. Which of the following could be the number of students in Ms. Patterson's class?

[Comment on this question](#)

# of group	work	# of students in cla
1	* $6 + 2 = 8$	
2	* $6 + 2 = 14$	
3	* $6 + 2 =$	

Lets continue the table we've been creating. The first number represents the number of groups of six students.

This is what the table would look like for **three** groups of **six** students with **two** extra students

[Comment on this hint](#)

of
of groups work in the class

- 1 * 6 + 2 = 8
- 2 * 6 + 2 = 14
- 3 * 6 + 2 = 20

Three groups of six students with two extra students

is 20 students

[Comment on this hint](#)

20 students is also a possible choice for the number of students in Ms. Patterson's class.

The correct answer is twenty. Select B. 20

[Comment on this hint](#)

Select one:

- A. 11
- B. 20
- C. 36
- D. 45

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #25910

You are previewing content.

Carolyn and Kim are selling Lemonade this summer.

It costs \$0.10 to make each cup of lemonade.

They are going to sell each cup of lemonade for \$0.25

If they sell 55 cups of lemonade, how much more money would they collect than they would spend?

[Comment on this question](#)

Request Help

Type your answer below (mathematical expression):

-

Submit Answer

Let's move on and figure out this problem

To figure out how much more money Carolyn and Kim would make than they would spend, lets first figure out how much money they would recieve from selling 55 cups of lemonade.

If Carolyn and Kim sell 55 cups of lemonade, what is the amount of money they will **collect**?

[Comment on this question](#)

If Carolyn and Kim sell 1 cup of lemonade, at \$0.25 they collect \$0.25

$$1 * .25 = .25$$

[Comment on this hint](#)

If Carolyn and Kim sell 2 cups of lemonade, at \$0.25 each they collect \$0.50

$$1 * .25 = .25$$

$$2 * .25 = .50$$

[Comment on this hint](#)

If Carolyn and Kim sell 55 cups of lemonade at \$0.25, they collect \$13.75

$$1 * .25 = .25$$

$$2 * .25 = .50$$

$$55 * .25 = 13.75$$

The correct answer is 13.75. Type 13.75

[Comment on this hint](#)

Type your answer below (mathematical expression):

• 13.75

Submit Answer
Correct!

Of the \$13.75 Carolyn and Kim collect, some of it went into making the lemonade.

How much does it cost in dollars to **make** 55 cups of lemonade?

[Comment on this question](#)

It costs \$0.10 to make 1 cup of lemonade at \$0.10 each.

$$1 * .1 = .1$$

[Comment on this hint](#)

It costs \$0.20 to make 2 cup of lemonade at \$0.10 each.

$$1 * .10 = .10$$

$$2 * .10 = .20$$

[Comment on this hint](#)

It costs \$5.50 to make 55 cup of lemonade at \$0.10 each.

$$1 * .10 = 0.10$$

$$2 * .10 = 0.20$$

$$55 * .10 = 5.50$$

The answer is \$5.50 type 5.50

[Comment on this hint](#)

Type your answer below (mathematical expression):

• 5.50

Submit Answer
Correct!

Now that we have seen two main parts finished, lets look at the original problem

Carolyn and Kim are selling Lemonade this summer.

It costs \$0.10 to make each cup of lemonade.

They are going to sell each cup of lemonade for \$0.25

If they sell 55 cups of lemonade, how much more money would they collect than they would spend?

[Comment on this question](#)

In a problem like this you subtract the cost of making the lemonade from the earnings you receive

If Carolyn and Kim had only made 1 cup of lemonade at a cost of \$0.10 and sold it at a cost of \$0.25 they would have earned \$0.15

$$1 * .25 - 1 * .10 = .15$$

[Comment on this hint](#)

If Carolyn and Kim had only made 2 cups of lemonade at a cost of \$0.10 and sold it at a cost of \$0.25 they would have earned \$0.30

$$1 * .25 - 1 * .10 = .15$$

$$2 * .25 - 2 * .10 = .30$$

[Comment on this hint](#)

If Carolyn and Kim made 55 cups of lemonade at a cost of \$0.10 and sold it at a cost of \$0.25 they would have earned \$8.25

$$1 * .25 - 1 * .10 = 0.15$$

$$2 * .25 - 2 * .10 = 0.30$$

$$55 * .25 - 55 * .10 = 8.25$$

The answer is \$8.25. Type in 8.25

[Comment on this hint](#)

Type your answer below (mathematical expression):

- 8.25

Submit Answer

Correct!

You are done with this problem!

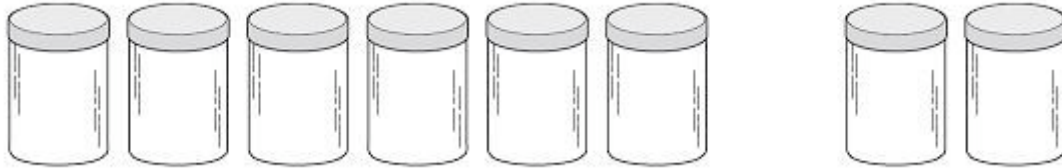
[Comment on this problem](#)

Assistment

Assistment #25874

You are previewing content.

Each jar contains an equal number of coins.



The total number of coins in 6 of the 8 jars is 54. How many coins are in all 8 jars?

[Comment on this question](#)

Request Help

Type your answer below (mathematical expression):

-

Submit Answer

Let's move on and figure out this problem

To find how many coins there are total, we first must find how many coins there should be in the two remaining jars. Let's start by finding how many coins are in one jar.

How many coins should there be in the **one** jar?

[Comment on this question](#)

The problem tells us that all the jars have the same number of coins in each one.

[Comment on this hint](#)

6 jars contain 54 coins. That means that in 6 jars, there are 54 coins.

[Comment on this hint](#)

To find how many coins there should be in **each jar**, you must divide the **number of coins** by the **number of jars**.

[Comment on this hint](#)

$54 / 6 = 9$ coins in one jar. Type in 9

[Comment on this hint](#)

Type your answer below (mathematical expression):

-

Submit Answer
Correct!

Now that we found how many coins are in each jar, we can find how many coins are in the two remaining jars.

How many coins are in the two remaining jars?

[Comment on this question](#)

We have 2 jars, so you have to multiply the number of coins in one jar number by 2.

[Comment on this hint](#)

$9 * 2 = 18$ Type in 18

[Comment on this hint](#)

Type your answer below (mathematical expression):

• 18

Submit Answer
Correct!

Now lets return to the original problem.

How many coins are in all 8 jars?

[Comment on this question](#)

There are 54 coins in 6 jars.

We found that there are 18 coins in the two remaining jars.

[Comment on this hint](#)

Now we add the number of coins in 2 jars to the number of coins in 6 jars.

[Comment on this hint](#)

$$\begin{array}{r} 1 \\ 54 \\ +18 \\ \hline 72 \end{array}$$

Enter 72

[Comment on this hint](#)

Type your answer below (mathematical expression):

- 72

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #25730

You are previewing content.

On Kelly's homework, the answer to the following problem shown below was marked wrong

$$178 - 59 = 129$$

Which of the following is one way for her to discover that her answer is wrong?

[Comment on this question](#)

Request Help

Select one:

- $129 - 59 = 70$
- $129 + 59 = 188$
- $178 + 129 = 307$
- $178 + 59 = 237$

Submit Answer

Let's move on and figure out this problem

[Lets look at an easier version of this problem:](#)

On John's homework, he got the following question wrong:

$$5 - 3 = 4$$

Which of the following is one way to show his answer is wrong?

[Comment on this question](#)

Consider fact families, which show the relationships between numbers.

In this case:

$$5 - 3 = 2$$

$$5 - 2 = 3$$

$$2 + 3 = 5$$

$$3 + 2 = 5$$

[Comment on this hint](#)

Notice how if you add the answer to a subtraction problem to the number you're subtracting you get the initial number

$$5 - 3 = 2$$

$$2 + 3 = 5$$

If this does not happen, something is wrong

[Comment on this hint](#)

John's problem reads

$$5 - 3 = 4$$

but

$4 + 3$ does not equal 5 , it equals 7

[Comment on this hint](#)

The correct answer is that John can tell he is incorrect by realizing $4 + 3 = 7$, not 5 . The answer is B

[Comment on this hint](#)

Select one:

- A. $4 - 3 = 1$
- B. $4 + 3 = 7$
- C. $4 + 5 = 9$
- D. $5 + 3 = 8$

Submit Answer
Correct!

On Kelly's homework the answer to the following problem shown below was marked wrong

$$178 - 59 = 129$$

Which of the following is one way for her to discover that her answer is wrong?

[Comment on this question](#)

Consider fact families, which show the relationship between numbers.

In this case:

$$178 - 59 = 119$$

$$178 - 119 = 59$$

$$59 + 119 = 178$$

$$119 + 59 = 178$$

[Comment on this hint](#)

Notice how if you add the answer to a subtraction problem to the number you're subtracting you get the initial number

$$178 - 59 = 119$$

$$119 + 59 = 178$$

If this does not happen, something is wrong

[Comment on this hint](#)

Kelly's problem reads

$$178 - 59 = 129$$

but

$129 + 59$ does not equal 178 , it equals 188

[Comment on this hint](#)

the correct answer is that Kelly can tell that she is wrong by realizing that $129 + 59 = 188$, not 178 . the correct answer is B

[Comment on this hint](#)

Select one:

- A. $129 - 59 = 70$
- B. $129 + 59 = 188$
- C. $178 + 129 = 307$
- D. $178 + 59 = 307$

Submit Answer

Correct!

You are done with this problem!

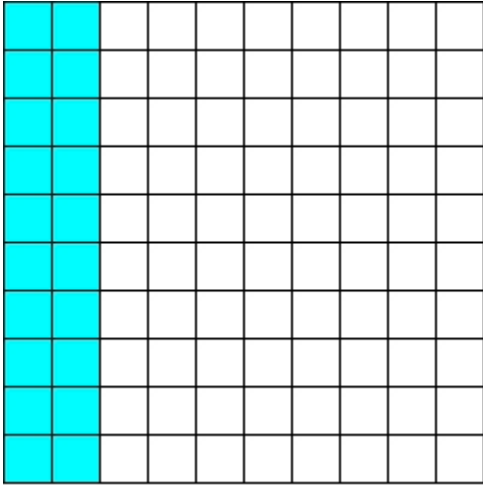
[Comment on this problem](#)

Assistment

Assistment #25682

You are previewing content.

The grid below is shaded to represent a fraction.



What fraction of the grid is shaded?

- A. $\frac{1}{20}$
- B. $\frac{1}{5}$
- C. $\frac{1}{4}$
- D. $\frac{1}{3}$

[Comment on this question](#)

Request Help

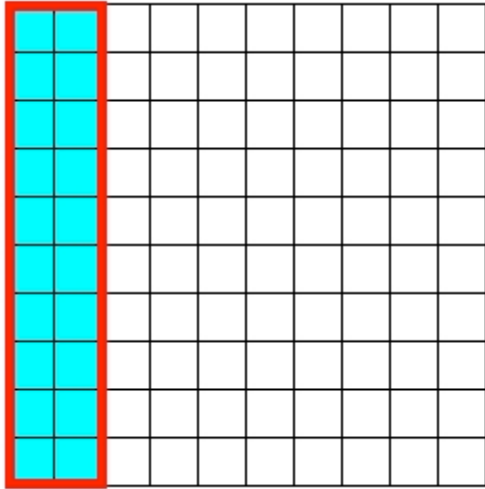
Select one:

- A
- B
- C
- D

Submit Answer

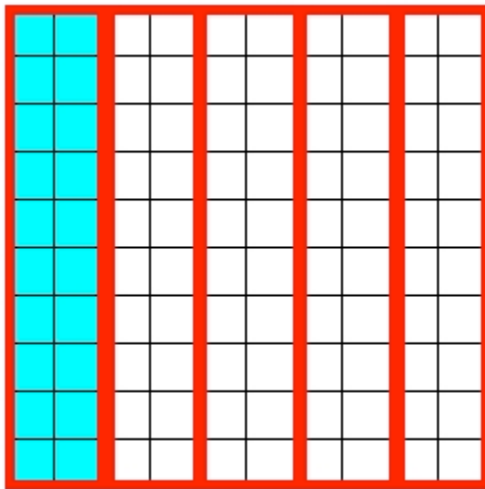
Let's move on and figure out this problem

How many times can you fit the shaded area (shown here highlighted by a red rectangle) into the rest of the square?



[Comment on this question](#)

Look at the following picture:



note how each red rectangle has the same number of small squares as the shaded one

[Comment on this hint](#)

There are 5 of these rectangles. The correct answer is 5

[Comment on this hint](#)

Type your answer below:

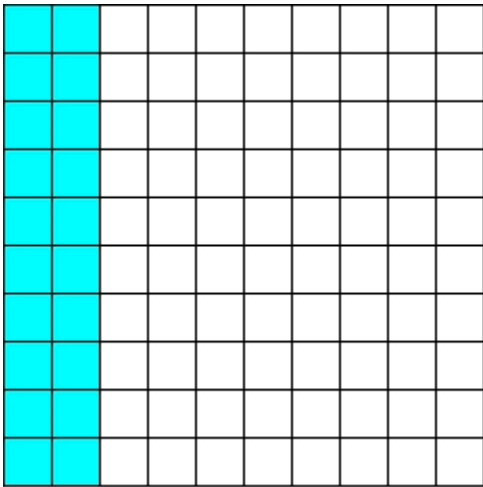
• 5

Submit Answer

Correct!

Now lets go back to the original question.

The grid below is shaded to represent a fraction.

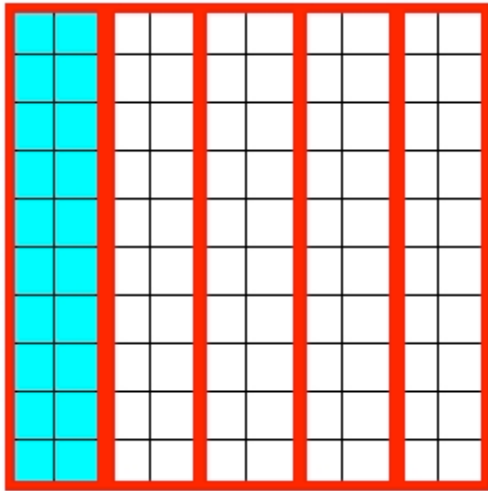


What fraction of the grid is shaded?

- A. $\frac{1}{20}$
- B. $\frac{1}{5}$
- C. $\frac{1}{4}$
- D. $\frac{1}{3}$

[Comment on this question](#)

Remember, we were able to break the square into **five** equal parts, **one** of which was shaded



[Comment on this hint](#)

A fraction is a part out of a whole.

We have

1 shaded area out of
5 shaded areas
that can fit in
total square

[Comment on this hint](#)

The correct answer is

B. $\frac{1}{5}$

click B and press submit

[Comment on this hint](#)

Select one:

- A
- B
- C
- D

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #12347

You are previewing content.

Judith has a total of 8 fish in her aquarium.
Exactly 6 of the fish are guppies.

What percent of the fish in the aquarium are guppies?

[Comment on this question](#)

Request Help

Select one:

- A. 48%
- B. 60%
- C. 68%
- D. 75%

Submit Answer

Let's move on and figure out this problem

Let's first find the fraction of guppies in the fish tank compared to the total number of fish in the fish tank. Don't forget to reduce the fraction.

What fraction of the fish are guppies?

[Comment on this question](#)

There are 8 fish in all. 6 out of 8 are guppies.

[Comment on this hint](#)

$6/8$ of the fish are guppies. You can reduce $6/8$ further.

[Comment on this hint](#)

$6/8 = 3/4$. Type in $3/4$

[Comment on this hint](#)

Type your answer below (mathematical expression):

-

Submit Answer

Correct!

Now use the fraction to solve the original problem.

Judith has a total of 8 fish in her aquarium.
Exactly 6 of the fish are guppies.

What percent of the fish in the aquarium are guppies?

[Comment on this question](#)

1/4 is 25%. What is 3/4 as a percent?

[Comment on this hint](#)

$$3/4 = 1/4 + 1/4 + 1/4 = 25\% + 25\% + 25\% = ?$$

[Comment on this hint](#)

25% + 25% + 25% = 75% Choose D.

[Comment on this hint](#)

Select one:

- A. 48%
- B. 60%
- C. 68%
- D. 75%

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #12330

You are previewing content.

Which of the following is closest to the product $298.7 * 10.1$?

[Comment on this question](#)

Request Help

Select one:

- A. 300
- B. 2,000
- C. 3,000
- D. 20,000

Submit Answer

Let's move on and figure out this problem

We are looking for an estimate, so that the numbers are easy to multiply.

What is the best estimate of 298.7?

[Comment on this question](#)

Choices **A: 200** and **C: 250** are not the best numbers with which to estimate because they are not the closest estimations to **298.7**.

[Comment on this hint](#)

Choice **B: 290** is still not the best estimation to **298.7** because it is not the closest number of the choices and it is also not as "nice" a number to work with.

[Comment on this hint](#)

Choice **D: 300** is the best estimation because it is the closest number to **298.7** of the choices. Choose D.

[Comment on this hint](#)

Select one:

- A. 200
- B. 290
- C. 250
- D. 300

Submit Answer

Correct!

Good. Now select the best estimate for 10.1?

[Comment on this question](#)

Choices **D: 1** can't be used because it is not close to **10.1**.

[Comment on this hint](#)

Choice **C: 11** is farther from **10.1** than 10.5, so it is not a good estimate.

[Comment on this hint](#)

Choice **B: 10.5** is both farther from **10.1** and is not as "nice" a number as **10**.

[Comment on this hint](#)

Choice A: 10 is the best estimate for 10.1 because it is the closest number to 10.1 of the choices. Choose A.

[Comment on this hint](#)

Select one:

- A. 10
- B. 10.5
- C. 11
- D. 1

Submit Answer

Correct!

Now let's look at the original problem.

Which of the following is closest to the product $298.7 * 10.1$?

[Comment on this question](#)

We estimated 298.7 to 300 and 10.1 to 10.

[Comment on this hint](#)

Now it is easy to estimate $298.7 * 10.1$ by multiplying $300 * 10$ instead.

[Comment on this hint](#)

To multiply $300 * 10$ just add a zero to 300 making it 3000. Therefore C is the best estimate. Select C.

[Comment on this hint](#)

Select one:

- A. 300
- B. 2000
- C. 3000
- D. 30,000

Submit Answer

Correct!

You are done with this problem!

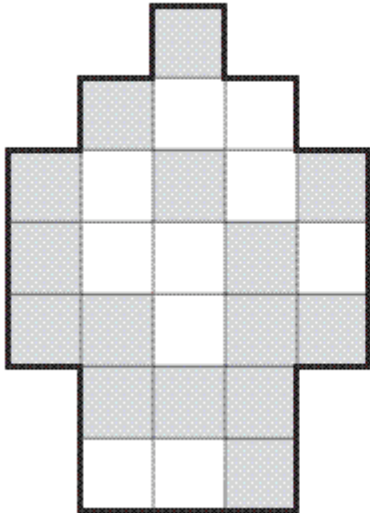
[Comment on this problem](#)



Assistment

Assistment #12376

You are previewing content.

Shing made the design shown above using gray square tiles and white square tiles.
What fractional part of the whole design is made up of **gray** tiles? Write your answer as a fraction.



Key	
	represents 1 gray tile
	represents 1 white tile

[Comment on this question](#)

Request Help

Type your answer below (mathematical expression):

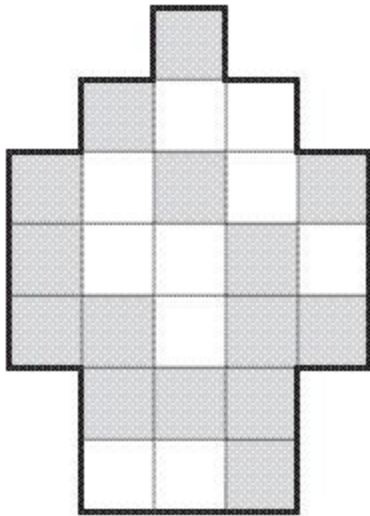
-

Submit Answer

Let's move on and figure out this problem

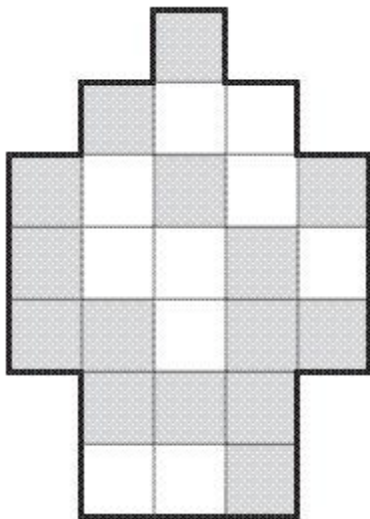
A fraction is part of a whole. Let's count how many tiles make up the whole design.

How many square tiles make up the whole design?

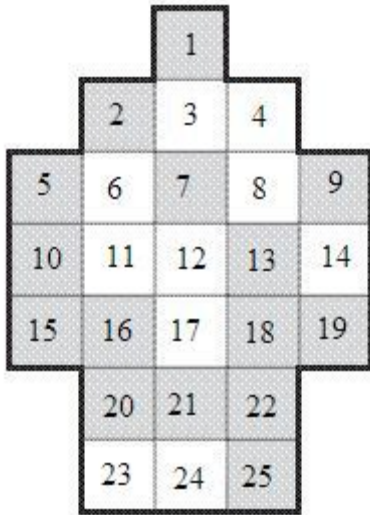


[Comment on this question](#)

First, count all of the tiles, white and grey.



[Comment on this hint](#)



[Comment on this hint](#)

There are 25 tiles in all. Type in 25

[Comment on this hint](#)

Type your answer below (mathematical expression):

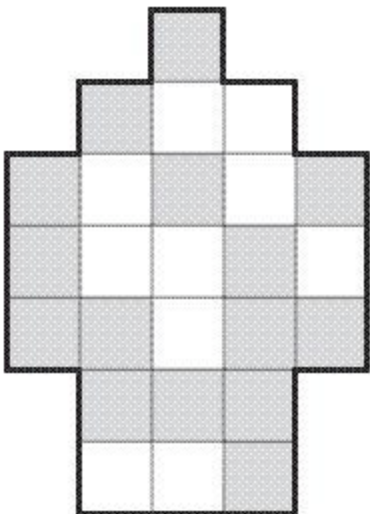
•

Submit Answer

Correct!

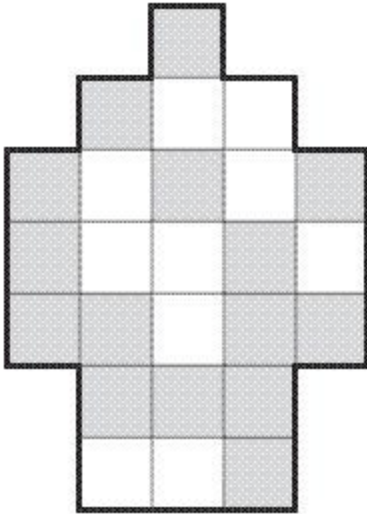
Now let's count the grey tiles.

How many gray tiles are in the design?

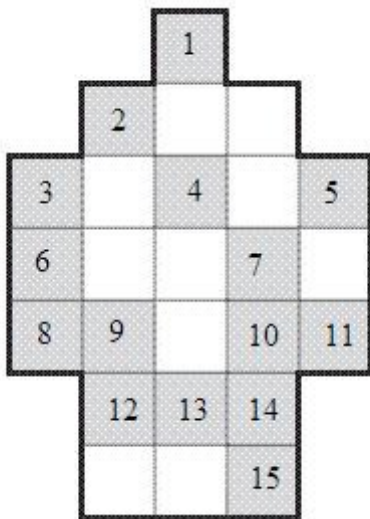


[Comment on this question](#)

Count the grey tiles.



[Comment on this hint](#)



[Comment on this hint](#)

There are 15 gray tiles. Type in 15

[Comment on this hint](#)

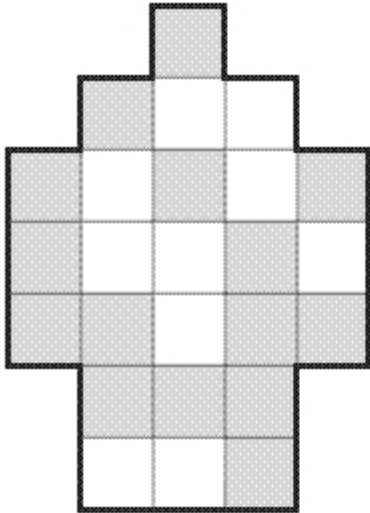
Type your answer below (mathematical expression):



• 15

Submit Answer
Correct!

Now let's try the original question.

What fractional part of the whole design is made up of gray tiles? Write your answer as a fraction.



Key	
	represents 1 gray tile
	represents 1 white tile

[Comment on this question](#)

Write your fraction like this: gray tiles/all tiles.

[Comment on this hint](#)

There are 15 gray tiles and 25 tiles in all.

[Comment on this hint](#)

Type in 15/25

You can also reduce it to 3/5

[Comment on this hint](#)

Type your answer below (mathematical expression):

•

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #12395

You are previewing content.

Which of the following shows the numbers in order from least to greatest?

[Comment on this question](#)

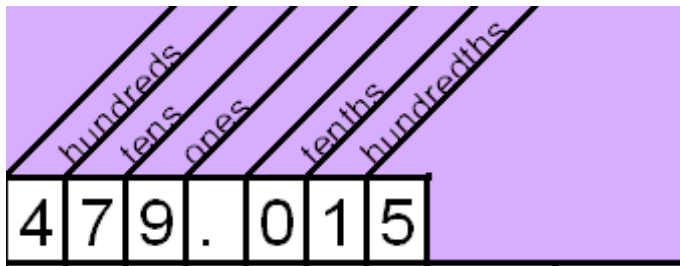
Request Help

Select one:

- A. 0.765, 0.82, 0.791
- B. 0.765, 0.791, 0.82
- C. 0.791, 0.82, 0.765
- D. 0.791, 0.765, 0.82

Submit Answer

Let's move on and figure out this problem



Decimal numbers are another way to write fractions or mixed numbers. For example, the number above is **four hundred seventy-nine and fifteen thousandths**.

Let's look at another example:

35.907

What digit is in the tenths place in 35.907?

[Comment on this question](#)

35.**9**07

The tenths place is the first one on the right of the decimal point

[Comment on this hint](#)

The digit in the tenths place is 9. Choose C

[Comment on this hint](#)

Select one:

- A. 3
- B. 5
- C. 9
- D. 0
- E. 7

Submit Answer

Correct!

Let's look at the list of numbers.

Which number has the greatest value?

[Comment on this question](#)

hundreds	tens	ones		tenths	hundredths	thousandths
		0	.	7	6	5
		0	.	8	2	
		0	.	7	9	1

Line up the decimal points for the three numbers.

Compare the digits in the greatest place first.

[Comment on this hint](#)

The digits in the ones place are all the same, so compare the digits in the tenths place

[Comment on this hint](#)

8 tenths is greater than 7 tenths, so 0.82 is the greatest number.

[Comment on this hint](#)

0.82 has the greatest value. Choose A

[Comment on this hint](#)

Select one:

- A. 0.82
- B. 0.765
- C. 0.791

Submit Answer
Correct!

Okay. 0.82 has the greatest value. Now we are left with 2 numbers: 0.765 and 0.791.

Which number is greater?

[Comment on this question](#)

The ones digits and the tenths digits are the same. Compare the hundredths digits.

hundreds	tens	ones		tenths	hundredths	thousandths
		0	.	7	6	5
		0	.	7	9	1

[Comment on this hint](#)

The hundredths digits are 6 and 9. Which one is greater?

[Comment on this hint](#)

0.791 is greater than 0.765. Choose 0.791

[Comment on this hint](#)

Select one:

- 0.765
- 0.791

Submit Answer

Correct!

Good. Now let's answer the original problem.

Which of the following shows the numbers in order from least to greatest?

[Comment on this question](#)

0.82 is the greatest number. It should be last.

[Comment on this hint](#)

0.791 is the next greatest number. It should be in the middle.

[Comment on this hint](#)

0.765 is the smallest number. It should be first

[Comment on this hint](#)

B. 0.765, 0.791, 0.82 shows the numbers in order from least to greatest. Choose B.

[Comment on this hint](#)

Select one:

- A. 0.765, 0.82, 0.791
- B. 0.765, 0.791, 0.82
- C. 0.791, 0.82, 0.765
- D. 0.791, 0.765, 0.82

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #12358

You are previewing content.
What is the value of the following expression?

$$3 + 6 * 4$$

[Comment on this question](#)

Request Help

Type your answer below:

-

Submit Answer

Let's move on and figure out this problem

According to the correct **order of operations**, one operation should be done before the other.

Which operation must be done first?

[Comment on this question](#)

There is a certain order that you must follow to find the value of a mathematical expression.

[Comment on this hint](#)

Just follow **PE(MD)(AS)**:

Parenthesis, **Exponents**, **Multiplication and Division** (from left to right), **Addition and Subtraction** (from left to right)

[Comment on this hint](#)

Take a look at the expression:

$$3 + 6 * 4$$

You see that there is **multiplication** and **addition** to do.

[Comment on this hint](#)

You must do the **multiplication** first. Select Multiplication.

[Comment on this hint](#)

Select one:

- Multiplication

-  Addition

Submit Answer
Correct!

Great, the multiplication should be done first.

Now let's look at the original problem.

$$3 + 6 * 4$$

What is the value of the expression?

[Comment on this question](#)

Do the **multiplication** first.

$$3 + 6 * 4$$

[Comment on this hint](#)

Next, **add** the **answer** you got from the **multiplication** to the **number** left in the expression.

$$3 + 6 * 4$$

$$3 + 24$$

[Comment on this hint](#)

$$3 + 6 * 4$$

$$3 + 24$$

$$27$$

The value of the expression is 27. Type in 27

[Comment on this hint](#)

Type your answer below:

-

Submit Answer
Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #25727

You are previewing content.

Steve scored 1,086,000 points in a video game. Which of the following expressions below is equal to 1,086,000?

[Comment on this question](#)

Request Help

Select one:

- $100 + 80 + 6$
- $1,000 + 80 + 6$
- $1,000,000 + 80,000 + 6,000$
- $1,000,000 + 800,000 + 60,000$

Submit Answer

Let's move on and figure out this problem

What does the 1 in 1,086,000 represent?

1,086,000

[Comment on this question](#)

The 1 in 1,086,000 represents the same thing as the 1 in 1,234,546 and 1,567,300

[Comment on this hint](#)

The 1 in 1,086,000 also represents the same thing as the 1 in 1,000,000

[Comment on this hint](#)

The correct answer is 1,000,000.

[Comment on this hint](#)

Select one:

- 100
- 1,000
- 1,000,000

Submit Answer

Correct!

What does the 8 in 1,086,000 represent?

1,086,000

[Comment on this question](#)

The 8 in 1,086,000 represents the same thing as the 8 in 85,235 and 183,000

[Comment on this hint](#)

The 8 in 1,086,000 represents the same thing as the 8 in 80,000

[Comment on this hint](#)

The correct answer is 80,000

[Comment on this hint](#)

Select one:

- 80
- 8
- 80,000
- 8,000,000

Submit Answer

Correct!

What does the 6 in 1,086,000 represent?

1,086,000

[Comment on this question](#)

The 6 in 1,086,000 means the same thing as the 6 in 6,540 and 126,300

[Comment on this hint](#)

The 6 in 1,086,000 represents the same thing as the 6 in 6,000

[Comment on this hint](#)

The answer is 6,000

[Comment on this hint](#)

Select one:

- 6
- 60
- 6,000
- 60,000
- 6,000,000

Submit Answer

Correct!

[Going back to the original problem:](#)

Steve scored 1,086,000 points in a video game. Which of the following expressions below is equal to 1,086,000?

[Comment on this question](#)

We know that the 1 in 1,086,000 stands for 1,000,000 We also know that the 8 stands for 80,000 and the 6 stands for 6,000. Consider what happens when you add these numbers

[Comment on this hint](#)

$$1,000,000 + 80,000 + 6,000 = 1,086,000$$

The answer is C.

[Comment on this hint](#)

Select one:

- A. $100 + 80 + 6$
- B. $1,000 + 80 + 6$
- C. $1,000,000 + 80,000 + 6,000$
- D. $1,000,000 + 800,000 + 60,000$

[Submit Answer](#)

Assistment

Assistment #25729

You are previewing content.

What is the value of the expression shown below?

$$2 + 4 * (3 + 7)$$

[Comment on this question](#)

Request Help

Type your answer below (mathematical expression):

-

Submit Answer

Let's move on and figure out this problem
What is the proper order of operations?

[Comment on this question](#)

A popular way to remember order of operations is to remember the acronym **PEMDAS**

[Comment on this hint](#)

The acronym **PEMDAS** means

P = Parenthesis

E = Exponent

MD = Multiplication and Division

AS = Addition and Subtraction

[Comment on this hint](#)

The correct answer is **B**, **Parenthesis** -> **Exponent** -> **Multiplication and Division** -> **Addition and Subtraction**

[Comment on this hint](#)

Select one:

- A. Parenthesis -> Exponent -> Addition and Subtraction -> Multiplication and Division
- B. Parenthesis -> Exponent -> Multiplication and Division -> Addition and Subtraction
- C. Multiplication and Division -> Addition and Subtraction -> Parenthesis -> Exponent
- D. Additon and Subtraction -> Multiplication and Division -> Parenthesis -> Exponent

Submit Answer

Correct!

Which of the following shows the first step of order of operations completed correctly on

$$2 + 4 * (3 + 7)$$

[Comment on this question](#)

remember PEMDAS

P = Parenthesis

E = Exponent

MD = Multiplication and Division

AS = Addition and Subtraction

[Comment on this hint](#)

P = Parenthesis

In $2 + 4 * (3 + 7)$ there are parenthesis to evaluate.

[Comment on this hint](#)

In $2 + 4 * (3 + 7)$ there are parenthesis to evaluate. This should be done first. The correct answer is C.
 $2 + 4 * (10)$

[Comment on this hint](#)

Select one:

- A. $2 + 12 + 7$
- B. $6 * (3 + 7)$
- C. $2 + 4 * (10)$

Submit Answer

Correct!

Now lets go back to the original problem:

What is the value of the expression shown below?

$$2 + 4 * (3 + 7)$$

[Comment on this question](#)

remember the acronym PEMDAS

P = Parenthesis

E = Exponent

MD = Multiplication and Division

AS = Addition and Subtraction

[Comment on this hint](#)

In the last question, we've already done the work in the **parenthesis**,

$$2 + 4 * (3 + 7)$$
$$2 + 4 * (10)$$

and there are no **exponents**, so next do the **multiplication and division**

and then the **addition and subtraction**

[Comment on this hint](#)

$$2 + 4 * (10) \text{ (parenthesis)}$$

$$2 + 40 \text{ (Multiplication and division)}$$

$$42 \text{ (Addition and subtraction)}$$

The correct answer is 42. type in 42.

[Comment on this hint](#)

Type your answer below:

•

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #26255

You are previewing content.

A baseball team won 75% of its games. If the team played 48 games, how many games did it win?

[Comment on this question](#)

Request Help

Type your answer below (mathematical expression):

-

Submit Answer

Let's move on and figure out this problem

[Lets look at the solution to a similar problem:](#)

A basketball team won 75% of its games. If the team played 56 games, how many games did they win?

Solution:

This problem involves figuring out the numerical equivalent of a percentage of something.

A few things to note:

- 1) "of" generally is generally a keyword for multiplication. This is true is in this case.
- 2) percentages can't be multiplied as a percent. In order to use multiplication on the percent, we need to convert it to a decimal

So:

By definition $75\% = 75/100 = \text{"seventy-five hundredths"} = 0.75$

$0.75 * 56 = 42.$

The answer is 42.

[Comment on this question](#)

Select one:

- I have read this example and understand it and now I am ready to try again

Submit Answer
Correct!

Now try the original problem again. You may look back at the worked example if that helps you.

A baseball team won 75% of its games. If the team played 48 games, how many games did it win?

Do your best; if you cannot get the answer select hint to get the answer so you can go on.

[Comment on this question](#)

The answer is 36.

[Comment on this hint](#)

Type your answer below (mathematical expression):

- 36

Submit Answer
Correct!
You are done with this problem!

[Comment on this problem](#)

Appendix C: Worked Examples

Assistment

Assistment #26151

You are previewing content.

What is the value of the expression shown below?

$$2 + 4 * (3 + 7)$$

[Comment on this question](#)

Request Help

Type your answer below (mathematical expression):

-

Submit Answer

Let's move on and figure out this problem

Lets look at the solution to a similar problem:

What is the value of the expression shown below?

$$6 + 3 * (2 + 6)$$

Solution to this problem:

The order of operations, often as **PEMDAS** is as follows:

Parenthesis

Exponents

Multiplication and Division

Addition and Subtraction

$6 + 3 * (2 + 6)$ Has **parenthesis**, so, following order of operations, solve whats inside them first.

$6 + 3 * (8)$ There are no **exponents** in this problem, so we move on to do the **multiplication and division** next.

6 + 24 Doing the last operation, addition and subtraction, we find the answer

30

The answer is 30.

[Comment on this question](#)

Select one:

- I have read this example and understand it and now I am ready to try again

Submit Answer

Correct!

What is the value of the expression shown below?

$$2 + 4 * (3 + 7)$$

[Comment on this question](#)

$$2 + 4 * (3 + 7) =$$

$$2 + 4 * (10) =$$

$$2 + 40 =$$

$$42$$

The answer is 42. Type 42.

[Comment on this hint](#)

Type your answer below (mathematical expression):

• 42

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #26153

You are previewing content.

On Kelly's homework, the answer to the following problem shown below was marked wrong

$$178 - 59 = 129$$

Which of the following is one way for her to discover that her answer is wrong?

[Comment on this question](#)

Request Help

Select one:

- A. $129 - 59 = 70$
- B. $129 + 59 = 188$
- C. $178 + 129 = 307$
- D. $178 + 59 = 237$

Submit Answer

Let's move on and figure out this problem

[Lets look at the solution to a similar problem:](#)

On John's homework, he got the following question wrong:

$$165 - 58 = 117$$

Which of the following is one way to show his answer is wrong?

- A. $117 + 58 = 175$
- B. $117 - 58 = 59$
- C. $165 + 58 = 223$
- D. $165 + 117 = 282$

Solution to this problem:

Consider fact families, which show the relationship between numbers.

In this case:

$$165 - 58 = 107$$

$$165 - 107 = 58$$

$$107 + 58 = 165$$

$$58 + 107 = 165$$

First, notice how adding the answer to a subtraction problem to the number being subtracted gets the initial answer:

$$165 - 58 = 107$$

$$107 + 58 = 165$$

Then, realize that $117 + 58 = 175$, not 165.

Using this method, John could realize his initial answer was wrong.

The answer is A.

[Comment on this question](#)

Select one:

- I have read this example and understand it and now I am ready to try again

Submit Answer
Correct!

Now try the original problem again. You may look back at the worked example if that helps you.

On Kelly's homework the answer to the following problem shown below was marked wrong

$$178 - 59 = 129$$

Which of the following is one way for her to discover that her answer is wrong?

Do your best; if you cannot get the answer select hint to get the answer so you can go on.

[Comment on this question](#)

$129 + 59 = 188$, not 178.

The correct answer is B. Click B

[Comment on this hint](#)

Select one:

- A. $129 - 59 = 70$
- B. $129 + 59 = 188$
- C. $178 + 129 = 307$
- D. $178 + 59 = 237$

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #26161

You are previewing content.

Carolyn and Kim are selling Lemonade this summer.

It costs \$0.10 to make each cup of lemonade.

They are going to sell each cup of lemonade for \$0.25

If they sell 55 cups of lemonade, how much more money would they collect than they would spend?

[Comment on this question](#)

Request Help

Type your answer below (mathematical expression):

-

Submit Answer

Let's move on and figure out this problem

[Lets look at a similar problem being solved:](#)

John and Andrew are holding a bakesale.

It costs \$0.15 to make each cookie.

They sell each cookie for \$0.50.

If they sell 30 cookies, how much more money in dollars would they collect than they would spend?

Solution to this problem:

One way to approach this problem is to take it in three steps.

1. Find out how much money John and Andrew **collect** selling 30 cookies.
2. Find out how much money John and Andrew **spent** to make 30 cookies.
3. Subtract the amount **spent** from the amount **collected**. This will show how much **more** the collected than spent.

Step 1: Amount collected

John and Andrew collect \$0.50 for **each** cookie they sell. To figure out how much money they collect for 30 cookies, multiply

$$30 * 0.50 = 15.$$

John and Andrew collect \$15 for 30 cookies.

Step 2: amount spent

John and Andrew spent \$0.15 to make **each** cookie. To find how much they spent to make 30, multiply

$$30 * 0.15 = 4.50$$

John and Andrew spent \$4.50 to make 30 cookies.

Step 3: How much more money did John and Andrew collect than they spent?

Amount Collected - Amount spent = amount more collected than spent.

$$15 - 4.50 = 11.50$$

John and Andrew collected \$11.50 more than they spent. The answer is 11.50.

[Comment on this question](#)

Select one:

- I have read this example and understand it and now I am ready to try again

Submit Answer

Correct!

Now try the original problem again. You may look back at the worked example if that helps you.

Carolyn and Kim are selling Lemonade this summer.

It costs \$0.10 to make each cup of lemonade.

They are going to sell each cup of lemonade for \$0.25

If they sell 55 cups of lemonade, how much more money would they collect than they would spend?

Do your best; if you cannot get the answer select hint to get the answer so you can go on.

[Comment on this question](#)

Carolyn and Kim will collect \$0.25 per cup of lemonade

$$0.25 * 55 = 13.75$$

they spent \$0.10 to make each cup of lemonade

$$0.10 * 55 = 5.50$$

$$13.75 - 5.50 = 8.25$$

The answer is 8.25. Type in 8.25

[Comment on this hint](#)

Type your answer below (mathematical expression):

•

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Assistment

Assistment #26150

You are previewing content.

Steve scored 1,086,000 points in a video game. Which of the following expressions below is equal to 1,086,000?

[Comment on this question](#)

Request Help

Select one:

- $100 + 80 + 6$
- $1,000 + 80 + 6$
- $1,000,000 + 80,000 + 6,000$
- $1,000,000 + 800,000 + 60,000$

Submit Answer

Let's move on and figure out this problem

[Lets look at the solution to a problem similar to the one above:](#)

Harry Potter and the Deathly Hollows sold 8,609,050 copies the day it came out. Which of the following expressions below is equal to 8,609,050?

- A. $8,000 + 600 + 90 + 5$
- B. $8,000,000 + 600,000 + 90,000 + 5,000$
- C. $8 + 6 + 9 + 5$
- D. $8,000,000 + 600,000 + 9,000 + 50$

Solution to this problem:

The **8** in **8,609,050** is placed in the millions position and stands for **8,000,000**.

The **6** in **8,609,050** is placed in the hundred-thousands position and stands for **600,000**

The **9** in **8,609,050** is placed in the thousands position and stands for **9,000**

The 5 in 8,609,050 is placed in the tens position and stands for 50

$$8,000,000 + 6,000,000 + 9,000 + 50 = 8,609,050$$

The correct answer is D.

[Comment on this question](#)

Select one:

- I have read this example and understand it and now I am ready to try again

Submit Answer

Correct!

Steve scored 1,086,000 points in a video game. Which of the following expressions below is equal to 1,086,000?

[Comment on this question](#)

$$1,086,000 = 1,000,000 + 80,000 + 6,000.$$

The answer is C. $1,000,000 + 80,000 + 6,000$. Click C.

[Comment on this hint](#)

Select one:

- A. $100 + 80 + 6$
- B. $1,000 + 80 + 6$
- C. $1,000,000 + 80,000 + 6,000$
- D. $1,000,000 + 800,000 + 60,000$

Submit Answer

Correct!

You are done with this problem!

[Comment on this problem](#)

Appendix D: Teacher Wiki

Adding Decimals

From TeacherWiki

How its Done

When you add decimals make sure you are adding tens with tens, ones with ones, tenths with tenths and so on. To do this we line up the decimal points.

Example

$$1.23 + 0.54 + 17.9342$$

Can be written

$$\begin{array}{r} 1.2300 \\ +17.9342 \\ 0.5400 \end{array}$$

From there, you can just add each of the columns, like you would in an addition problem using integers.

$$\begin{array}{r} 1.2300 \\ +17.9342 \\ \underline{0.5400} \\ 19.7042 \end{array}$$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Adding_Decimals"

- This page was last modified 05:55, 6 April 2008.

Addition

From TeacherWiki

Contents

- 1 Addition
 - 1.1 Description:
 - 1.2 Example
 - 1.2.1 $8 + (-15) + (-12) + 2$

Addition

Description:

Addition is combining numbers together. If all the numbers are positive you add them all up. If they are negative you must take them away when you add.

Example

$$8 + (-15) + (-12) + 2$$

Solution

$$8 + (-15) + (-12) + 2$$

$$-7 + (-12) + 2$$

$$-19 + 2$$

$$-17$$

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Addition>"

- This page was last modified 00:58, 11 April 2008.

Area

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Finding the area


Definition

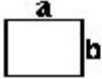
The area of a figure measures the size of the region enclosed by the figure.

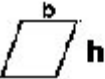
This is usually expressed in terms of some square unit, such as square ft (ft^2).

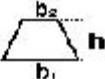
How It's Used


Use the area formula for that specific shape. For example,

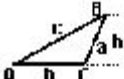
square = a^2 

rectangle = ab 

parallelogram = bh 

trapezoid = $h/2 (b_1 + b_2)$ 

circle = πr^2 

triangle = $(1/2) b h$ 

Example

Finding the area

What is the area of the square?



Solution

Using the area formula for a square, a^2 , the known side is squared.

$$4^2 = 4 * 4 = 16$$

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Area>"

- This page was last modified 19:35, 14 April 2008.

Combinatorics

From TeacherWiki

Contents

- 1 Definition
- 2 How Its Used
- 3 Example
 - 3.1 Number of sandwiches

Definition

This is the study of counting things.

How Its Used

Finding the total number of ways to combine items.

Note - It makes it much easier if you stay organized

Example

Number of sandwiches

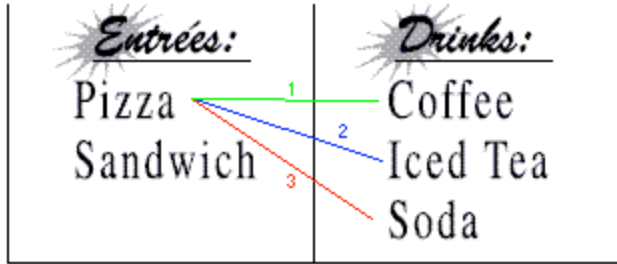
Use the picture bellow to list all the different lunch combinations you can make.

<i>Entrées:</i> Pizza Sandwich	<i>Drinks:</i> Coffee Iced Tea Soda
--------------------------------------	--

Solution

According to the picture, each entrée has one drink choice.

If only one entrée is selected, there are three different drinks to choose from which makes three different combinations to choose from. You can have pizza with coffee, pizza with iced tea, or pizza with soda.



If the other entrée is chosen then there are also another three different combinations. You can have sandwich with coffee, sandwich with iced tea, or sandwich with soda.

If the different combinations are added together, there are 6 total different combinations.

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Combinatorics>"

- This page was last modified 02:39, 2 May 2008.

Divisibility

From TeacherWiki

Contents

- 1 Definition
- 2 Examples
 - 2.1 Find numbers that are divisible by 2
 - 2.2 Find the divisibility trick for 3
 - 2.3 Find the divisibility trick for 4
 - 2.4 Find the divisibility trick for 5
 - 2.5 Find the divisibility trick for 6
 - 2.6 Find the divisibility trick for 9
 - 2.7 Find the divisibility trick for 10

Definition

Divisibility defines what integers divide into other integers where the answer is an integer.

4 is divisible by 2 because $4 \div 2 = 2$

4 is not divisible by 3 because $4 \div 3 = 1.33$

Examples

Find numbers that are divisible by 2

All even numbers (numbers ending in 2, 4, 6, or 8) are divisible by 2

Ex: 7388 ends in 8, which is even, and so 7388 is also even

Find the divisibility trick for 3

Add the digits of a number. If the sum of the digits is divisible by 3, so is the number

Ex:

921

$9 + 2 + 1 = 12$.

12 is divisible by 3. Therefore, so is 921.

$921 \div 3 = 307$

Find the divisibility trick for 4

If the last two digits of a number are divisible by 4, so is the whole number.

Ex:

7825812

The last two digits are 12.

12 is divisible by 4.

7825812 is divisible by 4.

Also, dividing by 4 is the same as dividing by 2 twice.

Find the divisibility trick for 5

Any number ending in 0 or 5 is divisible by 5.

92370 ends in 0 and is thus divisible by 5.

Find the divisibility trick for 6

Any number that is divisible by both 2 and 3 is divisible by 6

Ex: 132 132 ends in a 2, so it is even and therefore divisible by 2

$1 + 3 + 2 = 6$, which is divisible by 3 and therefore 132 is divisible by 3.

Since it is divisible by both 2 and 3, 132 is divisible by 6

$132 \div 6 = 22$.

Find the divisibility trick for 9

Add the digits of the number. If the sum of the digits is is divisible by 3, so is the number

Ex:

792

$7 + 9 + 2 = 18$.

18 is divisible by 9. Therefore, so is 792.

$792 \div 9 = 88$

Find the divisibility trick for 10

Any number ending in 0 is divisible by 10.

43370 ends in 0 and is thus divisible by 10.

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Divisibility>"

- This page was last modified 00:54, 11 April 2008.

Equilateral Triangle

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Equilateral Triangles

Definition

A triangle in which all three sides have equal lengths

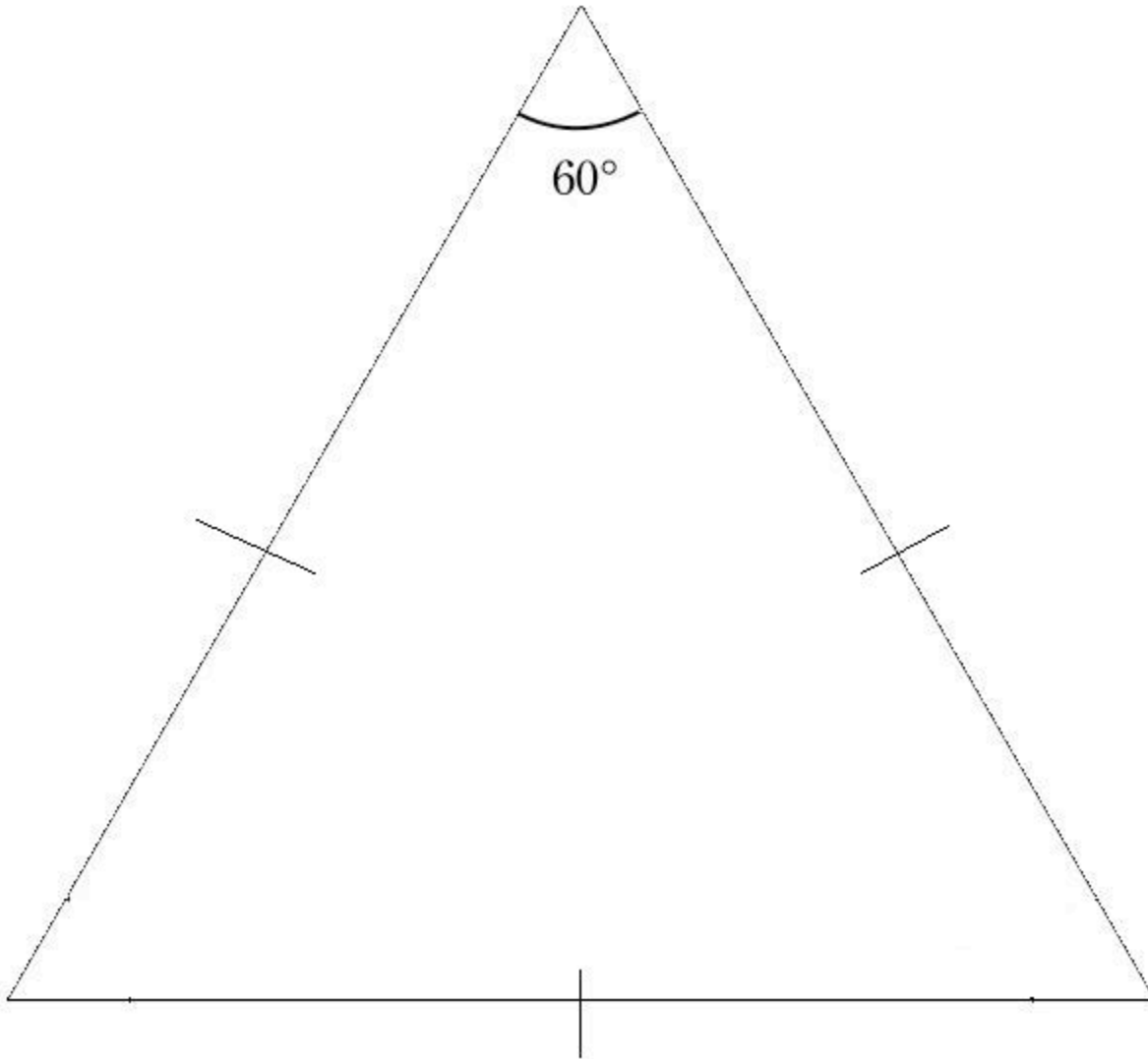
How It's Used

Used to solve for the third side of a triangle

Example

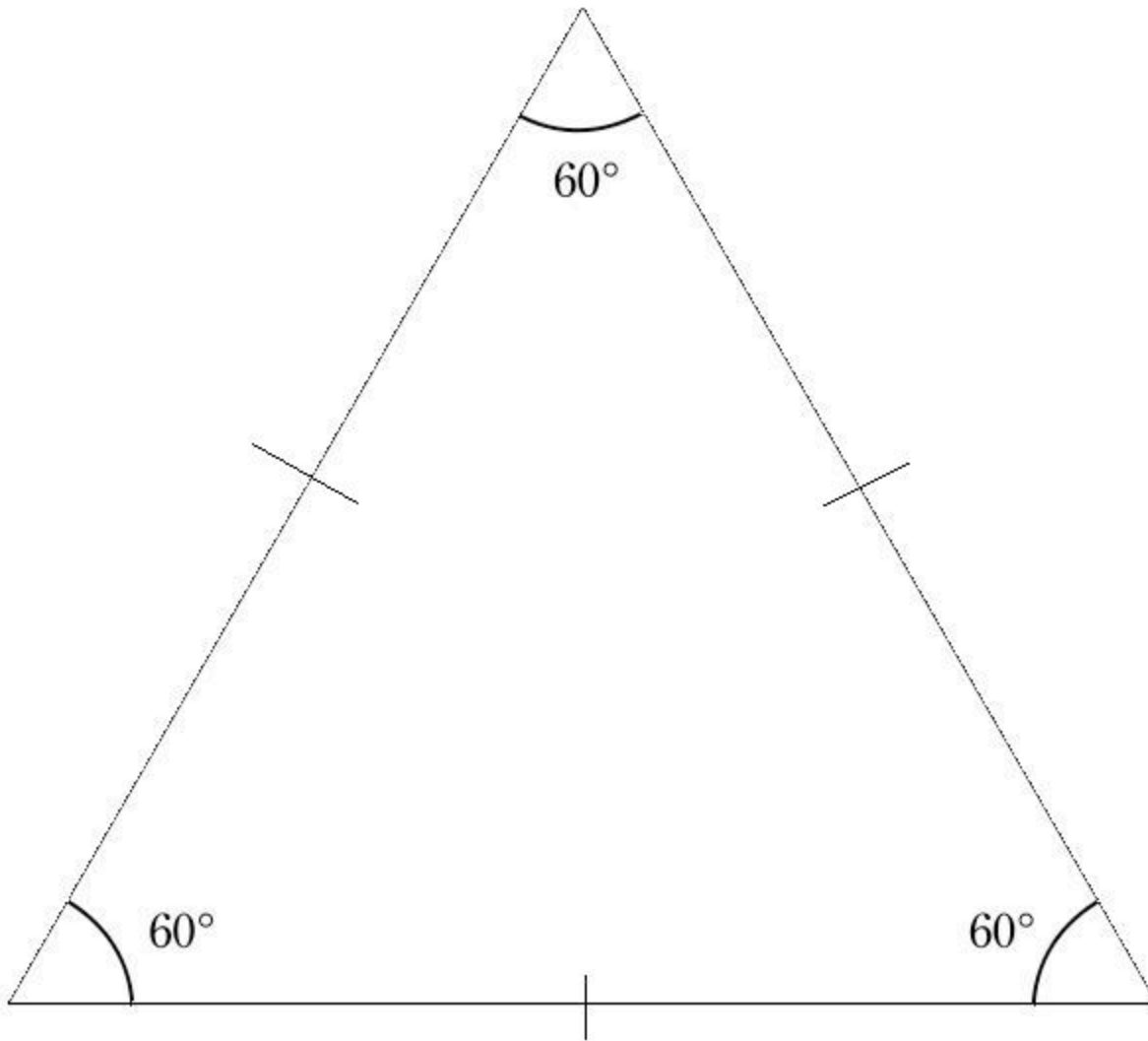
Equilateral Triangles

What are the other two angles in the triangle?

**Solution**

In equilateral triangles all sides are equal, therefore all angles are equal.

We know one angle already, which is 60 degrees



The other two angles in the triangle are also 60 degrees.

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Equilateral_Triangle"

- This page was last modified 01:00, 4 May 2008.

Equivalent Fractions Decimals Percents

From TeacherWiki

Contents

- 1 How it is done
 - 1.1 Fraction to decimal
 - 1.2 Decimal to Percent
 - 1.3 Percent to Decimal
 - 1.4 Percent to Fraction
 - 1.5 Decimal to Fraction
- 2 Example
 - 2.1 Order the following numbers from least to greatest: $\frac{4}{5}$ 22% 0.3

How it is done

Fraction to decimal

Divide the numerator (top) by the denominator (bottom)OR

Find an equivalent fraction with 100 as the denominator and then the numerator is the percent. Write the numerator with the percent sign.

Decimal to Percent

Percent means parts out of 100. The hundredths decimal place also means parts out of 100. So, if you move the decimal point to the right two places and add a percent sign you have the equivalent percent

Percent to Decimal

Reverse of above. Move the decimal back two places and remove the percent sign.

Percent to Fraction

Percent is parts out of 100, so, write the percent as the numerator (top) of the fraction (remove the percent sign), and 100 as the denominator (bottom).

Decimal to Fraction

Consider the naming system for decimal positions: tenths, hundredths, thousandths, etc. Note that this is the same way you would name fractions. Out of 10 reads tenths, out of reads means hundredths, etc.

Example

Order the following numbers from least to greatest: $\frac{4}{5}$ 22% 0.3

First, put everything in the same form.

Decimal form:

$$\frac{4}{5} = \frac{8}{10} = 0.8$$

$$22\% = \frac{22}{100} = 0.22$$

Now, we are ordering these decimals from least to greatest

.8, .22, 0.3 .

0.22, 0.3, 0.8 or

22%, .3, $\frac{4}{5}$

Fraction form:

$$22\% = \frac{22}{100} = \frac{11}{50}$$

$$0.3 = \frac{3}{10}$$

Now, we have $\frac{4}{5}$, $\frac{22}{100}$, $\frac{3}{10}$ We need these to have the same denominator.

Lets use 50.

$$\frac{4}{5} * \frac{10}{10} = \frac{40}{50}$$

$$\frac{3}{10} * \frac{5}{5} = \frac{15}{50}$$

Ordered, this would now be $\frac{11}{50}$, $\frac{15}{50}$, $\frac{40}{50}$ or 22%, 0.3, $\frac{4}{5}$

Percent form: $\frac{4}{5} = \frac{80}{100} = 80\%$

$$0.3 = 0.30 = 30\%$$

So, now we're ordering 22%, 80%, 30%

Ordered, this is: 22%, 30%, 80% or 22%, 0.3, $\frac{4}{5}$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Equivalent_Fractions_Decimals_Percents"

- This page was last modified 17:55, 11 April 2008.

Exponents

From TeacherWiki

Contents

- 1 Definition
- 2 Example
 - 2.1 2^3
 - 2.2 $2^4 * 2^5$
 - 2.3 $2^5/2^3$
 - 2.4 2^{34}

Definition

An Exponent shows how many times to multiply a number by itself

Example

$$2^3$$

3 is the exponent, showing how many times to multiply the 2 by itself, so

$$2^3 = 2 * 2 * 2$$

$$2^4 * 2^5$$

$$2^4 * 2^5 = 2 * 2 * 2 * 2 * 2 * 2 * 2 * 2 * 2 * 2 = 29 = 2^{4+5}$$

When a number (x) brought to a exponent (a) is multiplied by the same number brought to a exponent (b), it equals that

number brought to the first exponent plus the second exponent ($x^a * x^b = x^{a+b}$)

$$2^5/2^3$$

$$2^5/2^3 = 2 * 2 * 2 * 2 * 2 / 2 * 2 * 2$$

Note how 3 of the 2s on top can match 3 of the twos on the bottom

$$2 * 2 * 2 * 2 * 2 / 2 * 2 * 2$$

$$2^5/2^3 = 2^2 = 2^{5-3}$$

When a number (x) brought to a exponent (a) is divided by the same number brought to a exponent (b), it equals that number brought to the first exponent minus the second exponent

$$(x^a \div x^b = x^{a-b})$$

$$2^{3^4}$$

$$2^{3^4} = 2^3 * 2^3 * 2^3 * 2^3 = 2*2*2 * 2*2*2 * 2*2*2 * 2*2*2 = 2^{12} = 2^{3*4}$$

When a number (x) brought to a exponent (a) is brought to a exponent (b), it is the same as that number being brought to the first exponent multiplied by the second exponent. ($x^{a^b} = x^{a * b}$)

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Exponents>"

- This page was last modified 02:51, 19 March 2008.

Fraction Division

From TeacherWiki

Contents

- 1 How its done
- 2 Examples
 - 2.1 $2/3 \div 1/4$
- 3 Related pages

How its done

Flip (find the Reciprocal of) the second fraction and multiply

Examples

$2/3 \div 1/4$

Flip the second fraction and change the operation $\frac{2}{3} \div \frac{1}{4}$ becomes

$$\frac{2}{3} * \frac{4}{4}$$

Now multiply as you would normally

$$\frac{2}{3} * \frac{4}{1} = \frac{2 * 4}{3 * 1} = \frac{8}{3}$$

Related pages

Fraction Multiplication

Reciprocal

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Fraction_Division"

- This page was last modified 23:49, 8 April 2008.

Fraction Multiplication

From TeacherWiki

Contents

- 1 How its done
- 2 Examples
 - 2.1 What is half of five eighths?
 - 2.2 What is $75/76 * 7/100$?

How its done

Multiplying Fractions gives you a new fraction.

The **numerator** (top) of this fraction will be product of the numerator of each of the original numerators

The **denominator** (bottom) of this fraction will be the product of each of the original denominators

Of is a keyword meaning multiply.

Examples

What is half of five eighths?

Of is a keyword meaning multiply.

$$\text{Half of five eighths} = \frac{1}{2} * \frac{5}{8}$$

Multiply the numberators and the denominators

$$\frac{1}{2} * \frac{5}{8} = \frac{1 * 5}{8 * 2} = \frac{5}{16}$$

What is $75/76 * 7/100$?

This problem can be simplified before we solve it.

A number in the numerator of one fraction shares a common factor with a number in the denominator of the other.

$$75 \div 25 = 3$$

$$100 \div 25 = 4$$

So, we can take it out before multiplying the fractions.

$$\frac{75}{76} * \frac{7}{100} = \frac{75/25}{76} * \frac{7}{100/25} = \frac{3}{76} * \frac{7}{4}$$

Now, multiply the numerators with the numerators and the denominators with the denominators.

$$\frac{3}{76} * \frac{7}{4} = \frac{3 * 7}{76 * 4} = \frac{21}{304}$$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Fraction_Multiplication"

- This page was last modified 21:11, 6 May 2008.

Fractions

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Understanding fractions

Definition

A way to write numbers that are not whole numbers.

How It's Used

Fractions can be used to compare non integers, or numbers that are not whole.

Example

Understanding fractions

What is 3.4 expressed as a fraction?

Solution

To convert 3.4 to a fraction, first we must note that .4 is in the tenths place.

This can be represented as $\frac{4}{10}$.

Now we can convert the 3 to tenths as well.

Since $10/10 = 1$, we know that $30/10 = 3$.

Now we have $\frac{30}{10}$, which is the same as 3 and $\frac{4}{10}$, which is the same as 0.4.

Add these together $\frac{30}{10} + \frac{4}{10}$ and you get $\frac{34}{10}$.

3.4 can be written as a fraction as $\frac{34}{10}$.

- Note that fractions can be reduced or expanded.

For example,

34/10 can also be written as $\frac{17}{5}$, which is also 3.4, it has just been reduced by finding a common denominator.

34 and 10 both are divisible by 2. Here 2 is the common denominator, so each number is divided by the common denominator.

$\frac{34}{2} = 17$ and $\frac{10}{2} = 5$, thus the fraction has been reduced to $\frac{17}{5}$ which = 3.4.

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Fractions>"

- This page was last modified 02:56, 2 May 2008.

Graph Shape

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Graph Shape

Definition

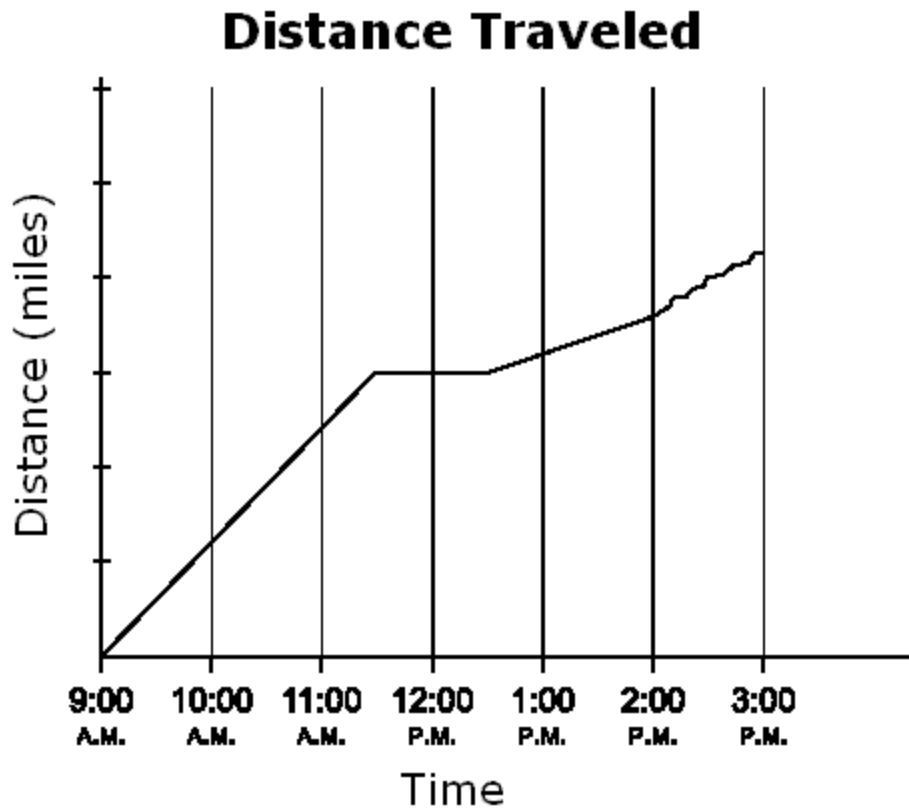
How It's Used

Understanding an x-y graph and interpret the data.

Example

Graph Shape

On the following graph, what is being compared?



Solution

Here distance is being compared to time.

As distance increases, so does time.

The traveler is going fastest from 9:00 to 11:30 because the line is the steepest here. The traveler covers more distance for the allotted time during this interval.

Note the flat region at 11:30 am, where the traveler stopped for a period of time before continuing.

Notice that as the y axis increases, the distance is increase.

And on the x-axis the time is increasing. The further on the x-axis you go, the larger the time value.

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Graph_Shape"

- This page was last modified 02:27, 2 May 2008.

Integers

From TeacherWiki

Definition

Integers are all the whole numbers (0,1,2,3,4,...) and their opposites (-1, -2, -3, -4...).

Example

Out of the following numbers, which is not an integer?

3, -72, 23.31, -50

Solution

Since we know an integer is a whole number and the opposites of whole numbers, let's go through the list.

3 is an integer, it is a whole number

-72 is an integer, it is the opposite of the whole number 72.

23.31 is not an integer, it contains a decimal.

-50 is an integer, it is the opposite of the whole number of 50.

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Integers>"

- This page was last modified 02:23, 11 April 2008.

Least Common Multiple

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Understanding the Least Common Multiple

Definition

The least common multiple of two or more integers is the smallest whole number that is divisible by each of the numbers.

How It's Used

This is very helpful when working with fractions, because the denominators should always be least common multiples in order to perform the math operation required.

There are two different methods for finding the least common multiple; one is to use the factor tree.

The other is list all the multiples of the numbers to be compared until the lowest common multiple is found.

Example

Understanding the Least Common Multiple

What is the least common denominator between 4 and 3?

Solution

First lets list all the multiples of 4, starting at 1 and going to say 7.

4, 8, **12**, 16, 20, **24**, 28

Now lets list all the multiples of 3, starting at 1 and also going to 7.

3, 6, 9, **12**, 15, 18, 21, **24**

The next step is to pick out the common multiples; here we have 12 and 24.

But we are looking for the least common multiple, so in this case it would be 12, because it is smaller than 24, making it the least common multiple.

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Least_Common_Multiple"

- This page was last modified 02:27, 2 May 2008.

Making Sense of Expressions and Equations

From TeacherWiki

Contents

- 1 Definition
 - 1.1 Epression
 - 1.2 Equation
- 2 Examples
 - 2.1 If $2n + 5 = 9$ what does $2n - 3$ equal?
 - 2.2 Fill in $>$, $<$, or $=$ for the following problem: $1/n \text{ ___ } 27/27n$

Definition

Epression

Numbers, operators, grouping symbols (parenthesis or brackets), and variables grouped to have a meaning that can be evaluated.

Equation

A statement asserting the equality of two expressions, usually written as a linear array of symbols that are separated into left and right sides and joined by an equal sign.

Examples

If $2n + 5 = 9$ what does $2n - 3$ equal?

Solution: look at the equations

Look at how similar the expressions are:

$$2n + 5$$

$$2n - 3$$

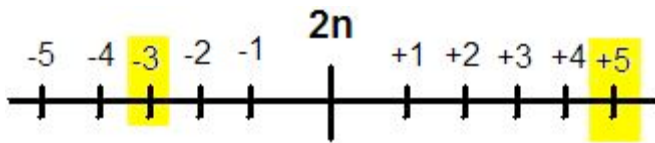
The difference is between the $+5$ and the -3 .

To find the difference means to subtract.

$$5 - -3 = 8(\text{see Subtraction})$$

So, the value of the expression $2n - 3$ is 8 less than the value of the expression $2n + 5$.

You can see this on the following number line:



$$\text{If } 2n + 5 = 9, 2n - 3 = 9 - 8 = 1$$

Or you can use algebra

$$2n + 5 = 9$$

$$2n + 5 - 8 = 9 - 8$$

$$2n - 3 = 1$$

Solution: solving for n

We have a full equation in $2n + 5 = 9$; lets solve it

$$2n + 5 = 9$$

$$2n + 5 - 5 = 9 - 5$$

$$2n = 4$$

$$\frac{2n}{2} = \frac{4}{2}$$

$$n = 2.$$

Now we can plug n into the second equation to solve it

$$2n - 3 = 2 * 2 - 3 = 1$$

Fill in >, <, or = for the following problem: $\frac{1}{n}$ ___ $\frac{27}{27n}$

Solution: look at the equation

We could look at the equation and see that $\frac{27}{27n} = \frac{27}{27} * \frac{1}{n}$.

Since $\frac{27}{27} = 1$, we can see algebraically that $\frac{1}{n} = \frac{27}{27n}$

Solution: substituting in numbers

substituting in 1 for n gives $\frac{1}{1} = \frac{27}{27 * 1}$ which is the same as $\frac{1}{1} = \frac{27}{27}$. Dividing, we find these equations are equal.

substituting in 2 for n gives $\frac{1}{2} = \frac{27}{27 * 2}$ which is the same as $\frac{1}{2} = \frac{27}{54}$. Dividing, we find these equations are also equal

Now lets try substituting in 1,000 for n.

$\frac{1}{1} = \frac{27}{27 * 1,000}$ which is the same as $\frac{1}{1,000} = \frac{27}{27,000}$. We can plug this into a calculator or divide on our own and see that these are also equal.

the answer is $\frac{1}{n} = \frac{27}{27n}$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Making_Sense_of_Expressions_and_Equations"

- This page was last modified 01:08, 11 April 2008.

Measurement Use Ruler

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Reading a ruler

Definition

How It's Used

Use the ruler to make measurements, depending on the units, English or metric.

Metric Ruler

They deal with centimeters and millimeters only.



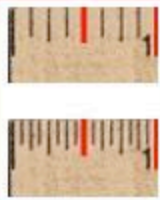
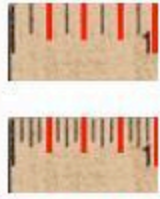
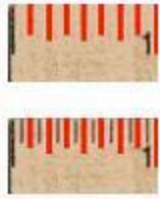

The larger lines with numbers are centimeters, and the smallest lines are millimeters. Millimeters are 1/10th of a centimeter, if you measure 4 marks after a centimeter, it is 1.4 centimeters long.

English Ruler

Take a look at the following English Rulers.



A ruler marked in 16ths. Every mark is 1/16th of an inch.

<p>The center mark between numbers is $1/2$.</p> <p>The red lines on these rulers are marked at $1/2$, and 1.</p>	
<p>The next smallest marks on a ruler are $1/4$ths.</p> <p>The red marks on these rulers are at $1/4$, $1/2$, $3/4$, and 1. ($1/2$ is the same as $2/4$)</p>	
<p>The next smallest marks on a ruler are $1/8$ths.</p> <p>The red marks on these rulers are at $1/8$, $1/4$, $3/8$, $1/2$, $5/8$, $3/4$, $7/8$, and 1.</p>	
<p>The next smallest mark, if there are any, are $1/16$ths.</p> <p>The red marks on this ruler are at $1/16$, $1/8$, $3/16$, $1/4$, $5/16$, $3/8$, $7/16$, $1/2$, $9/16$, $5/8$, $11/16$, $3/4$, $13/16$, $7/8$, $15/16$, and 1.</p>	

Below is an example.

Example

Reading a ruler

What is the reading of the red mark on the ruler?



Solution

First read the inches section of the ruler, 2 inches.

Then read in, since the ruler is broken into 16ths you can count how many lines there are to the red mark.

Or since you know that the large line in-between 2 and 3 is 2 and $8/16$ or 2.5 inches, you can move over one mark.

This makes the actual reading 2 and $9/16$ of an inch.

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Measurement_Use_Ruler"

- This page was last modified 16:20, 15 April 2008.

Multiplying Decimals

From TeacherWiki

Contents

- 1 How its Done
 - 1.1 Method 1 – using Estimation:
 - 1.2 Method 2 – counting decimal places:
- 2 Example
 - 2.1 $6.35 * 8.3$

How its Done

To multiply decimals, ignore the decimal point for initial multiplication, and multiply normally. Here are two ways to place the decimal:

Method 1 – using Estimation:

Estimate the product, then place the decimal so the answer has the same magnituted as the estimation.

Method 2 – counting decimal places:

Count the decimal places in the factors, and that will be the number of decimal places in the product.

Example

$$6.35 * 8.3$$

Solution using Method 1 - Estimation

First, just multiply as you would without decimal points.

$$635 * 83 = 52705$$

Now Estimate:

6.35 is close to 6

8.3 is close to 8

Our estimate is $6 * 8 = 48$

Finally Place the decimal:

Where should it go

0.52705 OR 5.2705 OR 52.705 OR 527.05

52.705 is the only choice close to 48

Therefore:

$$6.35 * 8.3 = 52.705.$$

Solution using Method 2 - counting decimal places

First, just multiply as you would without decimal points.

$$635 * 83 = 52705$$

Next, count the decimal places in the two factors 6.35 has 2 digits after the decimal point, and 8.3 has 1 digit after the decimal So the product is 3. 6.35 * 8.3 = 52.705

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Multiplying_Decimals"

- This page was last modified 18:52, 25 March 2008.

Multiplying Positive Negative Numbers

From TeacherWiki

Contents

- 1 How Its Done
- 2 Examples
 - 2.1 $-2 * 3$
 - 2.2 $-4 * -5$
 - 2.3 $-2 * -6 * -4$
 - 2.4 $-2 * 3 * -2$

How Its Done

A positive multiplied by a positive equals a positive

A positive multiplied by a negative equals a negative

A negative multiplied by a negative equals a positive

Examples

$-2 * 3$

$$2 * 3 = 6.$$

The 2 is negative, and the three is positive.

A negative times a positive equals negative

$$-2 * 3 = -6$$

$-4 * -5$

$$4 * 5 = 20.$$

A negative times a negative equals a positive.

$$-4 * -5 = 20$$

$-2 * -6 * -4$

$$-2 * -6 = 12 \text{ (a negative times a negative equals a positive)}$$

$$12 * -4 = -48 \text{ (negative times a positive equals negative)}$$

Note, an odd amount of negative numbers makes a negative solution

$$-2 * 3 * -2$$

$$-2 * 3 = -6 \text{ (a negative times a positive is a negative)}$$

$$-6 * -2 = 12 \text{ (a negative times a negative equals a positive)}$$

Note: an odd amount of negative numbers makes a negative answer.

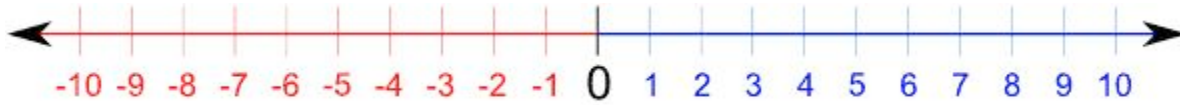
Retrieved from "http://nth5.wpi.edu/wiki/index.php/Multiplying_Positive_Negative_Numbers"

- This page was last modified 00:59, 19 March 2008.

Number Line

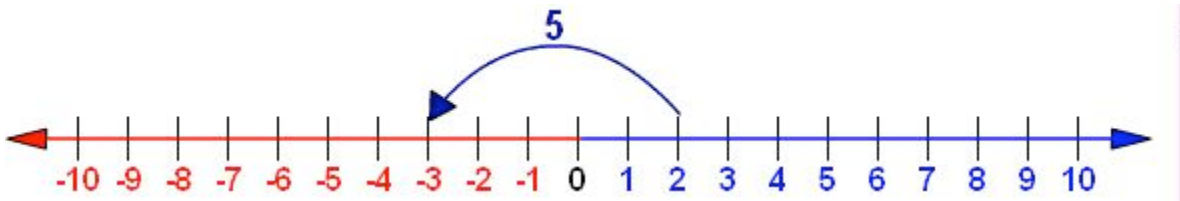
From TeacherWiki

Definition: A line with real numbers placed in their correct position in numerical order; can be positive and/or negative.



Example 1:

Use a number line to find $2 - 5$.

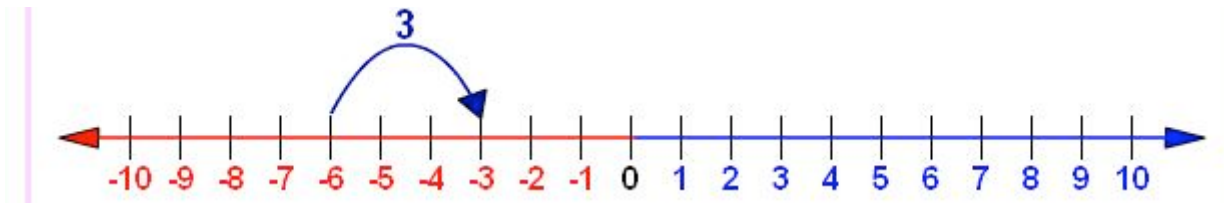


Start at 2 and move to the left (because you are subtracting) 5 spaces.

$$2 - 5 = (-3).$$

Example 2:

Use a number line to find $-6 + 3$?



Start at -6 and move to the right (because you are adding) 3 spaces.

$$(-6) + 3 = (-3).$$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Number_Line"

- This page was last modified 18:47, 18 March 2008.

Of Means Multiply

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example 1
 - 3.1 Of Means Multiply
- 4 Example 2

Definition

How It's Used

Understand that, of, means to multiply. In a given problem, certain words tell you what kind of math operation you will need to do.

Below is an example.

Example 1

Of Means Multiply

What is $\frac{3}{4}$ of 44?

Solution

Applying that of means multiply, the equation would become;

$$\frac{3}{4} * 44 =$$

$$3 * 44 / 4 =$$

$$3 * 11 = 33$$

Example 2

Billy has \$20. He gives $\frac{1}{2}$ of his money to his mom for a game. How much does Billy have left?

Solution

Since billy gave $\frac{1}{2}$ of his money to his mother, of means to multiply.

$$20 * \frac{1}{2} = 10$$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Of_Means_Multiply"

- This page was last modified 02:32, 2 May 2008.

Ordering Decimals

From TeacherWiki

How its done

Order decimals by their non decimal parts first. Then add zeros after the decimal until all the numbers have the same number of places after the decimal. Now put the numbers in order. Remember tenths will be greater than hundredths, etc.

Examples

Order from greatest to least: 0.3, 0.05, 0.22, 1.02

It might be helpful to rewrite the numbers so they all have two digits after the decimal point.

To ensure this, we should place a 0 after 0.3. This does not change the value of the number.

Consider this in terms of fractions:

$$0.3 = \frac{3}{10} \text{ (See Equivalent Fractions Decimals Percents)}$$

$$\frac{3}{10} * \frac{10}{10} = \frac{30}{100}$$

$$0.3 = \frac{3}{10} = \frac{30}{100} = 0.30$$

Now we have 0.30, 0.05, 0.22, 1.02.

Looking at the non decimal part first, we notice 1.02 is the greatest number

$$1.02 > 0.30 > 0.22 > 0.05$$

So the numbers ordered from greatest to least is 1.02, 0.30, 0.22, 0.05.

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Ordering_Decimals"

- This page was last modified 00:48, 11 April 2008.

Ordering Numbers

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Ordering Numbers

Definition

Arranging numbers in numerical order in order to easily asses the values for further evaluation.

How It's Used

This is the base step in determining many properties such as range, median or mode.

Example

Ordering Numbers

Place the following numbers in order from lowest to highest.

25, 1, 5, 7, -3, 74, -53

Solution

Negative numbers are smaller than positive numbers so they come first and the negative number with the largest absolute value is the lowest because it is the farthest to the left on a number line.

Following this place the numbers in order.

-53, -3, 1, 5, 7, 25, 74

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Ordering_Numbers"

- This page was last modified 14:53, 22 April 2008.

Pythagorean theorem

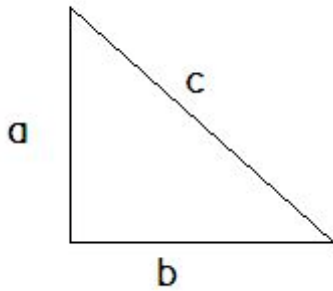
From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Pythagorean Theorem

Definition

In any right triangle, the area of the square whose side is the hypotenuse (the side opposite the right angle) is equal to the sum of the areas of the squares whose sides are the two legs (the two sides that meet at a right angle).



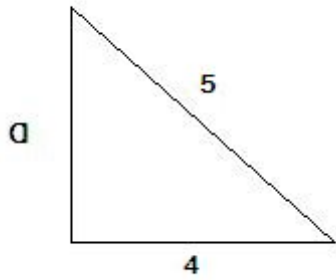
How It's Used

Used to solve for the third side of a triangle

Example

Pythagorean Theorem

What is the value of side a?



Solution Using the Pythagorean theorem, we know that $a^2 + 4^2 = 5^2$

We can now solve for a;

$$a^2 + 16 = 25$$

$$a^2 = 25 - 16$$

$$a^2 = 9$$

$$a = 3$$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Pythagorean_theorem"

- This page was last modified 17:44, 15 April 2008.

Range (Statistics)

From TeacherWiki

Contents

- 1 Definition
- 2 Examples
 - 2.1 Compute the range of the following list: 935, 278, 726, 465, 900
- 3 Related Pages

Definition

The distance between the largest and the smallest value in a set is called its range.

Examples

Compute the range of the following list: 935, 278, 726, 465, 900

Ordered from least to greatest, the list is: 278, 465, 726, 900, 935

Subtract the smallest value from the largest value: $935 - 278 = 657$

The range of this data is 657.

Related Pages

Subtraction

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Range_%28Statistics%29"

- This page was last modified 17:57, 11 April 2008.

Rate with Distance and Time

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Rate with distance and time

Definition

How It's Used

Breaking down the components given to determine a distance/time comparison and use this to evaluate your unknown values.

Below is an example.

Example

Rate with distance and time

Adam traveled 600 miles in 10 hours. He has another 1800 miles to his destination. How long will it take Adam to arrive at his destination if he continues along at this pace?

Solution

Adam has traveled 600 miles in 10 hours, or

$$600 \text{ miles} / 10 \text{ hours} = 60 \text{ miles} / 1 \text{ hour}$$

He has another 1800 miles to go at 60 miles /1 hour

$$1800 \text{ miles} / 60 \text{ miles} / 1 \text{ hour} = 30 \text{ hours until he reaches his destination}$$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Rate_with_Distance_and_Time"

- This page was last modified 23:06, 9 April 2008.

Reduce Fraction

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Reducing a fraction

Definition

Reducing a fraction is finding an equivalent fraction in which the numbers in the numerator and denominator are smaller integers.

How It's Used

To reduce, also known as simplifying a fraction to lowest terms, divide the numerator and denominator by their greatest common factor.

Example

Reducing a fraction

Reduce the fraction below to its lowest common denominator.

25/100

Solution

In order to start we need to find factors of 25 that are common with factors of 100.

5, and 25 are both factors of 25 and 100.

You can reduce the fraction $\frac{25}{100}$ by 5. It will become $\frac{5}{20}$ by dividing 25 and 100 both by the common multiple, 5.

$\frac{5}{20}$ can then be reduced again by a common multiple of 5 which would reduce to $\frac{1}{4}$.

If the original $\frac{25}{100}$ was reduced by the multiple of 25 to begin with, it would have become $\frac{1}{4}$ also.

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Reduce_Fraction"

- This page was last modified 02:52, 2 May 2008.

Rounding

From TeacherWiki

Contents

- 1 Definition
- 2 How its done
- 3 Examples
 - 3.1 Round 243.76 to the nearest ten.
 - 3.2 Round 243.76 to the nearest tenths
 - 3.3 Round 24.53% to the nearest whole percent

Definition

Finding the number closest to a specific place value.

If the number is closer to the value higher up, we round up.

If the number is closer to the value lower down, we round down.

How its done

Examine the value above and bellow your number and determine which one is closer. If the number is exactly half way between you round up.

Examples

Round 243.76 to the nearest ten.

Solution: We're rounding to the **ten**, so we know our number is between 240 and 250 (the closest numbers rounded to the tens)

$$240 < 243.76 < 250$$

240 is only 3.76 away from 243.76 so it is closest.

243.76 rounded to the nearest ten is 240.

Round 243.76 to the nearest tenths

Solution: We're rounding to the **tenths**, so we know the number is between 243.70 and 243.80 (the closest numbers rounded to the tenths)

243.80 is only .04 away from 243.76, so it is closest.

243.76 rounded to the nearest tenth is 243.80.

Round 24.53% to the nearest whole percent

Solution

Saying round to the nearest whole percent is like saying round to the nearest ones.

25% is 0.47% away from 24.53% so it is closest.

24.53% rounded to the nearest whole percent is 25%

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Rounding>"

- This page was last modified 18:05, 24 March 2008.

Similar Triangles

From TeacherWiki

Contents

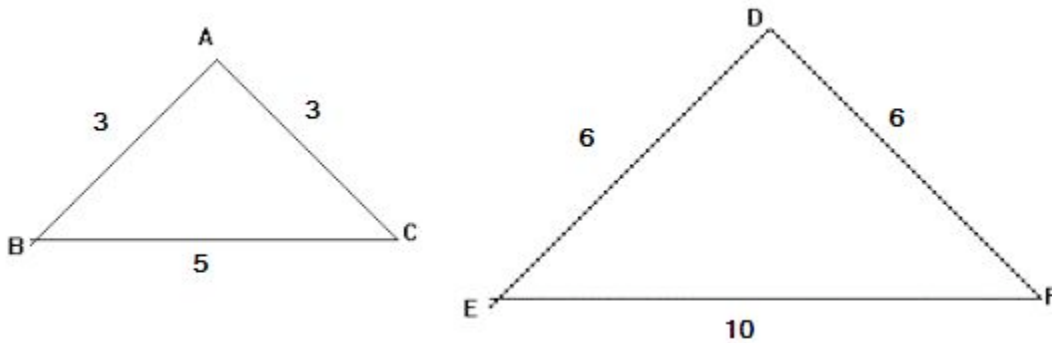
- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Similar Triangles

Definition

Two triangles will have the same angles and their sides will be in the same proportion.

How It's Used

Used to solve for the unknown sides of triangles.



Here:

angle A = angle D

angle B = angle E

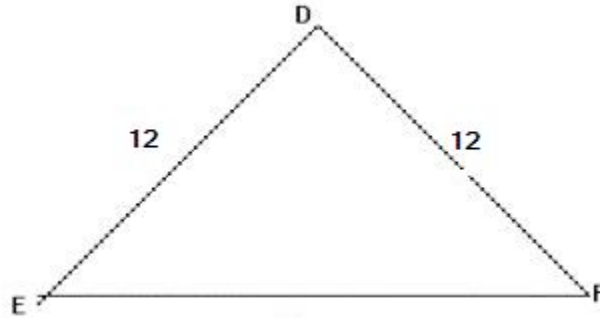
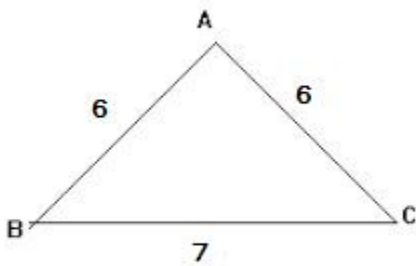
angle C = angle F

$AB/DE = BC/EF = AC/DF$

Example

Similar Triangles

What is the length of EF?



Solution

Since we can see that the triangles have two similar sides, we know the third must also be same.

Since $AB/DE = BC/EF$ and we know all the values besides EF, we can use that similarity.

$$\frac{6}{12} = \frac{7}{EF}$$

$$6 * EF = 7 * 12$$

$$6 * EF = 84$$

$$EF = 84/6 = 14$$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Similar_Triangles"

- This page was last modified 17:58, 15 April 2008.

Square Root

From TeacherWiki

Contents

- 1 Definition
- 2 Example
 - 2.1 Solve
 - 2.2 Estimate

Definition

The square root of a number is the number multiplied by itself that will give you that number. ($\sqrt{\quad}$)

$\sqrt{36}$ is read: "square root of 36"

Example

Solve $\sqrt{4}$

$$1 * 1 = 1$$

$$2 * 2 = 4$$

$$\sqrt{4} = 2$$

Estimate $\sqrt{2}$

To find which whole number a square root is closest too, look for a square near it. We know $1 * 1 = 1$ and $2 * 2 = 4$, so we know that $\sqrt{2}$ will be somewhere between 1 and 2. 2 is closer to 1 ($1 * 1$) than it is to 4 ($2 * 2$).

$\sqrt{2}$ will be closer to 1 than 2.

$$\sqrt{2} \approx 1.41421356$$

This is an irrational number. Many square roots are.

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Square_Root"

- This page was last modified 00:51, 11 April 2008.

Stem and Leaf Plot

From TeacherWiki

Definition

A stem-and-leaf plot is a display that organizes data to show its shape and distribution.

In a stem-and-leaf plot each data value is split into a "stem" and a "leaf".

The "leaf" is usually the last digit of the number and the other digits to the left of the "leaf" form the "stem".

Example

Make a stem and leaf plot for the following data set:

33, 37, 37, 52, 56, 59, 60, 60, 78

First we create a table.

Stem	Leaf

If we look at the data set, we can identify which numbers are stems, and which are leaves.

33, 37, 37, 52, 56, 59, 60, 60, 78

So the stem and leaf plot would look like this.

Stem	Leaf
3	3, 7, 7
4	
5	2, 6, 9
6	0, 0
7	8

Don't forget to create a legend for your plot, or a summary of how you set up your plot.

Legend: 3 | 7 means 37

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Stem_and_Leaf_Plot"

- This page was last modified 21:08, 21 April 2008.

Subtracting Decimals

From TeacherWiki

How its done

When you add decimals make sure you are subtracting tens with tens, ones with ones, tenths with tenths and so on. To do this we line up the decimal points

Example

$$57.231 - 1.34$$

$$57.231 - 1.34$$

Can be written as

$$\begin{array}{r} 57.231 \\ - 1.340 \end{array}$$

From there, you can just subtract each of the columns, as you would in a subtraction problem using integers

$$\begin{array}{r} 57.231 \\ - 1.340 \\ \hline 55.691 \end{array}$$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Subtracting_Decimals"

- This page was last modified 23:24, 8 April 2008.

Subtraction

From TeacherWiki

Contents

- 1 Definition
- 2 How its done
- 3 Examples
 - 3.1 $4 - (-2)$
 - 3.2 $3 - (+2)$
 - 3.3 $-6 - (-7)$

Definition

Subtraction is finding the difference

How its done

To subtract, add the opposite.

Examples

4 - (-2)

add the opposite $4 - (-2)$ is the same as saying $4 + (+2)$ or 6

3 - (+2)

$3 - (+2)$ is the same as $3 + (-2)$, or just $3 - 2 = 1$.

$3 + (-2) = 1$

-6 - (-7)

Add the opposite $-6 - (-7) = -6 + (+7) = 1$.

Think of the '**difference**' in height between something that is seven feet underground and something that is 6 feet underground.

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Subtraction>"

- This page was last modified 02:13, 15 April 2008.

Sum Of Interior Angles more than 3 Sides

From TeacherWiki

How its Done:

The sum of the angles in a triangle is 180 degrees.

SHOW IMAGE

For any polygon of more than 3 sides you can divide it into triangles.

SHOW IMAGE FOR IREGULAR HEXAGON.

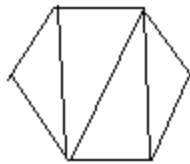
Each triangle has 180 degrees so just add up the total number of 180 degrees in the Polygon.

Examples:

1. Find the measure of the interior angles of a octagon

Solution:

Start at one vertex and make triangles by connecting it to the other vertexes. An Octagon will be divided into



6 triangles, as shown:

The sum of the interior angles in each of these triangles is 180.

The sum of the interior angles in all of these triangles would be $6 * 180$

The sum of the interior angles in an octagon is 1080.

related links

Interior Angles of a Triangle

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Sum_Of_Interior_Angles_more_than_3_Sides"

- This page was last modified 14:10, 24 March 2008.

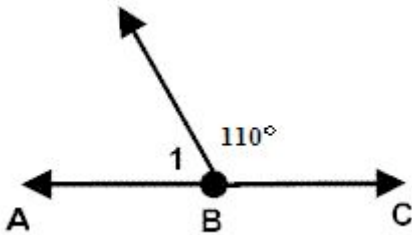
Supplementary Angles

From TeacherWiki

Definition: Adjacent angles forming a straight line. These angles add to 180° .

Angle a and b are supplementary.

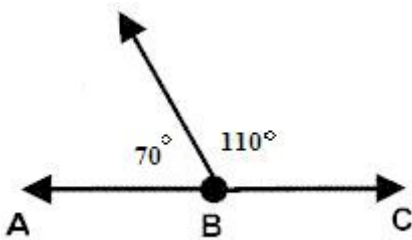
Example: What is value of angle 1?



To evaluate this, remember that supplementary angles add to 180.

$$180 - 110$$

$$70$$



Angle 1 is 70° .

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Supplementary_Angles"

- This page was last modified 19:00, 18 March 2008.

Surface Area

From TeacherWiki

Contents

- 1 Definition
- 2 How its Done
- 3 Examples
 - 3.1 Find the surface area of a cube with side length 4?
 - 3.2 Find the surface area of a Rectangular prism with length 7 width 4 and height 3
 - 3.3 Find the surface area of a cylinder with radius 6 and height 4?

Definition

The area of the shape a 3D object would make when opened up and lying flat.

How its Done

Surface Area Equations:

Cube: $6s^2$

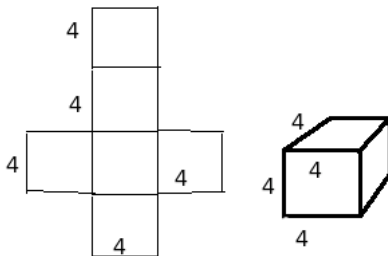
Rectangle $2 * \text{length} * \text{width} + 2 * \text{width} * \text{height} + 2 * \text{length} * \text{height}$

Sphere: $4 * \pi * \text{radius}^2$

Cylinder: $2 * \pi * \text{radius}^2 + 2 * \pi * \text{radius} * \text{height}$

Examples

Find the surface area of a cube with side length 4?



Solution

The surface of a cube is made up of 6 squares (see image above).

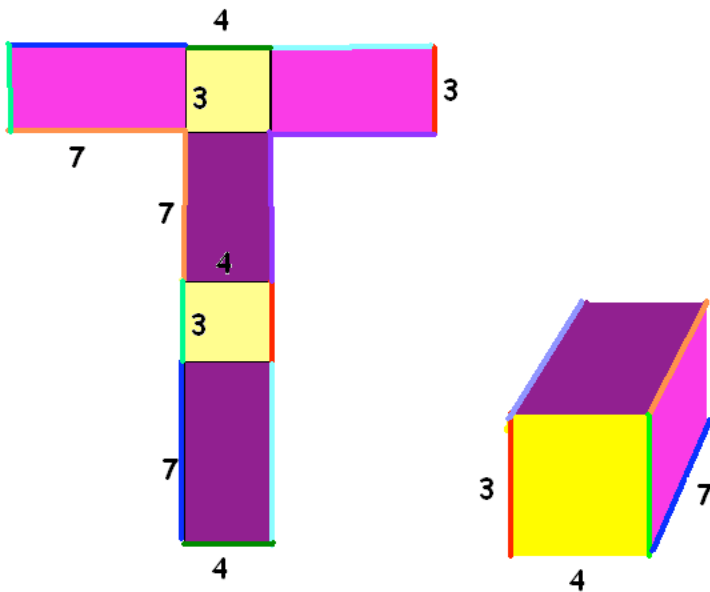
Each of those squares has an area calculated by multiplying the length of its side by itself.

So, the area of one face of this cube is $= 4 * 4 = 16$

The Surface area of the entire cube is $6 * \text{area of one face} = 6 * 16 = 96$.

The surface area of a cube with side length 4 is 96 square units

Find the surface area of a Rectangular prism with length 7 width 4 and height 3



Solution

The surface of this rectangular prism is made up of three different sized rectangles.

Two of them are the **front** and **back**, with size 3 (the height of the prism) x 4 (the width of the prism).

They each have area **12**. ($3 * 4 = 12$)

Two of them are the **left** and **right** sides with size 3 (the height of the prism) x 7 (the length of the prism).

They each have area **21**. ($3 * 7 = 21$)

Two of them are the **top** and **bottom**, with size 7 (the length of the prism) x 4 (the width of the prism).

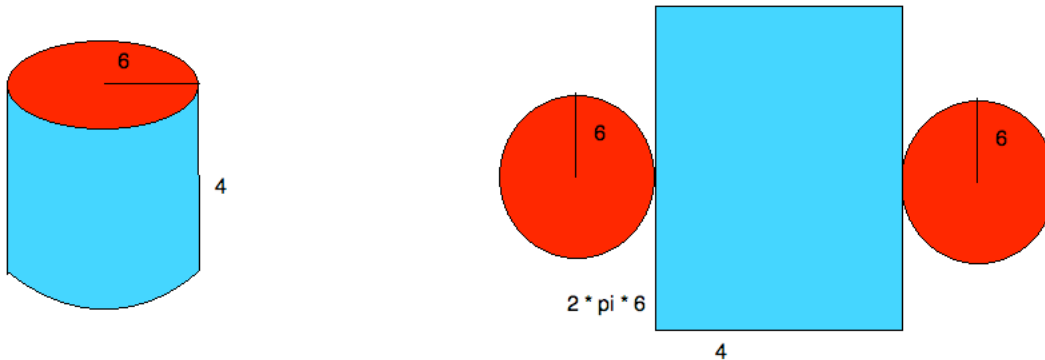
They each have area **28**. ($7 * 4 = 28$)

To find the surface area we add the area of each of these rectangles.

$$2 * 12 + 2 * 21 + 2 * 28 = 122.$$

The surface area of a rectangular prism with length 7 width 4 and height 3 is 122.

Find the surface area of a cylinder with radius 6 and height 4?



Solution

The surface area of a cylinder looks like two circles and a rectangle, with one side length being the height, and the other side length being the circumference of the circles.

The area of one of the circles = $\pi * r^2 = \pi * 6 * 6 = 36\pi$.

Both circles will have the same area, so multiply this by 2.

Now, add the area of the rectangle.

The Circumference of the circle = one side of the rectangle = $2 * \pi * r = 2 * \pi * 6 = 12\pi$

Area of rectangle = circumference of circle * height = $12\pi * 4 = 48\pi$.

The surface area of the whole cylinder = area of rectangle + area of bottom circle + area of top circle = area of rectangle + 2 * area of bottom circle = $48\pi + 2 * 36\pi = 120\pi$

The surface area of a cylinder with height 4 and radius 6 is 120π square units or about $120 * 3.14 = 376.8$ square units.

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Surface_Area"

- This page was last modified 02:01, 7 May 2008.

Symbolization Articulation

From TeacherWiki

Contents

- 1 Definition
- 2 How It's Used
- 3 Example
 - 3.1 Symbolization/Actualization

Definition

Representing a value or equation with a variable.

How It's Used

Substitutions are made to either allow one to work through the problem or make the problem easier to understand.

Below is an example.

Example

Symbolization/Actualization

Jake reads in the newspaper that the U.S. dollar is losing its value. One U.S. dollar was worth 86 cents in Canadian money. If n stands for the number of U.S. dollars, write the equation that gives the value, C , of those dollars in Canadian money?

Solution

We know 1 U.S dollar is equal to .86 dollars in Canada. We can rewrite this as

$$1 \text{ U.S. dollar} = .86 \text{ Canada dollar}$$

$$1n = .86 C$$

$$1n / .86 = C$$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Symbolization_Articulation"

- This page was last modified 16:23, 15 April 2008.

Venn Diagram

From TeacherWiki

Contents

- 1 Definition
- 2 How Its Used
- 3 Example
 - 3.1 Reading a Venn Diagram
 - 3.2 Application

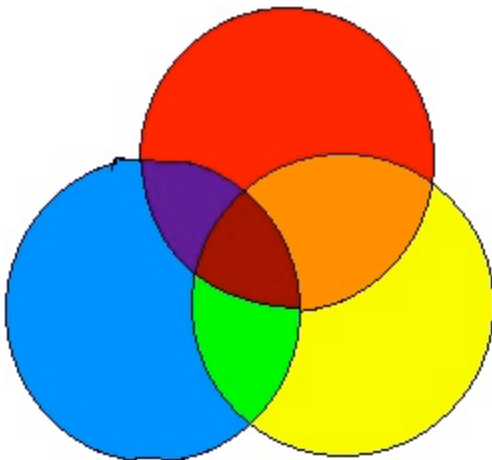
Definition

A picture made up of overlapping circles to show the relationships between groups.

How Its Used

That which the elements in one circle have in common with another circle is in its shared region.

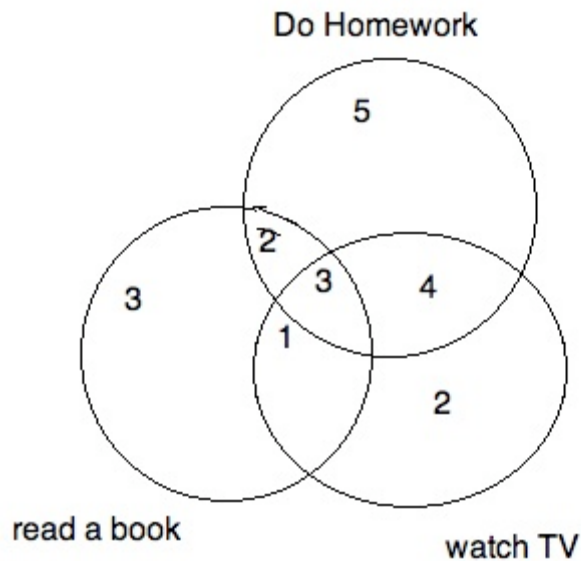
Below is an example using primary colors



Example

Reading a Venn Diagram

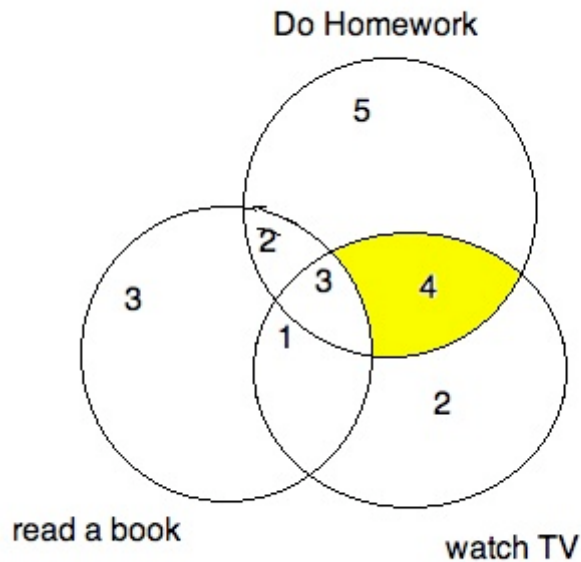
According to the Venn Diagram below, how many people watch TV and do their homework but do not read a book after school?



After school activities

Solution

Look at where the circle for watching TV overlaps with doing homework, but not with reading a book, shaded in the picture below.

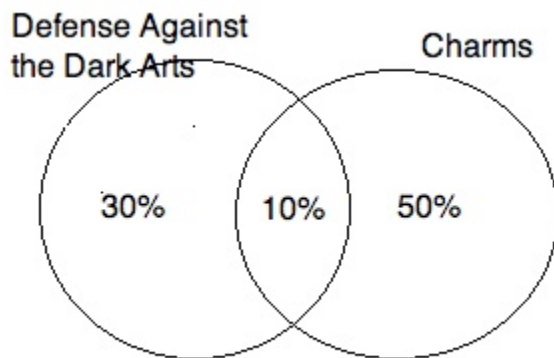


4 people do homework and watch TV but do not read a book after school.

Application

Students at Hogwarts can take Defense Against the Dark Arts, Charms, both, or neither. The percentages of Hogwarts students involved in each of the classes are shown in the venn diagram below

Courses taken by students at Hogwarts



What percent of students at Hogwarts take neither Defense Against the Dark Arts or Charms?

Solution

The Diagram tells us that 30% of the students are in Defense Against the Dark Arts and not Charms.

We also know that 50% of the students are in Charms and not Defense Against the Dark Arts.

10% of students are in both.

This means that 30% + 50% + 10% are in some combination of both Charms and Defense Against the Dark Arts.

90% of the students are in either Defense Against the Dark Arts, Charms, or both.

100% represents all of the students at Hogwarts.

$100\% - 90\% = 10\%$

10% of Hogwarts takes neither Defense Against the Dark Arts or Charms

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Venn_Diagram"

- This page was last modified 02:43, 21 March 2008.

Mean

From TeacherWiki

Mean

Definition

The mean is the average of the numbers given to you in a set.

Example

To find the mean, or average, of some numbers, you simply add all the numbers together, and then divide that number by how many numbers you have in the set.

Say you are given the numbers:

21, 33, 48, 51, 67

To find the mean, add up the numbers.

$$21 + 33 + 48 + 51 + 67 = 220$$

Then divide that number by how many numbers you were given in the set.

$$220/5 = 44$$

44 is the mean of those numbers.

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Mean>"

- This page was last modified 14:14, 7 April 2008.

Median

From TeacherWiki

Contents

- 1 Median
 - 1.1 Definition
 - 1.1.1 Example
 - 1.1.1.1 Find the Median
 - 1.1.1.2 Find the Median

Median

Definition

The middle number in a set of values.

The median is the number in the middle of all the numbers given to you for a problem.

Example

Find the Median

7, 85, 22, 64, 37

First have to arrange the numbers from least to greatest.

7, 22, 37, 64, 85

37 is the median.

Find the Median

28, 54, 2, 78, 99, 14

You still first order the numbers from least to greatest.

2, 14, 28, 54, 78, 99

Since there is no middle number. The median is between 28 and 54. We can average those two numbers to get the median.

$$(28 + 54) \div 2$$

$$82 \div 2$$

41

41 is the median of the set.

Retrieved from "<http://nth5.wpi.edu/wiki/index.php/Median>"

- This page was last modified 17:47, 18 April 2008.

Order of Operations

From TeacherWiki

Definition

The order of operations is the convention given for solving mathematical expressions.

It follows this order:

Parenthesis, Exponents, Multiplication and Division, Addition and Subtraction

Or

PEMDAS

Example

Solve this expression using the correct order of operations.

$(2+3) * 2^2 + 4$ First evaluate what is in the parenthesis.

$(5) * 2^2 + 4$ Then we do the exponent.

$(5) * 2^2 + 4 =$

$5 * 4 + 4 =$

Next is multiplication.

$5 * 4 + 4 =$
 $20 + 4 =$

Finally, we add.

$20 + 4 = 24$

$(2+3) * 2^2 + 4 = 24$

Retrieved from "http://nth5.wpi.edu/wiki/index.php/Order_of_Operations"

- This page was last modified 18:49, 15 April 2008.

Circle Graph

From TeacherWiki

Definition

A type of graph representing percents as pieces of a circle, like slices of a pizza.

Example

Mrs. Heffernan asked her class which of the sports Baseball, Basketball Football and Hockey they liked best. 11 chose Baseball, 6 chose Basketball, 7 chose Football, 1 chose Hockey. Make a circle graph of the data.

First put the data in a table and then

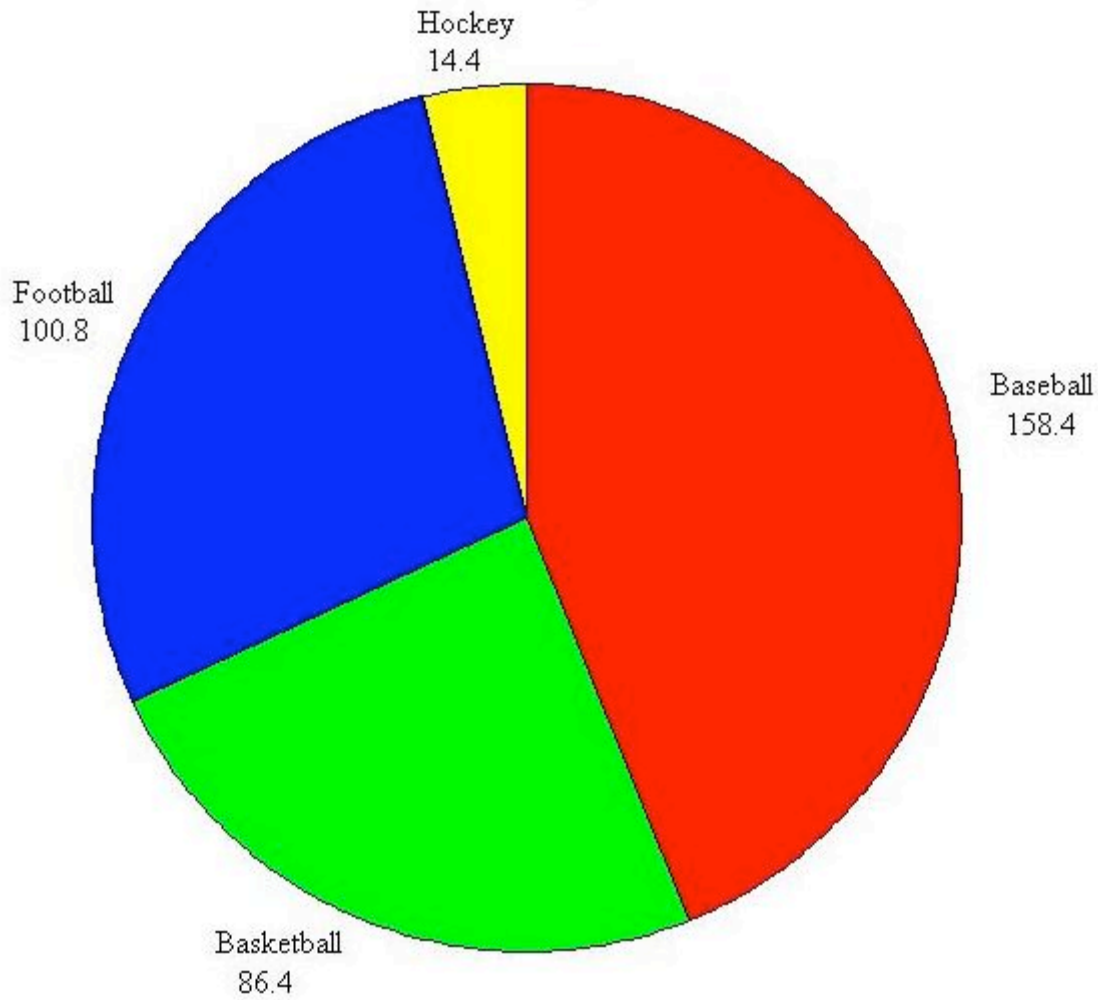
Favorite	No. of Students	Decimal	calculation	Degrees
Baseball	11	$11 \div 25 = 0.44$	$0.44 * 360$	158.4°
Basketball	6	$6/25 = 0.24$	$0.24 * 360$	86.4°
Football	7	$7/25 = 0.28$	$0.28 * 360$	100.8°
Hockey	1	$1/25 = 0.04$	$0.4 * 360$	14.4°

Once you find the decimal amount for a selection, multiply that by 360 (the total number of degrees in a circle) to find out how many degrees you should give to each section in your circle graph.

To make the “slice” on the circle graph, we take the degree we previously calculated, and use that number as the angle of the slice.

Take Basketball for example. We found the percent of the students who play basketball to be 24%. When we multiplied that percent by 360, we got 158.4° . To find the slice, use a protractor and measure 158.4° on the circle graph. We would put basketball starting from where baseball left off on the graph, and then start the next category starting from where basketball leaves off.

Favorite Sports



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