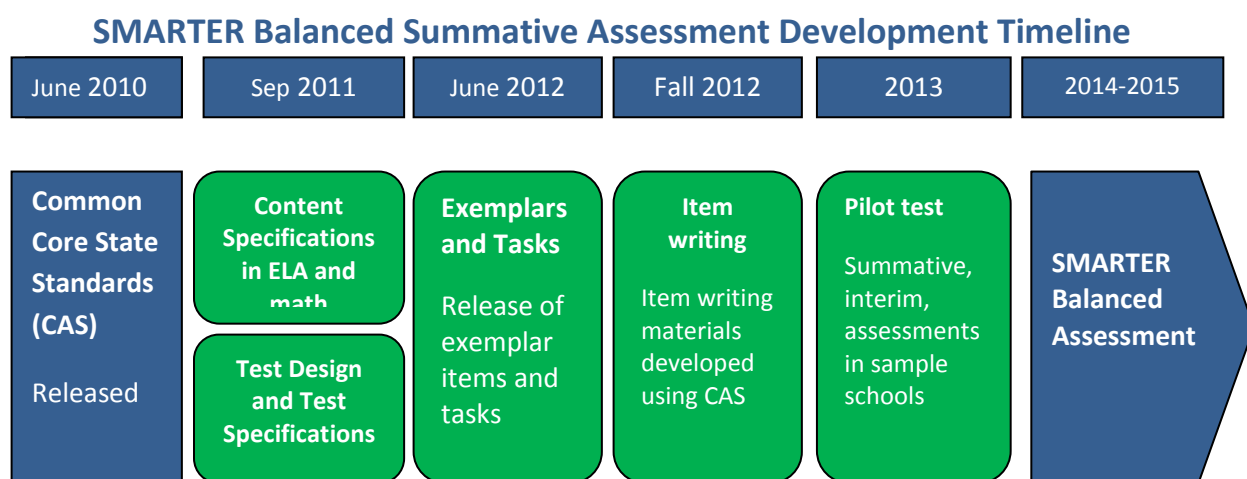


## SMARTER Balanced Assessment—Mathematics

As 2015 approaches and we transition from Delaware's DCAS testing to the Smarter Balanced Assessments, many teachers and administrators have been asking for information. What is the implementation timeline? What kinds of items will be on the test? What do assessment items look like? How are the tests scored? How will technology be utilized? While not every detail is known, information is available.

First, an implementation time line:



From <http://www.smarterbalanced.org/wordpress/wp-content/uploads/2012/05/TaskItemSpecifications/ItemSpecifications/GeneralItemSpecifications.pdf>

### Item Types

SBAC assessments are made up of four item types: Selected-Response, Constructed-Response, Technology-Enhanced, and Performance Task. A description of those items follows.

#### **Selected-Response Items (SR)**

Traditionally known as multiple choice, selected-response items include a stimulus and stem followed by three to five options from which a student is directed to choose only one.

#### **Constructed-Response Items (CR)**

The main purpose of a constructed-response item is to address targets and claims that are of greater complexity. They ask students to develop answers without suggested answer choices.

**Technology-enhanced Items/Tasks (TE)**

Technology-enhanced items can provide evidence for mathematics practices that could not be as reliably obtained from traditional SRs and CRs. Technology-enhanced items may stand alone or may be a tool used as part of the Performance Task and/or Constructed-Response items.

**Performance Tasks (PT)**

Performance tasks, the most complex of all items, include the following elements:

- Integrate knowledge and skills across multiple claims.
- Measure capacities such as depth of understanding, research skills, and/or complex analysis with relevant evidence.
- Require student-initiated planning, management of information/data and ideas, and/or interaction with other materials.
- Reflect a real-world task and/or scenario-based problem.
- Allow for multiple approaches.
- Represent content that is relevant and meaningful to students.
- Allow for demonstration of important knowledge and skills.
- Require scoring that focuses on the essence of the Claim(s) for which the task was written.
- Seem feasible for the school/classroom environment.

**Claims**

The Smarter Balanced summative assessments in mathematics are designed to measure the full range of student abilities in the Common Core State Standards or Core Academic Standards (CAS). Evidence will be gathered in support of four major claims: (1) Concepts and Procedures, (2) Problem Solving, (3) Communicating Reasoning, and (4) Modeling and Data Analysis. Students will receive an overall mathematics composite score. For the enhanced assessment, students will receive a score for each of three major claim areas. (Math claims 2 and 4 are combined for the purposes of score reporting.)

**Claim 1** — Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.

**Claim 2** — Students can solve a range of complex, well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.

**Claim 3** — Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.

**Claim 4** — Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.

## Glossary

*Item*: the entire item, including the stimulus, question/prompt, answer/options, scoring criteria, and metadata.

*Task*: similar to an item, yet typically more involved and usually associated with constructed-response, extended-response, and performance tasks.

*Stimulus*: the text, source (e.g., video clip), and/or graphic about which the item is written. The stimulus provides the context of the item/task to which the student must respond.

*Stem*: the statement of the question or prompt to which the student responds.

*Options*: the responses to a selected-response (SR) item from which the student selects one or more answers.

*Distracters*: the incorrect response options to an SR item.

*Distracter Analysis*: the item writer's analysis of the options or rationale for inclusion of specific options.

*Key*: the correct response(s) to an item.

*Top-Score Response*: one example of a complete and correct response to an item/task.

*Scoring Rubric*: the descriptions for each score point for an item/task that scores more than one point for a correct response.

A special thanks goes to Melia Franklin, Assistant Director of Assessment from the Missouri Department of Education, for organizing the below item samples into individual grade levels.

Additional information (including Scoring Rubrics) is available at:

<http://www.smarterbalanced.org/wordpress/wp-content/uploads/2012/03/DRAFTMathItemSpecsShowcase2.pdf>

<http://www.smarterbalanced.org/wordpress/wp-content/uploads/2012/05/TaskItemSpecifications/ItemSpecifications/GeneralItemSpecifications.pdf>.

## MAT.06.ER.2.000EE.C.172 Claim 2

Sample Item ID:	MAT.06.ER.2.000EE.C.172
Grade:	06
Primary Claim:	<b>Claim 2: Problem Solving</b> Students can solve a range of well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.
Secondary Claim(s):	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Primary Content Domain:	Expressions and Equations
Secondary Content Domain(s):	
Assessment Target(s):	2 C: Interpret results in the context of a situation.  2 A: Apply mathematics to solve well-posed problems arising from everyday life, society, and the workplace.  1 F: Reason about and solve one-variable equations and inequalities.
Standard(s):	6.EE.5
Mathematical Practice(s):	1, 2, 4
DOK:	2
Item Type:	ER
Score Points:	3
Difficulty:	H
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-specific attributes (e.g., accessibility issues):	
Notes:	Part of PT set

**Part A**

Ana is saving to buy a bicycle that costs \$135. She has saved \$98 and wants to know how much more money she needs to buy the bicycle.

The equation  $135 = x + 98$  models this situation, where  $x$  represents the additional amount of money Ana needs to buy the bicycle.

- When substituting for  $x$ , which value(s), if any, from the set

$\{0, 37, 98, 135, 233\}$  will make the equation true?

- Explain what this means in terms of the amount of money needed and the cost of the bicycle.

**Part B**

Ana considered buying the \$135 bicycle, but then she decided to shop for a different bicycle. She knows the other bicycle she likes will cost more than \$150.

This situation can be modeled by the following inequality.

$$x + 98 > 150$$

- Which values, if any, from  $-250$  to  $250$  will make the inequality true? If more than one value makes the inequality true, identify the least and greatest values that make the inequality true.
- Explain what this means in terms of the amount of money needed and the cost of the bicycle.

*Sample Top-Score Response:***Part A**

37 is the only value in the set that makes the equation true.

This means that Ana will need exactly \$37 more to buy the bicycle.

**Part B**

The values from 53 to 250 will make the inequality true.

This means that Ana will need from \$53 to \$250 to buy the bicycle.

*Scoring Rubric:*

Responses to this item will receive 0–3 points, based on the following:

**3 points:** The student shows a thorough understanding of equations and inequalities in a contextual scenario, as well as a thorough understanding of substituting values into equations and inequalities to verify whether or not they satisfy the equation or inequality. The student offers a correct interpretation of the equality and the inequality in the context of the problem. The student correctly states that 37 will satisfy the equation and that the values from 53 to 250 will satisfy the inequality.

**2 points:** The student shows a thorough understanding of substituting values into equations and inequalities to verify whether or not they satisfy the equation or inequality but limited understanding of equations or inequalities in a contextual scenario. The student correctly states that 37 will satisfy the equation and that the values from 53 to 250 will satisfy the inequality, but the student offers an incorrect interpretation of the equality or the inequality in the context of the problem.

**1 point:** The student shows a limited understanding of substituting values into equations and inequalities to verify whether or not they satisfy the equation or inequality and a limited understanding of equations and inequalities in a contextual scenario. The student correctly states that 37 will satisfy the equation, does not state that the values from 53 to 250 will satisfy the inequality, and offers incorrect interpretations of the equality and the inequality in the context of the problem. **OR** The student correctly states that the values from 53 to 250 will satisfy the inequality, does not state that 37 satisfies the equation, and offers incorrect interpretations of the equality and the inequality in the context of the problem.

**0 points:** The student shows little or no understanding of equations and inequalities in a contextual scenario and little or no understanding of substituting values into equations and inequalities to verify whether or not they satisfy the equation or inequality. The student offers incorrect interpretations of the equality and the inequality in the context of the problem, does not state that 37 satisfies the equation, and does not state that the values from 53 to 250 will satisfy the inequality.

## MAT.06.CR.1.000EE.E.169 C1 TE

Sample Item ID:	MAT.06.CR.1.000EE.E.169
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 E: Apply and extend previous understandings of arithmetic to algebraic expressions.
Content Domain:	Expressions and Equations
Standard(s):	6.EE.1, 6.EE.2
Mathematical Practice(s):	1, 2, 7
DOK:	2
Item Type:	CR
Score Points:	1
Difficulty:	H
Key:	$(7 \div 7 + 7)^2$
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	Makes use of equation editor for AI scoring or can be arranged using TE technologies.

Write an expression that is equivalent to 64 using each of the following numbers and symbols once in the expression.

7  
 7  
 7  
 2 (exponent of 2)  
 +  
 ÷  
 ( )

*Key and Distractor Analysis or Scoring Rubric for Multi-Part Items:*

key:  $(7 \div 7 + 7)^2$

## MAT.06.CR.1.000RP.A.174 C1 TA

Sample Item ID:	MAT.06.CR.1.000RP.A.174
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 A: Understand ratio concepts and use ratio reasoning to solve problems.
Content Domain:	Ratios and Proportional Relationships
Standard(s):	6.RP.1
Mathematical Practice(s):	1, 2
DOK:	2
Item Type:	CR
Score Points:	2
Difficulty:	L
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	

A restaurant worker used 5 loaves of wheat bread and 2 loaves of rye bread to make sandwiches for an event.

- Write a ratio that compares the number of loaves of rye bread to the number of loaves of wheat bread.
- Describe what the ratio 7:2 means in terms of the loaves of bread used for the event.

*Sample Top-Score Response:*

- 2:5
- 7:2 is the ratio of the total number of loaves of bread to the number of loaves of rye bread

Each part of this response is scored separately and earns 1 point for each correct response.



## MAT.06.CR.1.000RP.A.180 C1 TA

Sample Item ID:	MAT.06.CR.1.000RP.A.180
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 A: Understand ratio concepts and use ratio reasoning to solve problems.
Content Domain:	Ratios and Proportional Relationships
Standard(s):	6.RP.3
Mathematical Practice(s):	1, 2
DOK:	2
Item Type:	CR
Score Points:	2
Difficulty:	M
Key:	See Key.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	The response boxes accept up to 6 digits and a decimal point. No alpha characters or special characters allowed.

Ben's Game World is having a sale on video games. The store is offering a sale pack of 4 video games for \$43.80. What is the unit price of a video game in the sale pack?

\$

Roberto's Electronics is also having a sale on video games. The unit price of any video game at Roberto's Electronics is the same as the unit price of a video game in the sale pack at Ben's Game World. How much would it cost a customer for 7 video games at Roberto's Electronics?

\$

**Key:**

\$10.95

\$76.65

*Scoring Rubric for Multi-Part Items:*

Responses to this item will receive 0-2 points, based on the following:

**2 points:** The student demonstrates a thorough understanding of using ratio and rate reasoning to solve real-world problems. The student gives the unit rate in Part A of \$10.95 and the cost of \$76.65 for 7 video games in Part B.

**1 point:** The student demonstrates a partial understanding of using ratio and rate reasoning to solve real-world problems. The student gives the correct unit rate in Part A but answers Part B incorrectly OR the student answers Part A incorrectly but the answer in Part B corresponds to the incorrect answer in Part A.

**0 points:** The student demonstrates inconsistent or no understanding of using ratio and rate reasoning to solve real-world problems.

## MAT.06.CR.2.000RP.A.096 Claim 2

Sample Item ID:	MAT.06.CR.2.000RP.A.096
Grade:	06
Primary Claim:	<b>Claim 2: Problem Solving</b> Students can solve a range of complex, well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.
Secondary Claim(s):	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.
Primary Content Domain:	Ratios and Proportional Relationships
Secondary Content Domain(s):	The Number System
Assessment Target(s):	2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.  1 A: Understand ratio concepts and use ratio reasoning to solve problems.  1 C: Compute fluently with multi-digit numbers and find common factors and multiples.
Standard(s):	6.RP.3, 6.NS.3
Mathematical Practice(s):	1, 6
DOK:	2
Item Type:	CR
Score Points:	2
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	No symbols (like \$, −, or °) will be allowed in the response boxes. The first box will only allow up to 3 numeric characters, and the second box will allow up to 6 numeric characters, including the decimal point. The calculator tool will be unavailable for this item.

Alia wants to buy pizza for a party.

- 40 to 50 people will be coming to the party.
- A large pizza from Paolo's Pizza Place serves 3 to 4 people.
- Each large pizza from Paolo's Pizza Place costs \$11.50.

**Part A**

Alia wants to buy enough pizza so that people will not be hungry, and wants to have the least amount of pizza left over. How many large pizzas should Alia buy?

pizzas

**Part B**

If Alia buys the number of large pizzas that you determined in *Part A*, how much money will she spend on pizza?

\$

*Sample Top-Score Response:*

*Part A*  
13 pizzas

*Part B*  
\$149.50

*Scoring Rubric:*

Responses to this item will receive 0-2 points, based on the following:

**2 points:** The student demonstrates a thorough understanding of how to apply mathematics to solve problems involving ratio and rate reasoning and computation with multi-digit decimals. The student provides an estimate of 12-15 pizzas and correctly computes the cost for that number of pizzas.

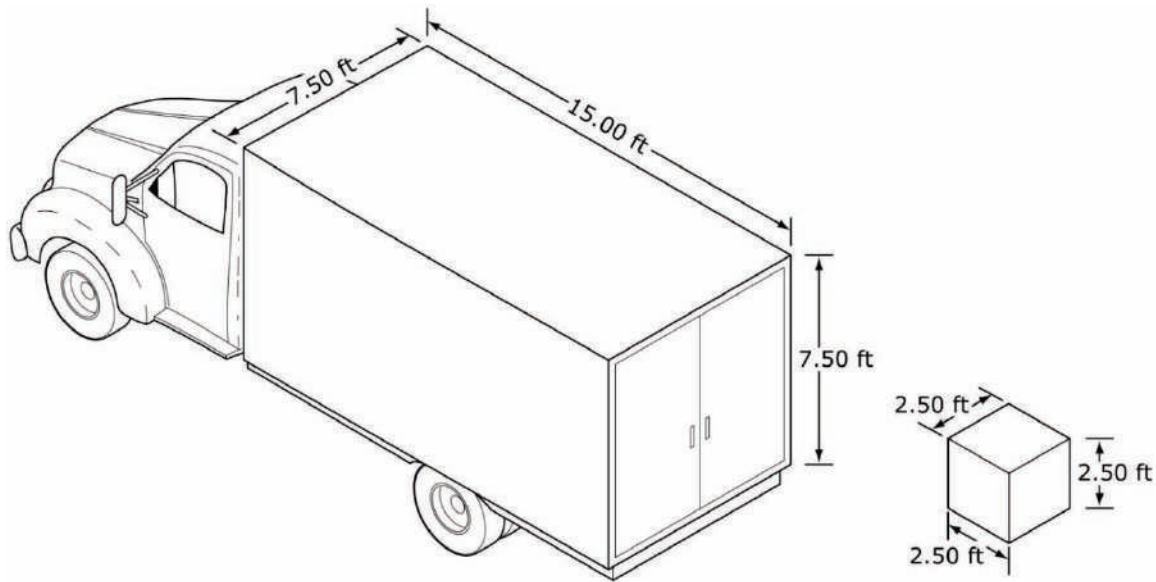
**1 point:** The student demonstrates a partial understanding of how to apply mathematics to solve problems involving ratio and rate reasoning and computation with multi-digit decimals. The student provides an low or high estimate of 9-11 or 16-18 pizzas, but correctly computes the cost for that number of pizzas OR the student provides an estimate of 12-15 pizzas but does not correctly compute the cost for that number of pizzas.

**0 points:** The student shows inconsistent or no understanding of how to apply mathematics to solve problems involving ratio and rate reasoning and computation with multi-digit decimals.

## MAT.06.ER.3.0000G.F.175 Claim 3

Sample Item ID:	MAT.06.ER.3.0000G.F.175
Grade:	06
Primary Claim:	<b>Claim 3: Communicating Reasoning</b> Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.
Secondary Claim(s):	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Primary Content Domain:	Geometry
Secondary Content Domain(s):	
Assessment Target(s):	3 F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions.  1 H: Solve real-world and mathematical problems involving area, surface area, and volume.  1 C: Compute fluently with multi-digit numbers and find common factors and multiples.
Standard(s):	6.G.2, 6.NS.3
Mathematical Practice(s):	1, 2, 4
DOK:	2
Item Type:	ER
Score Points:	3
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	Part of PT set

Cube-shaped boxes will be loaded into the cargo hold of a truck. The cargo hold of the truck is in the shape of a rectangular prism. The edges of each box measure 2.50 feet and the dimensions of the cargo hold are 7.50 feet by 15.00 feet by 7.50 feet, as shown below.



What is the volume, in cubic feet, of each box?

Determine the number of boxes that will completely fill the cargo hold of the truck. Use words and/or numbers to show how you determined your answer.

*Sample Top-Score Response:*

The volume of each box is 15.625 cubic feet.

54 boxes completely fill the cargo hold of the truck. The length of the cargo hold is 15 feet, so 15 divided by 2.50 equals 6. The width and height of the cargo hold are each 7.5 feet, so 7.5 divided by 2.5 equals 3. So the 6 boxes times 3 boxes times 3 boxes equals 54 total boxes that fit in the cargo hold.

*Scoring Rubric:*

Responses to this item will receive 0-3 points, based on the following:

**3 points:** The student shows thorough understanding of how to determine the volume of a cube and the volume of a rectangular prism built from unit cubes, and shows thorough understanding of how to support reasoning. The student correctly computes the volume of the box and the number of boxes needed to fill the cargo hold, and correctly explains how the number of cubes needed to fill the cargo hold was determined.

**2 points:** The student shows good understanding of how to determine the volume of a cube, a rectangular prism built from unit cubes, with supportive reasoning. The student correctly determines the number of boxes needed to fill the cargo hold based on the dimensions given for the box and offers a valid explanation of the process used to determine the number of cubes needed to fill the cargo hold, but may have incorrectly determined the volume of the cube. **OR** The student correctly determines the volume of a cube, however makes an error in determining the number of boxes needed to fill the cargo hold, but offers a valid explanation of the process used to determine the number of cubes needed to fill the cargo hold. **OR** The student determines the correct volume of a cube, and determines the number needed to fill the cargo hold, but offers incomplete or no supporting work.

**1 point:** The student shows partial understanding of how to determine the volume of a cube, a rectangular prism built from unit cubes, with supportive reasoning. The student correctly determines the volume of the cube, but is unable to determine a process or correct answer for the number of cubes needed to fill the cargo hold. **OR** The student incorrectly determines the volume of a cube, but uses that incorrect answer and correctly applies it to determining the number of cubes needed to fill the cargo hold (without supporting work).

**0 points:** The student shows little or no understanding of how to determine the volume of a cube, shows little or no understanding of how to determine the volume of a rectangular prism built from unit cubes, and shows little or no understanding of how to support reasoning. The student incorrectly determines the volume of the cube, incorrectly determines the number of boxes needed to fill the cargo hold based on the dimensions given for the box, and does not offer a valid explanation of the process used to determine the number of cubes needed to fill the cargo hold.

## MAT.06.ER.3.000EE.B.176 Claim 3

Sample Item ID:	MAT.06.ER.3.000EE.B.176
Grade:	06
Primary Claim:	<b>Claim 3: Communicating Reasoning</b> Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.
Secondary Claim(s):	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Primary Content Domain:	The Number System
Secondary Content Domain(s):	
Assessment Target(s):	3 B: Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.  1 E: Apply and extend previous understandings of arithmetic or algebraic expressions.
Standard(s):	6.EE.3
Mathematical Practice(s):	1, 2, 3
DOK:	3
Item Type:	ER
Score Points:	2
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	Part of PT set

Two expressions are shown below.

$$P: 2(3x - 9)$$

$$Q: 6x - 9$$

**Part A**

Apply the distributive property to write an expression that is equivalent to expression  $P$ .



**Part B**

Explain whether or not expressions  $P$  and  $Q$  are equivalent for any value of  $x$ .

*Sample Top-Score Response:*

Part A:

$$6x - 18$$

Part B:

$P$  and  $Q$  are not equivalent since the distributive property was not applied correctly. The first terms of  $P$  and  $Q$ ,  $6x$ , are equivalent, but the second terms of  $P$  and  $Q$ ,  $-18$  and  $-9$  respectively, are different.

*Scoring Rubric:*

Responses to this item will receive 0-2 points, based on the following:

**2 points:** The student shows thorough understanding of why the expressions  $P$  and  $Q$  are not equivalent and generates an equivalent expression for  $P$  by applying the distributive property.

**1 point:** The student generates an equivalent expression for  $P$  by applying the distributive property, but is not able to adequately explain that  $P$  and  $Q$  are not equivalent. **OR** The student can adequately explain why  $P$  and  $Q$  are not equivalent but makes an error in applying the distributive property to  $P$  when generating an equivalent expression.

**0 points:** The student shows little or no understanding of why the equations are not equivalent and does not generate an equivalent expression when applying the distributive property. Stating that the expressions are not equivalent, without proper support, is not sufficient to earn any points.

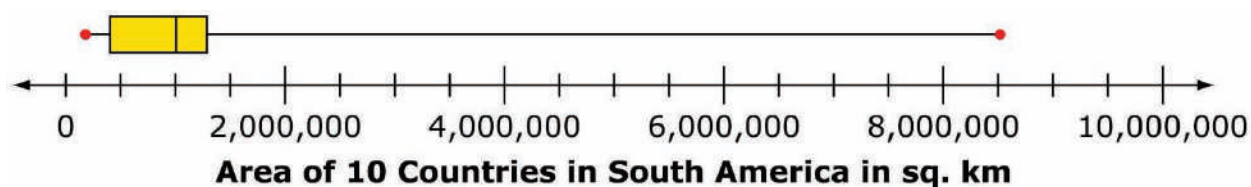
## MAT.06.ER.3.000SP.F.195 Claim 3

Sample Item ID:	MAT.06.ER.3.000SP.F.195
Grade:	06
Primary Claim:	<b>Claim 3: Communicating Reasoning</b> Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.
Secondary Claim(s):	<p>Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.</p> <p>Claim 2: Problem Solving Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies.</p>
Primary Content Domain:	Statistics and Probability
Secondary Content Domain(s):	
Assessment Target(s):	<p>3 F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions.</p> <p>3 B: Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.</p> <p>1 J: Summarize and describe distributions.</p> <p>2 C: Interpret results in the context of a situation.</p>
Standard(s):	6.SP.5
Mathematical Practice(s):	1, 3, 6, 7
DOK:	3
Item Type:	ER
Score Points:	2
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	

The areas, in square kilometers, of 10 countries in South America are shown in the table.

Country	Area, in Square Kilometers
Uruguay	176,215
Ecuador	256,369
Paraguay	406,752
Chile	756,102
Venezuela	912,050
Bolivia	1,098,581
Colombia	1,141,748
Peru	1,285,216
Argentina	2,780,400
Brazil	8,514,877

The data is also summarized in the box plot.



Which measure of center, the mean or the median, is best to use when describing this data? Thoroughly explain your reasoning for choosing one measure over the other measure.

*Sample Top-Score Response:*

The mean is not the best measure of center to use because the area of Brazil is much larger than the other areas. Only two areas are larger than the mean area. The best measure of center to use is the median because most of the areas are clustered together, as can be seen in the box plot, so the median reflects what the typical area is.

*Scoring Rubric:*

*Responses to this item will receive 0-2 points, based on the following:*

**2 points:** The student demonstrates thorough understanding of the best measure of center to use to describe a given set of data. The student provides a good explanation of why the mean is not the best AND why the median is the best.

**1 point:** The student demonstrates partial understanding of the best measure of center to use to describe a given set of data. The student provides either a good explanation of why the mean is not the best OR a good explanation of why the median is the best.

**0 points:** The student shows inconsistent or no understanding of the best measure of center to use to describe a given set of data. The student provides neither a good explanation of why the mean is not the best nor a good explanation of why the median is the best.

## MAT.06.PT.4.BDBRC.A.280 Claim 4

Sample Item ID:	MAT.06.PT.4.BDBRC.A.280
Title:	Bead Bracelet (BDBRC)
Grade:	06
Primary Claim:	<b>Claim 4: Modeling and Data Analysis</b> Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Secondary Claim(s):	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.
Primary Content Domain	Ratios and Proportional Relationships
Secondary Content Domain(s):	Equations and Expressions, The Number System, Numbers and Operations in Base Ten
Assessment Target(s):	<p>4 A: Apply mathematics to solve problems arising in everyday life, society, and the workplace.</p> <p>4 B: Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.</p> <p>4 D: Interpret results in the context of a situation.</p> <p>1A: Understand ratio concepts and use ratio reasoning to solve problems.</p> <p>1F: Reason about and solve one-variable equations and inequalities.</p> <p>1 G: Represent and analyze quantitative relationships between dependent and independent variables.</p> <p>1 C: Compute fluently with multi-digit numbers and find common factors and multiples.</p> <p>1 C (Gr 5): Understand the place-value system.</p>
Standard(s):	6.RP.1, 6.RP.2, 6.RP.3, 6.EE.7, 6.EE.9, 6.NS.3, 5.NBT.4
Mathematical Practice(s):	1, 3, 4, 5
DOK:	3
Item Type:	PT
Score Points:	16
Difficulty:	H
How This Task Addresses The "Sufficient Evidence" For This Claim:	The student carries out mathematical procedures with precision when determining the design of a bracelet. Once the design is determined, the student uses ratio and proportion to determine the number and type of beads needed for a necklace, as well as uses properties of inequalities in some instances. Finally, the student creates a cost analysis by determining the cost of the bracelet and necklace, along with the profit for the items when given a certain percentage.

Target-Specific Attributes (e.g., accessibility issues):	Accommodations may be necessary for students with fine motor-skill challenges and language-processing challenges.
Stimulus/Source:	<a href="http://www.orientaltrading.com">http://www.orientaltrading.com</a>
Notes:	Calculator tool should be available during this task.
Task Overview:	Students must calculate various ratios and proportions when constructing a beaded bracelet and necklace. Additionally, students must perform calculations to determine the cost of the items and the possible amount of profit, given certain criteria.
Teacher Preparation/Resource Requirements:	None
Teacher Responsibilities During Administration:	Monitor individual student work; provide resources as necessary.
Time Requirements:	Two sessions totaling no more than 120 minutes. <i>Part A</i> and <i>Part B</i> should be completed in Session 1. <i>Part C</i> and <i>Part D</i> should be completed in Session 2.

Prework: None

## Bead Bracelets

Your school is hosting an Arts and Crafts Fair to raise funds. Your class has been asked to help by designing and making jewelry for the fund-raiser. In this task, you will be asked to design a bracelet, calculate ratios, make predictions, and calculate costs.

### Designing a Bracelet

#### ***Part A***

Your principal has purchased the materials to make the jewelry. The materials include:


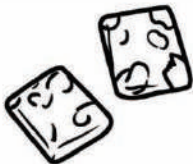
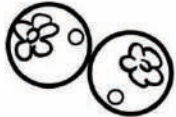
- Three types of glass beads
- Three types of spacer beads (the beads used to separate sections of glass beads)
- Beading wire (the wire that holds the beads when making

a bracelet or a necklace)


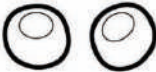

- Clasps (the fasteners that hold the ends of a bracelet or necklace together)

The cost of each type of bead is shown below.

### Glass Beads

	Type A – \$4.25 for a bag of 48 beads
	Type B – \$6.00 for a bag of 25 beads
	Type C – \$8.00 for a bag of 25 beads

### Spacer Beads

	Type D – \$4.00 for a bag of 25 beads
	Type E – \$8.00 for a bag of 24 beads
	Type F – \$7.00 for a bag of 300 beads

Design a bracelet using at least **two** types of glass beads and **one** type of spacer bead.

- Use between 8 and 12 glass beads.
- Use at least 6 spacer beads.
- Use no more than 25 total beads in your bracelet.

Write the type letter (A, B, C, D, E, or F) to represent each bead in your design. Use the 25 blanks below to lay out the design for your bracelet. Only write one letter in each blank you use.

\_\_\_\_\_

Write 5 ratios that can be used to mathematically describe the bracelet you designed. Make sure your ratios show each of the following:

- The relationship between one type of glass bead used and another type of glass bead used
- The relationship between one type of glass bead used and all the beads used
- The relationship between one type of glass bead used and a type of spacer bead used
- The relationship between all the glass beads used and all the spacer beads used
- The relationship between one type of spacer bead used and all the beads used



You have been given one bag of each type of bead that you have selected. Based on your design, how many complete bracelets can you make before you run out of one type of bead? Explain your answer using diagrams, mathematical expressions, and/or words.

***Part B*****Calculating the Costs**

The cost of one clasp and enough beading wire to make a bracelet is \$0.25. Using the information from *Part A*, determine the cost to create one of the bracelets you designed. Explain your answer using diagrams, mathematical expressions, and/or words.

In *Part A*, you determined the number of complete bracelets you could make before running out of one type of bead. Determine the cost to create this number of bracelets. Explain your answer using diagrams, mathematical expressions, and/or words.

**Part C**

**Matching Necklaces**

Your principal would like you to make some necklaces to match the bracelets you designed.

- The cost of one clasp and enough beading wire to make a 24-inch necklace is \$0.30.
- Your bracelet is 8 inches long.

Determine the cost to create a 24-inch necklace that contains the same ratios of beads as your bracelet contains. Explain your answer using diagrams, mathematical expressions, and/or words.

Approximately how many of each type of bead will be needed to create a 24-inch necklace? Explain your answer using diagrams, pictures, mathematical expressions, and/or words.

***Part D***

**Predicting Profits**

[The teacher should discuss the definition of profit in this context. "A profit is the amount of money that is earned when a product is sold. Profit is determined by subtracting the cost of making the products from the price charged to customers."]

For the Arts and Crafts Fair, your principal sets the price of each bracelet and necklace such that the school makes a profit that is 60% of the cost to make each piece of jewelry.

Determine the price at which your bracelet and necklace will be sold at the Arts and Crafts Fair. Explain your answer using diagrams, pictures, mathematical expressions, and/or words.

Your principal would also like to offer discounted prices for customers who buy sets of 3 bracelets. When customers buy sets of 3 bracelets, the school will make a profit that is 40% of the cost to make each bracelet. Determine the price at which a set of 3 bracelets will be sold at the Arts and Crafts Fair. Explain

your answer using diagrams, pictures, mathematical expressions, and/or words.

The list below shows the pieces of jewelry that were sold at the Arts and Crafts Fair.

- 5 sets of 3 bracelets
- 4 necklaces
- 20 individual bracelets

Determine the **total** profit the school made from selling these pieces of jewelry. Explain your answer using diagrams, mathematical expressions, and/or words.

*Sample Top-Score Response:***Part A**

F, D, A, D, A, D, F, B, F, D, A, D, A, D, F, B, F, D, A, D, A, D, F  
(highlighted for visual)

Ratios will vary based upon the layout of beads chosen by the student.

1 Type B glass bead to 3 Type A glass beads (1:3)

3 Type A glass beads to 1 Type B glass bead (3:1)

6 Type A glass beads out of 23 beads in total (6:23)

2 Type B glass beads out of 23 beads in total (2:23)

2 Type A glass beads to 3 Type D spacer beads (2:3)

1 Type A glass bead to 1 Type F spacer bead (1:1)

2 Type B glass beads to 9 Type D spacer beads (2:9)

2 Type B glass beads to 6 Type F spacer beads (1:3)

8 glass beads to 15 spacer beads (8:15)

9 Type D spacer beads out of 23 beads in total (9:23)

6 Type F spacer beads out of 23 beads in total (6:23)

I can make 2 bracelets. There are only 25 Type D spacer beads in a package, and my bracelet used 9 per bracelet.  $25 \div 9 = 2 \text{ R}7$ , so I can only make 2 complete bracelets before I run out of Type D spacer beads.

**Part B**

$4.25 \div 48 = 0.089$  so \$0.09 per Type A glass bead

$6.00 \div 25 = 0.24$  so \$0.24 per Type B glass bead

$4.00 \div 25 = 0.16$  so \$0.16 per Type D spacer bead

$7.00 \div 300 = 0.023$  so \$0.02 per Type F spacer bead

$6(\$0.09) + 2(\$0.24) + 9(\$0.16) + 6(\$0.02) + \$0.25 = \$2.83$

$2(\$2.83) = \$5.66$

**Part C**

$\$2.83 - \$0.25 = \$2.58$ ;  $\$2.58 \times 3 + \$0.30 = \$8.04$

The 8-inch bracelet was designed with 6 Type A glass beads. Based on this design, a 24-inch necklace would have 18 of these beads.

There are 2 Type B glass beads in the 8-inch bracelet. The 24-inch necklace would have 6 of these beads.

There are 9 Type D spacer beads in the 8-inch bracelet. The 24-inch necklace would have 27 of these beads.

There are 6 Type F spacer beads in the 8-inch bracelet. The 24-inch necklace would have 18 of these beads.

**OR**

$$23 \div 8 = 2.875 \text{ beads per inch}$$

$$2.875 \times 24 = 69 \text{ beads on a 24-inch necklace}$$

$$23 \div 6 = 3.83$$

$$69 \div 3.83 = 18.02$$

There will be approximately 18 Type A glass beads and 18 Type F spacer beads on the necklace.

$$23 \div 2 = 11.5$$

$$69 \div 11.5 = 6$$

There will be approximately 6 Type B glass beads on the necklace.

$$23 \div 9 = 2.56$$

$$69 \div 2.56 = 26.95$$

There will be approximately 27 Type D spacer beads on the necklace.

**OR**

$$\frac{6}{23} = \frac{n}{69}$$

$$6(69) = 23n$$

$$414 = 23n$$

$$414 \div 23 = n$$

$$18 = n$$

There will be approximately 18 Type A glass beads and 18 Type F spacer beads on the necklace.

$$\frac{2}{23} = \frac{n}{69}$$

$$2(69) = 23n$$

$$138 = 23n$$

$$138 \div 23 = n$$

$$6 = n$$

There will be approximately 6 Type B glass beads on the necklace.

$$\frac{9}{23} = \frac{n}{69}$$

$$9(69) = 23n$$

$$621 = 23n$$

$$621 \div 23 = n$$

$$27 = n$$

There will be approximately 27 Type D spacer beads on the necklace.

### **Part D**

$$\$2.83 \times 1.6 = \$4.53$$

$$\$8.04 \times 1.6 = \$12.86$$

$$(\$2.83 \times 3) \times 1.4 = \$11.89$$

Profit from sets of bracelets:

$$\$11.89 \times 5 = \$59.45; \$2.83 \times 15 = \$42.45; \$59.45 - \$42.45 = \$17.00$$

Profit from necklaces:

$$\$12.86 \times 4 = \$51.44; \$8.04 \times 4 = \$32.16; \$51.44 - \$32.16 = \$19.28$$

Profit from individual bracelets:

$$\$4.53 \times 20 = \$90.60; \$2.83 \times 20 = \$56.60; \$90.60 - \$56.60 = \$34.00$$

Total profit:

$$\$17.00 + \$19.28 + \$34.00 = \$70.28$$

### *Scoring Notes:*

Each section is evaluated independently. The total number of points is determined by adding the points assigned for each task.

### *Scoring Rubric:*

#### **Part A**

**6 points:** Thorough understanding of ratio and proportional relationships. Thorough understanding of the given directions. The student correctly used one type of spacer bead and at least two types of glass beads. The student correctly used no more than 25 total beads and correctly used 8 to 12 glass beads and at least 6 spacer beads. The student correctly wrote a set of 5 ratios according to bulleted directions. The student correctly used mathematics to find the number of bracelets that can be made using *all* the different types of beads the student chose for the bracelet.

**5 points:** Thorough understanding of ratio and proportional relationships. Partial understanding of the given directions. The student correctly used one type of spacer bead and at least two types of glass beads. The student used a number of glass beads or spacer beads that were outside of directions. The student correctly wrote a set of 5 ratios according to bulleted directions. The student correctly used mathematics to find the number of bracelets that can be made using *all* the different types of beads the student chose for the bracelet. **OR** The student did everything else required, but only correctly wrote 4 of the 5

required ratios. **OR** The student did everything else required, but did not correctly determine the number of bracelets that could be made.

**4 points:** Partial understanding of ratio and proportional relationships. Partial understanding of the given directions. The student did everything else required, but only correctly wrote 3 of the 5 required ratios. **OR** The student did everything else required, but only correctly wrote 4 of the 5 required ratios and did not correctly determine the number of bracelets that could be made. **OR** The student did everything else required, but used a number of glass beads or spacer beads that were outside of directions and only correctly wrote 4 of the 5 required ratios. **OR** The student did everything else required, but used a number of glass beads or spacer beads that were outside of directions and did not correctly determine the number of bracelets that could be made.

**3 points:** Partial understanding of ratio and proportional relationships. Partial understanding of the given directions. The student did everything else required, but only correctly wrote 2 of the 5 required ratios. **OR** The student did everything else required, but only correctly wrote 3 of the 5 required ratios and did not correctly determine the number of bracelets that could be made. **OR** The student did everything else required, but used a number of glass beads or spacer beads that were outside of directions and only correctly wrote 3 of the 5 required ratios. **OR** The student used a number of glass beads or spacer beads that were outside of directions, made an error with 1 ratio, and did not correctly determine the number of bracelets that could be made.

**2 points:** Partial understanding of ratio and proportional relationships. Partial understanding of the given directions. The student did everything else required, but only correctly wrote 1 of the 5 required ratios. **OR** The student did everything else required, but only correctly wrote 2 of the 5 required ratios and did not correctly determine the number of bracelets that could be made. **OR** The student did everything else required, but used a number of glass beads or spacer beads that were outside of directions and only correctly wrote 2 of the 5 required ratios. **OR** The student used a number of glass beads or spacer beads that were outside of directions, made an error with 2 ratios, and did not correctly determine the number of bracelets that could be made.

**1 point:** Limited understanding of ratio and proportional relationships. Limited understanding of the given directions. The student used a number of glass beads or spacer beads that were outside of directions, made an error with 3 or more ratios, and did not correctly determine the number of bracelets that could be made. **OR** The student used a number of glass beads or spacer beads that were outside of directions, made an error with 4 or 5 ratios, but correctly determined the number of bracelets that could be made.

**0 points:** No understanding of ratio and proportional relationships. No understanding of the given directions. The student made errors in every section of *Part A*.

### **Part B**

**3 points:** Thorough understanding of numbers and operations. Thorough understanding of solving real-world problems involving the cost of making bracelets. The student correctly determines the minimum cost of the bracelet by first dividing the total cost of each package of beads by the number of beads in the package. Then the student correctly multiplies each individual cost by the number of each type of bead in the bracelet. The student correctly determines the cost of the total number of bracelets created from one bag of each style of



bead by multiplying the number of bracelets that can be made and the cost of each individual bracelet.

**2 points:** Partial understanding of numbers and operations. Partial understanding of solving real-world problems involving the cost of making bracelets. The student correctly determines the minimum cost of the bracelet by first dividing the total cost of each package of beads by the number of beads in the package. Then the student correctly multiplies each individual cost by the number of each type of bead in the bracelet. The student incorrectly determines the cost of the total number of bracelets created from one bag of each style of bead when multiplying the number of bracelets that can be made and the cost of each individual bracelet.

**1 point:** Limited understanding of numbers and operations. Limited understanding of solving real-world problems involving the cost of making bracelets. The student correctly determines the minimum cost of the bracelet by first dividing the total cost of each package of beads by the number of beads in the package. Then the student incorrectly multiplies each individual cost by the number of each type of bead in the bracelet. The student incorrectly determines the cost of the total number of bracelets created from one bag of each style of bead when multiplying the number of bracelets that can be made and the cost of each individual bracelet.

**0 points:** No understanding of numbers and operations. No understanding of solving real-world problems involving the cost of making bracelets. The student incorrectly determines the minimum cost of the bracelet when dividing the total cost of each package of beads by the number of beads in the package. Then the student incorrectly multiplies each individual cost by the number of each type of bead in the bracelet. The student incorrectly determines the cost of the total number of bracelets created from one bag of each style of bead when multiplying the number of bracelets that can be made and the cost of each individual bracelet.

### **Part C**

**4 points:** Thorough understanding of ratio and proportions. Thorough understanding of mathematical expressions. The student correctly determines the cost for each inch of the necklace by subtracting \$0.25, multiplying the cost of the bracelet by 3, and adding \$0.30. The student correctly determines the number of each type of bead that would be needed for the necklace.

**3 Points:** Partial understanding of ratio and proportions. Partial understanding of mathematical expressions. The student correctly determines the cost for each inch of the necklace by subtracting \$0.25, multiplying the cost of the bracelet by 3, and adding \$0.30. The student makes an error when determining the number of 1 type of bead that would be needed for the necklace. **OR** The student makes an error when determining the cost of the necklace, but correctly determines the number of each type of bead that would be needed for the necklace.

**2 points:** Partial understanding of ratio and proportions. Partial understanding of mathematical expressions. The student correctly determines the cost for each inch of the necklace by subtracting \$0.25, multiplying the cost of the bracelet by 3, and adding \$0.30. The student makes an error when determining the number of 2 types of bead that would be needed for the necklace. **OR** The student makes an error when determining the cost of the necklace and makes an error when determining the number of 1 type of bead that would be

needed for the necklace.

**1 point:** Limited understanding of ratio and proportions. Limited understanding of mathematical expressions. The student correctly determines the cost for each inch of the necklace by subtracting \$0.25, multiplying the cost of the bracelet by 3, and adding \$0.30. The student does make errors in determining the number of 3 or more of the bead types needed to make the necklace. **OR** The student makes an error when determining the cost of the necklace and makes an error when determining the number of 2 types of bead that would be needed for the necklace.

**0 points:** No understanding of ratio and proportions. No understanding of mathematical expressions and inequalities. The student does not correctly complete any section of *Part C*.

***Part D***

**3 points:** Thorough understanding of numbers and operations and the number system. The student correctly determines the profit of 60% by multiplying the cost of the bracelet by 1.6 and the cost of the necklace by 1.6. The student correctly determines the 40% profit from selling a set of 3 bracelets by multiplying the cost of the bracelet by 3 and then multiplying that total by 1.4. The student correctly determines a total profit of \$70.28.

**2 points:** Partial understanding of numbers and operations and the number system. The student makes an error in 1 of the 3 sections of *Part D*.

**1 point:** Limited understanding of numbers and operations and the number system. The student makes an error in 2 of the 3 sections of *Part D*.

**0 points:** Little or no understanding of numbers and operations and the number system. The student makes errors in all 3 sections of *Part D*.

## MAT.06.PT.4.DGRDN.A.167 Claim 4

Sample Item ID:	MAT.06.PT.4.DGRDN.A.167
Title:	Design a Garden (DGRDN)
Grade:	06
Primary Claim:	<b>Claim 4: Modeling and Data Analysis</b> Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Secondary Claim(s):	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.
Primary Content Domain	Equations and Expressions
Secondary Content Domain(s):	Geometry, Operations and Algebraic Thinking, Measurement and Data
Assessment Target(s):	<p>4 A: Apply mathematics to solve problems arising in everyday life, society, and the workplace.</p> <p>4 B: Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.</p> <p>4 D: Interpret results in the context of a situation.</p> <p>1 G (Gr 6): Represent and analyze quantitative relationships between dependent and independent variables</p> <p>1 H (Gr 6): Solve real-world and mathematical problems involving area, surface area, and volume.</p> <p>1 I (Gr 5): Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.</p> <p>1 A (Gr 5): Write and interpret numerical expressions.</p> <p>1 I (Gr 4): Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.</p>
Standard(s):	6.EE.9, 6.G.1, 6.G.2, 5MD.3, 5.MD.5, 5.OA.2, 4.MD.3
Mathematical Practice(s):	1, 3, 4, 5
DOK:	3
Item Type:	PT
Score Points:	12
Difficulty:	M
How This Task Addresses The "Sufficient Evidence" For This Claim:	The student uses measurement skills such as finding the area of polygons, finding the volume to determine the amount of soil or mulch that must be purchased to fill the gardens for planting, and finding the perimeter to and surface area of each garden area. The student determines the cost of each garden by using variables to represent two quantities that change in relationship to one another; writes equations to express one

	quantity, thought of as the independent variable; and analyzes the relationship between the dependent and independent variable using tables.
Target-Specific Attributes (e.g., accessibility issues):	Accommodations may be necessary for students with fine motor-skill challenges and language-processing challenges.
Stimulus/Source:	<a href="http://www.homedepot.com">www.homedepot.com</a> <a href="http://www.lowes.com">www.lowes.com</a> Custom-Created Flyer or Newspaper Advertisements
Notes:	Multi-part task
Task Overview:	Students must work through various calculations in order to find the best deal, area, perimeter, and volume of each garden.
Teacher Preparation/Resource Requirements:	Calculators are available to students, either online or physically.
Teacher Responsibilities During Administration:	Monitor individual student work; provide resources as necessary.
Time Requirements:	Two sessions totaling no more than 120 minutes. Parts A and B should be completed in Session 1. Parts C, D, and the conclusion should be completed in Session 2.

Pework: none

## Design a Garden

You are volunteering at a community center. The director of the center has asked you to design a garden and to determine the amount and cost of materials to build the garden, including wood, soil, and plants.

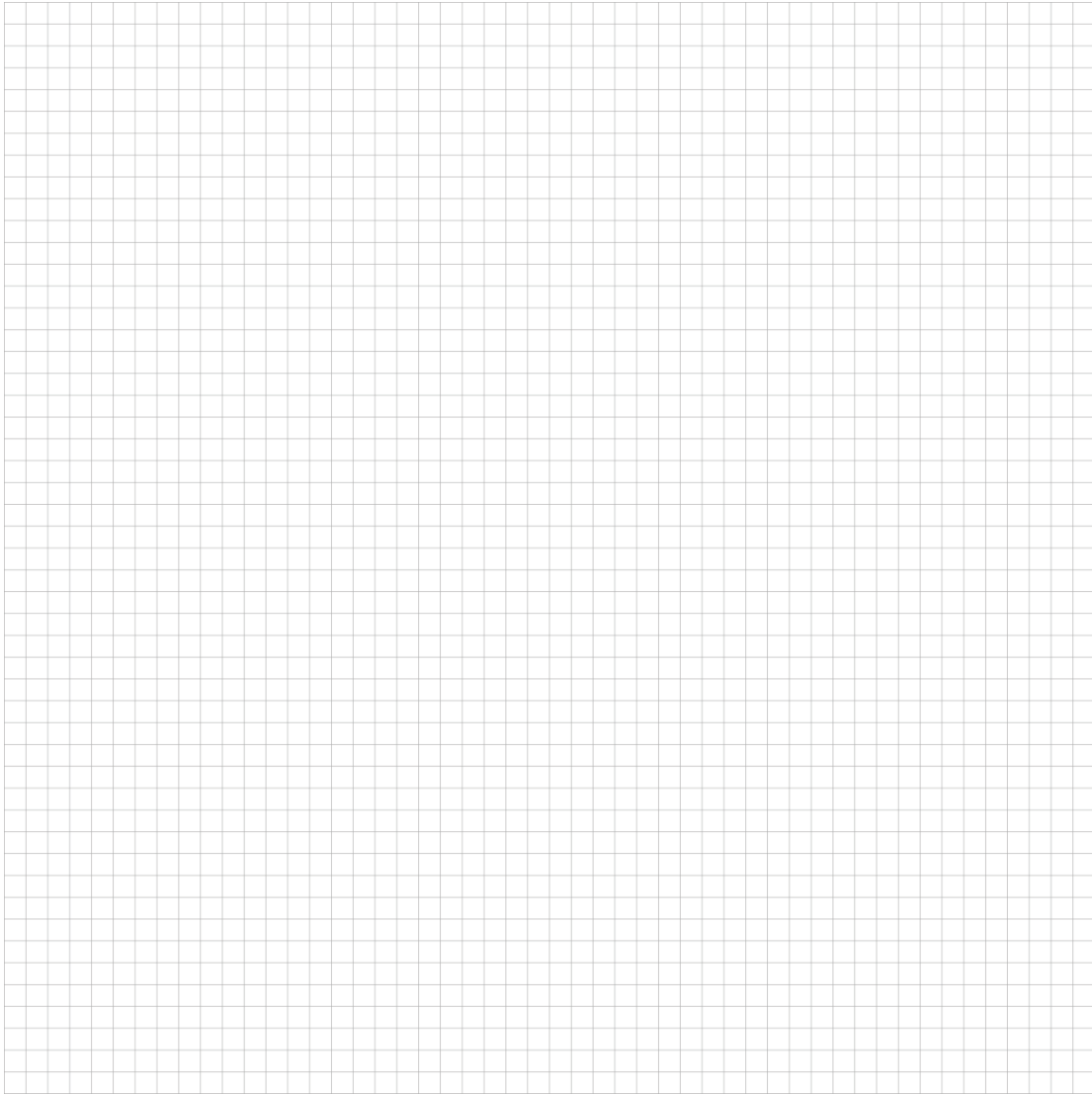
### **Part A**

The director has asked you to design different sections of the garden that meet the following conditions:

- Section 1 must be shaped like a square.
- Section 1 must have an area between 26 square feet and 50 square feet.
- Section 2 must be shaped like a rectangle but must **not** be a square.
- Section 2 must be exactly twice the area of Section 1.

On the grid below, draw your design for Section 1 and Section 2.

Be sure to label each section (1 or 2) and include the dimensions.  
Each box in the grid represents 1 square foot.



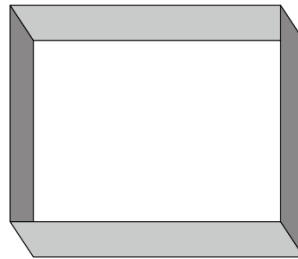
Based on your design, complete the following table:

Section	Area (square feet)	Perimeter (feet)
1		
2		

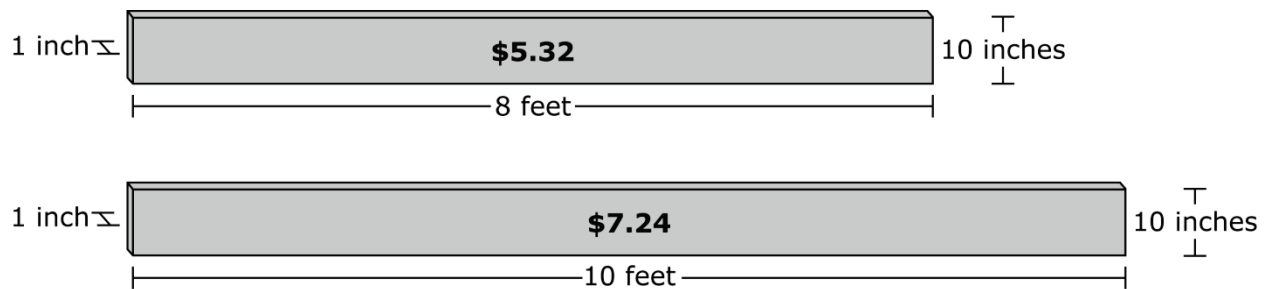
**Part B****Building Planter Boxes**

The director would like the sections to be contained in planter boxes that are 20 inches deep. You must buy the wood to construct the planter boxes for Section 1 and Section 2.

As seen in the picture below, a planter box is a rectangular prism that is filled with soil. It has no top or base.



Morris Hardware Store offers pressure-treated wood in two different lengths.



What is the minimum amount of wood that needs to be purchased to construct a planter box for both Sections 1 and 2? Explain your answer using diagrams, pictures, mathematical expressions, and/or words.

You plan to buy the wood to make the planter boxes from Morris Hardware Store. Using the information above, what is the **minimum** cost to buy the amount of wood needed for both boxes? Use mathematics to justify your answer.

**This is the end of Session 1.**

**Part C****Buying Plants**

The director would like you to buy and plant carrots and tomatoes in the garden.

You will plant carrots in Section 1 and tomatoes in Section 2. Each plant must be 1 foot away from the sides of the planter box and 1 foot away from each other. How many carrot plants and tomato plants do you need to buy? Provide mathematical justification for your answer.

Number of carrot plants \_\_\_\_\_

Number of tomato plants \_\_\_\_\_

You have a choice of two stores to buy the carrot plants and tomato plants, as shown below.

	<b>Greenthumb Garden Mart</b>	<b>Lawn &amp; Garden Depot</b>
Carrots	\$1.29 each	\$7.92 for 6
Tomatoes	\$1.89 each	\$8.70 for 6

Based on the unit rate, write an equation to represent the total cost to purchase any number of tomato plants at the Lawn & Garden Depot. In the equation, let  $C$  represent the total cost of the tomato plants in dollars and  $n$  represent the number of tomato plants bought.



What is the minimum amount you will need to pay to buy the carrot and tomato plants? Provide justification for your answer.

**Part D****Buying Soil**

It is recommended that planter boxes be filled with 6 or 9 inches of soil, depending on the type of plant. The carrot plants will be planted in 9 inches of soil and the tomato plants will be planted in 6 inches of soil.

Complete the table below to convert inches into feet.

Depth (in inches)	Depth (in feet)
3 inches	0.25 foot
6 inches	
9 inches	
12 inches	1 foot

Determine the depth, in feet, of the soil in each planter box.

**Planter Boxes**

Section	Depth (in feet)
1	
2	

Determine the minimum volume, in cubic feet, of soil that will be needed for the carrot plants and the tomato plants. Use mathematics to justify your answer.

Carrot plants need  cubic feet of soil.

Tomato plants need  cubic feet of soil.

The Greenthumb Garden Mart offers two different prices for soil, as shown below.



At this store, a cubic foot of soil weighs 80 pounds. Which type of soil will be the least expensive for you to buy? Use mathematics to justify your answer.

What is the total cost for purchasing soil from Greenthumb Garden Mart to fill both planter boxes? Explain your answer using diagrams, pictures, mathematical expressions, and/or words.

### ***Conclusion***

You have been given a budget of \$450 to build the garden you designed. Based on your work in *Part C* and *Part D*, do you have enough money to build the garden you designed? If so, justify your answer using mathematics or words. If not, what could you change so that you do not go over budget?

**End of Session 2**

## Sample Top-Score Response:

**Part A**

On the grid, draw and label Section 1 as a 6-by-6 square and Section 2 as an 8-by-9 rectangle.

Section 1 Area = 36 square feet    Perimeter = 24 feet

Section 2 Area = 72 square feet    Perimeter = 34 feet

**Part B**

For Section 1, I must buy 48 feet of wood. I multiplied the perimeter by 2 because the height of the planter box is 20 inches, and the height of the boards is 10 inches. For Section 2, I must buy 68 feet.

The unit price for the 8-foot board is \$0.67 and for the 10-foot board is \$0.72. The minimum cost is \$78.32. I found this cost by adding the cost for Section 1 and Section 2.

Section 1:  $48 \div 8 = 6$  boards  $\times \$5.32 = \$31.92$

Section 2: I need 68 feet, so I will buy 6 8-foot boards and 2 10-foot boards. So the cost is  $6 \text{ boards} \times \$5.32 + 2 \text{ boards} \times \$7.24 = \$46.40$

**Part C**

I will need to purchase 25 carrot plants and 56 tomato plants. I used the grid from the beginning of the test. Since the scale of each grid box is 1 foot by 1 foot, there are  $5 \times 5$  and  $7 \times 8$  intersections of grid lines. Each of these intersections is 1 foot away from the edge and 1 foot away from each other.

$$C = 1.45n.$$

The unit price for carrots is less at Greenthumb Garden Mart (\$1.29/plant) than at Lawn & Garden Depot (\$1.32/plant). The unit price for tomatoes is less at Lawn & Garden Depot (\$1.45/plant) than at Greenthumb Garden Mart (\$1.89/plant). So the minimum cost is  $\$113.45 = \$1.29 \times 25 + \$1.45 \times 56$ .

**Part D**

$$6 \text{ inches} = 0.50 \text{ feet} \quad 9 \text{ inches} = 0.75 \text{ feet}$$

Carrot plants need 27 cubic feet of soil.  $(0.75 \text{ feet} \times 36)$  square feet

Tomato plants need 36 cubic feet of soil.  $(0.5 \text{ feet} \times 72)$  square feet

The unit price of Organic Garden Soil Mix is  $\$4.65 = \$6.97 \div 1.5$ . Since 80 pounds of soil = 1 cubic foot, the unit rate of Premium Enriched Potting Soil is  $\$4.44 = 2 \times \$2.22$ .

I will buy Premium Enriched Potting Soil. The total cost of soil is  $\$279.72 = \$4.44(27+36)$

**Conclusion**

No, my plan is not within budget. The total cost to build the garden is  $\$471.49 = \$31.92 + \$46.40 + \$113.45 + \$279.72$ .

**Scoring Notes:**

Each part is evaluated independently. The total number of points is determined by adding the points assigned for each task.

*Scoring Rubric:***Part A**

**2 Points:** Thorough understanding of how to find area and perimeter of squares and rectangles. The student correctly draws on the grid a square and rectangle that satisfies the given conditions and correctly determines the area and perimeter of these quadrilaterals.

**1 Point:** Limited or inconsistent understanding of how to find area and perimeter of squares and rectangles. The student correctly finds the area and perimeter of a square and a rectangle that fails to satisfy one of the given conditions. **OR** The student correctly draws on the grid a square and rectangle that satisfy the given conditions but incorrectly determines the area or perimeter of one of these quadrilaterals.

**0 Points:** Limited or no understanding of how to find area and perimeter of squares and rectangles. The student does not completely answer any of the parts correctly.

**Part B**

**3 Points:** Thorough understanding of determining unit rates. Thorough understanding of solving real-world problems involving the perimeter of squares and rectangles. The student correctly determines the minimum cost of \$78.32.

**2 Points:** Thorough understanding of determining unit rates but partial understanding of solving real-world problems involving the perimeter of squares and rectangles. The student correctly determines the unit rate but finds the minimum cost by using 9 8-foot boards for Section 2. **OR** Thorough understanding of solving real-world problems involving the perimeter of squares and rectangles but partial understanding of determining unit rates. The student incorrectly determines the unit rate but consistently uses this rate in determining the minimum cost.

**1 Point:** Partial or inconsistent understanding of determining unit rates or of solving real-world problems involving the perimeter of squares and rectangles. The student finds only the unit rates.

**0 Points:** Limited or no understanding of determining unit rates and solving real-world problems involving the perimeter of squares and rectangles. The student does not correctly answer any part.

**Part C**

**3 Points:** Thorough understanding of analyzing patterns. Thorough understanding of writing an equation. Thorough understanding of solving real-world problems involving operations with decimals. The student correctly determines the number of plants to be 25 carrots and 56 tomatoes. The student writes a correct equation and defines all variables. The student determines the minimum cost to be \$113.45 with explanation.

**2 points:** Thorough understanding of analyzing patterns and writing equations but partial understanding of solving real-world problems involving decimals. The student correctly determines the number of plants and writes a correct equation but incorrectly solves the real-world problem involving decimals. **OR** Thorough understanding of analyzing patterns and of solving real-world problems involving decimals but partial understanding of writing equations. The student correctly determines the number of plants and solves the real-world problem involving decimals but writes an incorrect equation or a correct equation with variables undefined. **OR** Thorough understanding of writing equations and solving real-world

problems but limited understanding of analyzing patterns. The student correctly writes an equation and consistently solves the real-world problem involving decimals using an incorrect solution to the number of plants.

**1 Point:** Thorough understanding of either analyzing pattern or writing an equation. The student correctly determines the number of plants or writes a correct equation but is not able to solve real-world problems. **OR** Partial or inconsistent understanding of analyzing patterns or writing an equation or solving real-world problems involving operations with decimals. The student does not answer any part completely correctly.

**0 Points:** Limited or no understanding of analyzing patterns or writing an equation or solving real-world problems involving operations with decimals. The student does not correctly answer any part.

#### **Part D**

**3 Points:** Thorough understanding of solving real-world problems involving the volume of rectangular prisms. Thorough understanding of determining unit rates. The student correctly determines the cost of the soil is \$279.72.

**2 Points:** Thorough understanding of solving real-world problems involving the volume of rectangular prisms but limited understanding of determining unit rates. The student incorrectly determines the unit rate but consistently uses it to determine the cost of the soil. **OR** The student correctly determines the unit rates and the volume but incorrectly determines the cost.

**1 point:** Partial or inconsistent understanding of solving real-world problems involving the volume of rectangular prisms and of determining unit rates. The student incorrectly finds one of the unit rates and incorrectly calculates volume as well. **OR** The student only finds the unit rates. **OR** The student finds the volume of one of the prisms.

**0 Points:** Limited or no understanding of solving real-world problems involving the volume of rectangular prisms and of determining unit rates. The student determines only the conversion of the units. **OR** The student does not correctly answer any part.

#### **Conclusion**

**1 Point:** Thorough understanding of interpreting results in the context of a situation. The student provides a mathematical justification of why the plan is not within budget or provides a change to the plan that will bring the plan within budget.

**0 Points:** No understanding of interpreting results in the context of a situation. The student does not provide a mathematical justification for the answer.

Grade 6 Mathematics Sample SR Item C1 TE

MAT.06.SR.1.000EE.E.168 C1 TE

Sample Item ID:	MAT.06.SR.1.000EE.E.168
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 E: Apply and extend previous understandings of arithmetic to algebraic expressions.
Content Domain:	Expressions and Equations
Standard(s):	6.EE.3
Mathematical Practice(s):	1, 2, 7
DOK:	1
Item Type:	SR
Score Points:	1
Difficulty:	M
Key:	YYN
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	Multi-part item

For numbers 1a–1c, select Yes or No to indicate whether the pairs are equivalent expressions.

1a. Are  $4(3x - y)$  and  $12x - 4y$  equivalent expressions?

☐ Yes ☐ No

1b. Are  $32 + 16y$  and  $8(4 + 2y)$  equivalent expressions?

☐ Yes ☐ No

1c. Are  $3(x + 2y)$  and  $3x + 2y$  equivalent expressions?

☐ Yes ☐ No

*Key and Distractor Analysis:*

Key: A correct YYN response to this item will receive 1 point.

## MAT.06.SR.1.000EE.F.072 C1 TF

Sample Item ID:	MAT.06.SR.1.000EE.F.072
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 F: Reason about and solve one-variable equations and inequalities.
Content Domain:	Expressions and Equations
Standard(s):	6.EE.5
Mathematical Practice(s):	1, 2
DOK:	1
Item Type:	SR
Score Points:	2
Difficulty:	M
Key:	A, D, E
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	Multiples keys

Select the equation(s) where  $x = 5$  is a solution. Click all that apply.

(A)  $2x + 4 = 14$

(D)  $8 + 3x = 23$

(B)  $5x = 55$

(E)  $6x = 30$

(C)  $6x + 3 = 14$

(F)  $5x = 1$

*Key and Distractor Analysis or Scoring Rubric for Multi-part Items:*

**2 points:** The student shows a thorough understanding of evaluating equations at specific values. Chooses A, D, and E ONLY.

**1 point:** The student shows partial understanding of evaluating equations at specific values. Misses only 1 of the correct answers.

**0 points:** The student shows inconsistent or no understanding of evaluating equations at specific values or solving equations.



## MAT.06.SR.1.000EE.F.178 C1 TF

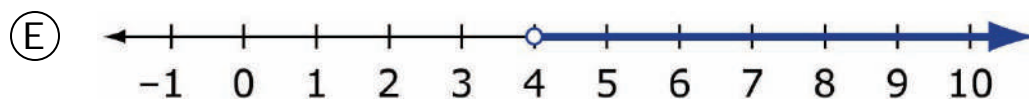
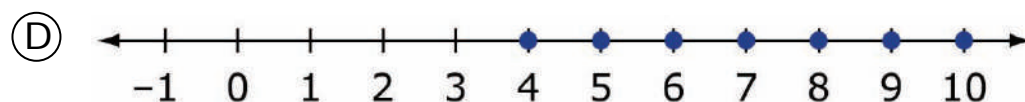
Sample Item ID:	MAT.06.SR.1.000EE.F.178
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 F: Reason about and solve one-variable equations and inequalities.
Content Domain:	Expressions and Equations
Standard(s):	6.EE.8
Mathematical Practice(s):	2
DOK:	1
Item Type:	SR
Score Points:	1
Difficulty:	M
Key:	B, C, E
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	Blind or low-vision students may have difficulty with aspects of this item related to number line graphs.
Notes:	Multi-Answer Item

An inequality is shown.

$$X > 4$$

Select the statement(s) and number line(s) that can be represented by the inequality. Click all that apply.

- Ⓐ The temperature increased by 4° Fahrenheit.
- Ⓑ The value of a number substituted for  $x$  is greater than 4.
- Ⓒ Marcus drinks more than 4 glasses of water every day.



## MAT.06.SR.1.000NS.B.179 C1 TB

Sample Item ID:	MAT.06.SR.1.000NS.B.179
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 B: Apply and extend previous understandings of multiplication and division to divide fractions by fractions.  1 F: Reason about and solve one-variable equations and inequalities.
Content Domain:	The Number System
Standard(s):	6.NS.1, 6.EE.6
Mathematical Practice(s):	1, 2
DOK:	1
Item Type:	SR
Score Points:	1
Difficulty:	L
Key:	B
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	

Hisaki is making sugar cookies for a school bake sale. He has  $3\frac{1}{2}$  cups of sugar. The recipe calls for  $\frac{3}{4}$  cup of sugar for one batch of cookies. Which equation can be used to find  $b$ , the total number of batches of sugar cookies Hisaki can make?

- Ⓐ  $3\frac{1}{2} \times \frac{3}{4} = b$
- Ⓑ  $3\frac{1}{2} \div \frac{3}{4} = b$
- Ⓒ  $3\frac{1}{2} + b = \frac{3}{4}$
- Ⓓ  $3\frac{1}{2} - b = \frac{3}{4}$

*Key and Distractor Analysis:*

- A. Incorrect operation; does not correctly interpret the quotient of fractions
- B. Correct
- C. Incorrect operation and equation; does not correctly interpret the quotient of fractions or the placement of the variable
- D. Incorrect operation and equation; does not correctly interpret the quotient of fractions or the placement of the variable

## MAT.06.SR.1.000NS.D.097 C1 TD

Sample Item ID:	MAT.06.SR.1.000NS.D.097
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 D: Apply and extend previous understandings of numbers to the system of rational numbers.
Content Domain:	The Number System
Standard(s):	6.NS.7
Mathematical Practice(s):	2
DOK:	1
Item Type:	SR
Score Points:	3
Difficulty:	L
Key:	FTFT
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	Multi-Answer, True/False Item

The level of the top of the water in the ocean is considered to be at an altitude of zero (0) feet.

- The ocean floor at a particular dive site is – 20 feet.
- A diver is located at – 5 feet at that same site.
- The captain of a boat is located at an altitude of 15 feet, directly above the diver.

For numbers 1a – 1d, select True or False for each statement.

1a. The distance from the captain to the diver is greater than the distance from the top of the water to the ocean floor.

☐ True   ☐ False

1b. The distance from the captain to the top of the water is the same as the distance from the diver to the ocean floor.

☐ True   ☐ False

1c. When the diver swims to  $-10$  feet, the diver will be the same distance below the top of the water as the captain is above the top of the water.

☐ True ☐ False

1d. When the diver swims to  $-10$  feet, the diver's distance to the ocean floor will be equal to diver's distance to the top of the water.

☐ True ☐ False

*Scoring Rubric for Multi-Part Items:*

*Responses to this item will receive 0-2 points, based on the following:*

**2 points:** FTFT

The student shows a thorough understanding of using the absolute value of coordinates to represent distances.

**1 point:** FTFF, TTFT, FTTF, FFFT

The student shows a partial understanding of using the absolute value of coordinates to represent distances and makes a single error.

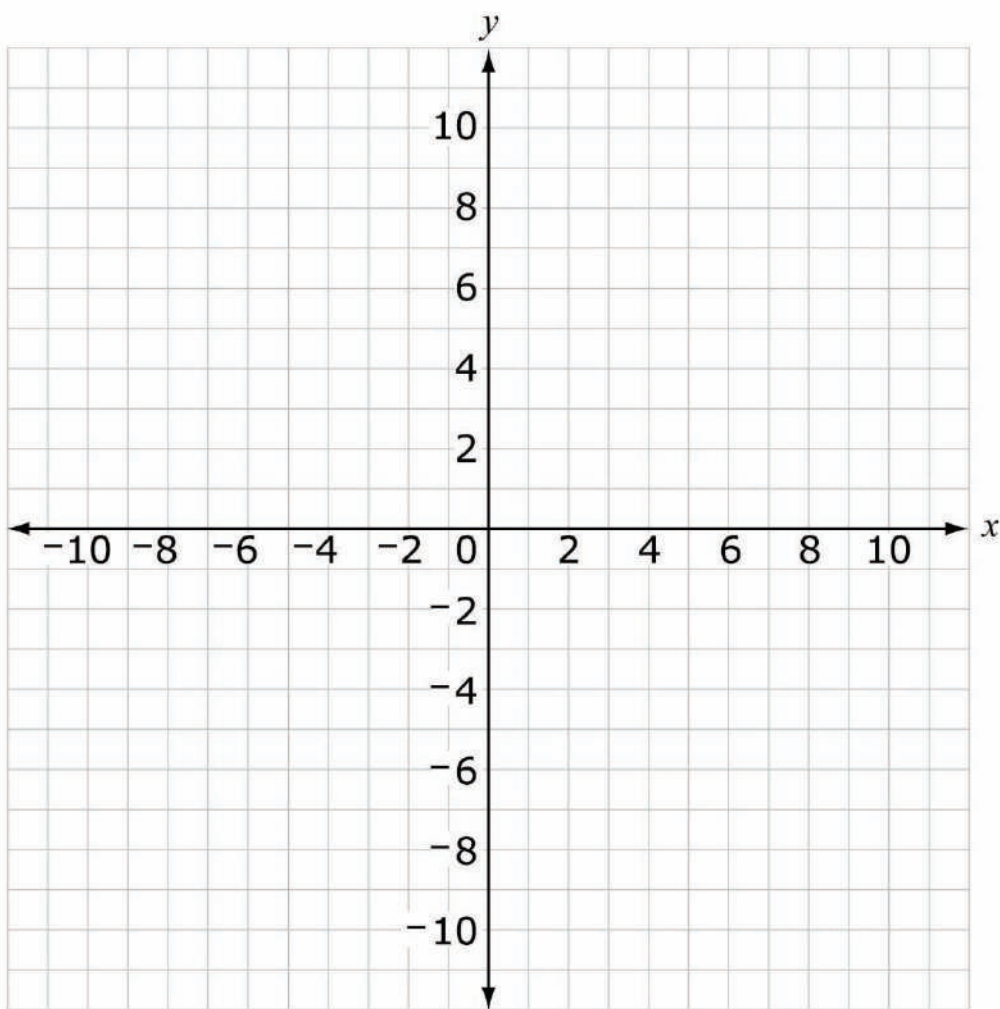
**0 points:** TFTF, TTTT, TFFT, FFTT, TTTF, TFFT, TFFF, FFTE, TTFE, FTTF, FFFF

The student shows a limited or inconsistent understanding of using the absolute value of coordinates to represent distances.

## MAT.06.SR.1.000NS.D.098 C1 TD

Sample Item ID:	MAT.06.SR.1.000NS.D.098
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 D: Apply and extend previous understandings of numbers to the system of rational numbers.
Content Domain:	The Number System
Standard(s):	6.NS.8
Mathematical Practice(s):	5
DOK:	1
Item Type:	SR
Score Points:	4
Difficulty:	L
Key:	F, T, F, F
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	Multi-Answer, True/False Item

The map of a town will be placed on a coordinate plane. City Hall will be located at the origin of the map



The locations of six other buildings that will be added to the coordinate plane are listed below.

- Bank  $(-8, 5)$
- School  $(-8, -6)$
- Park  $(4, 5)$
- Post Office  $(-9, 5)$
- Store  $(-9, -6)$

For numbers 1a–1d, select True or False for each statement, based on the given information.

- 1a. The bank is closer to the school than the post office is from the store.  
☐ True   ☐ False
- 1b. The distance from the bank to the school is equal to  $|5| + |-6|$ .  
☐ True   ☐ False
- 1c. A library has the same y-coordinate as the store. If the library is the same distance from the store as the park is from the bank, then the x-coordinate of the library is 4.  
☐ True   ☐ False
- 1d. The distance from the bank to the post office is equal to  $|-8| + |-9|$ .  
☐ True   ☐ False

*Scoring Rubric for Multi-Part Items:*

Each part is independently scored and worth 1 point, for a total of 4 points.



Grade 6 Mathematics Sample SR Item C1 TA

MAT.06.SR.1.000RP.A.181 C1 TA

Sample Item ID:	MAT.06.SR.1.000RP.A.181
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 A: Understand ratio concepts and use ratio reasoning to solve problems.
Content Domain:	Ratios and Proportional Relationships
Standard(s):	6.RP.3
Mathematical Practice(s):	1, 2
DOK:	2
Item Type:	SR
Score Points:	1
Difficulty:	M
Key:	D
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	

In art class, Marvin painted tiles to use for a project. For every 5 tiles he painted blue, he painted 8 tiles green.

Identify the equivalent ratio(s) of blue tiles to green tiles. Select all that apply.

- ☐ (A) 20:23
- ☐ (B) 40:25
- ☐ (C) 50:800
- ☐ (D) 60:96

*Key and Distractor Analysis:*

- A. Thought that any difference of 3 is equivalent.
- B. Reversed the ratio (green to blue)
- C. Saw the 5 and 8 and didn't pay attention to the place value.
- D. Key

## MAT.06.SR.2.000RP.D.181 C1 TA

Sample Item ID:	MAT.06.SR.2.000RP.D.181
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 A: Understand ratio concepts and use ratio reasoning to solve problems.
Content Domain:	Ratios and Proportional Relationships
Standard(s):	6.RP.3
Mathematical Practice(s):	1, 2
DOK:	2
Item Type:	SR
Score Points:	1
Difficulty:	M
Key:	D
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	

In art class, Marvin painted tiles to use for a project. For every 5 tiles he painted blue, he painted 8 tiles green.

Identify the equivalent ratio(s) of blue tiles to green tiles. Select all that apply.

- ☐ (A) 20:23
- ☐ (B) 40:25
- ☐ (C) 50:800
- ☐ (D) 60:96

*Key and Distractor Analysis:*

- A. Thought that any difference of 3 is equivalent.
- B. Reversed the ratio (green to blue)
- C. Saw the 5 and 8 and didn't pay attention to the place value.
- D. Key

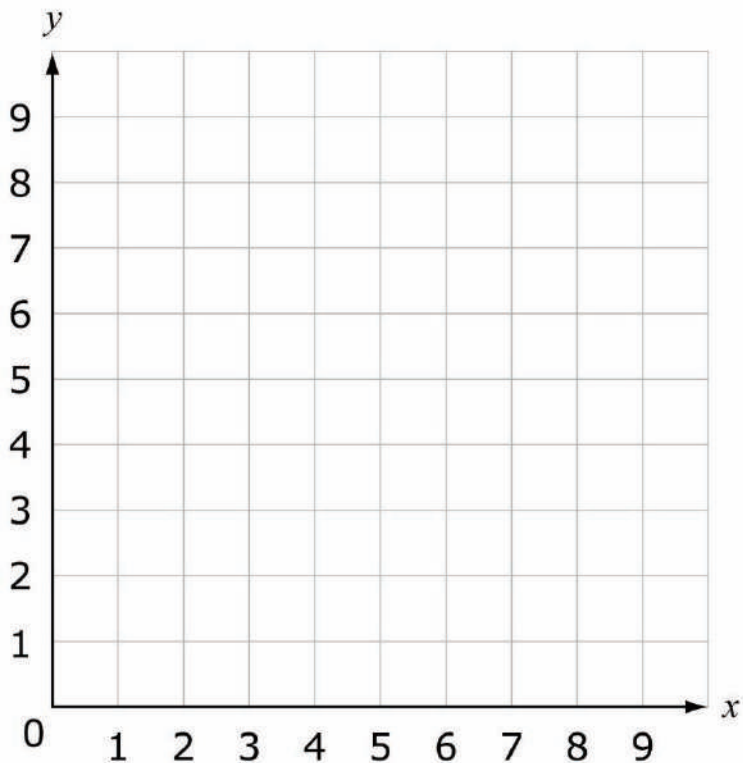
## MAT.06.TE.1.0000G.H.071 C1 TH

Sample Item ID:	MAT.06.TE.1.0000G.H.071
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 H: Solve real-world and mathematical problems involving area, surface area, and volume.
Domain:	Geometry
Standard(s):	6.G.1, 6.G.3
Mathematical Practice(s):	1, 4, 5
DOK:	2
Item Type:	TE
Score Points:	2
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	Blind and low vision students may have difficulty graphing the figure.
Notes:	TEI template: Vertex-Based Polygons; part B is CR scored.

**Part A**

On the coordinate grid, plot the following points in order and connect each plotted point to the previous one in the order shown to form a figure.

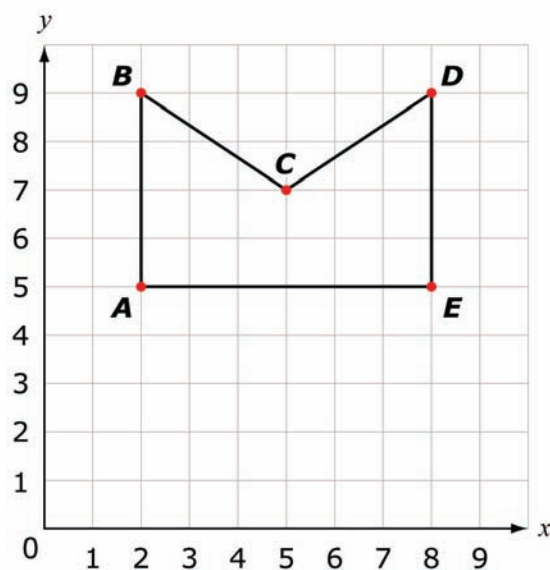
1. Point A (2, 5)
2. Point B (2, 9)
3. Point C (5, 7)
4. Point D (8, 9)
5. Point E (8, 5)
6. Point A (2, 5)

**Part B**

What is the area, in square units, of the enclosed figure?

square units

*Sample Top-Score Response:*



What is the area, in square units, of the enclosed figure?

18

square units

*Suggested Scoring Rubric:*

Each part is scored independently; worth 1 point each.

*TE information:*

**Item Code:** MAT.06.TE.1.0000G.H.071

**Template:** Vertex Based Polygons (does not exist at this time)

**Interaction Space Parameters:**

- A. False
- B.  $(0,0)$ ,  $(10,10)$ , 1, the axes are labeled  $x$  and  $y$ , no axis titles
- C. True
- D. False
- E. N/A
- F. Limit number of vertices to 5

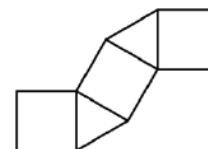
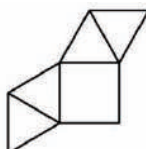
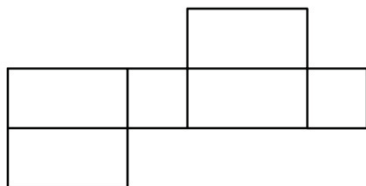
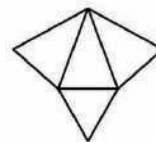
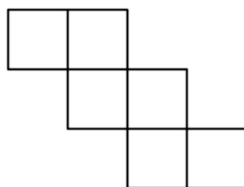
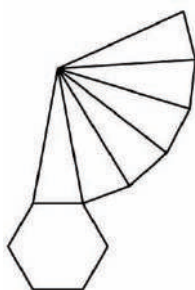
**Scoring Data (Specific to Each Item):**

- 1. False
- 2. True
  - a.  $(2, 5)$ , tolerance = 0
  - b.  $(2, 9)$ , tolerance = 0
  - c.  $(5, 7)$ , tolerance = 0
  - d.  $(8, 9)$ , tolerance = 0
  - e.  $(8, 5)$ , tolerance = 0
- 3. False
- 4. False
- 5. False

## MAT.06.TE.1.0000G.H.590 C1 TH

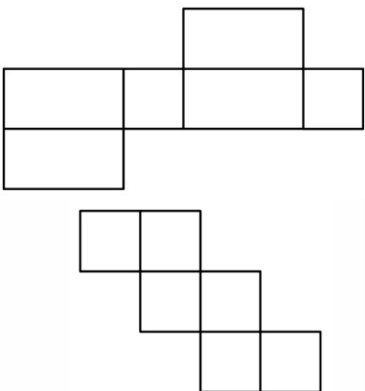
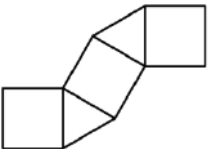
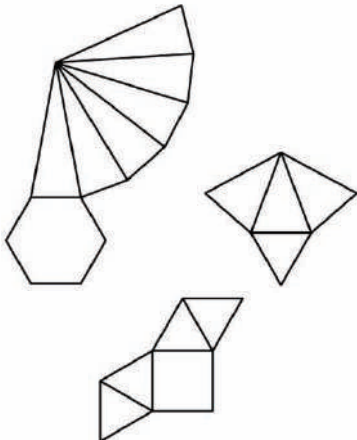
Sample Item ID:	MAT.06.TE.1.0000G.H.590
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 H: Solve real-world and mathematical problems involving area, surface area, and volume.
Content Domain:	Geometry
Standard(s):	6.G.4
Mathematical Practice(s):	1, 5, 7
DOK:	2
Item Type:	TE
Score Points:	1
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	TEI template: Classification

Classify each net as representing a rectangular prism, a triangular prism, or a pyramid. To place an object in a region, click the object, move the pointer over the region, and click again to place the object in the region. To return all objects to their original positions, click the Reset button.



Nets Forming a Rectangular Prism	Nets Forming a Triangular Prism	Nets Forming a Pyramid

*Sample Top-Score Response:*

Nets Forming a Rectangular Prism	Nets Forming a Triangular Prism	Nets Forming a Pyramid
		



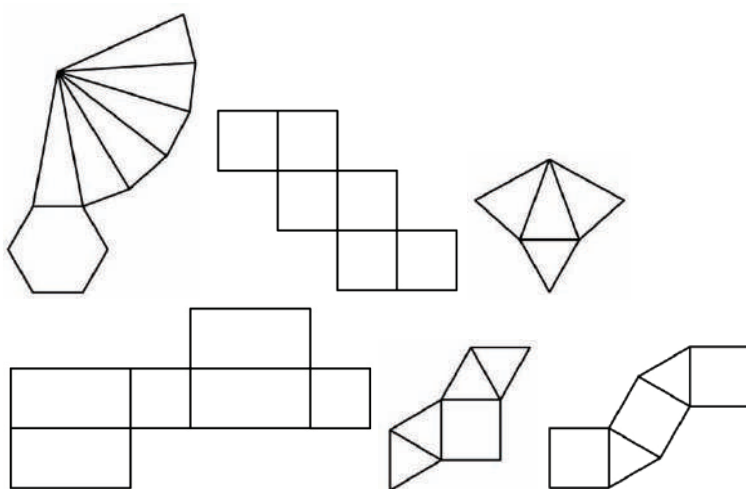
*TE Information:*

**Item Code:** MAT.06.TE.1.0000H.G.590

**Template:** Classification

**Interaction Space Parameters:**

- A. The 3 sections of the table: Nets Forming a Rectangular Prism, Nets Forming a Triangular Prism, Nets Forming a Pyramid
- B. The following 6 figures:



**Scoring Data:**

{1=BD}; {2=F}; {3=ACE}; {0 errors=1}

Grade 6 Mathematics Sample TE Item C1 TE

MAT.06.TE.1.000EE.E.690 C1 TE

Sample Item ID:	MAT.06.TE.1.000EE.E.690
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 E: Apply and extend previous understandings of arithmetic to algebraic expressions.
Content Domain:	Expressions and Equations
Standard(s):	6.EE.4
Mathematical Practice(s):	1, 2
DOK:	2
Item Type:	TE
Score Points:	1
Difficulty:	M
Key:	See Key.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	TEI template: Classification

Identify each expression as either equal to  $12x + 36y$  or **not** equal to  $12x + 36y$ . Drag each expression to the appropriate box below.

$$(10x + 36y) + (2x + y)$$

$$6(2x + 6y)$$

$$3(4x + 5y) + 7(3y)$$

$$5x + 5y + x + y + 6x + 6y$$

Expressions Equivalent to $12x + 36y$	Expressions Not Equivalent to $12x + 36y$

Grade 6 Mathematics Sample TE Item C1 TE

**Key:**

Expressions equivalent to  $12x + 36y$ :  $6(2x + 6y)$ ,  $3(4x + 5y) + 7(3y)$

Expressions not equivalent to  $12x + 36y$ :  $(10x + 36y) + (2x + y)$ ,  $5x + 5y + x + y + 6x + 6y$

*TE Information:*

**Item Code:** MAT.06.TE.1.000EE.E.690

**Template:** Classification

**Interaction Space Parameters:**

- A. The 2 sections of the table: expressions equivalent to  $12x + 36y$ , expressions not equivalent to  $12x + 36y$
- B. The following 4 expressions:  $(10x + 36y) + (2x + y)$ ,  $6(2x + 6y)$ ,  $3(4x + 5y) + 7(3y)$ ,  $5x + 5y + x + y + 6x + 6y$

**Scoring Data:**

$\{1=BC, 2=AD\}=1$

## MAT.06.TE.1.000EE.F.170 C1 TF

Sample Item ID:	MAT.06.TE.1.000EE.F.170
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 F: Reason about and solve one-variable equations and inequalities.
Content Domain:	Expressions and Equations
Standard(s):	6.EE.6
Mathematical Practice(s):	2, 4
DOK:	1
Item Type:	TE
Score Points:	1
Difficulty:	M
Key:	$3b+5$ (see others below)
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	Tab entry will be used in place of click and drag for students that need this accommodation.
Notes:	TE Template: Select and Order

Let  $b$  represent a number.

Click and drag the objects (numbers, operation symbols, letter) to the line below to create an expression that represents the following:

"5 more than the product of 3 and the number  $b$ "

Not all objects will be used.

3	5	$b$	+	−	×	÷
---	---	-----	---	---	---	---

---

Key:

$3b+5$  or  $3xb+5$  or  $bx3+5$  or  $5+3b$  or  $5+3xb$  or  $5+bx3$

See TE Information

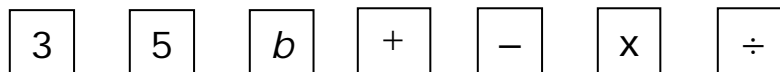
TE information:

**Template: Select and Order**

**Item ID:** MAT.06.TE.1.000EE.F.170

**Interaction Space Parameters:**

- A. An image with seven squares containing the two digits, one variable, and four operators 3, 5,  $b$ ,  $+$ ,  $-$ ,  $\times$ ,  $\div$  respectively.
- B. Five images of squares.



**Scoring Data:**

$\{1=A, 2=F, 3=C, 4=D, 5=B\} = 1$

$\{1=C, 2=F, 3=A, 4=D, 5=B\} = 1$

$\{1=B, 2=D, 3=A, 4=F, 5=C\} = 1$

$\{1=B, 2=D, 3=C, 4=F, 5=A\} = 1$

## MAT.06.TE.1.000EE.F.177 C1 TF

Sample Item ID:	MAT.06.TE.1.000EE.F.177
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 F: Reason about and solve one-variable equations and inequalities.
Content Domain:	Expressions and Equations
Standard(s):	6.EE.7
Mathematical Practice(s):	1, 2, 4, 7
DOK:	1
Item Type:	TE
Score Points:	2
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	
Notes:	TE Template: Connections

Read each of the following problem situations. Label each situation according to the equation that would answer the question. If neither equation works, select "Neither." The labels may be used more than one time.

[To connect two objects, click the first object and then the second object. A line will be automatically drawn between the two objects.]

The school auditorium can seat 325 students. In the auditorium there are 25 rows with the same number of seats in each row. Which equation can be used to find  $x$ , the number of seats in each row in the school auditorium?

$$25 + x = 325$$

There are 25 soccer balls in a store. The total number of soccer balls and basketballs in the store is 325. Which equation can be used to find  $x$ , the number of basketballs in the store?

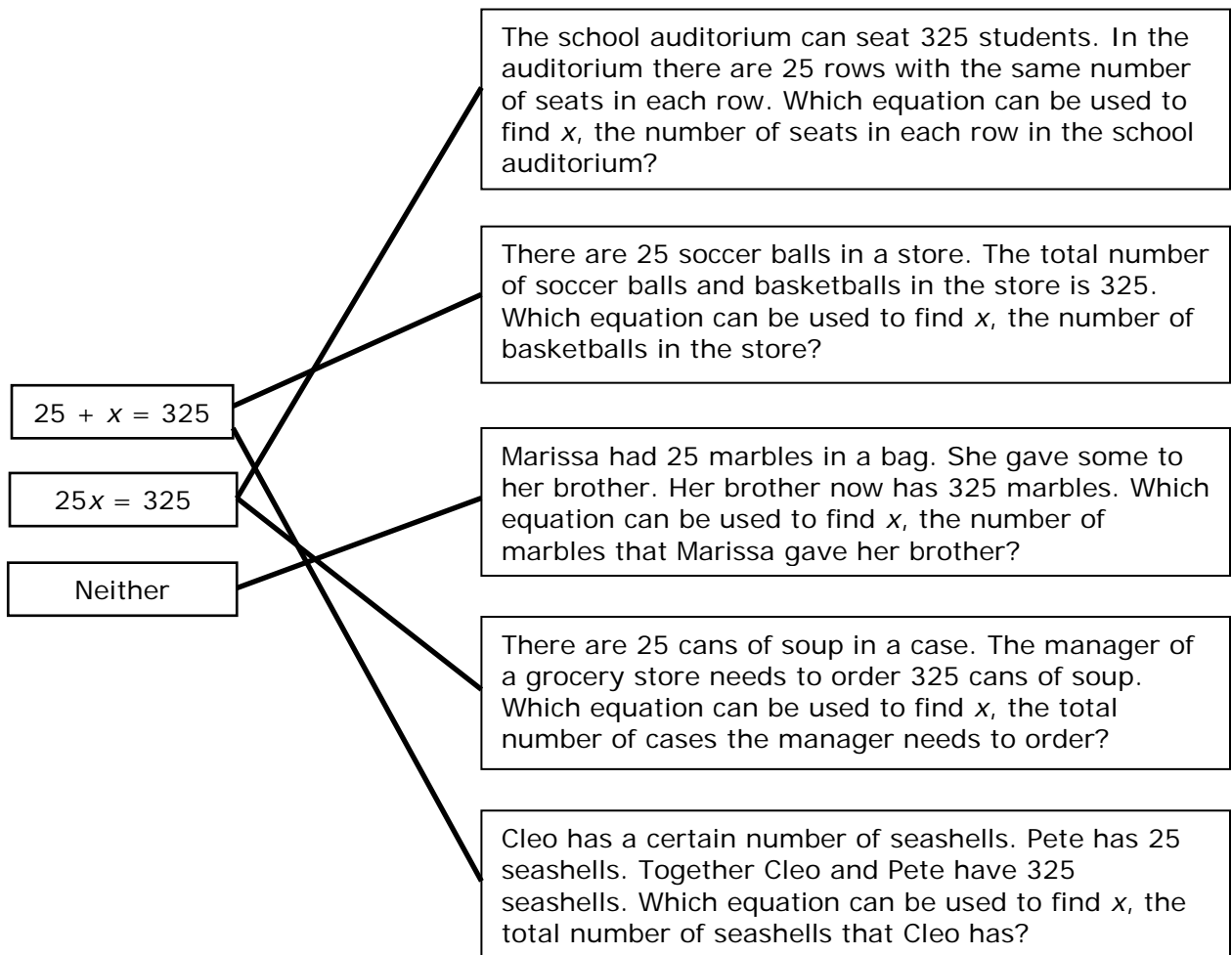
$$25x = 325$$

Marissa had 25 marbles in a bag. She gave some to her brother. Her brother now has 325 marbles. Which equation can be used to find  $x$ , the number of marbles that Marissa gave her brother?

Neither

There are 25 cans of soup in a case. The manager of a grocery store needs to order 325 cans of soup. Which equation can be used to find  $x$ , the total number of cases the manager needs to order?

Cleo has a certain number of seashells. Pete has 25 seashells. Together Cleo and Pete have 325 seashells. Which equation can be used to find  $x$ , the total number of seashells that Cleo has?

*Sample Top-Score Response:**Scoring Rubric:*

Responses to this item will receive 0-2 points, based on the following:

**2 points:** The student shows a thorough understanding of identifying equations that match a given real-world scenario and chooses  $25x = 325$ ,  $25 + x = 325$ , Neither,  $25x = 325$ ,  $25 + x = 325$

**1 point:** The student shows a limited understanding of identifying equations that match a given real-world scenario and misidentifies one of the equations by using addition instead of multiplication for the variable, or multiplication instead of addition for the variable, or uses "Neither" in place of where an equation could have been utilized.

**0 points:** The student shows little or no understanding of identifying equations that match a given real-world scenario and misidentifies two or more of the equations by using addition instead of multiplication for the variable, and/or multiplication instead of addition for the variable, and/or uses "Neither" in place of where an equation could have been utilized.



TE information:

**Template: Connections**

**Item ID:** MAT.06.TE.1.000EE.F.177

**Interaction Space Parameters:**

A. Three images in the first region:

$$25 + x = 325$$

A

$$25x = 325$$

B

Neither

C

B. Five images in the second region:

1

The school auditorium can seat 325 students. In the auditorium there are 25 rows with the same number of seats in each row. Which equation can be used to find  $x$ , the number of seats in each row in the school auditorium?

2

There are 25 soccer balls in a store. The total number of soccer balls and basketballs in the store is 325. Which equation can be used to find  $x$ , the number of basketballs in the store?

3

Marissa had 25 marbles in a bag. She gave some to her brother. Her brother now has 325 marbles. Which equation can be used to find  $x$ , the number of marbles that Marissa gave her brother?

4

There are 25 cans of soup in a case. The manager of a grocery store needs to order 325 cans of soup. Which equation can be used to find  $x$ , the total number of cases the manager needs to order?

5

Cleo has a certain number of seashells. Pete has 25 seashells. Together Cleo and Pete have 325 seashells. Which equation can be used to find  $x$ , the total number of seashells that Cleo has?

**Scoring Data:**

{A-2, A-5, B-1, B-4, C-3} {0 errors=2} {1 error=1}

## MAT.06.TE.1.000NS.D.173 C1 TD

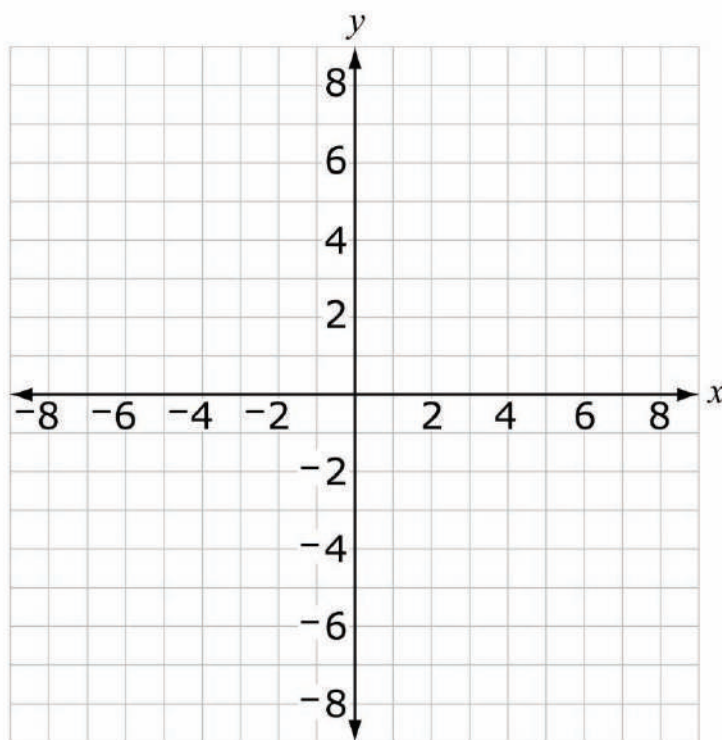
Sample Item ID:	MAT.06.TE.1.000NS.D.173
Grade:	06
Primary Claim:	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Secondary Claim(s):	
Primary Content Domain:	The Number System
Secondary Content Domain(s):	
Assessment Target(s):	1 D: Apply and extend previous understandings of numbers to the system of rational numbers.
Standard(s):	6.NS.6
Mathematical Practice(s):	1, 2, 5
DOK:	2
Item Type:	TE
Score Points:	3
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	It will be a challenge to assess blind or low-vision students, or students with limited motor skills with regard to plotting points in a coordinate plane.
Notes:	TEI Template: Plotting Points

The coordinates of point  $P$  are  $(-6, 5)$ . Point  $R$  is a reflection of point  $P$  across the  $x$ -axis.

The coordinates of point  $Q$  are  $(-1, 0)$ . Point  $T$  is a reflection of point  $Q$  across the  $y$ -axis.

**Part A**

Plot and label points  $P$ ,  $Q$ ,  $R$ , and  $T$  on the coordinate plane.

**Part B**

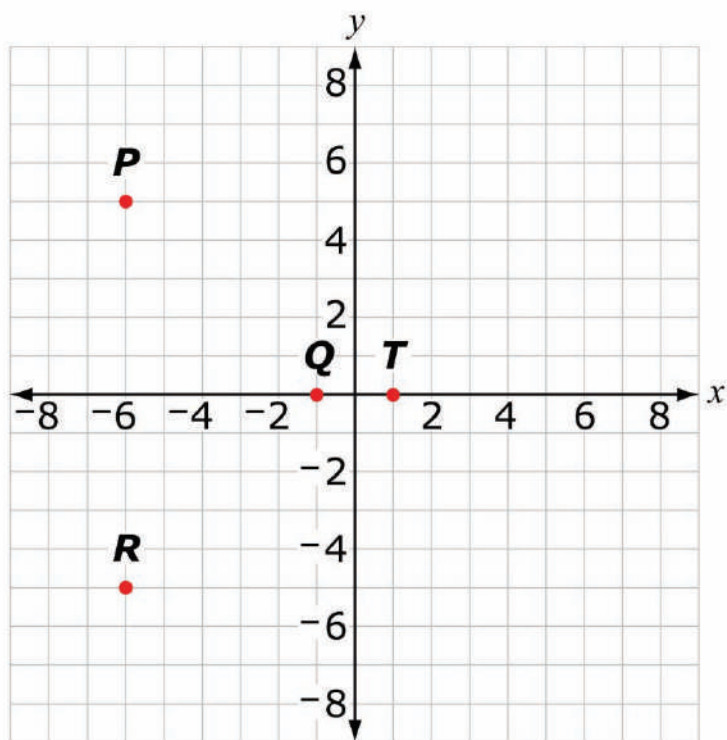
The coordinates of point  $V$  are  $(7, 4)$ . Point  $W$  is a reflection of point  $V$  across the  $x$ -axis.

In which quadrant will point  $W$  be located?

- (A) I
- (B) II
- (C) III
- (D) IV

*Sample Top-Score Response:*

*Part A*



*Part B*

Quadrant IV

*Scoring Rubric:*

Part A 1 point for correctly plotting points P and R.  
1 point for correctly plotting points Q and T.

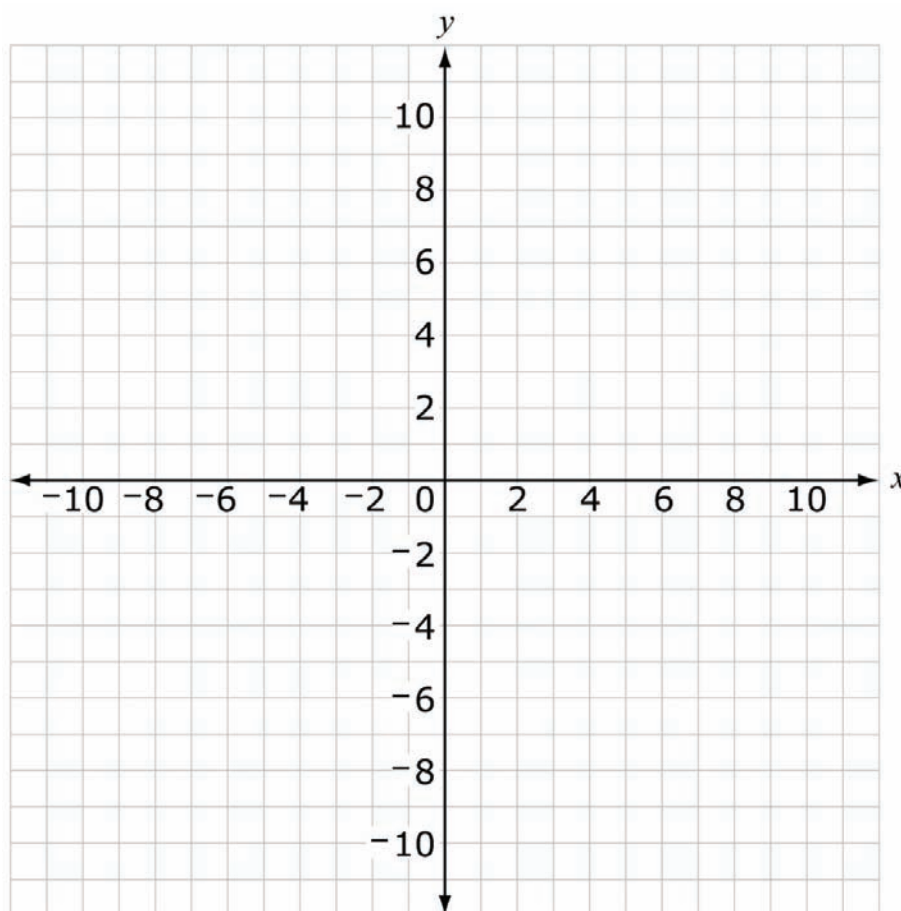
Part B 1 point for correctly choosing D; Quadrant IV.

## MAT.06.TE.1.000NS.D.278 C1 TD

Sample Item ID:	MAT.06.TE.1.000NS.D.278
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 D: Apply and extend previous understandings of numbers to the system of rational numbers.
Content Domain:	The Number System
Standard(s):	6.NS.8
Mathematical Practice(s):	1, 2, 4, 5
DOK:	1
Item Type:	TE
Score Points:	1
Difficulty:	L
Key:	Points at $(-4, 2)$ , $(6, 2)$ , $(1, 7)$ , $(1, -3)$
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	May present a challenge for students with visual or fine-motor-skill disabilities.
Notes:	TE Template: Placing points

Plot four unique points on the coordinate grid that are each 5 units from the point  $(1, 2)$ . Each point must contain coordinates with integer values.

To create a point, click on any space where grid lines intersect in the coordinate grid below.



*TE Information:*

**Item Code:** MAT.06.TE.1.000NS.D.278

**Template:** Placing Points

**Interaction Space Parameters:**

- A. True
- B. N/A
- C. True
- D. False

- E. N/A
- F. True
- G. 4

**Scoring Data:**

Point 1:  $(-4, 2)$ ; tolerance=0; correct score-points=0.25;  
Point 2:  $(6, 2)$ ; tolerance=0; correct score-points=0.25;  
Point 3:  $(1, 7)$ ; tolerance=0; correct score-points=0.25;  
Point 4:  $(1, -3)$ ; tolerance=0; correct score-points=0.25;  
Algorithm: SumOnly

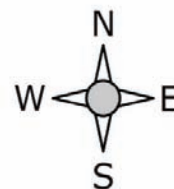
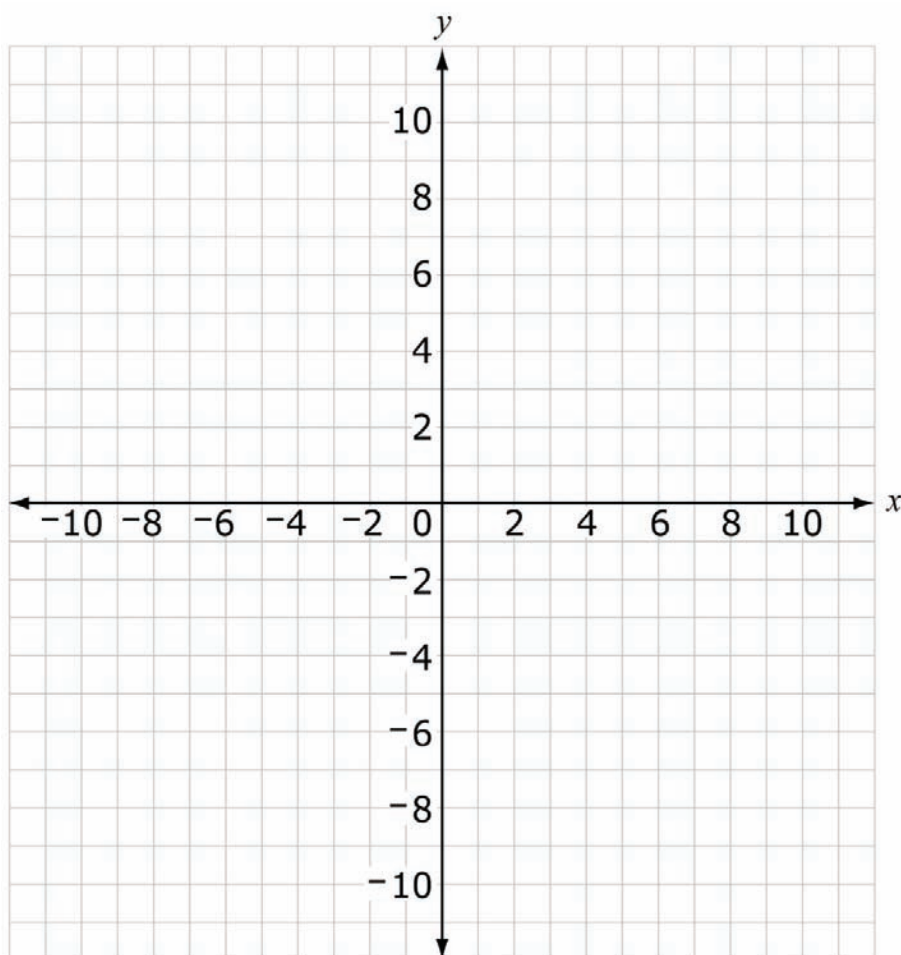
## MAT.06.TE.1.000NS.D.288 C1 TD

Sample Item ID:	MAT.06.TE.1.000NS.D.288
Grade:	06
Claim(s):	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 D: Apply and extend previous understandings of numbers to the system of rational numbers.
Content Domain:	The Number System
Standard(s):	6.NS.8
Mathematical Practice(s):	1, 2, 4, 5
DOK:	1
Item Type:	TE
Score Points:	1
Difficulty:	L
Key:	Dot at (3, -1)
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	Students must understand the compass rose. May present a challenge for students with visual or fine motor skill disabilities.
Notes:	TE template: Placing Points



The map of a town is placed on a coordinate grid with each whole number distance north (N), south (S), east (E), or west (W) representing 1 block.

A grocery store has the coordinates  $(-2, -4)$ . The owners of the grocery store plan to build an additional grocery store at a location that is 5 blocks to the east and 3 blocks to the north of the original store. Plot the location of the additional grocery store on the coordinate grid.



*TE Information:*

**Item Code:** MAT.06.TE.1.000NS.D.288

**Template:** Placing Points

**Interaction Space Parameters:**

- A. True
- B. N/A
- C. Visible
- D. True
- E. A compass showing north, south, east, and west is needed to the right of the coordinate plane.
- F. True
- G. 1

**Scoring Data:** SumOnly

- A. 3
- B. -1
- C. 0
- D. 1
- E. 0

## MAT.06.TE.1.000SP.J.171 C1 TJ

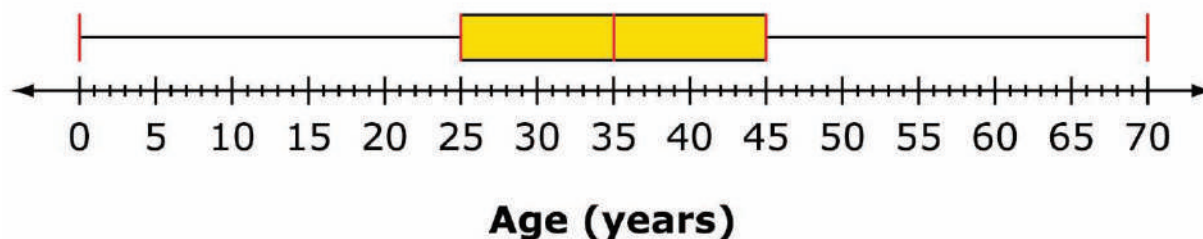
Sample Item ID:	MAT.06.TE.1.000SP.J.171
Grade:	06
Primary Claim:	<b>Claim 1: Concepts and Procedures</b> Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Secondary Claim(s):	
Primary Content Domain:	Statistics and Probability
Secondary Content Domain(s):	
Assessment Target(s):	1 J: Summarize and describe distributions.
Standard(s):	6.SP.4, 6.SP.5
Mathematical Practice(s):	4, 5
DOK:	2
Item Type:	TE
Score Points:	2
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (e.g., accessibility issues):	It will be a challenge to assess blind or low-vision students, or students with limited motor skills with regard to creating box plots.
Notes:	

The ages, in years, of the 28 members of a gym class are listed.

19, 21, 22, 27, 29, 31, 31, 31, 33, 34, 37, 38, 39, 39,  
39, 41, 43, 45, 46, 47, 49, 49, 51, 51, 52, 54, 56, 63

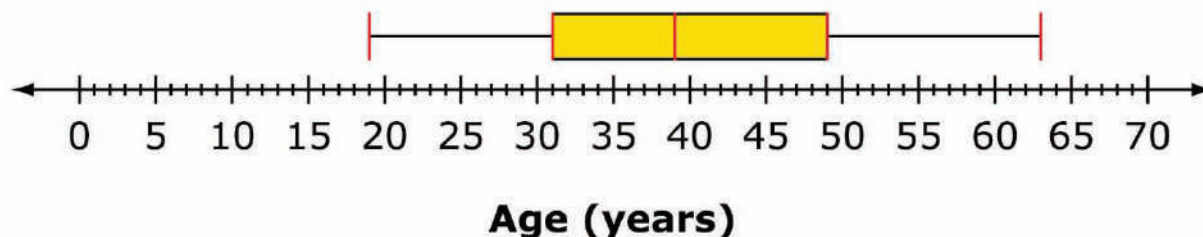
Construct a box plot of the data in the list. Click each red line in the box plot and drag it to the correct position.

### Ages of Gym Class Members



*Sample Top-Score Response:*

### **Ages of Gym Class Members**



*Scoring Rubric:*

*Responses to this item will receive 0-2 points, based on the following:*

**2 points:** The student shows a thorough understanding of how to construct a box plot. The student correctly plots the minimum, both quartiles, median, and maximum.

**1 point:** The student shows a partial understanding of how to construct a box plot. The student correctly plots 3 or 4 of the 5 values mentioned above, and the values that are not plotted correctly are only 1 away from the correct value.

**0 points:** The student shows little or no understanding of how to construct a box plot. The student correctly plots less than 3 of the 5 values, or the student plots 1 or more values that are more than 1 away from the correct value.