Motivational Video Study

Interactive Qualifying Project completed in partial fulfillment
of the Bachelor of Science degree at
Worcester Polytechnic Institute, Worcester, MA

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Date: April 4, 2013

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Abstract

ASSISTments, an online tutoring system developed at Worcester Polytechnic Institute, has been finding ways to improve student learning. The purpose of this motivational video study is to see if students do better in math problems if they watch motivational videos during the skillbuilders. We designed and built skillbuilders where students practice math problems as part of their homework. In the experimental condition, students get motivational videos when they get problems wrong. In the control, students do not get the videos. A between-subject analysis revealed that when viewing the motivational video students completed significantly more questions than when they did not. A review of homework completion rates did not reveal a reliable difference. However it is important to note that with so few assignments, differences in completion rates may not be meaningful. Overall, the study finds that motivational videos are effective in enhancing students' persistence in doing their assignments.

Authorship

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Authorship	STK
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Introduction

The relationship between motivation, affect and student performance in intelligent tutoring systems (ITS) has been explored (Arroyo et al., 2009; Conati & Maclaren, 2009; Forbes-Riley & Litman, 2011; Robison et al., 2009). Researchers have established the need to address affect to increase student engagement within ITS (De Vicente & Pain, 2002; Graesser et al., 2008;). As a result, many research groups are focusing on detecting disengagement and responding to within the system to re engage the learner (Burleson & Picard, 2007; Chaffar et al. 2009; Conati & Maclaren, 2009; D'Mello et al., 2010; Robison et al. 2009). However, these are complex systems, some having costly sensors. Additionally, they focus on system use within the classroom rather than when being used for homework. An alternative approach is to embed videos into a homework assignment to increase student motivation and therefore persistence (Kelly et al., 2013).

The present study uses ASSISTments, an intelligent tutoring system, to deliver a homework assignment with embedded motivational videos. Thousands of students currently use this system to complete nightly homework, successfully increasing student performance (Mendicino et al., 2009; Kelly et al, 2013). The “skill builder” feature within ASSISTments has been found to improve student learning. To complete such an assignment, students must demonstrate mastery of a skill by completing three consecutive questions correctly. To improve performance on such a task, student perseverance is essential. Therefore increasing a student’s willingness to complete as many questions as necessary to complete an assignment is critical to student learning.

It has been determined that “grit”, or perseverance, is essential to success in a variety of domains (Duckworth et al., 2007). This suggests that interventions that positively impact grit and

increase persistence, might lead to higher long-term learning gains. As a result, the present study provides an intervention intended to target grit. Measures of perseverance include homework completion (Fredricks et al., 2011) or in this case, the number of questions completed.

In the United States, many teachers from middle schools use math textbooks as their principal teaching tool. ASSISTments has introduced the idea of incorporating textbooks with online tutoring system. This enables teachers to assign problem sets to students electronically, and have access to students' progress and grades, which are automatically taken care of in ASSISTments tools. Not only the teachers get such feedbacks but also the students obtain instant feedbacks on every problem set they do. The main goal is for ASSISTments to be a tool used by teachers in order to help students have better success in their schools' respective mathematics curriculums.

For our study, we created skillbuilder problem sets by following the guidelines set forth in the Common Core Standards. The Common Core Standards are based on the criteria laid down by the states. The standards are carefully designed by teachers, parents and community leaders to reflect what skills students should learn for specific grade levels. The following is a list of some state standards we base our skillbuilders upon:

- 4.MD.3 Area and Perimeter
- 4.MD.4 Interpreting Statistical Data (Addition and Subtraction using Fraction)
- 5.MD.2 Interpreting Statistical Data (Fraction)
- 5.MD.3 Volume of Rectangular Prism
- 5.MD.5c Adding Volume of Rectangular Prisms
- 6.SP.1 Recognizing Statistical Questions
- 6.SP.2 Understanding Statistical Data

- 6.SP.3 Interpreting Statistical Data

In order to keep track of every skillbuilder problem set we built and to organize their content, we thoroughly documented all the problem sets. Such documentation provides an explanation of different types of assistments that can be found in each skillbuilder problem set. Besides, the documentation ensures to keep our study organized and keep track of all the content created. All the documentations and screenshots of problem sets used in the study can be found in Appendix A and Appendix B. In documenting each problem set, we recorded the assistment number of the problem set, the number of assistment templates used in the problem set, the assistment numbers of those templates, a screenshot of what each assistment looks like in the test drive, and a list of the properties of each template. The properties give detail information such as type of the problem (standard or variablized), the variables in the problem, possible ranges of variables, and the expected type of answers such as arithmetic and multiple choice.

In addition to the documentation of the problem sets, we created an advertisement powerpoint that demonstrates each problem set with screenshot. By looking at the powerpoint, participating teachers can have a quick and easy look at how the problem sets look like before assigning to their students. The powerpoint included in the Appendix D provides the purpose and overview of the study, representations of what motivational videos look like, screenshots of test drive of the problem sets, and next steps for teachers to take to assign the problem sets to their students.

The powerpoint also has internal links so that teachers can easily navigate from one problem set to another. The first page contains the content, in which all the problem sets are not only listed but also linked to the respective pages. The thumbnails of motivational videos are also linked to the actual videos so that teachers can preview prior to giving assignments. The home

button on the lower left corner will take the viewer back to the beginning slide and the ‘next slide’ button goes to subsequent slide. The use of the powerpoint advertisement gives teachers an opportunity to easily view all the assistments which will be given to the students in the study.

Background

ASSISTments, an online math tutoring system, was founded by Professor Neil Heffernan in 2003. It was intended to help teachers and students have a better teaching and learning experience. The goal of Assistments system is to provide an easily accessible aid to improve the traditional classroom learning experience. Since its inception, ASSISTments has been growing as a successful web-based tutoring system with the funding from the U.S. Department of Education, the National Science Foundation, and the Bill and Melinda Gates Foundation. To improve the effectiveness of teaching and learning through ASSISTments online tutoring system, several studies such as ours have been implemented and many more will be. These studies provide ASSISTments with valuable guidelines to expand as a more successful and more effective tutoring systems for students not only across the U.S but also around the world.

ASSISTments has gained much success by creating original content for teachers to assign students from their classroom. Another step is to build content using other resources such as textbooks and Common Core Standard guidelines. Up until recently, many schools utilize hardcopy textbooks as primary teaching resources. However, lately ASSISTments have gained attention from many schools in the United States through advertisements. Several schools around the country have become interested in relying on ASSISTments as a tool to improve not only the learning experience of students but also the tutoring experience of teachers. Through discussions with teachers and administrative personnel from various schools, ASSISTments has been constantly trying to find ways to offer the best web-based tutoring tools. To fulfill this goal, many studies have been carried out and the ASSISTments system has been improved tremendously according to the findings from the studies.

ASSISTments, as an online tutoring system, has been of great help for teachers to tutor their students more effectively. Since ASSISTments is an online tutoring system that takes care of grading, progress report, and so on, the system is a great help to many teachers, particularly in grading assignments. By using ASSISTments tutoring system, teachers no longer need to spend a lot of time grading homework assignments, and giving feedbacks. Hence, ASSIStments allows teachers to spend extra time on other aspects of the class, thereby improving teaching and learning experiences of the class. In addition, by utilizing effective ASSISTments tools, teachers can better assess the academic success of the class in several areas of curriculum.

As mentioned above, ASSISTments has set a goal to integrate materials from other resources in addition to creating original content. The skills used in our study are based on Common Core guidelines as a partial fulfilment of this goal. The primary purpose of our study is to determine whether students do better in assignments and have desire to work harder if they see motivational videos while working on the problem sets. To serve this purpose, we include a normal video for control condition in our problem sets. Using statistical functions, the overall performance of the two groups is to be compared to assess the effectiveness of motivational videos.The results obtained from our study will aid ASSIStments in accomplishing its goal of improving the overall learning experiences. Surely, the success of our study will bring many advantages to not only teachers and students. And, this has become a primary motivation to conduct our motivational video study.

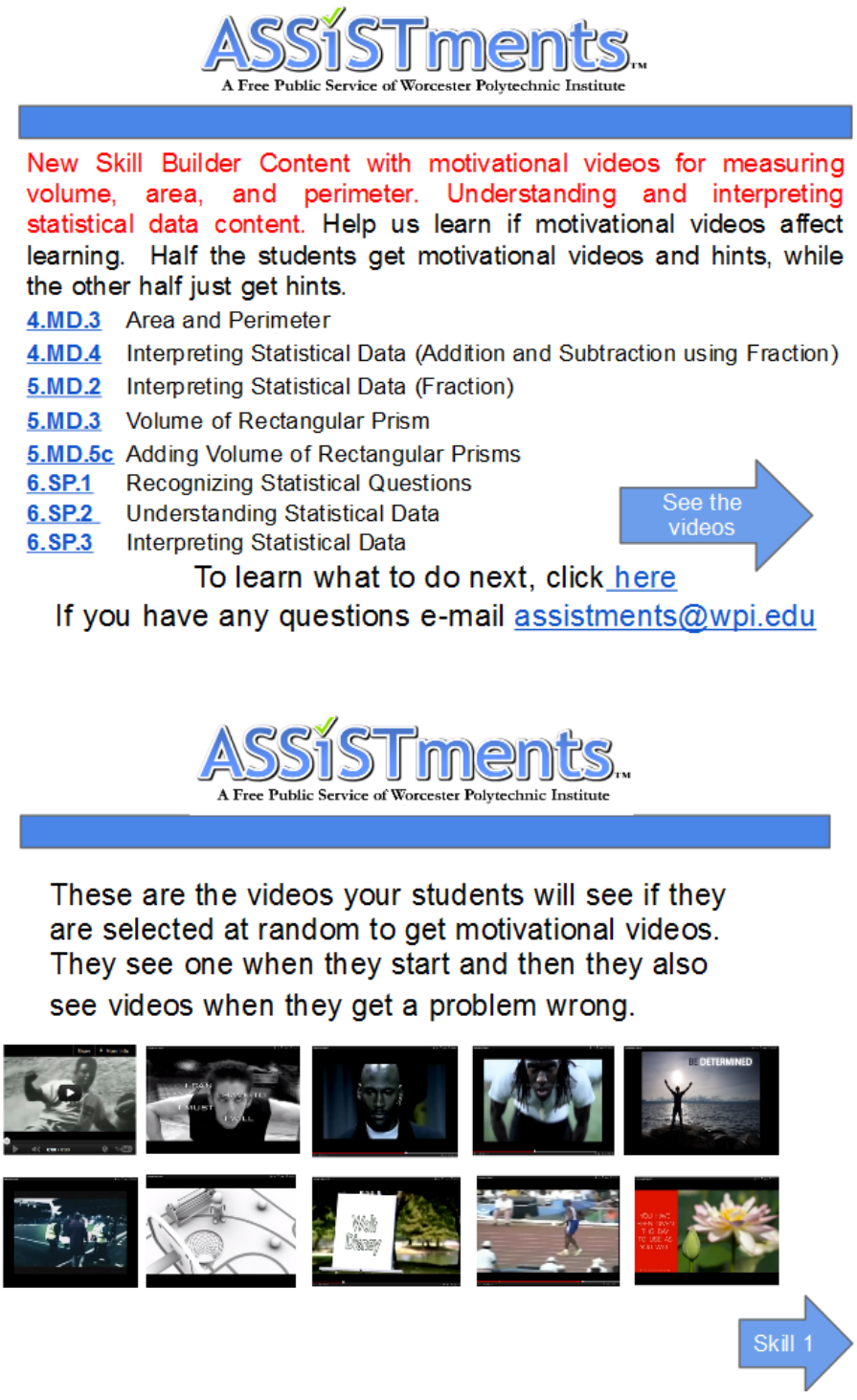

Figure 1 : PowerPoint Advertisements Showing Common Core State Standards used in building Problem Sets (top), and Sample Motivational Videos (Bottom)

Methodology

The content used to build our problem sets are based on Common Core Standards so it reflects the necessary knowledge and learning skills that 5th, 6th, and 7th graders should have. Moreover, the content is designed in order to be relevant to the real-world problems.

In our study, 144 students in 5th, 6th and 7th grades from several schools in Massachusetts participated as an assignment in their math class. All of our problem sets are designed so that participating students can fall into either experimental condition, in which students get to watch motivational videos, or control condition, in which they watch a regular video. Assigning students to experimental or control group in this random fashion ensures that the two groups are balanced with students of different academic backgrounds.

In experimental condition, students see an introductory video to get them motivated throughout the skillbuilder problem set. This video is accompanied by a brief motivating statement: “Think about how important it is to work hard”. There can be two responses to the video. Students can say they are ready or they had technical difficulties in case if they did not see the video . This way, we can take out of consideration those who had technical difficulties in our study. After watching the introductory video, students begin to work for a series of assistments. This series of problems start with five special assistments that provide students with not only hints but also scaffolding. This scaffolding incorporates a motivational video to motivate students when they get the problem wrong. When they get a wrong answer, they get a chance to watch a motivational video, accompanied by a short statement of encouragement:

> “Even though you got the problem wrong, you can learn this. Read the hints provided for this one if you need to, it will not count against you. Then try again for the 3 right in a row!”:

Students can respond to the video in degrees of inspiration they got or they can also respond they had technical difficulties if they could not see the video.. They can answer as follows:

This video is very much inspiring.

This video is somewhat inspiring.

This video is not quite inspiring.

I had technical difficulties.

After watching the short motivational video, students can choose to use the hints provided in the problem or they can try finishing the problem on their own. If the students do not get three right in a row after working out five of these special motivational video assistments, they have to continue working on random regular assistments which do not have any scaffolding with motivational videos. These regular assistments, however, provide students with hints.

In control condition, students watch an opening video of a teacher saying that the problem set is a skillbuilder problem set so students will have to work until they get three problems right in row. There can be two responses to this video. The student can either say they saw the video or say they had technical difficulties in case if they could not see the video. This response is recorded so that we can eliminate the students who had technical difficulties in our study. After watching this normal introductory video, students are asked to work out random assistments. These random assistments are regular assistment problems with no videos. There is no scaffolding in these regular assistments. However, the students can still have access to hints.When they get three assistments right in a row, they finish the skillbuilder problem set.

Table 1 : Common Core State Standard and Corresponding Problem Set ID

Common Core Standard	Skill	Problem Set ID
4.MD.3	Area and Perimeter	91607
4.MD.4	Interpreting Statistical Data (Addition and Subtraction using Fraction)	84971
5.MD.2	Interpreting Statistical Data (Fraction)	91600
5.MD.3	Volume of Rectangular Prism	84903
5.MD.5c	Adding Volume of Rectangular Prisms	91602
6.SP.1	Recognizing Statistical Questions	91599
6.SP.2	Understanding Statistical Data	91605
6.SP.3	Interpreting Statistical Data	91601

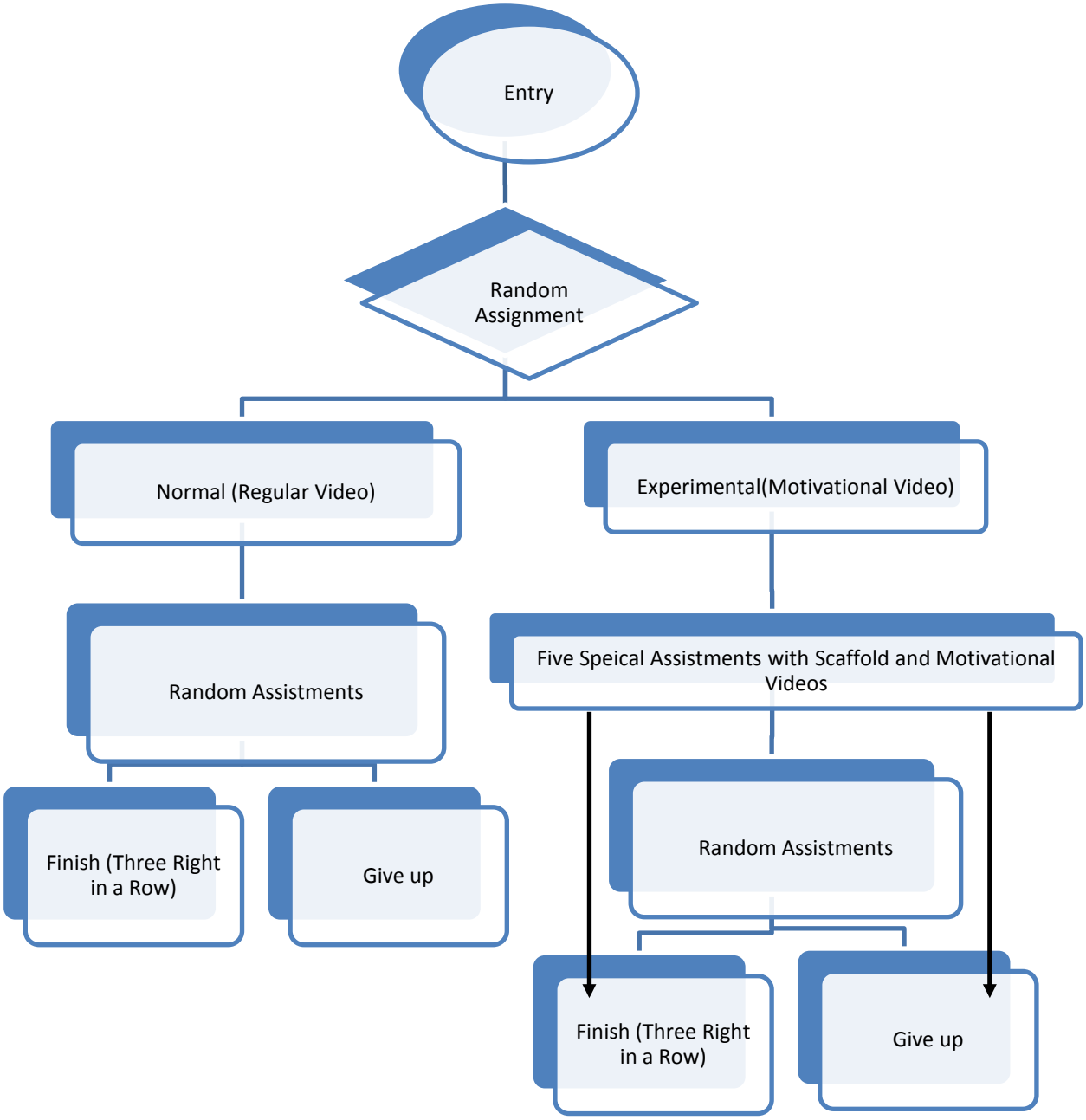

Figure 2 : Skillbuilder Problem Set Flowchart

Results and Discussion

Our obtained data can be found in Appendix C. This raw data contains comprehensive information such as student name, teacher name, problem sequence ID, assistments ID, student's answer, completion status and so on for all of our problem sets.

Since the raw data contains extraneous information that is not pertinent to our study, we refined the data so that there are four columns each for seven problem sets (total of 28 columns) for each student. The four columns comprise the first problem ID done by the student, the answer for this first problem, the number of attempts the student made for the problem set, and completion status of the problem set.

Next, each of the seven problem sets is analyzed separately in Excel. For each problem set, the following is calculated:

- Total number of students
- Number of students in experiment
- Number of students in control
- Number of students in experiment (with no technical difficulties)
- Number of students in control (with no technical difficulties)
- Average number of attempts by students in experiment (with no technical difficulties)
- Average number of attempts by students in control (with no technical difficulties)
- Ttest to compare the average number of attempts of two groups
- Z-Score for students in experiment (with no technical difficulties)
- Z-Score for students in control (with no technical difficulties)
- Ttest to compare the Z-Scores of two groups

The data analysis is summarized in Table 2 and Table 3.

Table 2: Student Participation Statistics

Common Core Standard	5.MD.3	6.SP.1	5.MD.2	6.SP.3	5.MD.5c	6.SP.2	4.MD.3
Problem Set ID	84903	91599	91600	91601	91602	91605	91607
Total Number of Students	36	40	42	76	33	40	101
Number of Students in Experiment	22	18	17	42	19	21	53
Number of Students in Control	14	22	25	34	14	19	48
Number of Students in Experiment with No Technical Difficulty	13	10	10	21	12	11	26
Number of Students in Control with No Technical Difficulty	7	12	12	12	7	9	18

Table 3 : Student Attempt and Z-Score Statistics

Common Core Standard	5.MD.3	6.SP.1	5.MD.2	6.SP.3	5.MD.5c	6.SP.2	4.MD.3
Problem Set ID	84903	91599	91600	91601	91602	91605	91607
Number of Students in Experiment who Complete (No Tech Diff)	12	5	3	9	12	5	7
Number of Students in Control who Complete (No Tech Diff)	7	4	7	7	6	7	8
Average Number of Attempts by Students in Experiment (No Tech Diff)	4.62	12	10.7	5.71	5	8.73	7.88
Average Number of Attempts by Students in Control (No Tech Diff)	5	7.58	9.5	6.33	5.57	6.56	4.78
Ttest	0.650516	0.0665	0.009835	0.654747	0.500193	0.199076	0.034195
Z-score for Students in Experiment (No Tech Diff)	-0.13004	0.42609	0.65723	-0.08447	0.15313	0.21022	0.18322
Z-score for Students in Control (No Tech Diff)	0.09057	-0.3550	-0.39801	0.081	0.48565	-0.37714	-0.46025
Ttest	0.65052	0.0665	0.00984	0.65475	0.50019	0.19908	0.0342

As seen in Table 2, in both control and experimental groups, there were students who were not able to watch the videos due to technical difficulties. About half or more students were not able to watch motivational videos. We had to exclude those students from the study and take into consideration only the students who did not have technical difficulties.

In Table 3, the data is analyzed for students who did not have any technical difficulties. By comparing the results in the rows, average number of attempts by students in experiment and average number of attempts by students in control, we can see that students in experiment, who watched motivational videos, have in general higher average number of attempts than students in

control who did not watch any motivational videos. This result means that students who watched motivational videos tend to persist in doing problem sets than those who did not watch motivational videos.

The Z-scores for each of the study were also computed in Excel and shown in Table 3. The t-test values of the Z-scores and those of the average number of attempts are found to be the same. This also validates the result that the motivational videos are effective in student's persistence.

Table 4 : Data Analysis of Students who did both Experimental and Control Studies

	Average Z score for Control	Average Z score for Experiment	Completion (Control)	Completion (Experiment)
student 2	-0.06645	0.002516	0.333333	0.5
student 18	-0.36275	-0.54269	0.5	1
student 24	-0.49274	0.004962	1	1
student 42	0.259702	-0.04497	0.666667	1
student 59	-0.0006	1.595685	0	0
student 65	-0.62134	0.724587	1	0
student 67	0.050023	0.596986	0.75	1
student 68	-1.34258	-0.65548	0	0
student 69	0.428859	0.476264	0.666667	0.333333
student 70	-0.3749	0.032275	1	0
student 72	1.83126	1.133553	0.666667	0
student 75	-0.62253	-0.58008	0	0.666667
student 78	-0.57374	-0.11083	0.8	1
student 82	-0.39653	0.05741	1	1
student 86	-0.42877	1.518821	1	1
student 96	-0.05367	-0.13743	0.75	0.666667
student 113	-0.28946	1.442716	1	0.5
student 117	0.06318	1.201753	0.75	0.666667
student 121	-0.80509	-0.22493	1	0.8
student 122	0.009797	-0.42399	1	0.666667
student 129	-0.29794	-0.48483	0.333333	1
student 131	-1.07157	1.656902	0	1
student 142	-0.42877	1.204982	1	0.666667
	T-test for average Z-scores	0.005048	T-test for completion	0.773901

Out of all students in the study, only students who did both control studies and experimental studies were considered in Table 4. Among all the problem sets they work on, we only take into consideration the problem sets in which they did not have any technical difficulties. In the table, the average Z-score for the control problem sets and the average Z-score for experimental problem set can be compared. The completion columns indicate the fraction of how many problems they finished out of total control problem sets and experimental problem sets respectively. Then, we compute the T-test of average Z-scores and T-test of completion to see if there is significant difference between the two groups. The paired t-test of average Z-scores reveals that students who watch motivational videos completed more questions than those who did not watch any motivational videos. But the t-test analysis of homework completion rates shows that there is no significance difference. However it is important to note that with so few assignments, differences in completion rates may not be meaningful.

Conclusions and Recommendations

According to this motivational video study, we can conclude that motivational videos are effective in enhancing student's persistence. We discovered that the average number of attempts by students who watch motivational videos is generally higher than that by students who did not watch any motivational videos. Although this result does not guarantee higher completion rate, higher persistence shown by students is a very promising sign, and this suggests that incorporating motivational videos into future assistments would be beneficial to students.

Re-running the study with a larger student population is recommended. In our study, a total of 145 students took part in seven motivational video studies. However, many of the students had technical difficulties and therefore removed in the analysis of each problem set. In the final analysis which take into consideration all seven problem sets, only students who participated in both experimental and control studies without technical difficulties were included, and the student population size drops to 23. Unfortunately, the proportion of students removed is a large number, and therefore future studies should address the causes of these technical difficulties to decrease the attrition rate.

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Appendices

Appendix A: Documentation & Problem Sets Created by Aung Thu Htet

This appendix includes detailed documentation on the assistment templates created by Aung Thu Htet. . Examples of parent assistments for each problem set are shown in the documentation. For each skill, the documentation is followed by the printout of the problem sets.

Skills	Links
4.MD.3 - Area and Parameter	**http://goo.gl/zqBSb (DOC)** **http://goo.gl/xcET7 (Problem Set Print)**
5.MD.3 - Volume of Rectangular Prism	**http://goo.gl/HCuCC (DOC)** **http://goo.gl/t5vj0 (Problem Set Print)**
5.MD.5c - Relate Volume to the Operations of Multiplication and Addition	**http://goo.gl/SQC78 (DOC)** **http://goo.gl/fW7tW (Problem Set Print)**
6.SP.1 - Interpreting Statistical Questions	**http://goo.gl/w5SEd (DOC)** **http://goo.gl/KOdJ0 (Problem Set Print)**

Appendix B: Documentation & Problem Sets Created by Soe Thet Ko

This appendix includes detailed documentation on the assistment templates created by Soe Thet Ko. Examples of parent assistments for each problem set are shown in the documentation. For each skill, the documentation is followed by the printout of the problem sets.

Skills	Links
4.MD.4 - Interpreting Statistical Data (Addition and Subtraction Using Fraction)	**http://goo.gl/dFXLG (DOC)** **http://goo.gl/TAkj3 (Problem Set Print)**
5.MD.2 - Interpreting Statistical Data (Fraction)	**http://goo.gl/FLp6B (DOC)** **http://goo.gl/6JNhd (Problem Set Print)**
6.SP.2 - Understanding Statistical Data	**http://goo.gl/2zT5A (DOC)** **http://goo.gl/dNFSb (Problem Set Print)**
6.SP.3 - Interpreting Statistical Data	**http://goo.gl/Qv6Bh (DOC)** **http://goo.gl/BAMwy (Problem Set Print)**

Appendix C: Data Analysis Spreadsheets

This appendix includes the pdf files of data analysis for each of the problem set, and the excel sheet of the final analysis data.

5.MD.3 Volume of Rectangular Prism (problem set id 84903) - http://goo.gl/GplXv

6.SP.1 Recognizing Statistical Questions (problem set id 91599) - http://goo.gl/mRoGn

5.MD.2 Interpreting Statistical Data (Fraction) (problem set id 91600) - http://goo.gl/dDtP8

6.SP.3 Interpreting Statistical Data (problem set id 91601) - http://goo.gl/tEBxD

5.MD.5c Adding Volume of Rectangular Prisms (problem set id 91602) - http://goo.gl/8wmI4

6.SP.2 Understanding Statistical Data (problem set id 91605) - http://goo.gl/eYxdN

4.MD.3 Area and Perimeter (problem set id 91607) - http://goo.gl/K0jjo

Final Data Analysis - http://goo.gl/BKH0l

Appendix D: Powerpoint Advertisement for Study

This appendix contains the powerpoint advertisement for motivational video studies on eight common core standards. The powerpoint documents representative problems that students will solve for each of the standard.

Links: http://goo.gl/kPFtk (pdf)

http://goo.gl/Auwv9 (Presentation)

Appendix A.1.1: 4.MD.3 Skill Documentation

Skill	Grade
4.MD.3, Area & Perimeter of Rectangle in Real World Problems	4.MD.3

THE MASTERY SET (AREA)

Mastery Problem Set	Number of Templates
72438	5
Number to Master	Number of Attempts
3	10

THE MASTERY SET (PERIMETER)

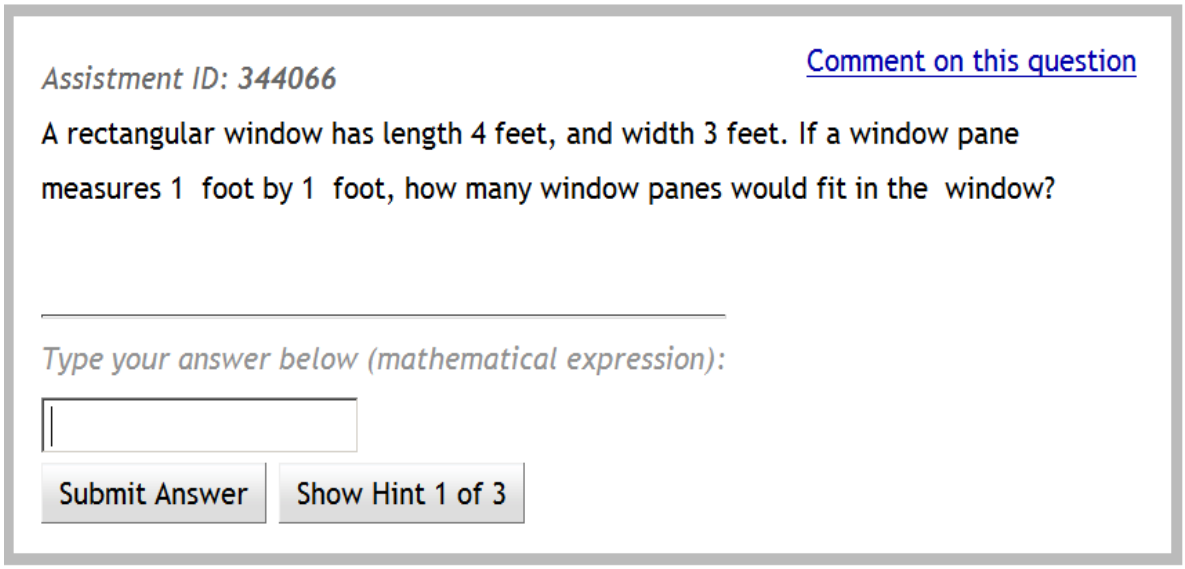
Mastery Problem Set	Number of Templates
72442	3
Number to Master	Number of Attempts
3	10

THE MASTERY SET (PERIMETER AND AREA)

Mastery Problem Set	Number of Templates
72445	8
Number to Master	Number of Attempts
3	10

Templates:

344066



- The context in this template is variabilized. The rectangular enclosure can be a brownie pan, floor of a room, window, a piece of land, a roof, or a piece of paper.
- The length and width of the context are also variablilized with the function rand(), while keeping the numbers practical in real world
- The unit object to be counted can be brownie, tile, window pane, moss mat, solar panel, or colored sticker respectively to the previously mentioned contexts.

345255

Comment on this question

Assistment ID: 345255

A solar panel measures 1 foot by 1 foot . If a rectangular roof has length 15 feet, and width 7 feet, how many solar panels would fit in the roof?

Type your answer below (mathematical expression):

Submit Answer | Show Hint 1 of 3

- The context in this template is variabilized. The rectangular enclosure can be a pen, brownie pan, floor of a room, window, a piece of land, a roof, or a piece of paper.
- The length and width of the context are also variablilized with the function rand(), while keeping the numbers practical in real world
- The unit object to be counted can be brownie, sheep, tile, window pane, moss mat, solar panel, or colored sticker respectively to the previously mentioned contexts.

345254

Comment on this question

Assistment ID: 345254

A rectangular pen has length 14 meters, and width 5 meters. If a llama needs a 1 meter by 1 meter of space, how many llamas would fit in the pen?

Type your answer below (mathematical expression):

Submit Answer | Show Hint 1 of 3

- The rectangular enclosure is fixed as pen.
- The length and width of the pen are also variablilized with the function rand(), while keeping the numbers practical in real world
- The animal to be counted can be goats, cows, pigs, or llamas.

347085

Comment on this question

*Assistment ID: **347085***

A sheep needs a 1 meter by 1 meter space, and 80 sheep fit in a rectangular pen. If the length of the pen is 10 meters, what would be its width in meters?

Type your answer below (mathematical expression):

Submit Answer | Show Hint 1 of 3

- The context in this template is variabilized. The rectangular enclosure can be a pen, brownie pan, floor of a room, window, a piece of land, a roof, or a piece of paper.
- The length is variablilized with the function rand(), while keeping tt practical in real world.
- The unit objects in the enclosure can be sheep, brownie, tile, window pane, moss mat, solar panel, or colored sticker respectively to the previously mentioned contexts.
- The number of objects in the enclosure is also variabilized with practical numbers.

347086

Assistment ID: **347086**

Comment on this question

A solar panel measures 1 foot by 1 foot , and 165 solar panels fit in a rectangular roof. If the width of the roof is 11 feet, what would be its length in feet?

Type your answer below (mathematical expression):

Submit Answer | Show Hint 1 of 3

- The context in this template is variabilized. The rectangular enclosure can be a pen, brownie pan, floor of a room, window, a piece of land, a roof, or a piece of paper.
- The width is variablilized with the function rand(), while keeping it practical in real world.
- The unit objects in the enclosure can be sheep, brownie, tile, window pane, moss mat, solar panel, or colored sticker respectively to the previously mentioned contexts.
- The number of objects in the enclosure is also variabilized with practical numbers.

348342

Assistment ID: 348342

Comment on this question

A rectangular swimming pool area has length 20 feet, and width 12 feet. If we want to put fence along the four sides of the swimming pool area, find how many feet of the fence should we need.

Type your answer below (mathematical expression):

Submit Answer | Show Hint 1 of 3

- The context in this template is variabilized. The rectangular enclosure can be pen, brownie pan, floor of a room, window, piece of land, swimming pool area, or cake.
- The length and width of the context are also variablilized with the function rand(), while keeping the numbers practical in real world
- The enclosing object can be fence, icing trim, baseboards, casing, fence, fence, or frosting trim respectively to the previously mentioned contexts.

348344

Comment on this question

*Assistment ID: **348344***

We need 38 inches of icing trim to put along all four sides of a rectangular brownie pan. If the length of the brownie pan is 13 inches, find the width.

Type your answer below (mathematical expression):

Submit Answer | Show Hint 1 of 3

- The context in this template is variabilized. The rectangular enclosure can be pen, brownie pan, floor of a room, window, piece of land, swimming pool area, or cake.
- The length is variablilized with the function rand(), while keeping it practical in real world.
- The enclosing object can be fence, icing trim, baseboards, casing, fence, fence, or frosting trim respectively to the previously mentioned contexts.
- The perimeter is also variabilized with practical numbers.

348351

Comment on this question

*Assistment ID: **348351***

We need 12 feet of casing to put along all four sides of a rectangular window. If the width of the window is 2 feet, find the length.

Type your answer below (mathematical expression):

Submit Answer | Show Hint 1 of 3

- The context in this template is variabilized. The rectangular enclosure can be pen, brownie pan, floor of a room, window, piece of land, swimming pool area, or cake.
- The width is variablilized with the function rand(), while keeping it practical in real world.
- The enclosing object can be fence, icing trim, baseboards, casing, fence, fence, or frosting trim respectively to the previously mentioned contexts.
- The perimeter is also variabilized with practical numbers.

Appendix A.1.2: 4.MD.3 Skill Sample Problem Print

1)Assistment #361677 "361677 - Area & Perimeter of Rectangle in Real World Problems (PERIMETER: find perimeter)"

A rectangular pen has length 10 meters, and width 9 meters. If we want to put fence along the four sides of the pen, find how many meters of the fence should we need.

Algebra:

✓ 38

Hints:

- First, sketch a picture of a pen, and
label its length and width with the given dimensions.
-

Note : The figure is not to scale

Here is a sketch of a pen with length 10 and width 9.
Notice that there are two lengths and two widths in the rectangular pen in the figure.
Since you want to cover all four sides, you need to calculate the total measurement of two lengths, and two widths.

-

The perimeter = (2 * length) + (2 * width)

= (2 * 10) + (2 * 9)

= 38

Type in 38.

2)Assistment #361697 "361697 - Area & Perimeter of Rectangle in Real World Problems (PERIMETER: find width)"

We need 48 feet of baseboards to put along all four sides of a rectangular floor of a room. If the length of the floor of a room is 14 feet, find the width.

Algebra:

✓ 10

Hints:

- First, sketch a picture of a floor of a room, and label its length and width with the given dimensions.
-

Note : The figure is not to scale

Here is a sketch of a floor of a room with length 14 and unknown width.

Notice that there are two lengths and two widths in the rectangular floor of a room in the figure.

You have the total measurement of two lengths, and two widths, which is the perimeter given.

-

The perimeter	= (2 * length) + (2 * width)
48	= (2 * 14) + (2 * width)
2 * width	= 48 - (28)
width	= 10

Type in 10.

3) Assistment #361777 "361777 - Area & Perimeter of Rectangle in Real World Problems (PERIMETER: find length)"

We need 46 feet of baseboards to put along all four sides of a rectangular floor of a room. If the width of the floor of a room is 11 feet, find the length.

Algebra:

✓ 12

Hints:

- First, sketch a picture of a floor of a room, and label its length and width with the given dimensions.
-

Note : The figure is not to scale

Here is a sketch of a floor of a room with width 11 and unknown length.

Notice that there are two lengths and two widths in the rectangular floor of a room in the figure.

You have the total measurement of two lengths, and two widths, which is the perimeter given.

-

The perimeter	= (2 * length) + (2 * width)
46	= (2 * length) + (2 * 11)
2 * length	= 46 - 22
length	= 12

Type in 12.

4) Assistment #361797 "361797 - Area & Perimeter of Rectangle in Real World Problems (AREA: find area)"

A moss mat measures 1 meter by 1 meter . If a rectangular piece of land has length 22 meters, and width 10 meters, how many moss mats would fit in the piece of land?

Algebra:

✓ 220

Hints:

- First, sketch a picture of a piece of land, and

label its length and width with the given dimensions.

- *Note : The figure is not to scale*

Here is a sketch of a piece of land with length 22 and width 10.

Since each moss mat fits into a square meters, you need to find the area in squared meters.

-

The area = length * width
= 22 meters * 10 meters
= 220 meters* meters

Type in 220.

5) Assistment #361717 "361717 - Area & Perimeter of Rectangle in Real World Problems (AREA: find width)"

A brownie measures 1 inch by 1 inch , and 60 brownies fit in a rectangular brownie pan. If the length of the brownie pan is 12 inches, what would be its width in inches?

Algebra:

✓ 5

Hints:

- First, sketch a picture of a brownie pan, and

label its length and width.

-

Note : The figure is not to scale

Here is a sketch of a brownie pan with length 12 and unknown width.

Since each brownie fits into a square inches, and you have the area 60, you need to find the number which when multiplied by length 12 gives you the area 60.

- The area = length * width

60 inches * inches = 12 inches * width

width = 60 inches * inches ÷ 12 inches

= 5 inches

Type in 5.

6) Assistment #361757 "361757 - Area & Perimeter of Rectangle in Real World Problems (AREA: find length)"

A sheep needs a 1 meter by 1 meter space, and 65 sheep fit in a rectangular pen. If the width of the pen is 5 meters, what would be its length in meters?

Algebra:

✓ 13

Hints:

- First, sketch a picture of a pen, and label its length and width.
-

Note : The figure is not to scale

Here is a sketch of a pen with width 5 and unknown length.
Since each sheep fits into a square meters, and you have the area 65, you need to find the number which when multiplied by width 5 gives you the area 65.

-

The area	= length * width
65 meters*meters	= length * 5 meters
length	= 65 meters*meters ÷ 5 meters
	= 13 meters

Type in 13.

7) Assistment #361737 "361737 - Area & Perimeter of Rectangle in Real World Problems (only sheep)"

A rectangular pen has length 10 meters, and width 9 meters. If a cow needs a 1 meter by 1 meter of space, how many cows would fit in the pen?

Algebra:

✓ 90

Hints:

- First, sketch a picture of pen, and label its length and width with the given dimensions.
-

Note : The figure is not to scale

Here is a sketch of a pen with length 10 and width 9.
Since each cow fits into a square meter, you need to find the area in meter squared.

-

The area = length * width

= 10 m * 9 m

= 90 m*m

Type in 90.

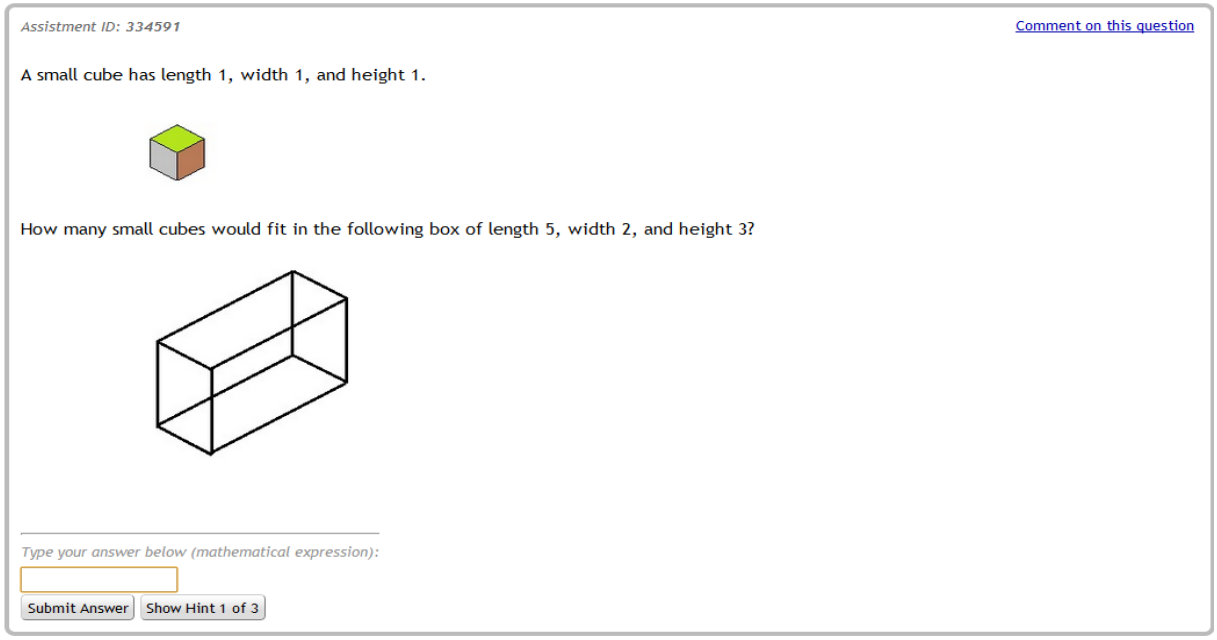
Appendix A.2.1: 5.MD.3 Skill Documentation

Skill	Grade
5.MD.3, Volume of Rectangular Prism	5.MD.3

THE MASTERY SET

Mastery Problem Set	Number of Templates
54623	1
Number to Master	Number of Attempts
3	10

Templates:



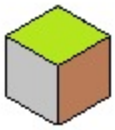
334591

- The small cube is a fixed (not variabilized) image that shows up on every problem in the template.
- There are 11 boxes (to scale) for this template.
- The boxes are variabilized images chosen from the set of 11.

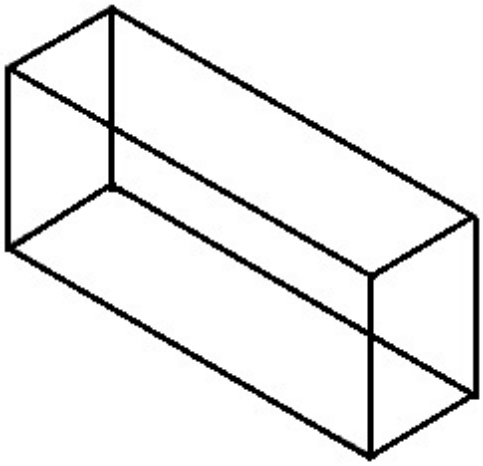
Appendix A.2.2: 5.MD.3 Skill Sample Problem Print

1) Assistment #340054 "340054 - Measure Volume "

A small cube has length 1, width 1, and height 1.



How many small cubes would fit in the following box of length 2, width 7, and height 3?

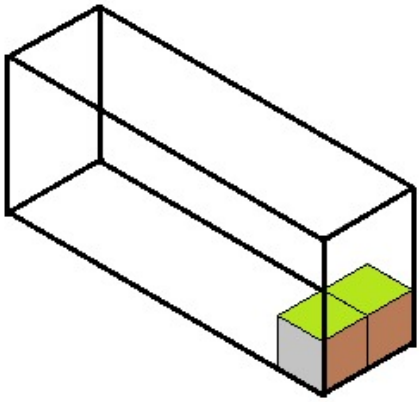


Algebra:

✓ 42

Hints:

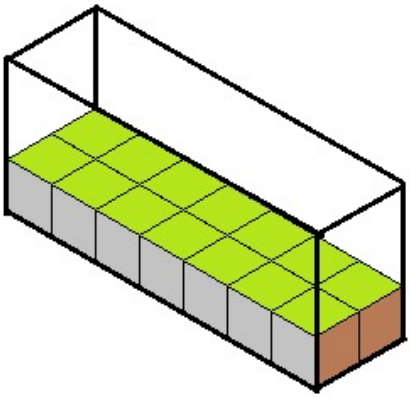
- Fill in one front row of the bottom of the box.



There would be 2 cubes in the front row.

- Now fill in the bottom area of the box.

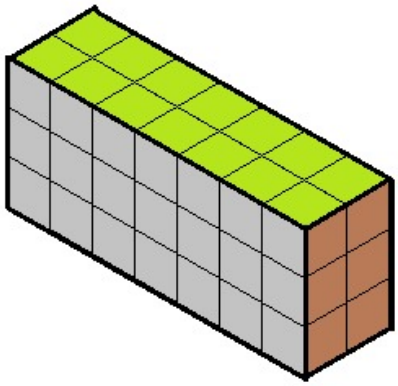
Try finding how many cubes would fit in the bottom area of the box.



There would be 14 cubes in the bottom area.

- You have the number of cubes in the bottom area 14, and the height of the box is 3.

Fill in the whole box by adding up all 3 layers.



There would be 42 cubes.
Type in 42.

Appendix A.3.1: 5.MD.5c Skill Documentation

Skill	Grade
5.MD.5c.Relate volume to the operations of multiplication and addition	5.MD.5c

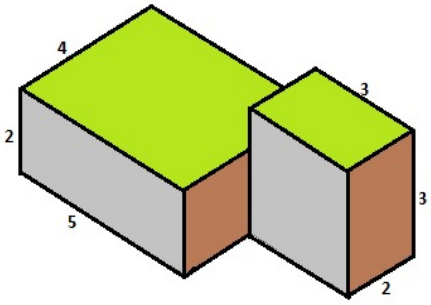
THE MASTERY SET

Mastery Problem Set	Number of Templates
55693	3
Number to Master	Number of Attempts
3	10

Templates:
333458

Assistment ID: 333458 Comment on this question

The length, width, and height of the rectangular prisms are given.
Find the total volume of the figure below.



Type your answer below (mathematical expression):

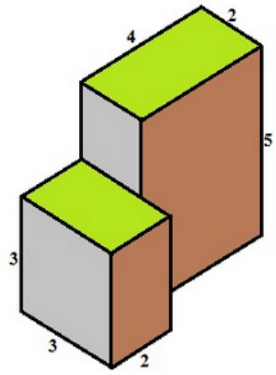
Submit Answer Show Hint 1 of 3

- There are all together 10 figures of combined rectangular prisms placed front and back.
- The image in the question is a variabilized image that is selected from the set of 10 figures.
- The length, width, and height of the prisms are given along with the figure.
- The student needs to calculate the volume of each rectangular prism and add them together to obtain the total volume of the figure.

339615

Assistment ID: 339615 Comment on this question

The length, width, and height of the rectangular prisms are given.
Find the total volume of the figure below.



Type your answer below (mathematical expression):

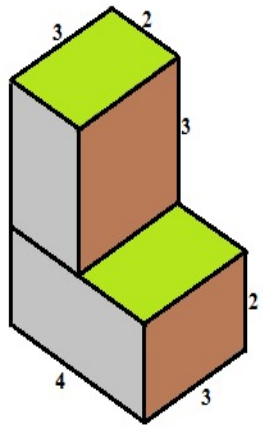
Submit Answer Show Hint 1 of 3

- There are all together 10 figures of combined rectangular prisms placed side by side.
- The image in the question is a variabilized image that is selected from the set of 10 figures.
- The length, width, and height of the prisms are given along with the figure.
- The student needs to calculate the volume of each rectangular prism and add them together to obtain the total volume of the figure.

339618

Assistment ID: 339618 Comment on this question

The length, width, and height of the rectangular prisms are given.
Find the total volume of the figure below.



Type your answer below (mathematical expression):

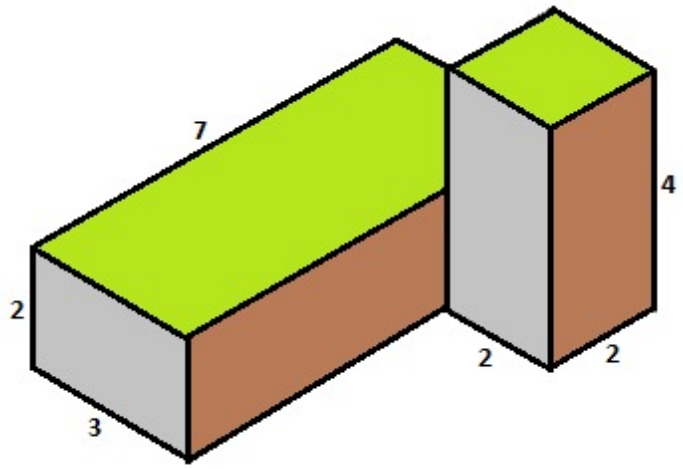
Submit Answer Show Hint 1 of 3

- There are all together 10 figures of combined rectangular prisms placed top to bottom.
- The image in the question is a variabilized image that is selected from the set of 10 figures.
- The length, width, and height of the prisms are given along with the figure.
- The student needs to calculate the volume of each rectangular prism and add them together to obtain the total volume of the figure.

Appendix A.3.2: 5.MD.5c Skill Sample Problem Print

1) Assistment #341733 "341733 - Relate volume to the operations of multiplication and addition"

The length, width, and height of the rectangular prisms are given.
Find the total volume of the figure below.



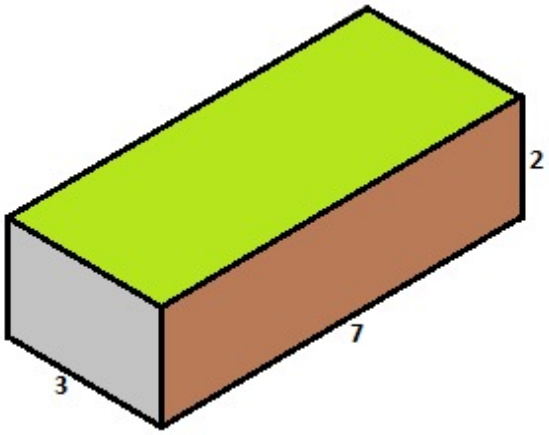
Algebra:

✓ 58

Hints:

- What would be the volume of the prism in the back?

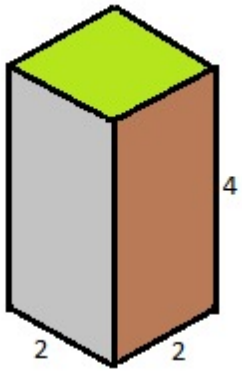
The volume is length times width times height.



So the volume of prism A is 7 * 3 * 2.

- What would be the volume of the prism in the front?

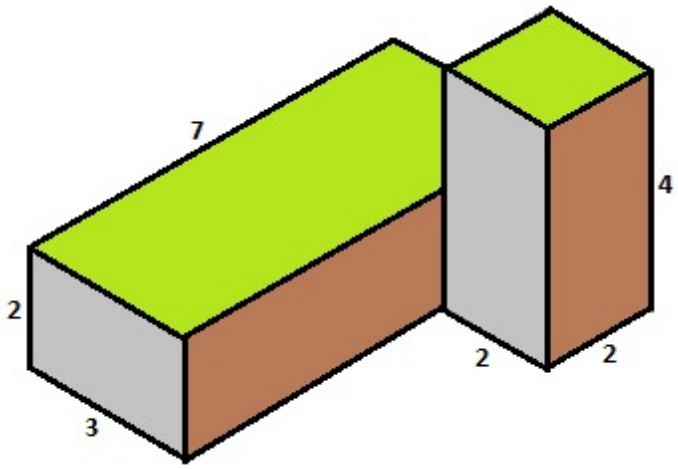
The volume is length times width times height.



So the volume of prism B is 2 * 2 * 4.

- Now you have the volume of prism in the back, which is 42, and the volume of prism in the front, which is 16.

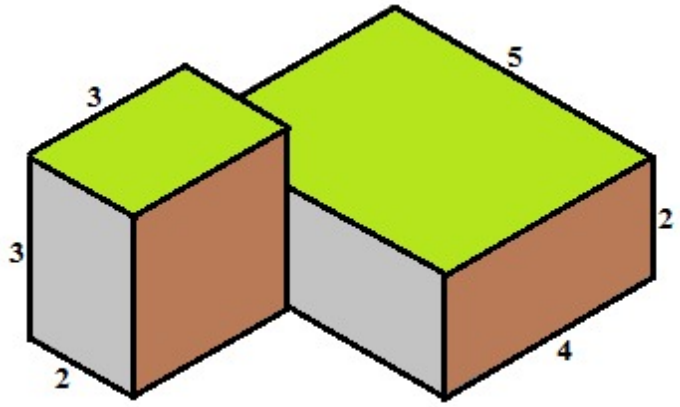
You can obtain the combined volume by adding the two volumes together.



The volume of combined prism is 42 + 16.
Type in 58.

2) Assistment #341765 "341765 - Relate volume to the operations of multiplication and addition (side-to-side)"

The length, width, and height of the rectangular prisms are given.
Find the total volume of the figure below.



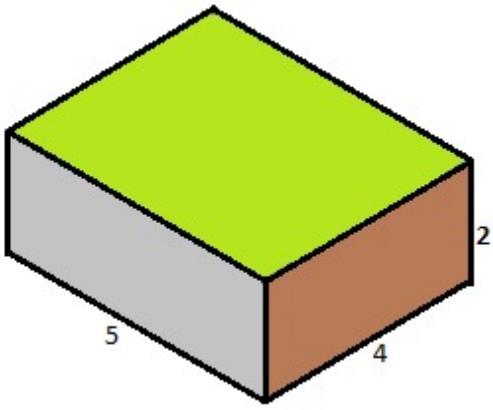
Algebra:

✓ 58

Hints:

- What would be the volume of the right prism?

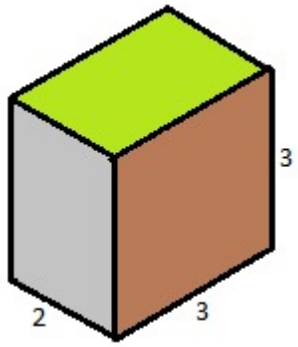
The volume is length times width times height.



So the volume of prism A is 4 * 5 * 2.

- What would be the volume of the left prism?

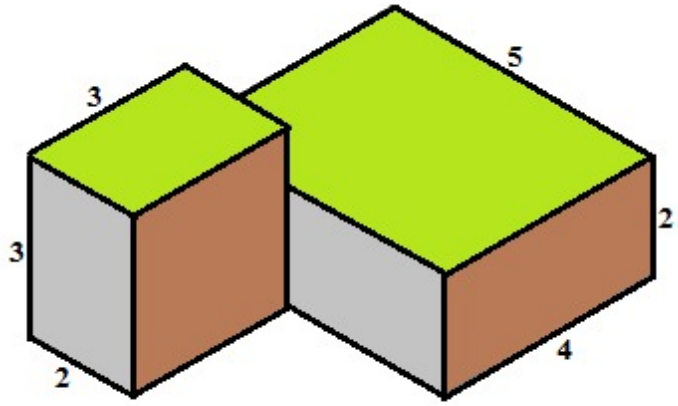
The volume is length times width times height.



So the volume of prism B is 3 * 2 * 3.

- Now you have the volume of the right prism, which is 40, and the volume of the left prism, which is 18.

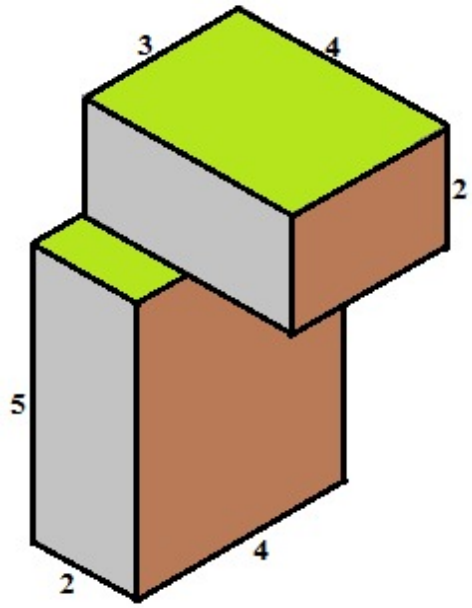
You can obtain the combined volume by adding the two volumes together.



The volume of combined prism is 40 + 18.
Type in 58.

3) Assistment #341857 "341857 - Relate volume to the operations of multiplication and addition (top-to-bottom)"

The length, width, and height of the rectangular prisms are given.
Find the total volume of the figure below.



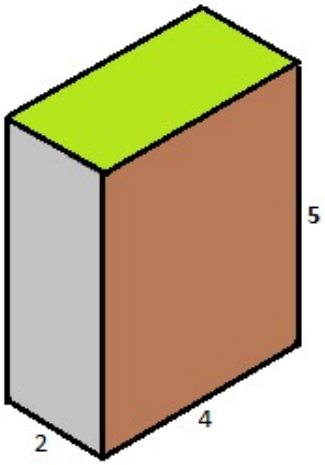
Algebra:

✓ 64

Hints:

- What would be the volume of the bottom prism?

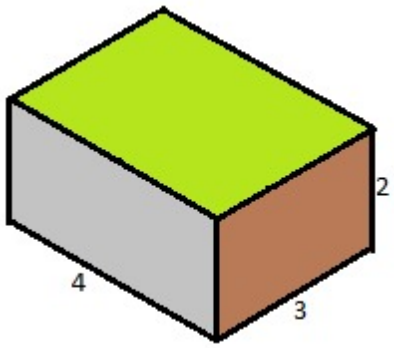
The volume is length times width times height.



So the volume of prism A is 4 * 2 * 5.

- What would be the volume of the top prism?

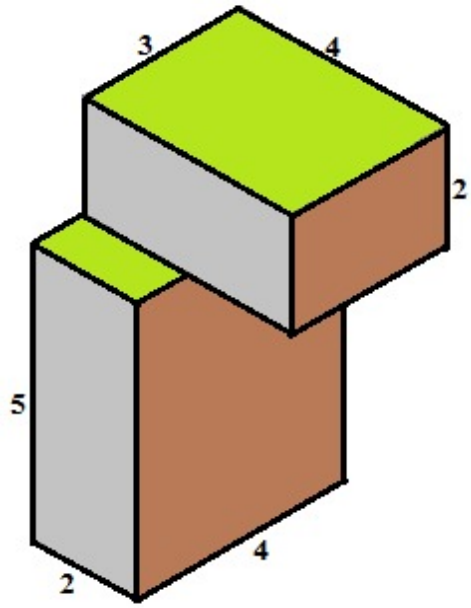
The volume is length times width times height.



So the volume of prism B is 3 * 4 * 2.

- Now you have the volume of the bottom prism, which is 40, and the volume of the top prism, which is 24.

You can obtain the combined volume by adding the two volumes together.



The volume of combined prism is 40 + 24.

Type in 64.

Appendix A.4.1: 6.SP.1 Skill Documentation

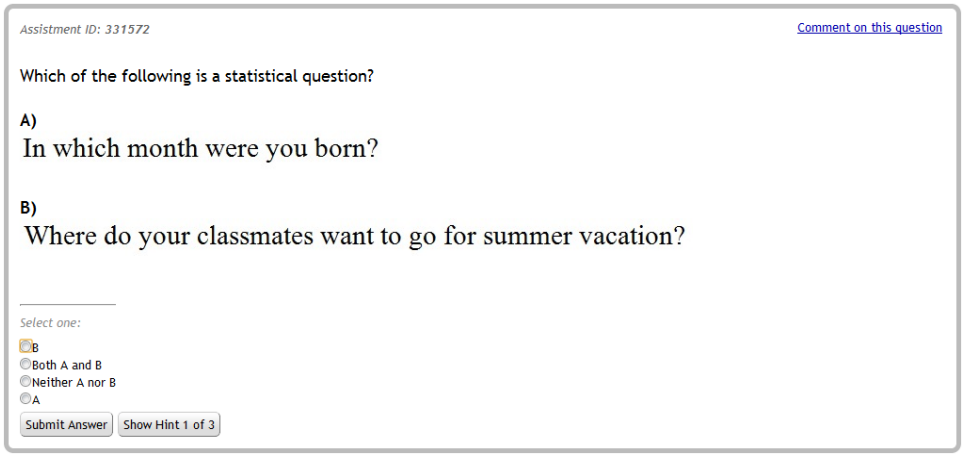
Skill	Grade
6.SP.1, Recognizing Statistical Questions	6.SP.1

THE MASTERY SET

Mastery Problem Set	Number of Templates
53233	4
Number to Master	**Number of Attempts**
3	10

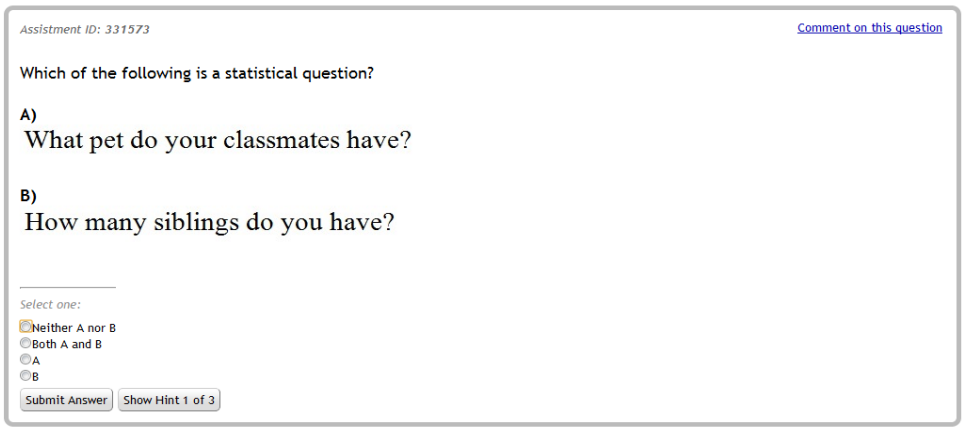
Templates:

331572



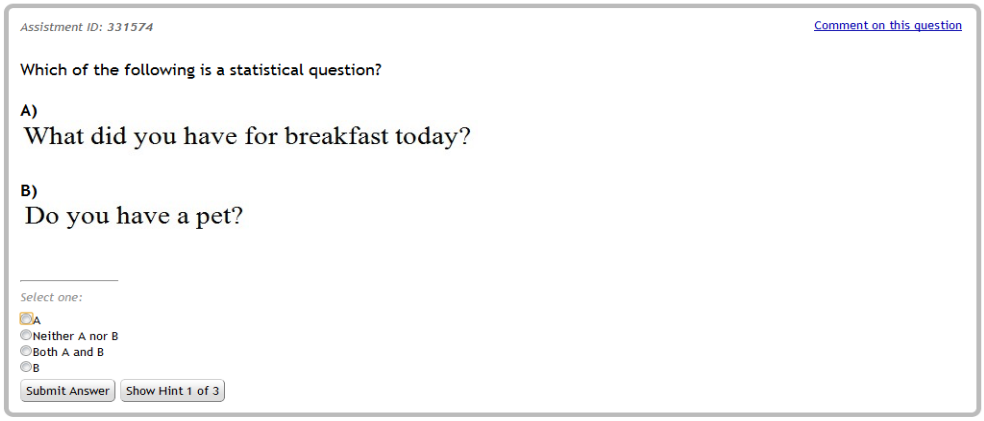
- There are 10 statistical questions and 10 non-statistical questions prepared.
- The question A is selected from 10 non-statistical questions and the question B is selected from 10 statistical questions.
- The answer will always be B.

331573



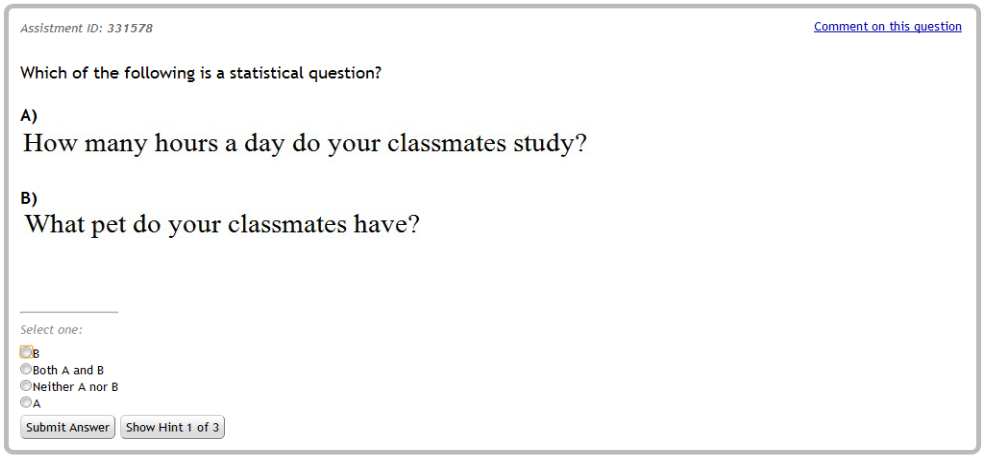
- There are 10 statistical questions and 10 non-statistical questions prepared.
- The question A is selected from 10 statistical questions and the question B is selected from 10 non-statistical questions.
- The answer will always be A.

331574



- There are 10 statistical questions and 10 non-statistical questions prepared.
- Question A is selected from 5 non-statistical questions and question B is selected from the other 5 non-statistical questions, so that the two questions will never be the same.
- The answer will always be Both A and B.

331578



- There are 10 statistical questions and 10 non-statistical questions prepared.
- Question A is selected from 5 statistical questions and question B is selected from the other 5 statistical questions, so that the two questions will never be the same.
- The answer will always be Neither A and B.

Appendix A.4.2: 6.SP.1 Skill Sample Problem Print

1) Assistment #336737 "336737 - Statistical Question 1"

Which of the following is a statistical question?

A)

Do you have a pet?

B)

What colors do your classmates like?

Multiple choice:

- ✗ A
- ✓ B
- ✗ Both A and B
- ✗ Neither A nor B

Hints:

- A statistical question anticipates variability, and may have several different answers.

Try asking yourself how many different answers there are for each question.

If there is only one answer, it is not a statistical question.

- Question A can have only one answer.

Question B can have different answers depending on who you ask.

- Question B is a statistical question. Select B.

2) Assistment #336781 "336781 - Statistical Question 2"

Which of the following is a statistical question?

A)

How tall are students in your class?

B)

How many hours do you study daily?

Multiple choice:

- ✓ A
- ✗ B
- ✗ Both A and B
- ✗ Neither A nor B

Hints:

- A statistical question anticipates variability, and may have several different answers.

Try asking yourself how many different answers there are for each question.

If there is only one answer, it is not a statistical question.

- Question B can have only one answer.

Question A can have different answers depending on who you ask.

- Question A is a statistical question. Select A.

3) Assistment #336798 "336798 - Statistical Question 3"

Which of the following is a statistical question?

A)

How many siblings do you have?

B)

Do you have a pet?

Multiple choice:

- ✗ A
- ✗ B
- ✗ Both A and B
- ✓ Neither A nor B

Hints:

- A statistical question anticipates variability, and may have several different answers. Try asking yourself how many different answers there are for each question.

If there is only one answer, it is not a statistical question.

- Both questions can have only one answer.
- Neither question A nor question B is a statistical question. Select Neither A nor B.

4) Assistment #336834 "336834 - Statistical Question 4"

Which of the following is a statistical question?

A)

Where do your classmates want to go for summer va

B)

In which months were your classmates born?

Multiple choice:

- ✗ A
- ✗ B
- ✓ Both A and B
- ✗ Neither A nor B

Hints:

- A statistical question anticipates variability, and may have several different answers.

Try asking yourself how many different answers there are for each question.

If there is only one answer, it is not a statistical question.

- Both questions can have different answers depending on who you ask.

- Both question A and question B are statistical questions. Select both A and B.

Appendix B.1.1: 4.MD.4 Skill Documentation

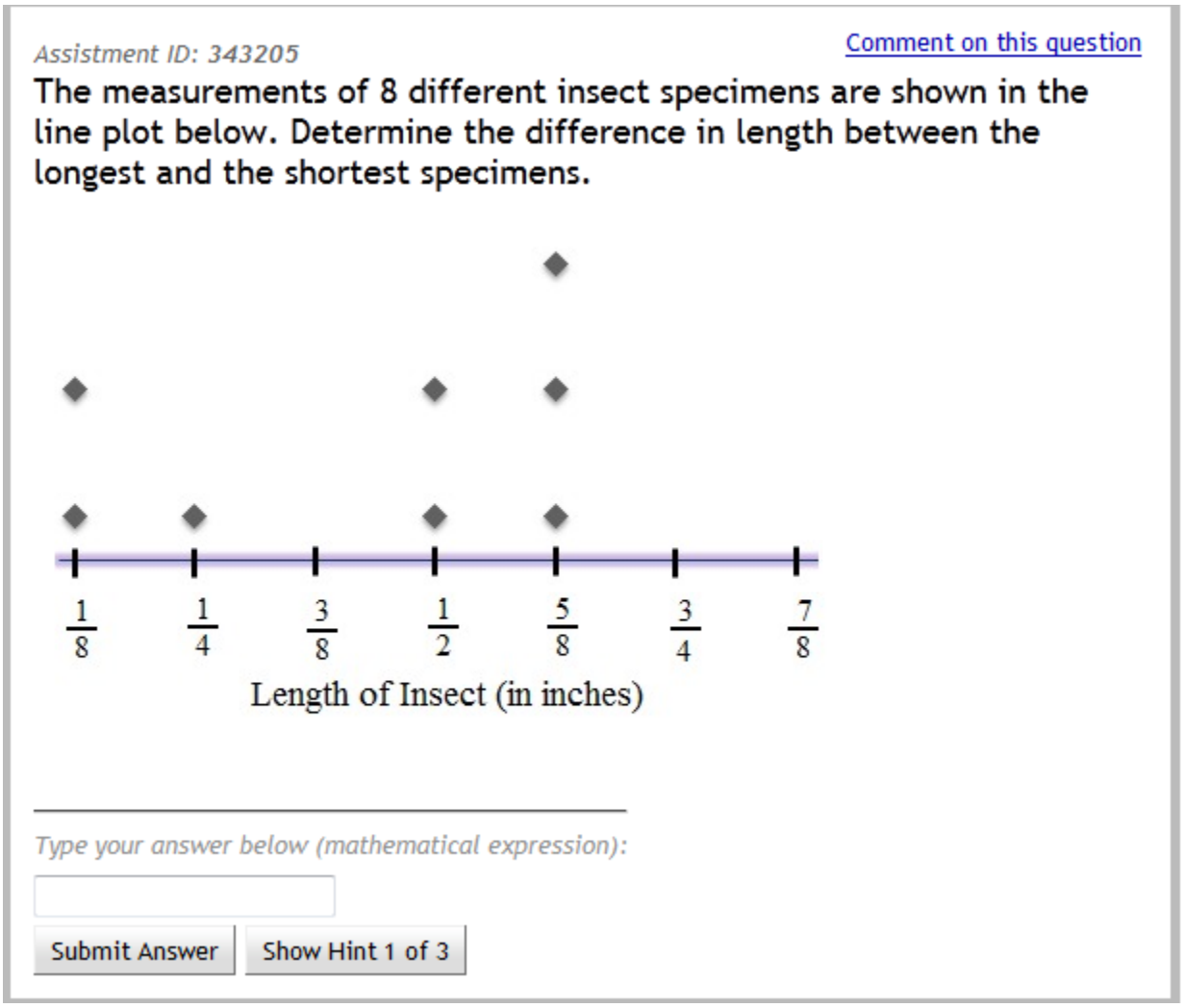
Skill	Grade
4.MD.4, Interpreting Statistical Data (Addition & Subtraction using Fraction)	4.MD.4

THE MASTERY SET

Mastery Problem Set	Number of Templates
78704	2
Number to Master	Number of Attempts
3	10

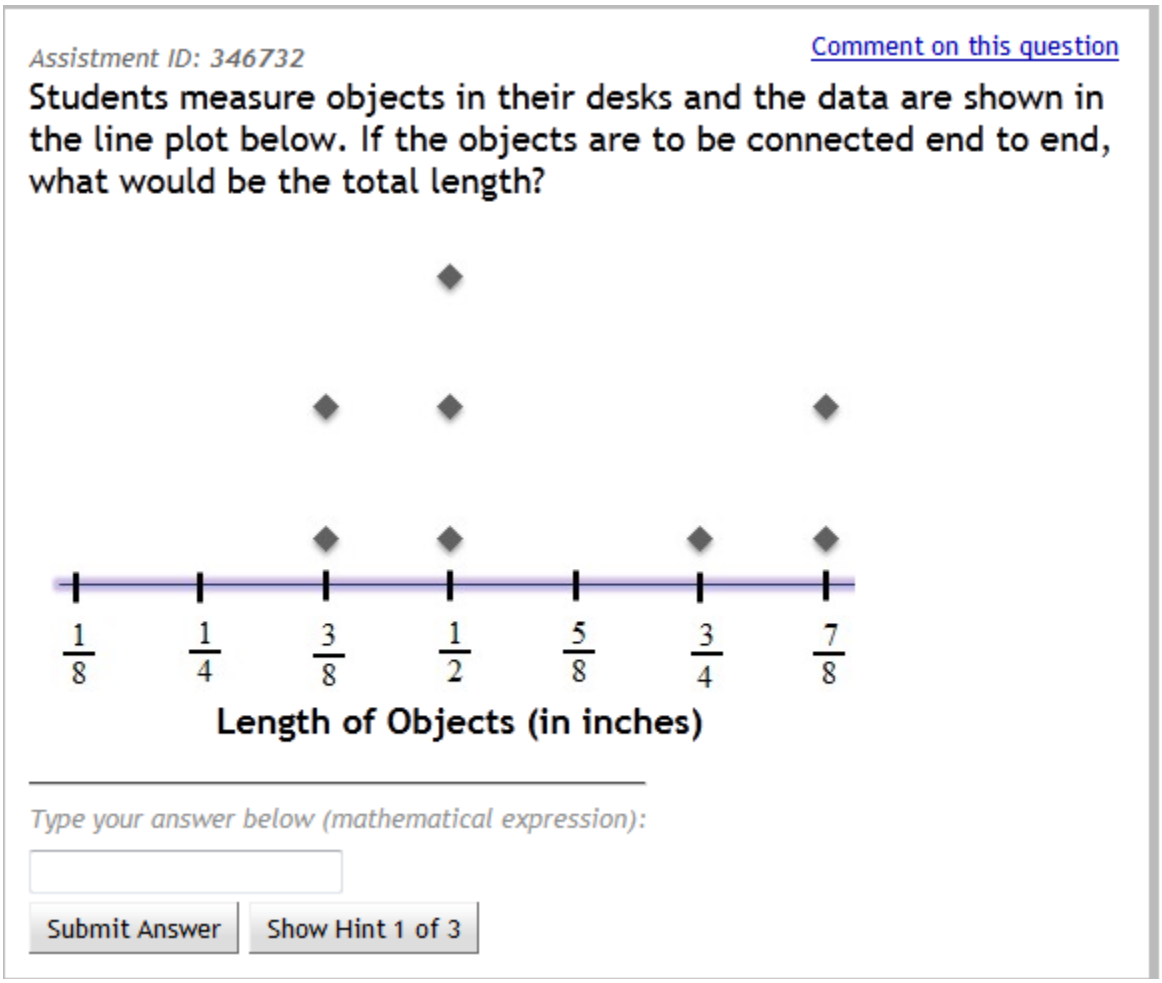
Templates:

343205



- There are 8 line plots for this template.

346732

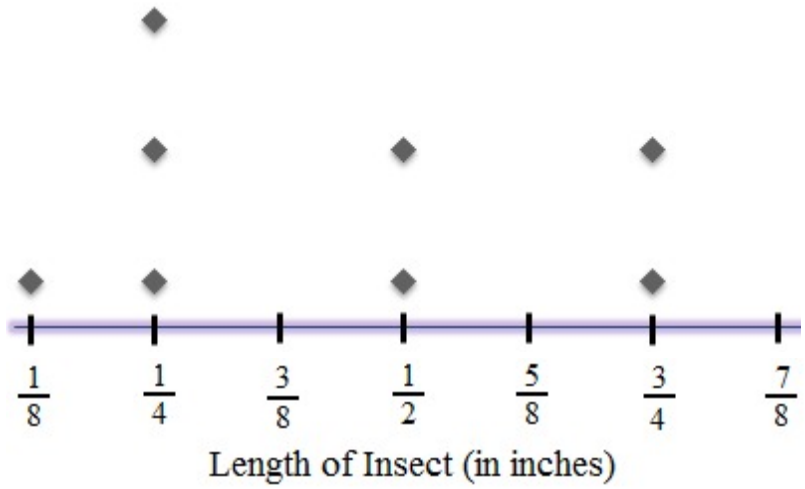


- There are 8 line plots for this template.

Appendix B.1.2: 4.MD.4 Skill Sample Problem Print

1) Assistment #368015 "368015 - 57508 - Fraction (Subtraction)"

The measurements of 8 different insect specimens are shown in the line plot below. Determine the difference in length between the longest and the shortest specimens.



Algebra:

✓ 0.625

Hints:

- The difference in length is obtained by subtraction of the minimum value from the maximum value. First, try to identify the minimum value and the maximum value of the data points.
- The maximum is $\frac{3}{4}$, and the minimum is $\frac{1}{8}$
- Difference = $\frac{3}{4} - \frac{1}{8} = \frac{5}{8}$

Type $\frac{5}{8}$

2) Assistment #368086 "368086 - 57508 - Fraction (Addition)"

Students measure objects in their desks and the data are shown in the line plot below. If the objects are to be connected end to end, what would be the total length?

Length of Objects (in inches)

Algebra:

✓ 3 3/8

Hints:

- To get the total length, add up the values of all data points. There are 8 data points in the plot.
- Total = $\frac{1}{8} + \frac{1}{8} + \frac{1}{4} + \frac{1}{2} + \frac{1}{2} + \frac{5}{8} + \frac{5}{8} + \frac{5}{8}$
- Total length = $\frac{27}{8}$

Type $\frac{27}{8}$

(or) 3 3/8

Appendix B.2.1: 5.MD.2 Skill Documentation

Skill	Grade
5.MD.2, Interpreting Statistical Data (Fraction)	5.MD.2

THE MASTERY SET

Mastery Problem Set	Number of Templates
76046	3
Number to Master	Number of Attempts
3	10

Templates Used: All

THE MASTERY SET (Subtraction)

Mastery Problem Set	Number of Templates
76020	1
Number to Master	Number of Attempts
3	10

Templates Used: 343205

THE MASTERY SET (Addition)

Mastery Problem Set	Number of Templates
76033	1
Number to Master	Number of Attempts
3	10

Templates Used: 346732

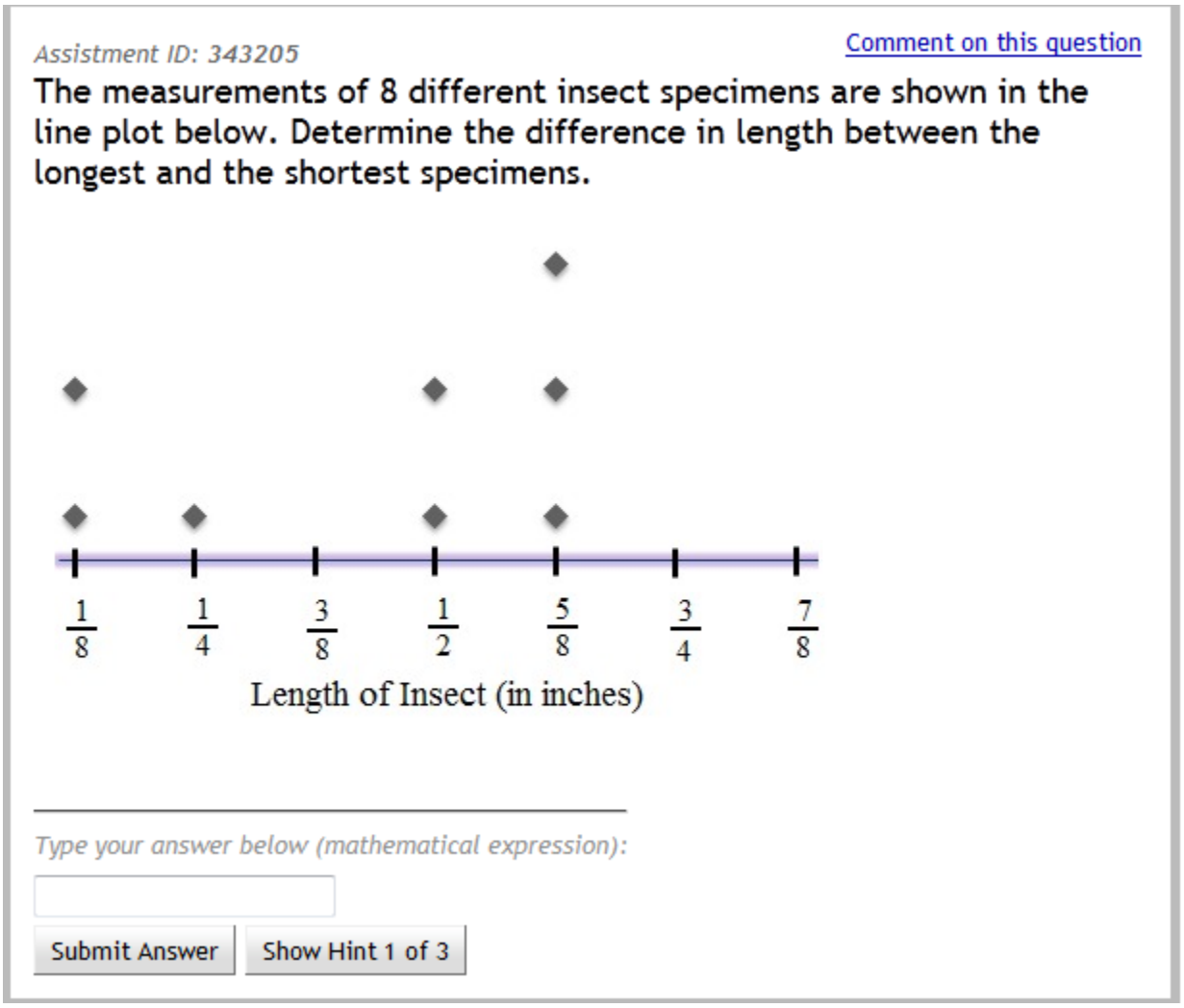
THE MASTERY SET (Mean)

Mastery Problem Set	Number of Templates
76040	1
Number to Master	Number of Attempts
3	10

Templates Used: 347131

Templates:

343205

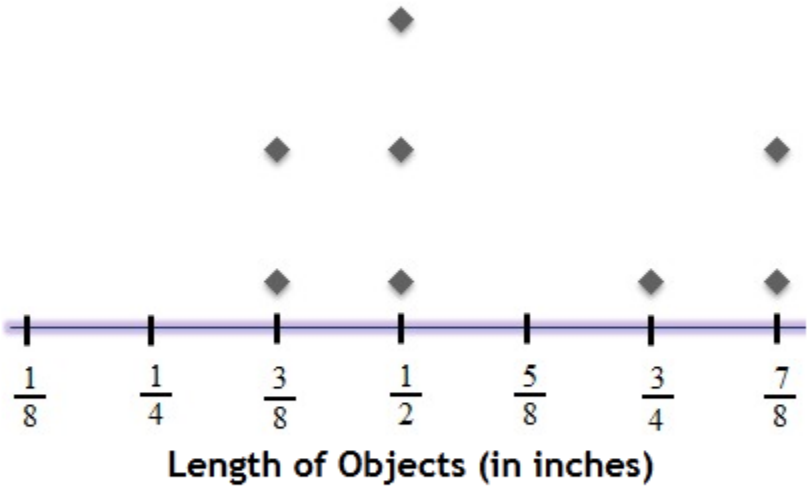


- There are 8 line plots for this template.

346732

Assistment ID: 346732 Comment on this question

Students measure objects in their desks and the data are shown in the line plot below. If the objects are to be connected end to end, what would be the total length?



Type your answer below (mathematical expression):

Submit Answer Show Hint 1 of 3

- There are 8 line plots for this template.

347131

Assistment ID: 347131 Comment on this question

The following line plot shows the amount of orange juice in liters in 8 jugs. How much liquid will each jug contain if distributed equally?

Type your answer below (mathematical expression):

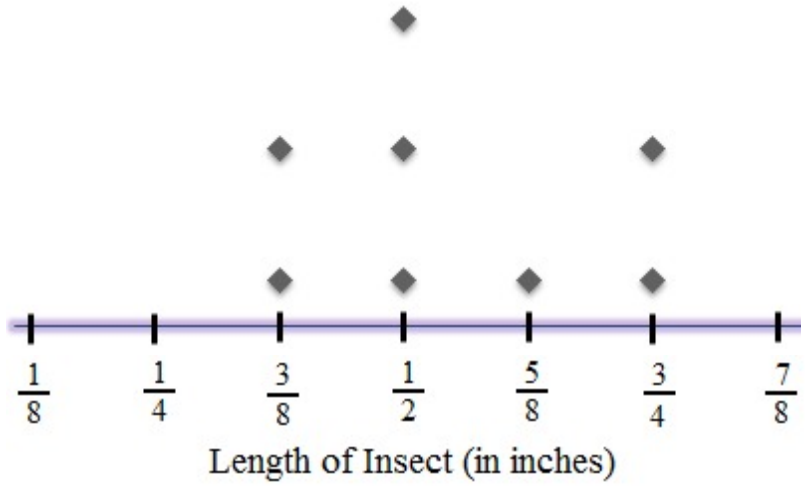
Submit Answer Show Hint 1 of 3

- There are 8 line plots for this template.

Appendix B.2.2: 5.MD.2 Skill Sample Problem Print

1) Assistment #365612 "365612 - 57508 - Fraction (Subtraction)"

The measurements of 8 different insect specimens are shown in the line plot below. Determine the difference in length between the longest and the shortest specimens.



Algebra:

✓ 0.375

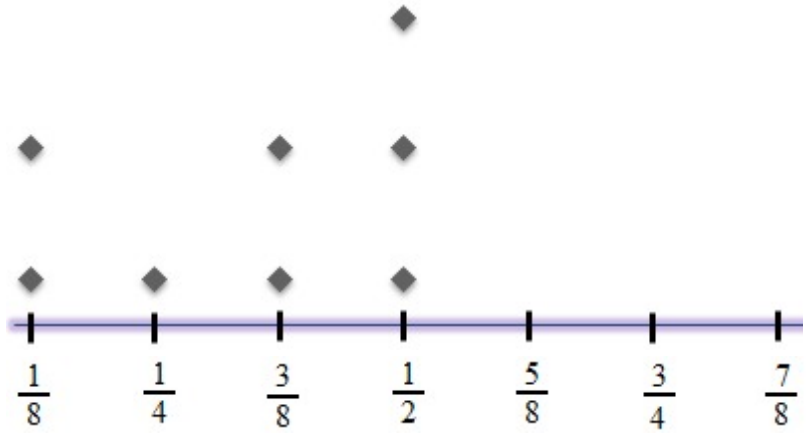
Hints:

- The difference in length is obtained by subtraction of the minimum value from the maximum value. First, try to identify the minimum value and the maximum value of the data points.
- The maximum is $\frac{3}{4}$, and the minimum is $\frac{3}{8}$
- Difference = $\frac{3}{4} - \frac{3}{8} = \frac{3}{8}$

Type $\frac{3}{8}$

2) Assistment #365669 "365669 - 57508 - Fraction (Addition)"

Students measure objects in their desks and the data are shown in the line plot below. If the objects are to be connected end to end, what would be the total length?



Length of Objects (in inches)

Algebra:

✓ 2 3/4

Hints:

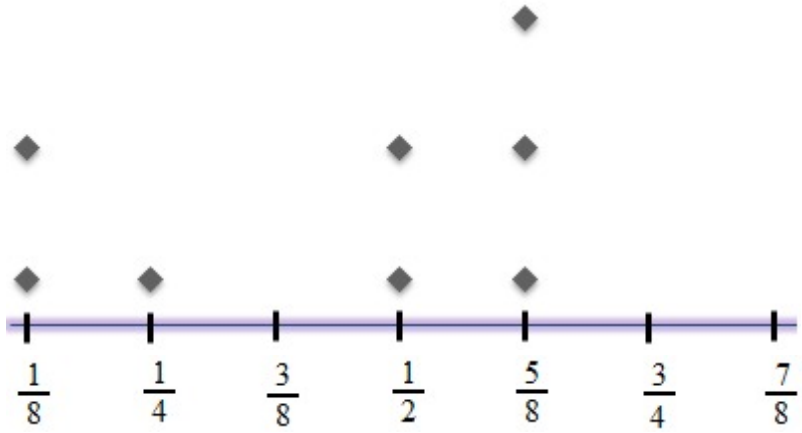
- To get the total length, add up the values of all data points. There are 8 data points in the plot.
- Total = $\frac{1}{8} + \frac{1}{8} + \frac{1}{4} + \frac{3}{8} + \frac{3}{8} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$
- Total length = $\frac{11}{4}$

Type $\frac{11}{4}$

(or) 2 3/4

3) Assistment #365709 "365709 - 57508 - Fraction (Mean)"

The following line plot shows the amount of orange juice in liters in 8 jugs. How much liquid will each jug contain if distributed equally?



Amount of Orange Juice (in liters)

Algebra:

✓ 0.421875

Hints:

- "Having the liquid distributed equally" implies "the mean amount of liquid".

Mean is the sum divided by the count.

- The sum is obtained by adding the values of all data points.

$$\text{Sum} = \frac{1}{8} + \frac{1}{8} + \frac{1}{4} + \frac{1}{2} + \frac{1}{2} + \frac{5}{8} + \frac{5}{8} + \frac{5}{8}$$

$$= \frac{1}{8} + \frac{1}{8} + \frac{2}{8} + \frac{4}{8} + \frac{4}{8} + \frac{5}{8} + \frac{5}{8} + \frac{5}{8}$$

$$= \frac{27}{8}$$

$$= \frac{27}{8}$$

There are 8 jugs, so the count is simply 8.
count = 8

- Liquid in each jug $= \frac{\text{sum}}{\text{count}} = \frac{1}{\text{count}} \times \text{sum} = \frac{1}{8} \times \frac{27}{8} = \frac{27}{64}$

Type 27/64

(or) 0.421875

Appendix B.3.1: 6.SP.2 Skill Documentation

Skill	Grade
6.SP.2, Understanding Statistical Data	6.SP.2

THE MASTERY SET

Mastery Problem Set	Number of Templates
56520	9
Number to Master	Number of Attempts
3	10

Templates Used: All

THE MASTERY SET (Spread of Line Plots)

Mastery Problem Set	Number of Templates
56513	3
Number to Master	Number of Attempts
3	10

Templates Used: 331255, 337298, 337299

THE MASTERY SET (Gaps in Line Plots)

Mastery Problem Set	Number of Templates
56517	4
Number to Master	Number of Attempts
3	10

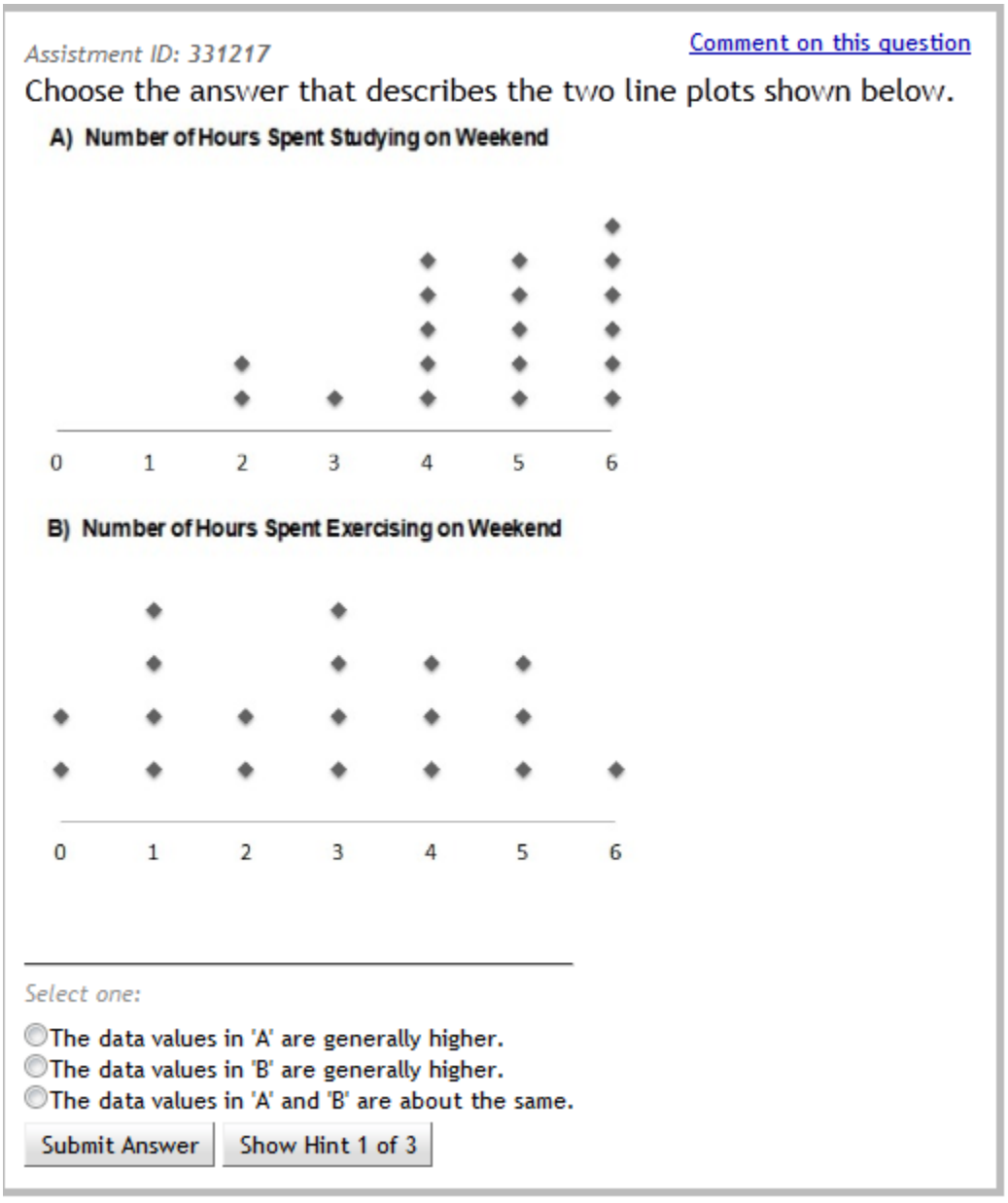
Templates Used: 331304, 337295, 337296, 337297

THE MASTERY SET (Comparison of Line Plots)

Mastery Problem Set	Number of Templates
56519	2
Number to Master	Number of Attempts
3	10

Templates Used: 331217, 337302

Templates:
331217



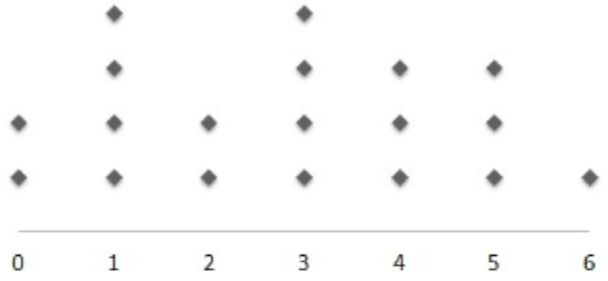
- There are 9 line plots with cluster of high data values for A and 9 line plots without cluster of high data values for B.
- There are 9 titles for A and 9 titles for B.
- The answer will always be "The data values in 'A' are generally higher."

337302

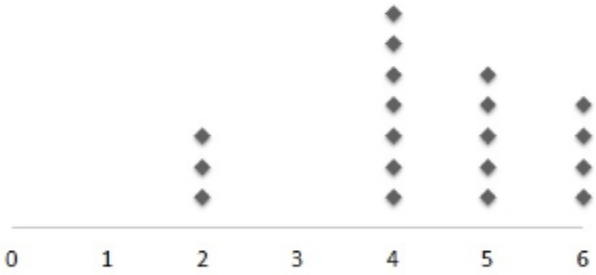
Assistment ID: 337302 Comment on this question

Choose the answer that describes the two line plots shown below.

A) Algebra Scores



B) Geometry Scores



Select one:

- The data values in 'B' are generally higher.
- The data values in 'A' are generally higher.
- The data values in 'A' and 'B' are about the same.

Submit Answer | Show Hint 1 of 3

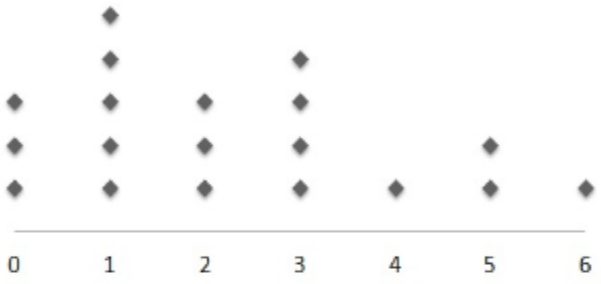
- There are 9 line plots without cluster of high data values for A and 9 line plots with cluster of high data values for B.
- The are 9 titles for A and 9 titles for B.
- The answer will always be “The data values in ‘B’ are generally higher.”

337298

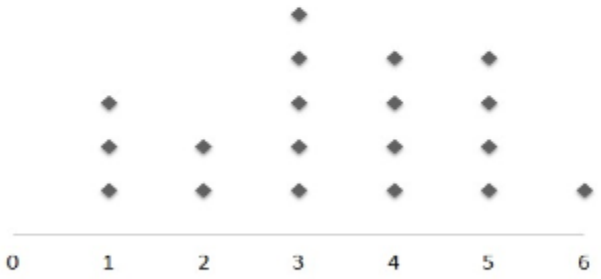
Assistment ID: 337298 Comment on this question

Choose the answer that describes the two line plots shown below.

A) Number of Pencils



B) Number of Pens



Select one:

- 'A' and 'B' have the same range.
- 'A' has a a larger range than 'B'.
- 'B' has a a larger range than 'A'.

Submit Answer | Show Hint 1 of 3

- There are 9 line plots for A and 9 line plots for B. The plots for A have a larger range.
- There are 9 titles for A and 9 titles for B.
- The answer will always be “A has a larger range than B.”

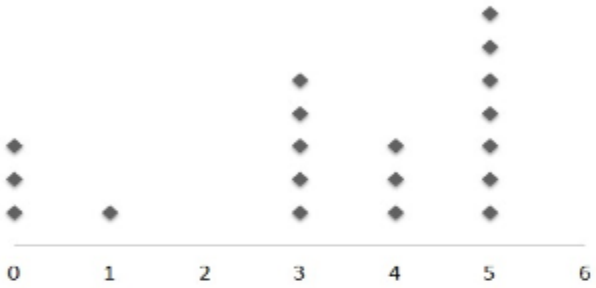
331255

Comment on this question

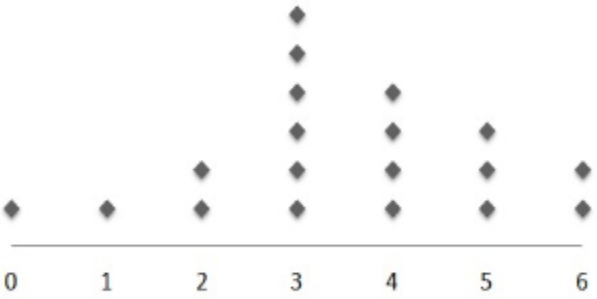
Assistment ID: 331255

Choose the answer that describes the two line plots shown below.

A) Number of Emails Sent Yesterday



B) Number of Text Messages Sent Yesterday



Select one:

- 'A' and 'B' have the same range.
- 'B' has a a larger range than 'A'.
- 'A' has a a larger range than 'B'.

Submit Answer | Show Hint 1 of 3

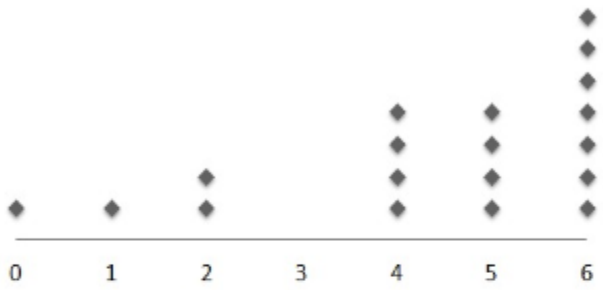
- There are 9 line plots for A and 9 line plots for B. The plots for B have a larger range.
- There are 9 titles for A and 9 titles for B.
- The answer will always be “B has a larger range than A.”

337299

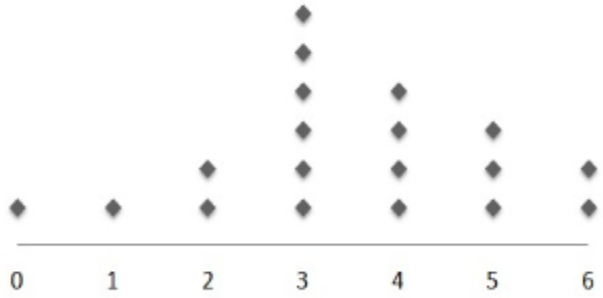
Assistment ID: 337299 Comment on this question

Choose the answer that describes the two line plots shown below.

A) Algebra Scores



B) Geometry Scores



Select one:

- 'A' has a a larger range than 'B'.
- 'B' has a a larger range than 'A'.
- 'A' and 'B' have the same range.

Submit Answer | Show Hint 1 of 3

- There are 9 line plots for A and 9 line plots for B. The plots have the same range.
- There are 9 titles for A and 9 titles for B.
- The answer will always be “A and B have the same range.”

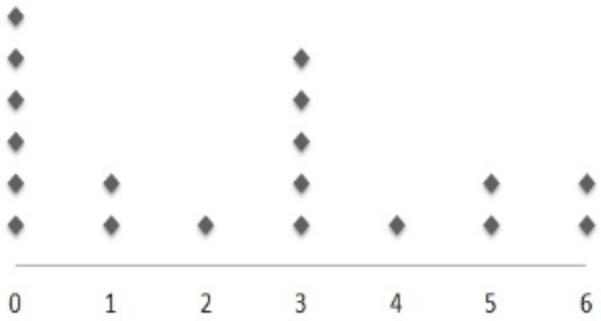
337295

Assistment ID: 337295 Comment on this question

Choose the answer that describes the two line plots shown below:

A) Number of Ties

B) Number of Jackets



Select one:

- Only A has gap(s).
- Only B has gap(s).
- Neither has a gap.
- Both have gaps.

Submit Answer | Show Hint 1 of 3

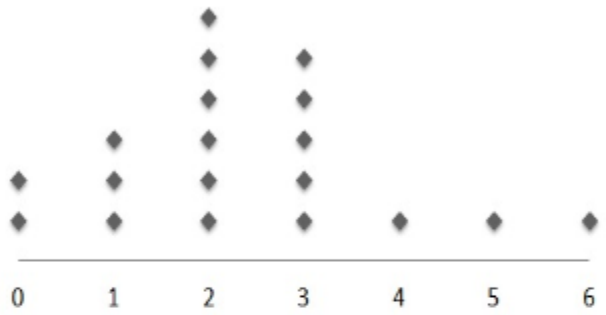
- There are 9 line plots for A and 9 line plots for B. The plots for A have gaps.
- There are 9 titles for A and 9 titles for B.
- The answer will always be “Only A has gap(s).”

331304

Assistment ID: 331304 Comment on this question

Choose the answer that describes the two line plots shown below:

A) Number of Calls Received on Weekend



B) Number of Calls Received during Weekdays

Select one:

- Both have gaps.
- Only A has gap(s).
- Only B has gap(s).
- Neither has a gap.

Submit Answer | Show Hint 1 of 3

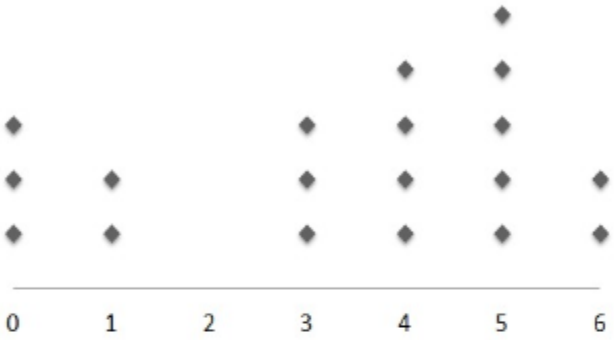
- There are 9 line plots for A and 9 line plots for B. The plots for B have gaps.
- There are 9 titles for A and 9 titles for B.
- The answer will always be “Only B has gap(s).”

337296

Assistment ID: 337296 Comment on this question

Choose the answer that describes the two line plots shown below:

A) Number of Cookies Eaten at a Party



B) Number of Brownies Eaten at a Party

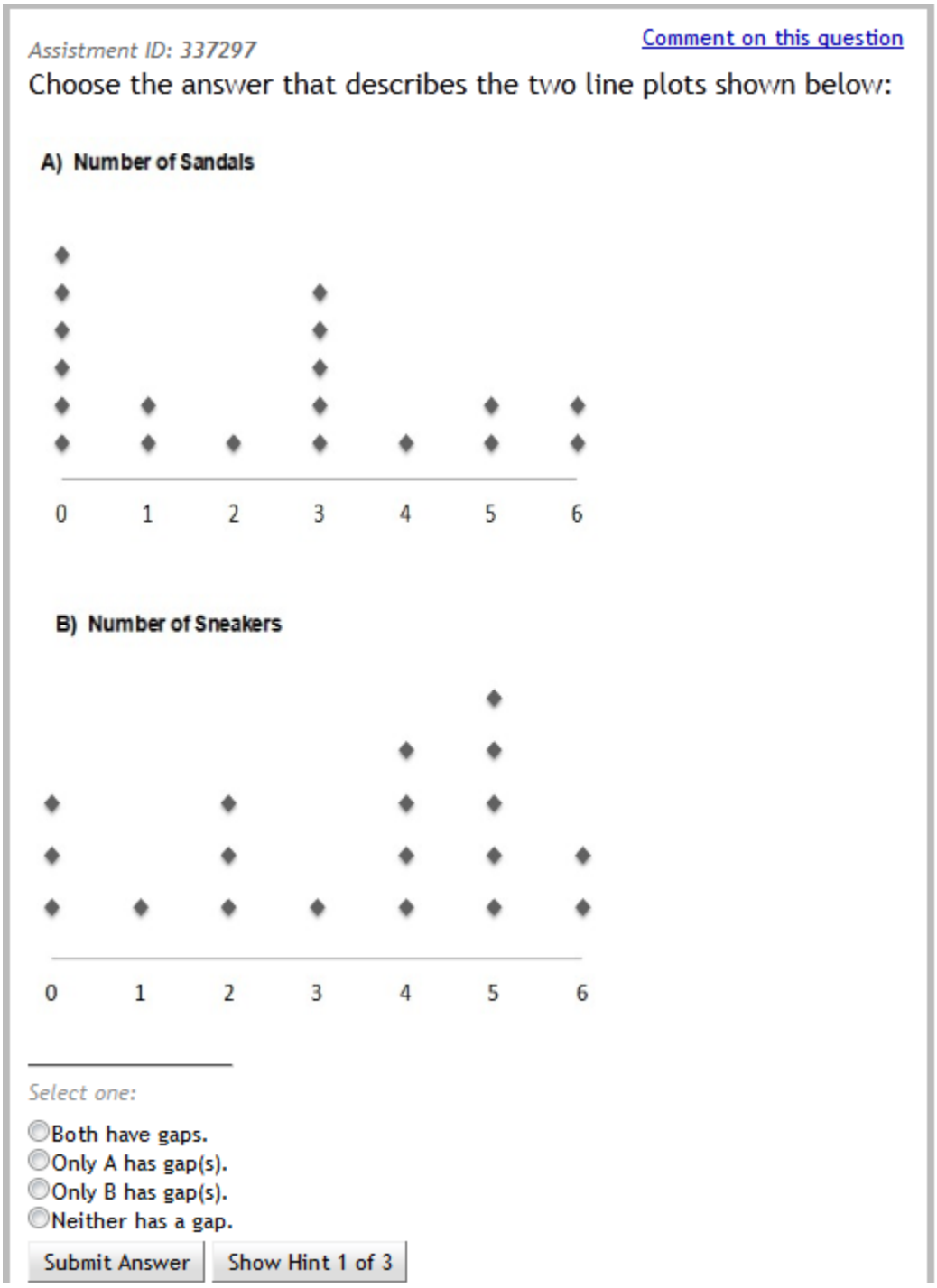
Select one:

- Both have gaps.
- Only A has gap(s).
- Only B has gap(s).
- Neither has a gap.

Submit Answer | Show Hint 1 of 3

- There are 9 line plots for A and 9 line plots for B. The plots for both A and B have gaps.
- There are 9 titles for A and 9 titles for B.
- The answer will always be “Both have gaps.”

337297

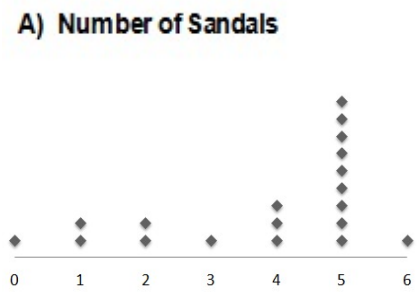


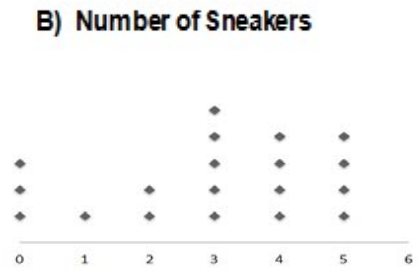
- There are 9 line plots for A and 9 line plots for B. All the plots don't have a gap.
- There are 9 titles for A and 9 titles for B.
- The answer will always be "Neither has a gap."

Appendix B.3.2: 6.SP.2 Skill Sample Problem Print

1) Assistment #344372 "344372 - 57849 - Spread of Line Plots (A)"

Choose the answer that describes the two line plots shown below.





Multiple choice:

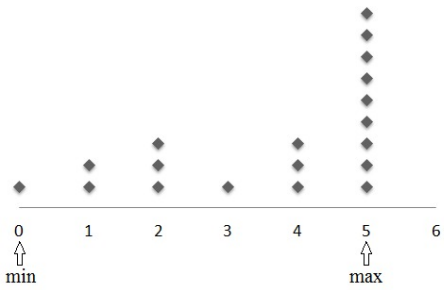
✗ 'A' and 'B' have the same range.

✗ 'B' has a a larger range than 'A'.

✓ 'A' has a a larger range than 'B'.

Hints:

- The range of a line plot is the difference between the maximum and minimum values represented by the data points.
- The following example demonstrates the determination of the range of a line plot.



Range = 5 - 0 = 5

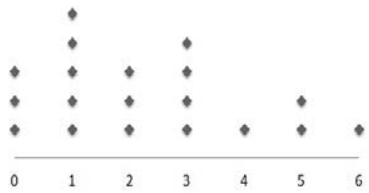
- The answer is

'A' has a a larger range than 'B'.

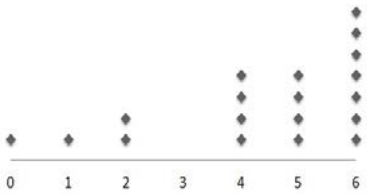
2) Assistment #344389 "344389 - 57849 - Gaps in Line Plots (B)"

Choose the answer that describes the two line plots shown below:

A) Number of Pencils



B) Number of Pens

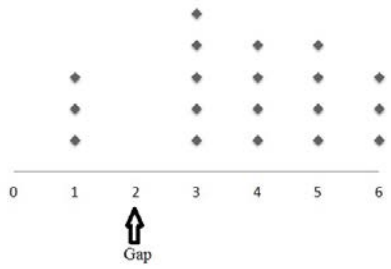


Multiple choice:

- ✗ Both have gaps.
- ✗ Neither has a gap.
- ✗ Only A has gap(s).
- ✓ Only B has gap(s).

Hints:

- A gap is a space between data points on a line plot.
- As an example, a gap is identified in the line plot shown below.



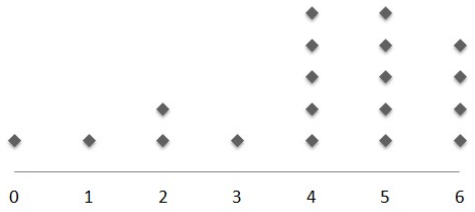
- The answer is

Only B has gap(s).

3) Assistment #344433 "344433 - 57849 - Comparison of Line Plots (A)"

Choose the answer that describes the two line plots shown below.

A) Number of Hours Spent Studying on Weekend



B) Number of Hours Spent Exercising on Weekend

Multiple choice:

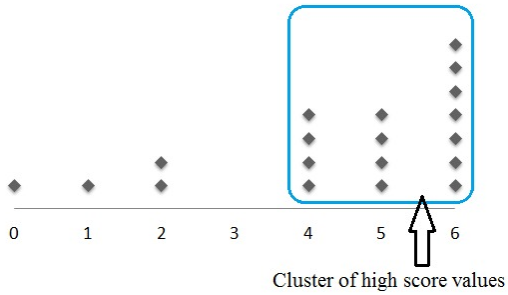
✗ The data values in 'A' and 'B' are about the same.

✗ The data values in 'B' are generally higher.

✓ The data values in 'A' are generally higher.

Hints:

- The line plot with higher scores will have more data points clustered around high score values (the rightmost side of the plot).
- A cluster of high score values is identified in the following line plot as an example.



- The answer is

The data values in 'A' are generally higher.

Appendix B.4.1: 6.SP.3 Skill Documentation

Skill	Grade
6.SP.3, Interpreting Statistical Data	6.SP.3

THE MASTERY SET

Mastery Problem Set	Number of Templates
76114	9
Number to Master	Number of Attempts
3	10

Templates Used: All

THE MASTERY SET (Range of Line Plots)

Mastery Problem Set	Number of Templates
76113	2
Number to Master	Number of Attempts
3	10

Templates Used: 334206, 335987

THE MASTERY SET (Mode of Line Plots)

Mastery Problem Set	Number of Templates
76110	4
Number to Master	Number of Attempts
3	10

Templates Used: 334250, 338607, 338654, 338663

THE MASTERY SET (Median of Line Plots)

Mastery Problem Set	Number of Templates
76108	2
Number to Master	Number of Attempts
3	10

Templates Used: 343012, 345673

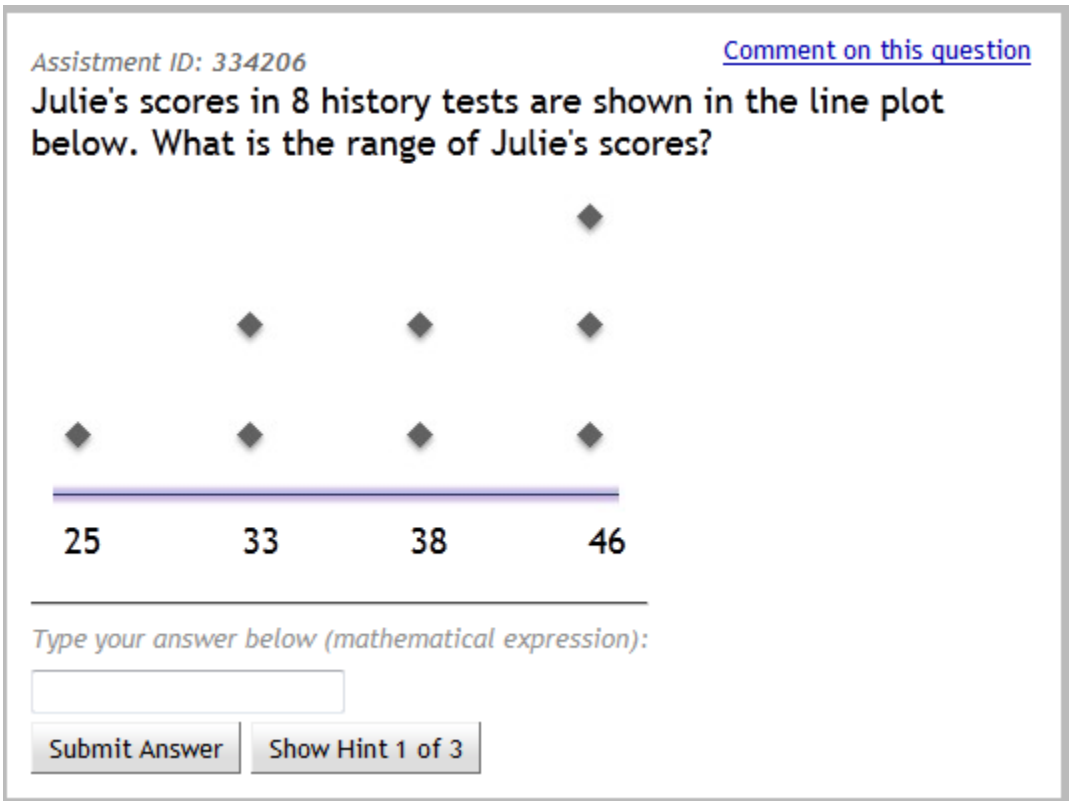
THE MASTERY SET (Mean of Line Plots)

Mastery Problem Set	Number of Templates
76091	1
Number to Master	Number of Attempts
3	10

Templates Used: 338745

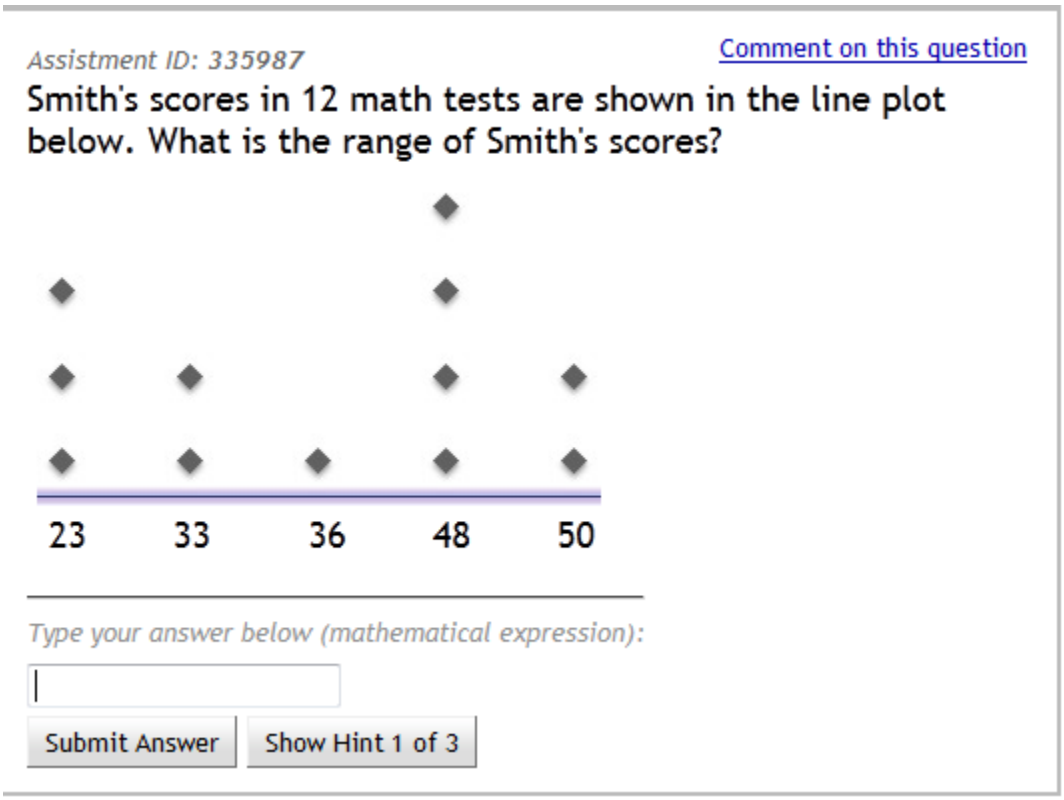
Templates:

334206



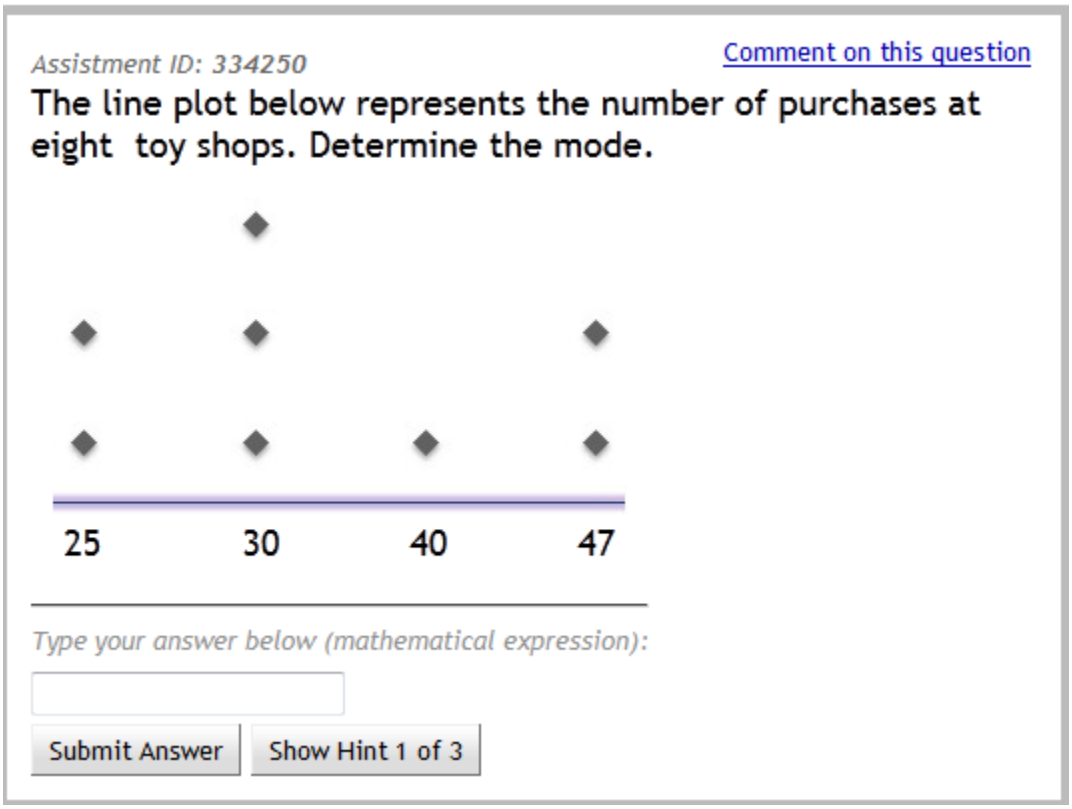
- There are 5 line plots (all with 4 data values) for this template.
- The data values are variabilized.
- The name of the student and the subject are also variabilized.

335987



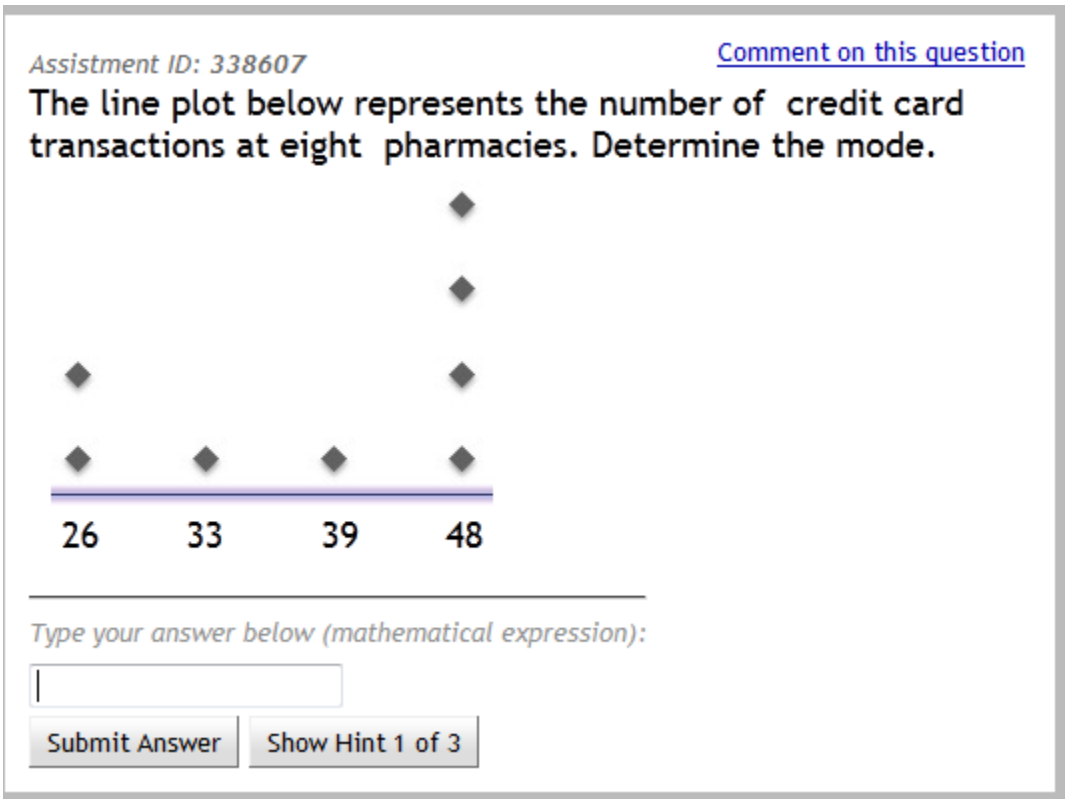
- There are 5 line plots (all with 5 data values) for this template.
- The data values are variabilized.
- The name of the student and the subject are also variabilized.

334250



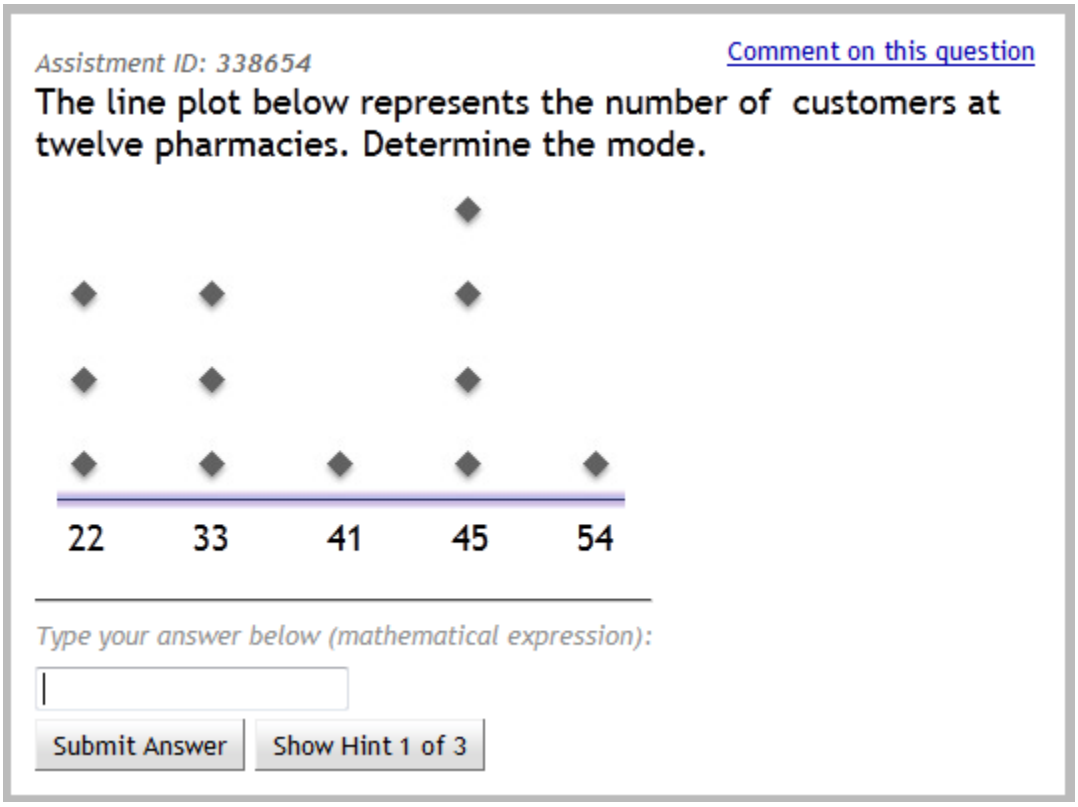
- There are 5 line plots (all with 4 data values) for this template.
- The data values are variabilized.
- The type of store is also variabilized.
- The answer will always be the second data value from the left.

338607



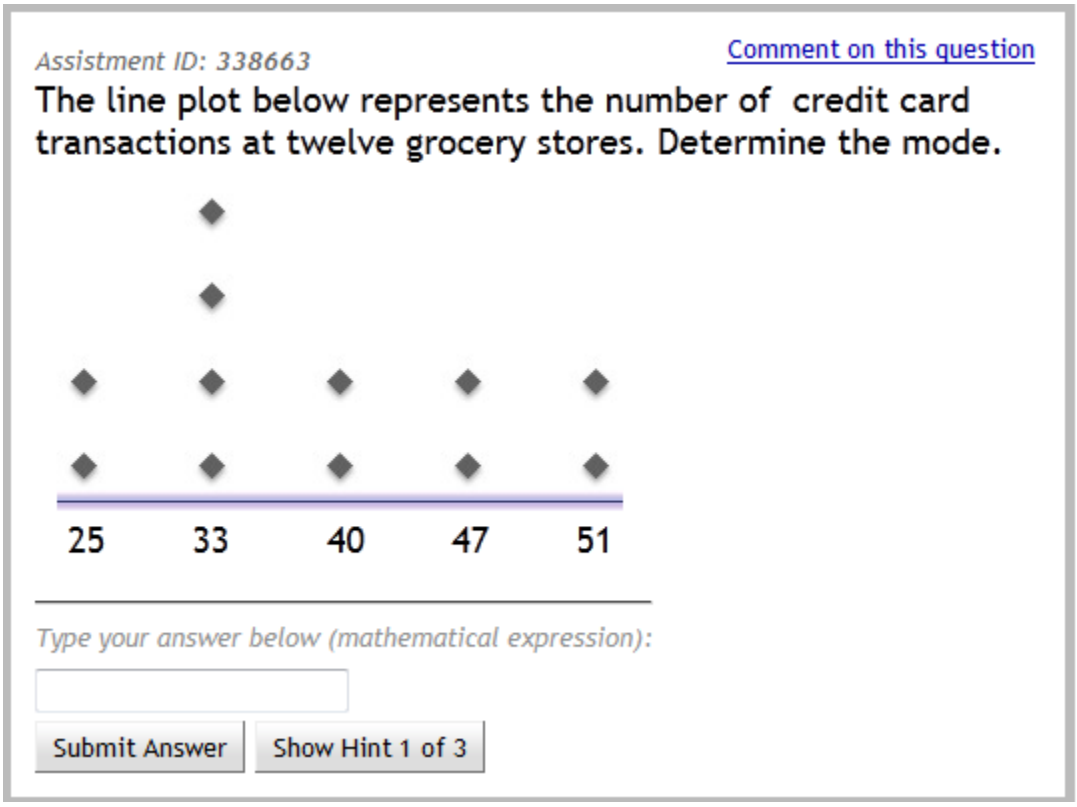
- There are 5 line plots (all with 4 data values) for this template.
- The data values are variabilized.
- The type of store is also variabilized.
- The answer will always be the rightmost data value.

338654



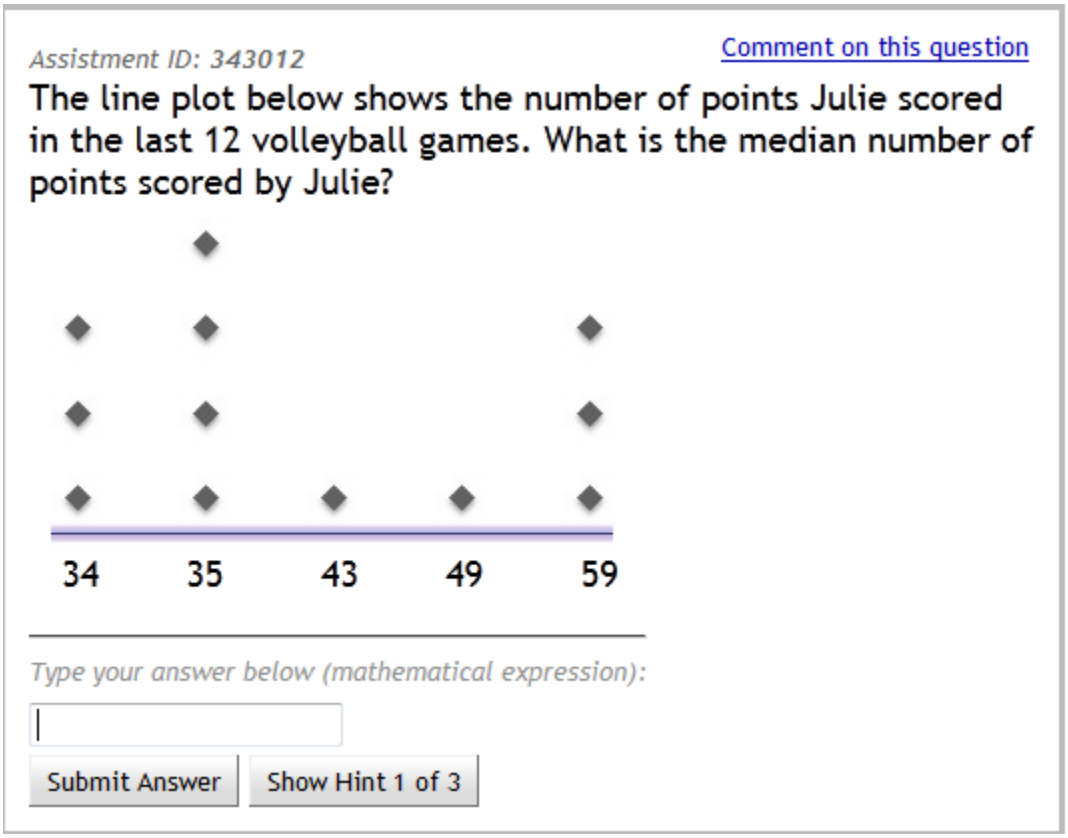
- There are 5 line plots (all with 5 data values) for this template.
- The data values are variabilized.
- The type of store is also variabilized.
- The answer will always be the second data value from the right.

338663



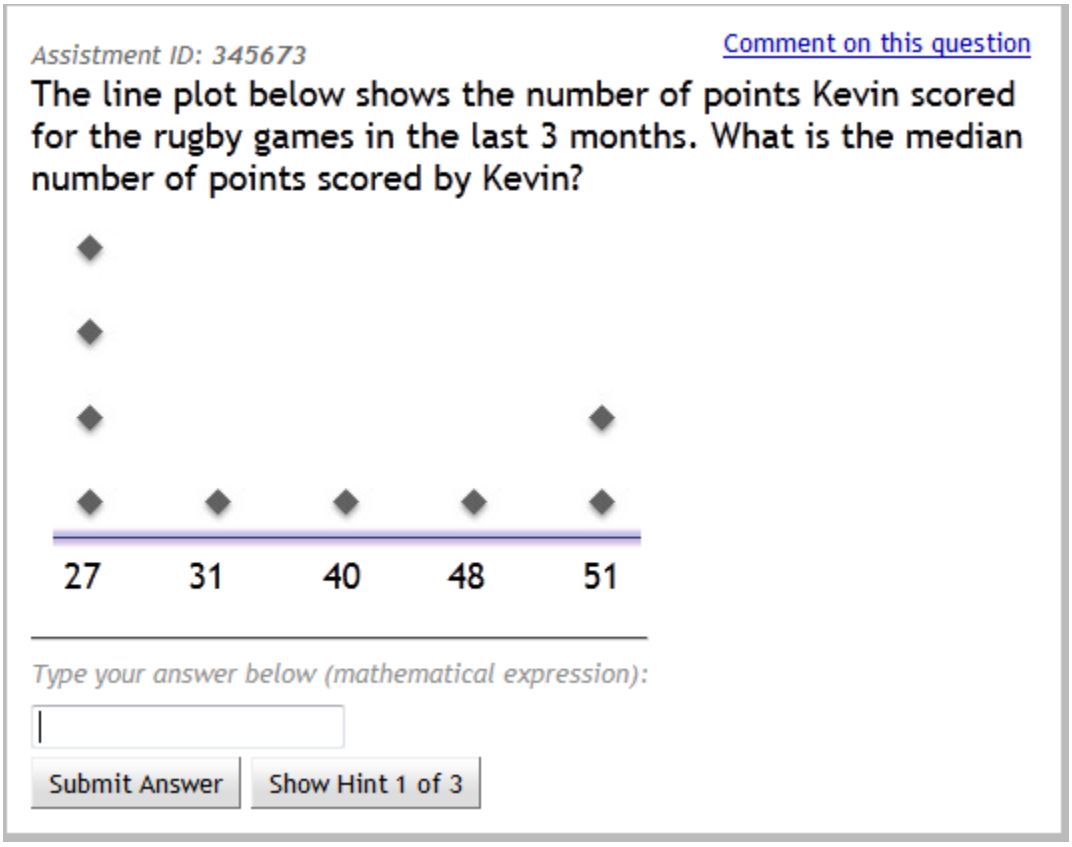
- There are 5 line plots (all with 5 data values) for this template.
- The data values are variabilized.
- The type of store is also variabilized.
- The answer will always be the second data value from the left.

343012



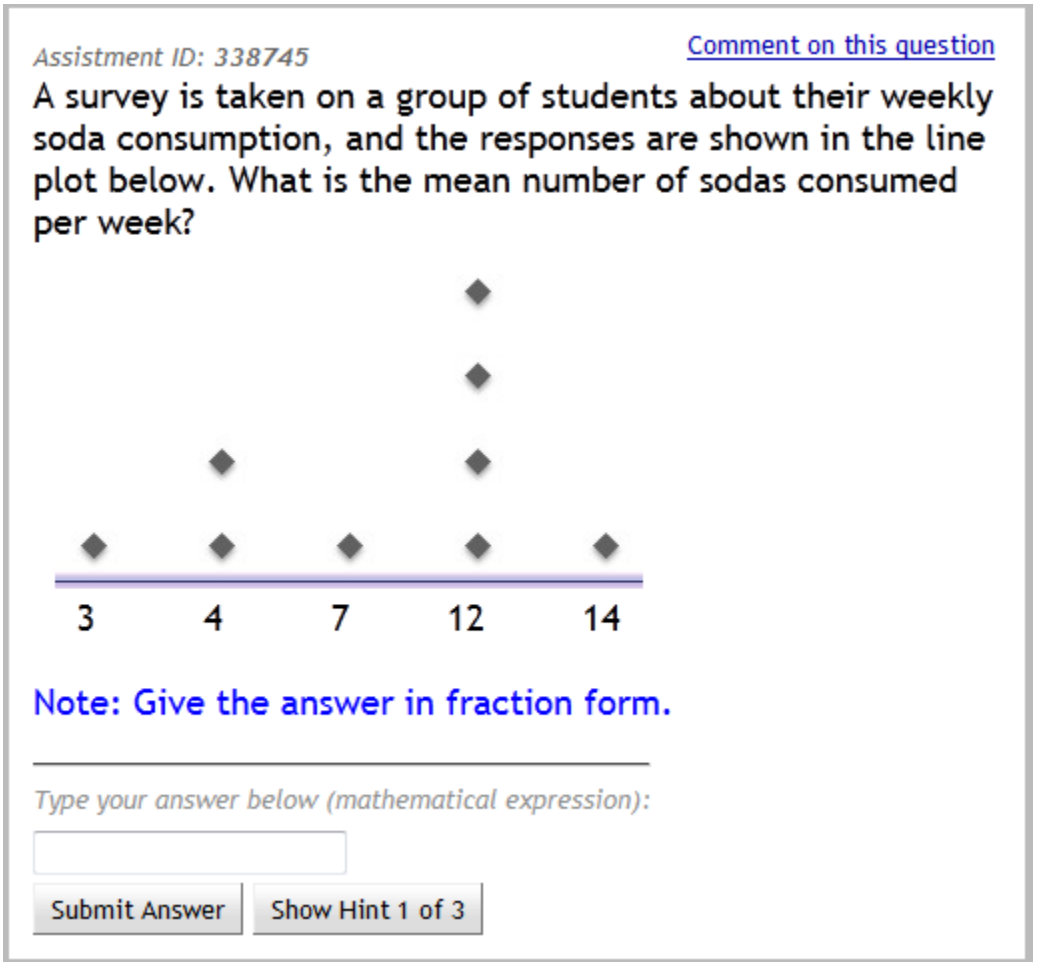
- There are 10 line plots (all with even number of data points) for this template.
- The data values are variabilized.
- The person name and the game are also variabilized.

345673



- There are 10 line plots (all with odd number of data points) for this template.
- The data values are variabilized.
- The person name and the game are also variabilized.

338745

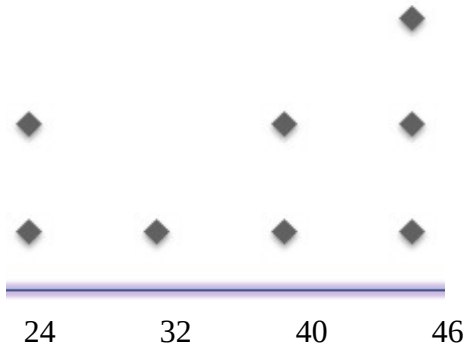


- There are 6 line plots for this template.
- The data values are variabilized.
- The type of food is also variabilized..

Appendix B.4.2: 6.SP.3 Skill Sample Problem Print

1) Assistment #365980 "365980 - 57508 - Mode of Line Plots (Algebra - 4 values) T2"

The line plot below represents the number of customers at eight pharmacies. Determine the mode.



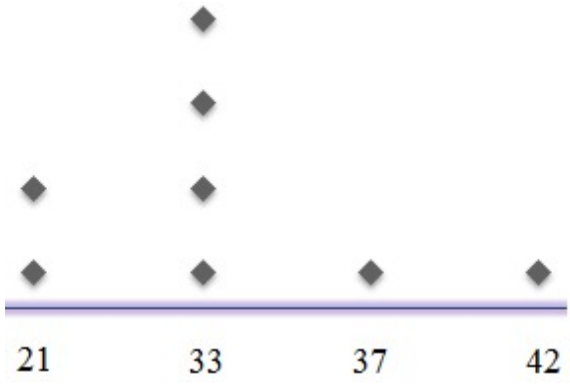
Algebra:

✓ 46

Hints:

- The mode is the number that occurs most frequently in a set of numbers.
- On a line plot, the mode will have the highest stack of data marks.

An **example** is demostrated below.



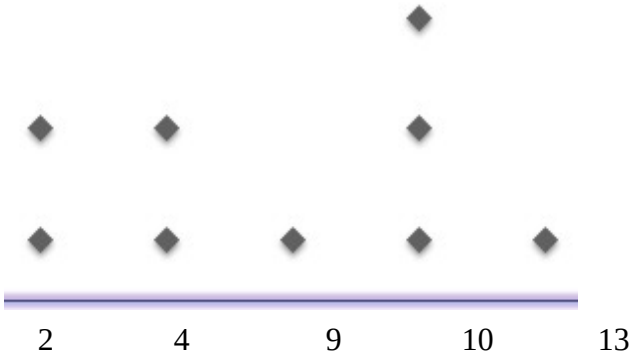
From this **example plot**, you can see that the highest stack of marks is at 33. There are more marks at 33 than in any other place. So 33 is the mode.

- For the given problem, the mode is 46.

Type 46

2) Assistment #365997 "365997 - 57508 - Mean of Line Plots (Algebra)"

A survey is taken on a group of students about their weekly hotdog consumption, and the responses are shown in the line plot below. What is the mean number of hotdogs consumed per week?



Note: Give the answer in fraction form.

Algebra:

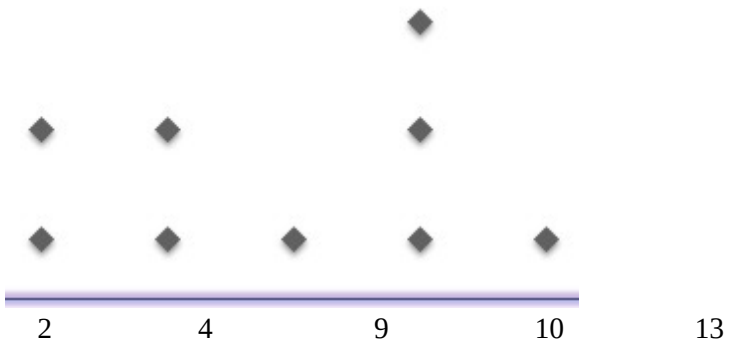
✓ 7.11111111111111

Hints:

- Mean is the average of a set of numbers.

To calculate the mean, we add up all the numbers, and then divde by how many numbers there are.

- Mean is the sum divided by the count.



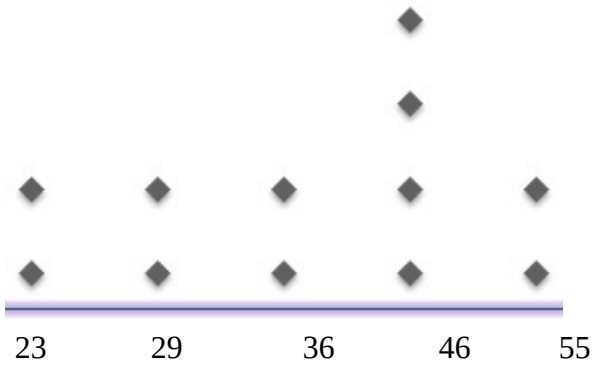
sum = (2 × 2) + (4 × 2) + (9 × 1) + (10 × 3) + (13 × 1) = 64
count = 9

- mean = sum/count = 64/9

Type 64/9

3) Assistment #366032 "366032 - 57508 - Range of Line Plots (Algebra - 5 values)"

Julie's scores in 12 history tests are shown in the line plot below. What is the range of Julie's scores?



Algebra:

✓ 32

Hints:

- The range is the difference between the maximum value and the minimum value of the set of data points.
- The maximum value is 55, and

the minimum value is 23.

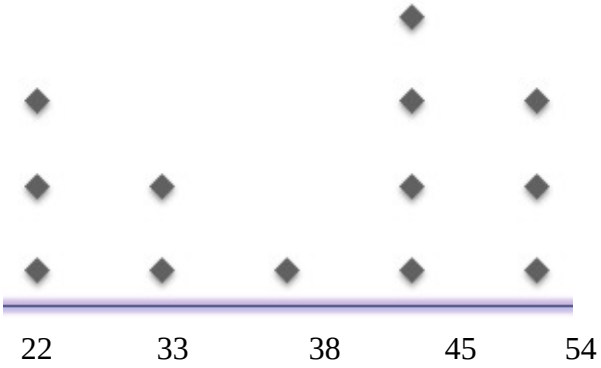
- The range is the difference between 55 and 23.

55 - 23 = 32

Type 32

4) Assistment #366041 "366041 - 57508 - Median of Line Plots (Algebra) Odd Number of Points"

The line plot below shows the number of points Julie scored for the rugby games in the last 3 months. What is the median number of points scored by Julie?

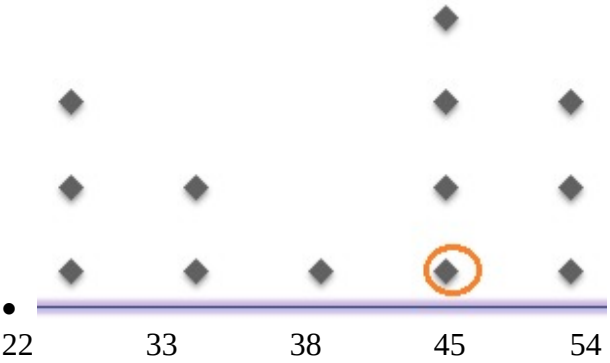


Algebra:

✓ 45

Hints:

- The median is the middle number in a sorted list of numbers.



For this problem, there are 13 data points and median is the 7th data point, circled on the line plot.

- median = 45

Type 45

Appendix D: Powerpoint Advertisement for Study

Slide1

ASSISTments
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New Skill Builder Content with motivational videos for measuring volume, area, and perimeter. Understanding and interpreting statistical data content. Help us learn if motivational videos affect learning. Half the students get motivational videos and hints, while the other half just get hints.

- 4.MD.3 Area and Perimeter
- 4.MD.4 Interpreting Statistical Data (Addition and Subtraction using Fraction)
- 5.MD.2 Interpreting Statistical Data (Fraction)
- 5.MD.3 Volume of Rectangular Prism
- 5.MD.5c Adding Volume of Rectangular Prisms
- 6.SP.1 Recognizing Statistical Questions
- 6.SP.2 Understanding Statistical Data
- 6.SP.3 Interpreting Statistical Data

See the videos

To learn what to do next, click here

If you have any questions e-mail assistments@wpi.edu

Slide2

ASSISTments
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These are the videos your students will see if they are selected at random to get motivational videos. They see one when they start and then they also see videos when they get a problem wrong.

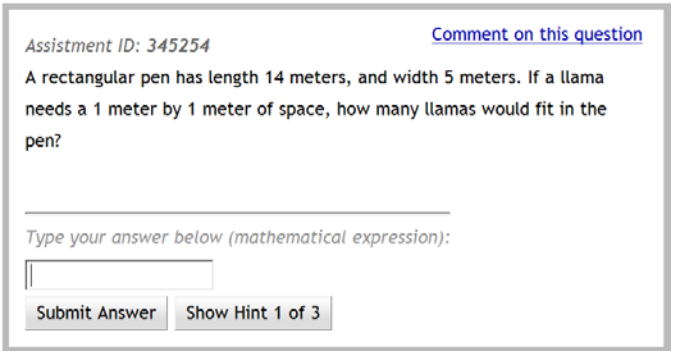
Skill 1

Slide3

ASSISTments
A Free Public Service of Worcester Polytechnic Institute

4.MD.3 Area and Perimeter

Skill Builder (work until 3 right in a row) - 91607



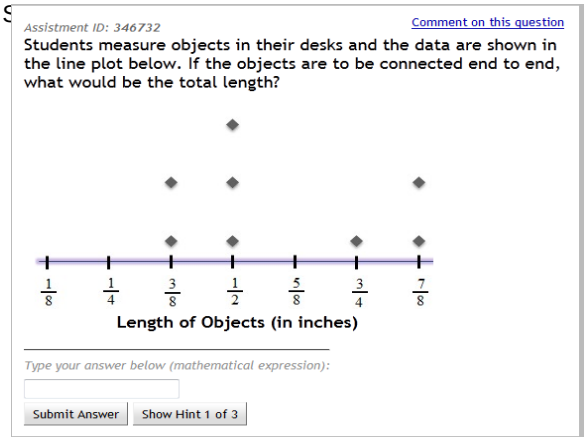
Home

Skill 2

Slide4

ASSISTments
A Free Public Service of Worcester Polytechnic Institute

4.MD.4 Interpreting Statistical Data (Addition and Subtraction using Fraction)



Home

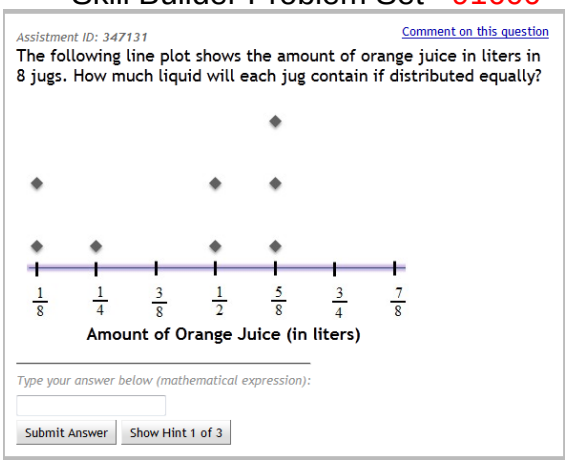
Skill 3

Slide5

ASSISTments
A Free Public Service of Worcester Polytechnic Institute

5.MD.2 Interpreting Statistical Data (Fraction)

Skill Builder Problem Set - 91600



Home

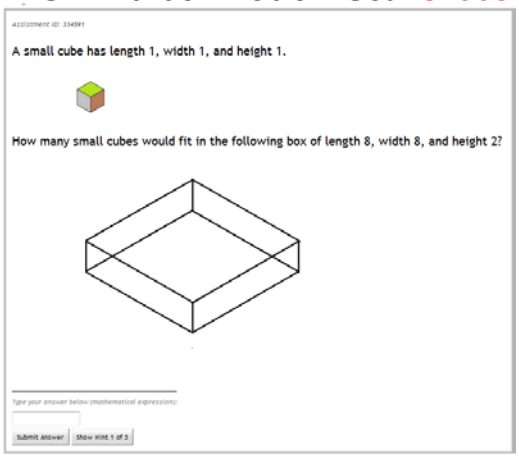
Skill 4

Slide6

ASSISTments
A Free Public Service of Worcester Polytechnic Institute

5.MD.3 Volume of Rectangular Prism

Skill Builder Problem Set - 84903



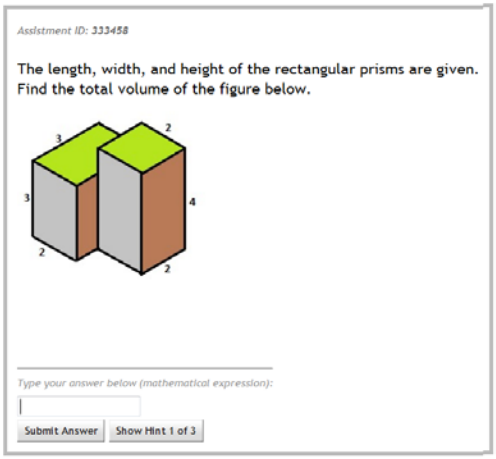
Home

Skill 5

Slide7

ASSISTments
A Free Public Service of Worcester Polytechnic Institute

5.MD.5c Adding Volume of Rectangular Prism Skill Builder Problem Set - 91602



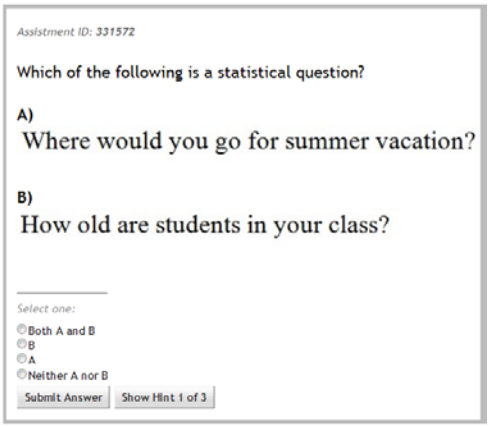
Home

Skill 6

Slide8

ASSISTments
A Free Public Service of Worcester Polytechnic Institute

6.SP.1 Recognizing Statistical Questions Skill Builder Problem Set - 91599



Home

Skill 7

Slide9

ASSISTments
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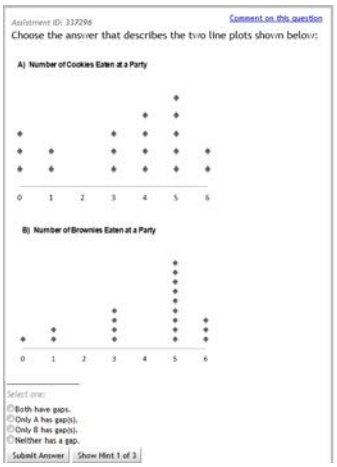
6.SP.2 Understanding Statistical Data

Skill Builder Problem Set - 91605



Home

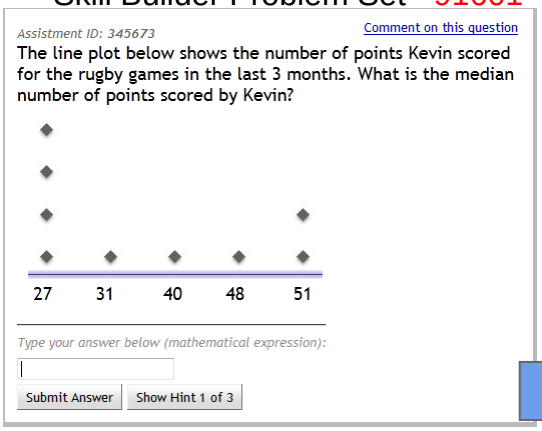
Skill 8

Slide10

ASSISTments
A Free Public Service of Worcester Polytechnic Institute

6.SP.3 Interpreting Statistical Data

Skill Builder Problem Set - 91601



Home

More Information

Slide11

Your Next Steps

1. Find the content you would like to give to your students.
2. Assign one, some, or all of the problem sets. Because of the videos this is best for homework or if students have earphones in school.
3. Students will work until they get three right in a row and there is tutoring so you can look at the data or just monitor that students have finished.

The problem set can also be found in Assistments Certified Problem Set, see image below: