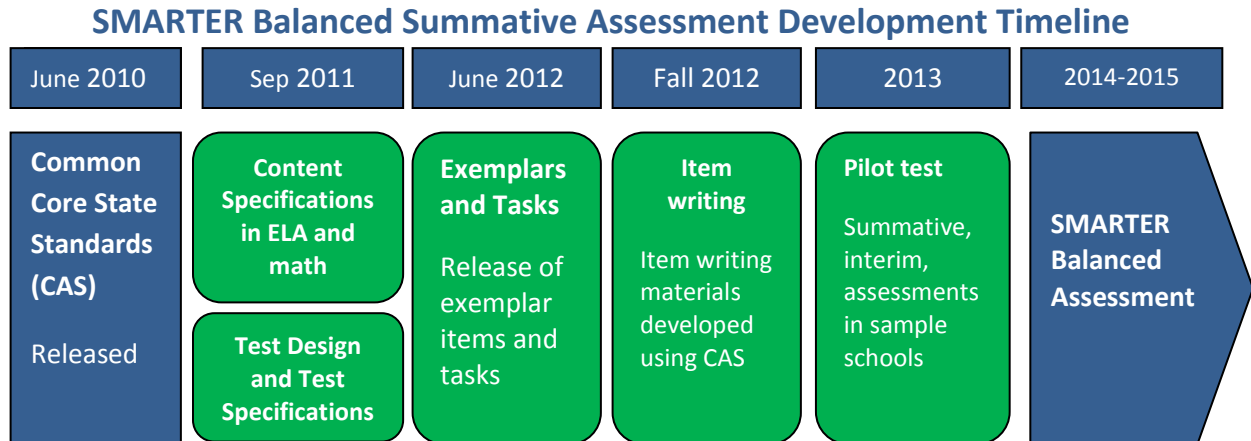# SMARTER Balanced Assessment
4ᵗʰ Grade Mathematics

As 2015 approaches and we transition from Missouri's traditional MAP 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:

SMARTER Balanced Summative Assessment Development Timeline

June 2010	Sep 2011	June 2012	Fall 2012	2013	2014-2015
Common Core State Standards (CAS) Released	**Content Specifications in ELA and math** **Test Design and Test Specifications**	**Exemplars and Tasks** Release of exemplar items and tasks	**Item writing** Item writing materials developed using CAS	**Pilot test** Summative, interim, assessments in sample schools	**SMARTER Balanced Assessment**

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

Distracter: 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.

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

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

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

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

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

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.

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

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

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

Additional Sample Items are available:

[3rd GRADE SAMPLE ELA ITEMS](#)   [4th GRADE SAMPLE ELA ITEMS](#)   [5th GRADE SAMPLE ELA ITEMS](#)   [6TH GRADE SAMPLE ELA ITEMS](#)

[7TH GRADE SAMPLE ELA ITEMS](#)   [8TH GRADE SAMPLE ELA ITEMS](#)   [9TH GRADE SAMPLE ELA ITEMS](#)

[10TH GRADE SAMPLE ELA ITEMS](#)   [11TH GRADE SAMPLE ELA ITEMS](#)

[3RD GRADE SAMPLE MATHEMATICS ITEMS](#)   [5TH GRADE SAMPLE MATHEMATICS ITEMS](#)   [6TH GRADE SAMPLE MATHEMATICS ITEMS](#)

[7TH GRADE SAMPLE MATHEMATICS ITEMS](#)   [8TH GRADE SAMPLE MATHEMATICS ITEMS](#)   [HIGH SCHOOL SAMPLE MATHEMATICS ITEMS](#)

MAT.04.SR.1.000OA.B.023 C1 TB

Sample Item Id:	MAT.04.SR.1.000OA.B.023
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 B: Gain familiarity with factors and multiples.
Content Domain:	Operations and Algebraic Thinking
Standard(S):	4.OA.4
Mathematical Practice(S):	1, 2
DOK:	1
Item Type:	SR
Score Points:	1
Difficulty:	L
Key:	C
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	

Which number is both a factor of 100 and a multiple of 5?

Ⓐ   4

Ⓑ   40

Ⓒ   50

Ⓓ 500

Key and Distractor Analysis:

A Did not consider criteria of "multiple of 5"
B Did not consider criteria of "factor of 100"
C Correct
D Multiplied 100 and 5

MAT.04.CR.2.000MD.A.062 Claim 2

|	
Sample Item Id:	MAT.04.CR.2.000MD.A.062
Grade:	04
Primary Claim:	**Claim 2: Problem Solving** 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:	Measurement and Data
Secondary Content Domain(S):	
Assessment Target(S):	2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. 2 D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). 1 I: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
Standard(S):	4.MD.3
Mathematical Practice(S):	1, 2, 3, 4, 5, 6
DOK:	2
Item Type:	CR
Score Points:	4
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	TE template: Drop Downs, Vertex-Based Quadrilaterals

Ms. McCrary wants to make a rabbit pen in a section of her lawn. Her plan for the rabbit pen includes the following:

- It will be in the shape of a rectangle.
- It will take 24 feet of fence material to make.
- Each side will be longer than 1 foot.
- The length and width will measure whole feet.

Part A

Draw 3 **different** rectangles that can each represent Ms. McCrary's rabbit pen. Be sure to use all 24 feet of fence material for each pen.

Use the grid below. Click the places where you want the corners of your rectangle to be. Draw one rectangle at a time. If you make a mistake, click on your rectangle to delete it. Continue as many times as necessary.

Key
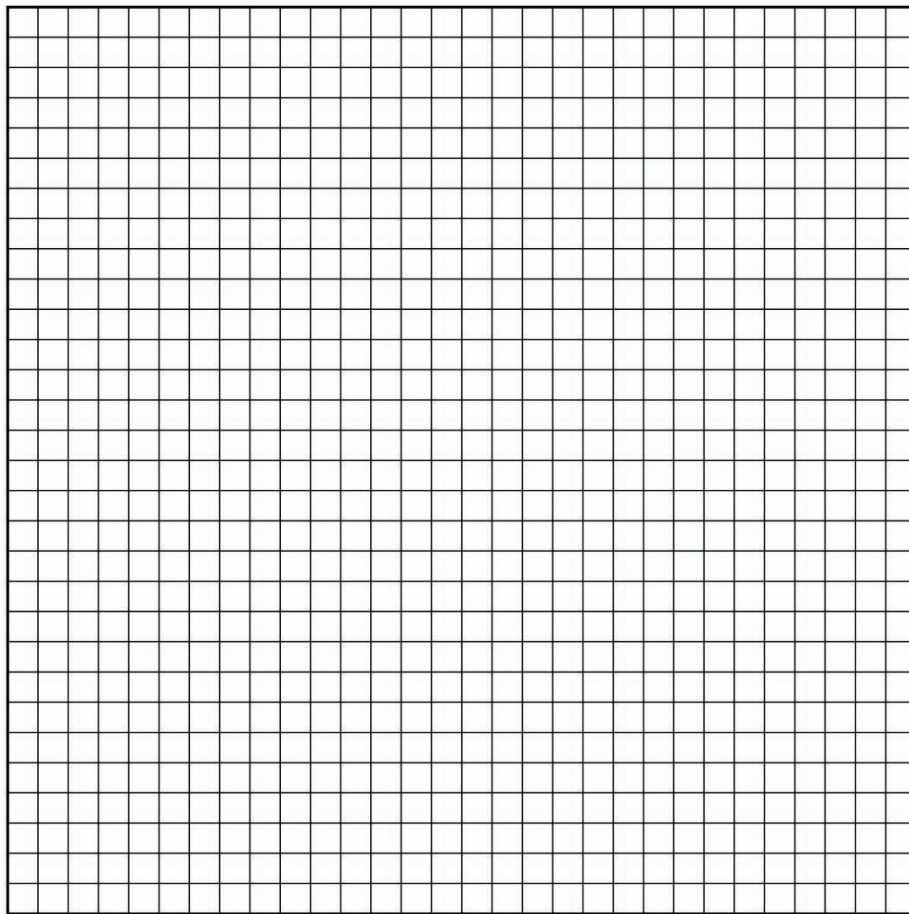
□ = 1 square foot

Use your keyboard to type the length and width of each rabbit pen you draw. Then type the area of each rabbit pen. Be sure to select the correct unit for each answer.

[Students will input length, width, and area for each rabbit pen. Students will choose unit from drop down menu.]

Pen 1

Length: ☐ ☐ (feet, square feet)

Width: ☐ ☐ (feet, square feet)

Area: ☐ ☐ (feet, square feet)

Pen 2

Length: ☐ ☐ (feet, square feet)

Width: ☐ ☐ (feet, square feet)

Area: ☐ ☐ (feet, square feet)

Pen 3

Length: ☐ ☐ (feet, square feet)

Width: ☐ ☐ (feet, square feet)

Area: ☐ ☐ (feet, square feet)

Part B

Ms. McCrary wants her rabbit to have more than 60 square feet of ground area inside the pen. She finds that if she uses the side of her house as one of the sides of the rabbit pen, she can make the rabbit pen larger.

- Draw another rectangular rabbit pen.
- Use all 24 feet of fencing for 3 sides of the pen.
- Use one side of the house for the other side of the pen.
- Make sure the ground area inside the pen is greater than 60 square feet.

Use the grid below. Click the places where you want the corners of your rectangle to be. If you make a mistake, click on your rectangle to delete it.

Side of House

Key
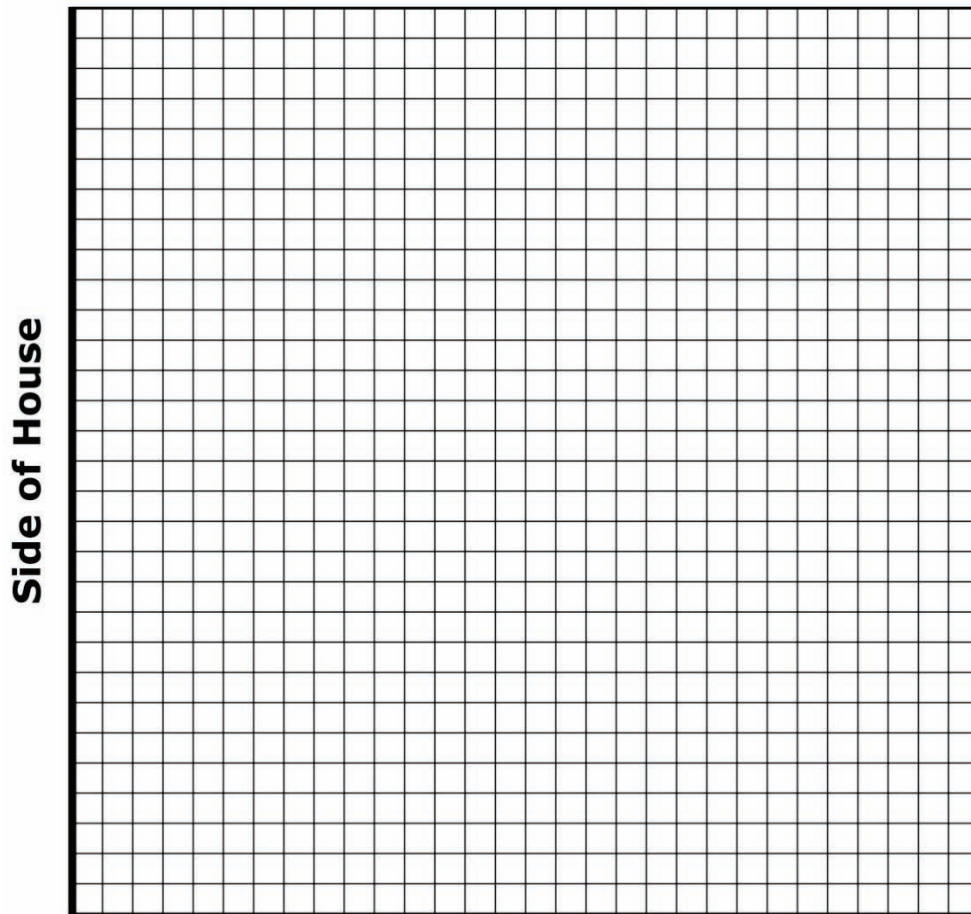
□ = 1 square foot

Use your keyboard to type the length and width of your new rabbit pen you draw. Then type the area of the rabbit pen. Be sure to select the correct unit for each answer.

Length: [   ] [   ] (feet, square feet)

Width: [   ] [   ] (feet, square feet)

Area: [   ] [   ] (feet, square feet)

Sample Top-Score Response:

Draws 3 different rectangles with a perimeter of 24 feet (2x10, 3x9, 4x8, 5x7, 6x6).

Rabbit Pen 1
Length: ___4_feet_____ Width:_____9_feet_____

Area: _____36_square feet_____

Rabbit Pen 2
Length: _____2_feet___ Width: ___10_feet_____

Area: _____20_square feet_____

Rabbit Pen 3
Length: _____3_feet_____ Width: _____9_feet_____

Area: _____27_square feet_____

Using the house as one side of the pen, draws a rectangle that has an area greater than 60 square feet.

Length: _____4_feet_____ Width: _____16_feet_____

Area: _____64_square feet_____

Scoring Rubric:

Responses to this item will receive 0-4 points, based on the following:

4 points: The student has thorough understanding of applying area and perimeter formulas for rectangles in real-world and mathematical problems. This is shown by completing the following:

- Draws 3 different rectangles with a perimeter of 24 (2x10, 3x9, 4x8, 5x7, 6x6).
- Writes the length and width of each rectangle correctly with the corresponding area (2x10=20, 3x9=27, 4x8=32, 5x7=35, 6x6=36).
- Using the house as one side of the pen, draws a rectangle that has a greater area than each of the other three that were drawn.
- Labels length, width, and area appropriately. (NOTE: The second dimension is the side opposite the house: ~~1x22=22~~, ~~2x20=40~~, ~~3x18=54~~, 4x16=64, 5x14=70, 6x12=72, 7x10=70, 8x8=64, ~~9x6=54~~, ~~10x4=40~~. Crossed-out dimensions will not yield an area greater than 60 square feet, but these could be counted for partial credit.)

3 points: The student has understanding of applying area and perimeter formulas for rectangles in real-world and mathematical problems. This is shown by completing the following: Three of the above. **OR** Draws and labels at least 2 rectangles correctly in the first and second bullets, correctly completes the additional bullets. **OR** Correctly completes the first two bullets, but draws a rectangle with the crossed-out dimensions above for the third bullet and calculates the correct area.

2 points: The student has partial understanding of applying area and perimeter formulas for rectangles in real-world and mathematical problems. This is shown by completing the following: Two of the above. **OR** Draws and labels at least 2 rectangles correctly in the first and second bullets. **OR** Draws and labels at least 1 rectangle correctly in the first and second bullets, draws a rectangle that uses 24 feet of fencing and has an area greater than 60 square feet for the third bullet.

1 point: The student has limited understanding of applying area and perimeter formulas for rectangles in real-world and mathematical problems. This is shown by completing the following: One of the above. **OR** Draws and labels 1 rectangle correctly in the first and second bullets. **OR** Draws a rectangle that uses 24 feet of fencing and has an area greater than 60 square feet for the third bullet.

0 points: Shows little or no understanding of applying area and perimeter formulas for rectangles in real-world and mathematical problems.

NOTE: The maximum number of score points that can be earned for a response that does not include labels or includes incorrect labels is 3.

TE Information:

Item Code: MAT.04.CR.2.000MD.A.062

Template: Vertex-Based Quadrilaterals

Interaction Space Parameters:

- A. False (do not use default grid)
- B. Grid bottom-left is 0,0, top-right is 30,30; grid increment is one unit; do not display axes
- C. True (grid is visible)
- D. False (no graphic overlay)
- E. True (limit vertices to four)

Scoring Data:

1. True (consider this characteristic): rectangles
2. False (do not consider coordinates)
3. False (do not consider side lengths)
4. True (consider this characteristic); perimeter=24; tolerance=0
5. False (do not consider area)

TE Information:

Item Code: MAT.04.CR.2.000MD.A.062

Template: Drop Downs

Interaction Space Parameters:
- A. 12 menus
- B. All menus: [feet, square feet]; default = feet

Scoring Data:
Menu 1 = feet
Menu 2 = feet
Menu 3 = square feet
Menu 4 = feet
Menu 5 = feet
Menu 6 = square feet
Menu 7 = feet
Menu 8 = feet
Menu 9 = square feet
Menu 10 = feet
Menu 11 = feet
Menu 12 = square feet

Scoring Rule: NumErrors (0 Errors = 1)

MAT.04.CR.2.000MD.A.434 Claim 2

Sample Item Id:	MAT.04.CR.2.000MD.A.434
Grade:	04
Primary Claim:	**Claim 2: Problem Solving** 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:	Measurement and Data
Secondary Content Domain(S):	Operations and Algebraic Thinking
Assessment Target(S):	2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. 2 C: Identify results in the context of a situation. 1 I: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. 1 A: Use the four operations with whole numbers to solve problems.
Standard(S):	4.MD.1, 4.OA.3, 3.OA.7, 2.NBT.4
Mathematical Practice(S):	1, 2, 6, 8
DOK:	2
Item Type:	CR
Score Points:	3
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Multi-part item

Spencer uses his hand to measure different lengths. He knows that the length of his hand is 6 inches, as shown below.
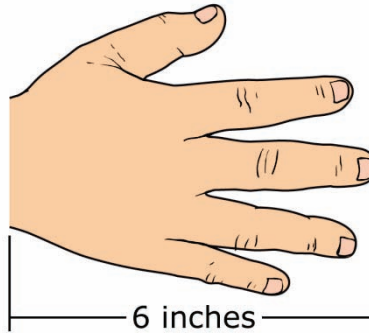
6 inches

The table below shows the total number of hand lengths that Spencer used to measure each object.

Measuring Objects

Object	Number of Hand Lengths	Number of Inches	Number of Feet
Computer monitor	4		
Picture frame	6		
Classroom door	16		

Complete the table above. Click in a box and then type the correct number of inches or feet for each number of Spencer's hand lengths.

Use Spencer's measurement to identify each object below that has a length that is <u>greater</u> than 1 yard.

Computer monitor	Picture frame	Classroom door

[Click on each object to select it.]

Sample Top-Score Response:

Measuring Objects

Object	Number of Hand Lengths	Number of Inches	Number of Feet
Computer monitor	4	24	2
Picture frame	6	36	3
Classroom door	16	96	8

Student selects "Classroom door."

Computer monitor	Picture frame	Classroom door

Scoring Rubric:

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

3 points: The student has a thorough understanding of converting measurement units within one system of units. The student completed the conversion table without error and chose "Classroom door" as the only object with a length that is greater than 1 yard.

2 points: The student has a good understanding of converting measurement units within one system of units. The student completed the conversion table with an error made with one object (the error may be carried through on that single row) and chose "Classroom door" as the only object with a length that is greater than 1 yard. **OR** The student made no errors in the table conversions, but identified the picture frame incorrectly (not paying attention to "greater than" 1 yard).

1 point: The student has a partial understanding of converting measurement units within one system of units. The student was only able to convert hands to inches in the table, but not to yards. **OR** The student made the same error consistently in converting hands to inches (e.g., multiplies each hand length by 12 instead of 6), but correctly converted inches to yards for at least two of the objects. **OR** The student correctly converted only one row of the table and chose "Classroom door" in the last part.

0 points: The student has a limited or no understanding of converting measurement units within one system of units. The student did not complete any part of the table correctly. Without correct conversions in the table, answering "Classroom door" is not enough to earn any points.

MAT.04.CR.2.000MD.D.481 Claim 2

Sample Item Id:	MAT.04.CR.2.000MD.D.481
Grade:	04
Primary Claim:	**Claim 2: Problem Solving** 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:	Measurement and Data
Secondary Content Domain(S):	Number and Operations—Fractions
Assessment Target(S):	2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. 2 D: Identify important quantities in a practical situation and map their relationships. 1 J: Represent and interpret data. 1G: Build fractions from unit fractions by applying and extending previous understandings of operations with whole numbers.
Standard(S):	4.MD.4, 4.NF.3
Mathematical Practice(S):	1, 2, 5, 6, 8
DOK:	2
Item Type:	CR
Score Points:	1
Difficulty:	L
Key:	$1\frac{2}{8}$ cups or equivalent mixed number
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Technology-enabled item (video explanation of key term: evaporation)

Click on the play button to view a video about evaporation.

Evaporation_Animation.mov

Judy conducted an experiment. She put a total of $2\frac{1}{8}$ cups of water into an empty container. Then, Judy recorded the amount of water that evaporated from the container each day for four days.

The line plot below shows the amount of water that evaporated from the container on each of the four days.

Amount of Water That Evaporated Each Day (cups)
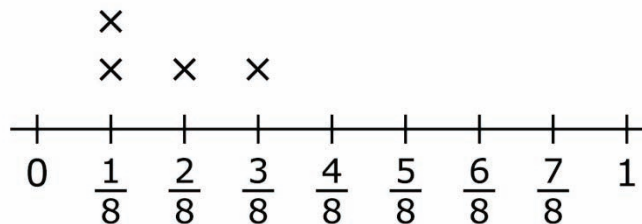
Each × represents 1 day.

What mixed number represents the amount of water left in the container at the end of the fourth day?

$\boxed{}\dfrac{\boxed{}}{\boxed{}}$ Cups

MAT.04.CR.2.000NF.A.209 Claim 2

Sample Item Id:	MAT.04.CR.2.000NF.A.209
Grade:	04
Primary Claim:	**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.
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:	Number and Operations—Fractions
Secondary Content Domain(S):	
Assessment Target(S):	2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. 1 G: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
Standard(S):	4.NF.3
Mathematical Practice(S):	1, 2, 6, 7, 8
DOK:	3
Item Type:	CR
Score Points:	2
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	http://www.tpc.tulane.edu/public_types.html
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Multi-part task

A zookeeper made this line plot to show the ages of all the baboons at a zoo.

Baboon Ages (in years)
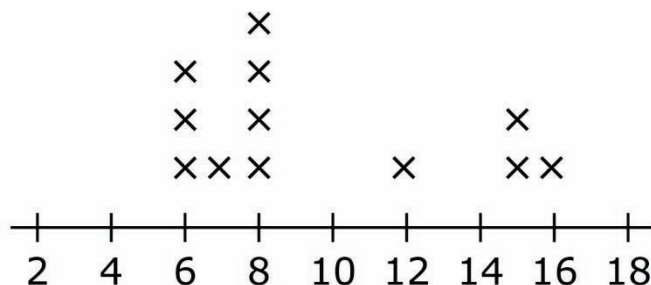
Part A

What fraction of the baboons at this zoo are eight years old?

$$\frac{\square}{\square}$$

Part B

What fraction of all the baboons at this zoo are **<u>not</u>** 8 years old?

$$\frac{\square}{\square}$$

Sample Top-Score Response:

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

Part A

$\frac{4}{12}$ or $\frac{1}{3}$

Part B

$\frac{8}{12}$ or $\frac{2}{3}$

MAT.04.CR.2.000OA.A.511 Claim 2

Sample Item Id:	MAT.04.CR.2.000OA.A.511
Grade:	04
Primary Claim:	**Claim 2: Problem Solving** 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:	Operations and Algebraic Thinking
Secondary Content Domain(S):	Numbers and Operations in Base Ten
Assessment Target(S):	2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. 2 C: Interpret results in the context of a situation. 1 A: Use the four operations with whole numbers to solve problems. 1 E: Use place-value understanding and properties of operations to perform multi-digit arithmetic.
Standard(S):	4.NBT.4, 4.OA.3
Mathematical Practice(S):	1, 2, 3, 4, 5, 6
DOK:	2
Item Type:	CR
Score Points:	1
Difficulty:	L
Key:	See Sample Top-Score Response.
Stimulus/Source:	http://www.sciencedaily.com/releases/1998/11/981126102802.htm
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	

A scientist watched a group of squirrels collect acorns. Each squirrel **ate** some of the collected acorns and **stored** the rest of the collected acorns.

The table below shows data for three squirrels in the group. The number of acorns each squirrel **stored** is missing from the table. Fill in the data that are missing from the table.

Acorns Collected by Squirrels

| Squirrel	Number Eaten	Number Stored	Total Number Collected
X	40		100
Y	50		105
Z	35		95

Sample Top-Score Response:

The student completes the table with 60 for Squirrel X, 55 for Squirrel Y, and 60 for Squirrel Z.

MAT.04.ER.2.000MD.A.049 Claim 2

Sample Item Id:	MAT.04.ER.2.000MD.A.049
Grade:	04
Primary Claim:	**Claim 2: Problem Solving** 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:	Measurement and Data
Secondary Content Domain(S):	
Assessment Target(S):	2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. 2 B: Select and use appropriate tools strategically. 1 K: Geometric measurement: understand concepts of angle and measure angles.
Standard(S):	4.MD.6, 4.MD.7
Mathematical Practice(S):	1, 2, 4, 5, 6
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:	Multi-part item; requires use of online protractor. First two response boxes allow up to 3 numeric entries and no degree symbol.

Look at the figure below.
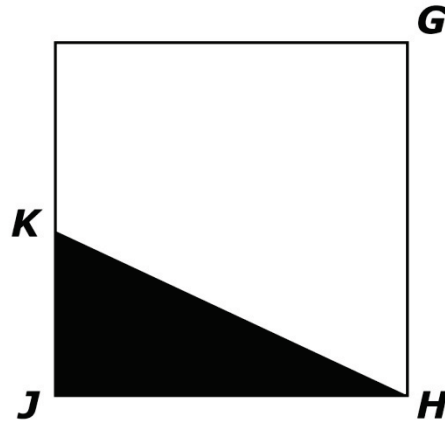
Use the online protractor to measure angle *KHJ* in degrees.

Click in the box and then type the measure of angle *KHJ*.

[ ] degrees

The measure of angle *GHJ* is 90 degrees. Use the measure of angle *GHJ* to find the measure of angle *GHK*, in degrees.

[ ] degrees

In the space below, use pictures, numbers, and/or words to show how you found the measure of angle *GHK*.

Sample Top-Score Response:

25

65

I know that the measure of angles *KHJ* and *GHK* should add up to be the same measure as angle *GHJ*. If angle *GHJ* has a measure of 90°, then the other two angles together have to have that measure. I subtracted 25° from 90° to get 65°. I could also use these equations: 90 − 25 = 65 or 65 + 25 = 90.

Scoring Rubric:

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

3 points: Student has thorough understanding of measuring angles in whole-number degrees using a protractor and recognizing angle measure as additive. The student completes the following:
- Writes 25 for the measure of angle *KHJ* (+/- 2 degrees).
- Writes 65 for the measure of angle *GHJ* (+/- 2 degrees).
- Writes a thorough and correct explanation of reasoning, as shown in Sample Top-Score Response.

2 points: Student has partial understanding of measuring angles in whole-number degrees using a protractor and recognizing angle measure as additive. The student completes the first 2 bullets, but provides an explanation of reasoning that is incomplete or incorrect. **OR** The student makes a mistake in the first bullet, writes a correct measure for angle *GHJ* incorporating this incorrect angle measure, and provides a thorough and correct explanation of reasoning.

1 point: The student has limited understanding of measuring angles in whole-number degrees using a protractor and recognizing angle measure as additive. The student correctly completes only the first bullet.

0 points: Shows little or no understanding of measuring angles in whole-number degrees using a protractor and recognizing angle measure as additive.

Smarter Balanced
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MAT.04.ER.2.000MD.B.510 Claim 2

Sample Item Id:	MAT.04.ER.2.000MD.B.510
Grade:	04
Primary Claim:	**Claim 2: Problem Solving** 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:	Measurement and Data
Secondary Content Domain(S):	Number and Operations—Fractions
Assessment Target(S):	2B: Select and use appropriate tools strategically. 1K: Geometric measurement: understand concepts of angle and measure angles. 1G: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. 1I: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. 1L: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
Standard(S):	4.MD.6, 4.MD.2, 4.NF.3, 4.G.2, 3.MD.8, 2.MD.1
Mathematical Practice(S):	1, 4, 5, 6
DOK:	2
Item Type:	ER
Score Points:	5
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	A protractor and a standard inch ruler are required.
Notes:	Part of PT set

Use your protractor and ruler to help you complete this problem. Measure angles to the nearest degree. Measure lengths to the nearest $\frac{1}{4}$ inch.

Part A

Triangle P is shown below. The measure of each angle of Triangle P is the same. The length of each side of Triangle P is the same.
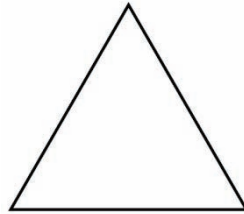
Label one side of Triangle P with its side length, in inches.

Label one angle with its measure, in degrees.

Triangle Q is shown below.
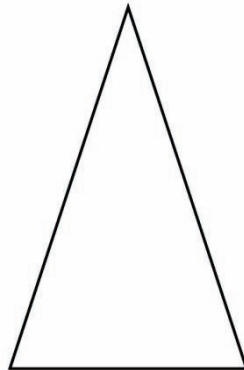
Label each side of Triangle Q with its side length, in inches.

Part B

What is the difference between the perimeter of Triangle Q and the perimeter of Triangle P? Use numbers and words to show how you found your answer.

Sample Top-Score Response:

Part A

The student labels one side of Triangle P as $1\frac{1}{4}$ inches. The student labels any angle in Triangle P as 60°. The student labels the sides of Triangle Q as 2 inches, 2 inches, and $1\frac{1}{4}$ inches.

Part B: The difference between the perimeters is $1\frac{2}{4}$ inches (or equivalent mixed number).

$$1\frac{1}{4}+1\frac{1}{4}+1\frac{1}{4}=3\frac{3}{4} \text{ inches (Perimeter of Triangle P)}$$

$$2+2+1\frac{1}{4}=5\frac{1}{4}\text{inches (Perimeter of Triangle Q)}$$

$$5\frac{1}{4}\text{inches}-3\frac{3}{4}\text{ inches}=$$

$$\frac{21}{4}\text{inches}-\frac{15}{4}\text{ inches}=\frac{6}{4}\text{ inches (This is the same as }1\frac{2}{4}\text{ inches.)}$$

Scoring Rubric:

Responses to this item will receive 0-5 points, based on the following:

5 points: The student has a thorough understanding of measuring angles to whole-number degrees, measuring line segments to the nearest quarter inch, finding perimeters, and subtracting mixed numbers. The student completed *Part A* and *Part B* without error and provided a complete explanation of sound mathematical reasoning.

4 points: The student has a good understanding of measuring angles to whole-number degrees, measuring line segments to the nearest quarter inch, finding perimeters, and subtracting mixed numbers. The student completed *Part A* and *Part B* without error, but provided an explanation of reasoning in *Part B* that was incomplete or did not make sense. **OR** The student made 1 error* in *Part A*, but completed *Part B* correctly (incorporating error from *Part A*, if applicable), providing a complete explanation of sound mathematical reasoning. **OR** The student completed *Part A* without error, made a minor error in finding difference between perimeters, but provided an explanation in *Part B* that showed a general understanding of how to find perimeters and differences, using mixed numbers.

3 points: The student has partial understanding of measuring angles to whole-number

degrees, measuring line segments to the nearest quarter inch, finding perimeters, and subtracting mixed numbers. The student completed *Part A* without error, but did not provide a correct answer or explanation of reasoning in *Part B*. **OR** The student made 2 errors in *Part A,* but completed *Part B* correctly (incorporating errors from *Part A*, if applicable), providing a complete explanation of sound mathematical reasoning.

2 points: The student has partial understanding of measuring angles to whole-number degrees, measuring line segments to the nearest quarter inch, finding perimeters, and subtracting mixed numbers. The student completed *Part A* with 1 error and did not provide a correct answer or explanation of reasoning in *Part B*. **OR** The student made 2 errors in *Part A,* completed *Part B* correctly (incorporating errors from *Part A*, if applicable), but provided an explanation of reasoning in *Part B* that was incomplete or did not make sense.

1 point: The student has little understanding of measuring angles to whole-number degrees, measuring line segments to the nearest quarter inch, finding perimeters, and subtracting mixed numbers. The student completed *Part A* with 2 errors and did not provide a correct answer or explanation of reasoning in *Part B*.

0 points: The student has little understanding of measuring angles to whole-number degrees, measuring line segments to the nearest quarter inch, finding perimeters, and subtracting mixed numbers. The student did not complete any of the parts of the item correctly.

*Note: Only one error in each labeling task in *Part A* should be counted against the student. For example, when labeling Triangle Q, the student labels side lengths of 2 inches, 3 inches, and 1 inch. Even though the student mislabeled two sides, for scoring purposes, this should be considered 1 error.

MAT.04.ER.2.000OA.C.509 Claim 2

Sample Item Id:	MAT.04.ER.2.000OA.C.509
Grade:	04
Primary Claim:	**Claim 2: Problem Solving** 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:	Operations and Algebraic Thinking
Secondary Content Domain(S):	Numbers and Operations in Base Ten
Assessment Target(S):	2C: Interpret results in the context of a situation. 2D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). 1A: Use the four operations with whole numbers to solve problems. 1E: Use place-value understanding and properties of operations to perform multi-digit arithmetic.
Standard(S):	4.OA.3, 4.NBT.5, 4.NBT.6
Mathematical Practice(S):	1, 2, 4, 6, 7
DOK:	2
Item Type:	ER
Score Points:	2
Difficulty:	H
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Part of PT set

Mr. Torres sold a total of 30 boxes of sports cards at his store on Monday. These boxes contained only baseball cards and football cards.

- Each box contained 25 sports cards.
- He earned $3 for each sports card he sold.
- He earned a total of $1134 from the football cards he sold.

What amount of money did Mr. Torres earn from the baseball

cards he sold? In the space below, use pictures, numbers, and/or words to show how you got your answer.

Sample Top-Score Response:

$1116

25	25	25	25	25	25	25	25	25	25
25	25	25	25	25	25	25	25	25	25
25	25	25	25	25	25	25	25	25	25

30 boxes × 25 cards = 750 cards in all the boxes together

$750 \times 3 = 2250$ The total amount earned from all cards is $2250.

$2250 - 1134 = 1116$ The total amount earned ($2250) minus the amount earned from football cards ($1134) is the amount earned from baseball cards ($1116).

Scoring Rubric:

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

2 points: Student has a thorough understanding of how to solve multistep word problems with whole numbers using multiplication and division. The student correctly answers $1116 and provides a thorough explanation of reasoning that makes sense with the answer given.

1 point: Student has a partial understanding of how to solve multistep word problems with whole numbers using multiplication and division. The student correctly answers $1116 but provides an explanation of reasoning that is incomplete or flawed. **OR** The student knows operations/steps needed to solve the problem but makes an error in computation, carries this error out, and provides a thorough explanation of reasoning that makes sense with the answer given.

0 points: Student has little or no understanding of how to solve multistep word problems with whole numbers using multiplication and division. The student incorrectly solves the problem and provides no explanation of reasoning or an explanation of reasoning that does not make sense to the answer given.

MAT.04.ER.3.000NF.F.210 Claim 3

Sample Item Id:	MAT.04.ER.3.000NF.F.210
Grade:	04
Primary Claim:	**Claim 3: Communicating Reasoning** 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:	Number and Operations—Fractions
Secondary Content Domain(S):	
Assessment Target(S):	3 F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions. 1 F: Extend understanding of fraction equivalence and ordering.
Standard(S):	4.NF.1
Mathematical Practice(S):	1, 2, 3, 4, 7
DOK:	2
Item Type:	ER
Score Points:	4
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Part of PT set

James and Benito each have a bag of pencils. Some pencils are sharpened and some are not.

James' bag of pencils has:

- A total of 5 pencils
- Exactly 2 sharpened pencils

Benito's bag of pencils has:

- A total of 10 pencils
- Exactly __ sharpened pencils

Benito has the same fraction of sharpened pencils in his bag as James has in his bag.

Part A

Exactly how many of Benito's pencils are sharpened?

Part B

In the space below, draw pictures of the pencils in James' bag and the pencils in Benito's bag. Use numbers to show the fractions of sharpened and unsharpened pencils in each bag.

James' Bag
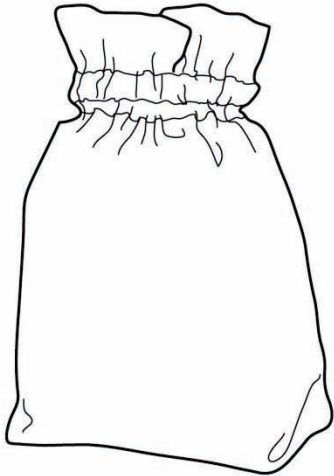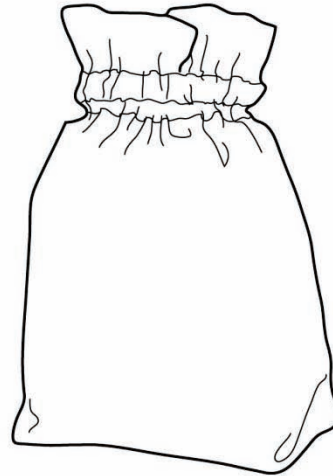
Fraction Sharpened:

Fraction Unsharpened:

Benito's Bag

Fraction Sharpened:

Fraction Unsharpened:

Part C

Benito's bag has a total of 10 pencils inside, and James' bag has a total of 5 pencils inside. How can the **fraction** of sharpened pencils in James' bag be the same as the fraction of sharpened pencils in Benito's bag, even though they have a different number of pencils? Explain your answer using both numbers and words.

Sample Top-Score Response:

Part A: 4

Part B:

James' Bag
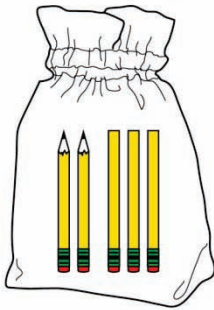
Fraction Sharpened: $\frac{2}{5}$

Fraction Unsharpened: $\frac{3}{5}$

Benito's Bag
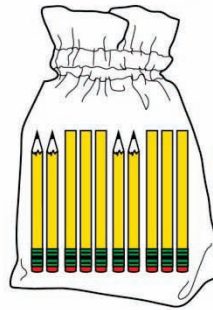
Fraction Sharpened: $\frac{4}{10}$ (or $\frac{2}{5}$)

Fraction Unsharpened: $\frac{6}{10}$ (or $\frac{3}{5}$)

Part C:
A fraction describes a part out of the whole group. The fraction of sharpened

pencils in James' bag is $\frac{2}{5}$ or 2 out of 5 in the group. This is the same as the fraction of sharpened pencils in Benito's bag because the total number of pencils is 2 times more and the number of sharpened pencils is also 2 times more. When I divide Benito's pencils into fifths (like in James' bag), I see that there are two sets of fifths. Each set has 2 out of 5 pencils sharpened. So, even though the number of sharpened pencils in Benito's bag is 4, the fraction out of the whole group is the same as in James' bag.

Scoring Rubric:

Responses to this item will receive 0-4 points, based on the following:

4 points: The student has a thorough understanding of equivalent fractions and modeling equivalent fractions with different denominators. The student correctly answered 4 for *Part A.* The student correctly modeled the fraction of sharpened pencils in each bag, along with including the correct fractions below each bag in *Part B.* The student described informally how equivalent fractions could be found by multiplying *a/b* by *n/n* in *Part C.*

3 points: The student has a good understanding of equivalent fractions and modeling equivalent fractions with different denominators. The student correctly answered 4 for *Part A.* The student correctly modeled the fraction of sharpened pencils in each bag, along with including the correct fractions below each bag in *Part B.* The student's explanation may be incomplete or flawed when describing how equivalent fractions could be found by multiplying *a/b* by *n/n* in *Part C.* **OR** The student proceeded with a fraction other than 2/5 for James' bag but correctly completed *Parts A*, *B*, and *C* accordingly.

2 points: The student has a partial understanding of equivalent fractions and modeling equivalent fractions with different denominators. The student correctly answered 4 for *Part A.* The student correctly modeled most of the fractions of sharpened pencils in each bag, along with including corresponding fractions below each bag in *Part B.* The student made no attempt to explain how equivalent fractions could be found by multiplying *a/b* by *n/n* in *Part C.* **OR** The student proceeded with a number other than 4 in *Part A*, but answered *Part B* correctly using the other number in corresponding fractions, and *Part C* is incomplete. **OR** The student provided a good description of how equivalent fractions could be found by multiplying *a/b* by *n/n* in *Part C*, but left other parts of the problem incomplete.

1 point: The student has little understanding of equivalent fractions and modeling equivalent fractions with different denominators. The student was able to complete part of the task correctly, but not enough to demonstrate knowledge of fractions or how similar fractions are related. **OR** The student proceeded with a fraction other than 2/5 for James' bag and only answered 2 parts correctly.

0 points: The student has no understanding of equivalent fractions and modeling equivalent fractions with different denominators. The student answered all parts incorrectly.

MAT.04.ER.3.000OA.A.512 Claim 3

Sample Item Id:	MAT.04.ER.3.000OA.A.512
Grade:	04
Primary Claim:	**Claim 3: Communicating Reasoning** 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:	Operations and Algebraic Thinking
Secondary Content Domain(S):	
Assessment Target(S):	3A: Test propositions or conjectures with specific examples. 1B: Gain familiarity with factors and multiples.
Standard(S):	4.OA.4
Mathematical Practice(S):	1, 2, 3, 8
DOK:	2
Item Type:	ER
Score Points:	2
Difficulty:	H
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Part of PT set

Peter made the statement shown below.

"The number 32 is a multiple of 8. That means all of the factors of 8 are also factors of 32."

Is Peter's statement correct? In the space below, use numbers and words to explain why or why not.

Sample Top-Score Response:

Peter's statement is correct. The factors of 8 are 1, 2, 4, and 8. The factors of 32 are 1, 2, 4, 8, 16, and 32.

Scoring Rubric:

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

2 points: The student has a thorough understanding of the relationship between factors and multiples of numbers. The student correctly answers both parts and provides an explanation of reasoning that is thorough and correct for each part.

1 point: The student has a partial understanding of the relationship between factors and multiples of numbers. The student indicates that Peter's statement is correct, but provides an explanation of reasoning that is incomplete or contains a flaw.

0 points: The student has no understanding of the relationship between factors and multiples of numbers. The student does not complete any part correctly. Identifying Peter's statement as correct is not sufficient, by itself, to earn any credit.

MAT.04.ER.3.00NBT.E.031 Claim 3

Sample Item Id:	MAT.04.ER.3.00NBT.E.031
Grade:	04
Primary Claim:	**Claim 3: Communicating Reasoning** 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:	Numbers and Operations in Base Ten
Secondary Content Domain(S):	
Assessment Target(S):	3 E: Distinguish correct logic or reasoning from that which is flawed, and, if there is a flaw in the argument, explain what it is. 1 D: Generalize place value understanding for multi-digit whole numbers
Standard(S):	4.NBT.3
Mathematical Practice(S):	2, 3
DOK:	3
Item Type:	ER
Score Points:	2
Difficulty:	H
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Part of PT item set

A teacher asked her students to use estimation to decide if the sum of the problem below is closer to 4,000 or 5,000.

496 + 1,404 + 2,605 + 489 =

One student replied that she thinks the sum is closer to 4,000. She used the estimation shown below to support her reasoning.

Is the student's reasoning correct? In the space below, use numbers and words to explain why or why not. If the student's reasoning is not correct, explain how she should have estimated.

Sample Top-Score Response:

The student's reasoning is incorrect. She was rounding to the thousands place. She had 2 numbers that were less than 500, and she decided to round these numbers to 0. This is like saying these numbers were not in the problem at all. She needs to account for these two numbers. The sum of 496 and 489 is very close to 1,000. If I break 1,404 and 2,605 into smaller numbers, I can combine 404 and 605 for a sum of about 1,000. Then I can combine the 1,000 and 2,000 from 1,404 and 2,605 for a sum of 3,000. When I add all of these numbers (1,000 + 1,000 + 3,000), the sum is 5,000, not 4,000.

Scoring Rubric:

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

2 points: Student has a thorough understanding of how to estimate and how improper estimation can lead to flawed reasoning. Student states that the student in the scenario used reasoning that is incorrect and provides reasoning that shows a better estimation strategy.

1 point: Student has a partial understanding of how to estimate and how improper estimation can lead to flawed reasoning. Student states that the student in the scenario used reasoning that is incorrect, but alternate estimation strategy is also flawed.

0 points: Student has little or no understanding of how to estimate and how improper estimation can lead to flawed reasoning. Student states that the student in the scenario used reasoning that is correct.

MAT.04.ER.3.00NBT.E.037 Claim 3

Sample Item ID:	MAT.04.ER.3.00NBT.E.037
Grade:	04
Primary Claim:	**Claim 3: Communicating Reasoning** 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:	Numbers and Operations in Base Ten
Secondary Content Domain(s):	
Assessment Target(s):	3 E: Distinguish correct logic or reasoning from that which is flawed, and, if there is a flaw in the argument, explain what it is. 1 E: Use place-value understanding and properties of operations to perform multi-digit arithmetic.
Standard(s):	4.NBT.5
Mathematical Practice(s):	1, 2, 3, 4, 5
DOK:	3
Item Type:	ER
Score Points:	2
Difficulty:	H
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-specific attributes (e.g., accessibility issues):	
Notes:	Part of a PT item set

Pablo solved a multiplication problem using two different methods. He made a mistake in either Method W or Method Z.

Method W	Method Z
23 × 49	23 × 49

Method W

23 × 49

20 × 9 =   180
  3 × 9 =   27
20 × 4 =   80
  3 × 4 = + 12
            299

Method Z

Area Model

$$40 \qquad + 9$$

	40	+ 9
20	800	180
+ 3	120	27

Rectangle Sections

$$\overset{1}{800}$$
120
180
+ 27
_____
1,127

Identify the method where Pablo made a mistake and explain what he should do to correct it.

Sample Top-Score Response:

Pablo made a mistake when using Method W. He should have multiplied 20 and 3 by 40 instead of by 4. He made a place-value error. Multiplying by 40 instead of by 4 would have resulted in the same answer as when he used Method Z (1,127).

Scoring Rubric:

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

2 points: The student has a thorough understanding of how to multiply multi-digit whole numbers using more than one strategy to verify answers. The student indicates the place-value error in Method W and explains how to correct the error.

1 point: The student has a partial understanding of how to multiply multi-digit whole numbers using more than one strategy to verify answers. The student indicates the place-value error in Method W, but does not fully explain how to correct the error.

0 points: The student has little or no understanding of how to multiply multi-digit whole numbers using more than one strategy to verify answers. The student indicates that the error occurred in Method W, but does not identify the error correctly and includes an explanation that does not make sense mathematically. **OR** The student indicates an error in Method Z that does not exist.

MAT.04.PT.4.ARTPJ.A.155 Claim 4

|	
Sample Item Id:	MAT.04.PT.4.ARTPJ.A.155
Title:	Art Project Fractions
Grade:	03
Primary Claim:	**Claim 4: Modeling and Data Analysis** 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
Primary Content Domain	**Numbers and Operations—Fractions**
Secondary Content Domain(S):	Measurement and Data
Assessment Target(S):	4 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. 1 F: Extend understanding of fraction equivalence and ordering. 1G: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
Standard(S):	4.NF.1, 4.NF.2, 4.NF.3, 4.NF.4, 3.NF.1, 3.NF.2, 3.NF.3, 3.MD.6, 3.MD.7
Mathematical Practice(S):	1, 2, 3, 4, 5, 6
DOK:	3
Item Type:	PT
Score Points:	14
Difficulty:	M
How This Task Addresses The "Sufficient Evidence" For This Claim:	The student is given directions to create a design and then asked to construct and use mathematical models within the design to interpret and solve problems.
Target-Specific Attributes (E.G., Accessibility Issues):	Accommodations may be necessary for students who have fine-motor-skill challenges or are visually challenged.
Stimulus/Source:	Pattern blocks
Notes:	Multi-part performance task
Task Overview:	Students are asked to create a design using pattern blocks, figure the unit fraction each block represents if 1 yellow hexagon represents one whole, combine each group of unit fractions, make comparisons among the fractions, and create a design representing a specific value based on what was learned about the shapes and the unit fractions they represent.
Teacher Preparation/ Resource Requirements:	Students should have access to pattern blocks. (Only yellow hexagons, red trapezoids, blue rhombi, and green triangles are needed. Tan rhombi and orange squares are not needed.) http://www.aug.edu/~lcrawford/Tools/pattern_blocks.pdf has cutout pages of pattern blocks. These will need to be prepared in advance. Each student should get a **minimum** of 1 yellow hexagon, 2 red trapezoids, 3 blue rhombi, and 6

	green triangles. Plain white paper or 1-inch isometric dot paper is also needed. http://www.printablepaper.net/preview/IsometricDots-1inch has a free downloadable version of the isometric dot paper.
Teacher Responsibilities During Administration:	Monitor individual work; hand out and collect materials as required for each session.
Time Requirements:	Two sessions totaling no more than 120 minutes. Each part of this task should be done in sequential order.

The Task:

Session 1

Art Project with Pattern Blocks

Use the pattern blocks that your teacher gives you to help you with this task. There are five parts to this task, and you must work through them in order.

Be sure you have the following pattern blocks before you begin.
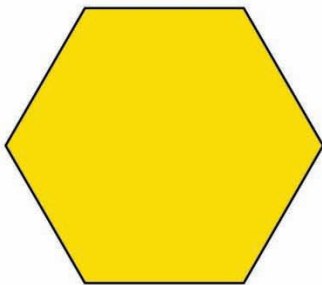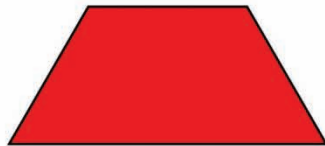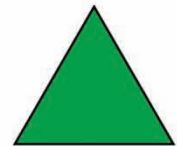
Yellow Hexagon   **Red Trapezoid**   **Blue Rhombus**   **Green Triangle**

Part A

Each yellow hexagon pattern block represents one whole. The other colored pattern blocks represent a fraction of the whole yellow hexagon.

Write the fraction of the yellow hexagon each colored shape represents.

1 yellow hexagon represents ____1____ yellow hexagon.

1 red trapezoid represents _____ yellow hexagon.

1 blue rhombus represents _____ yellow hexagon.

1 green triangle represents _____ yellow hexagon.

Part B

Use the pattern block shapes to make a picture for an art project.

These rules for making your picture must be followed:

- At least one of each shape must be included in the picture.
- The shapes may touch the edges of other shapes.
- The shapes must <u>not</u> overlap each other.

Click on a shape and then click in the space below to put a shape in the picture. Continue as many times as necessary.
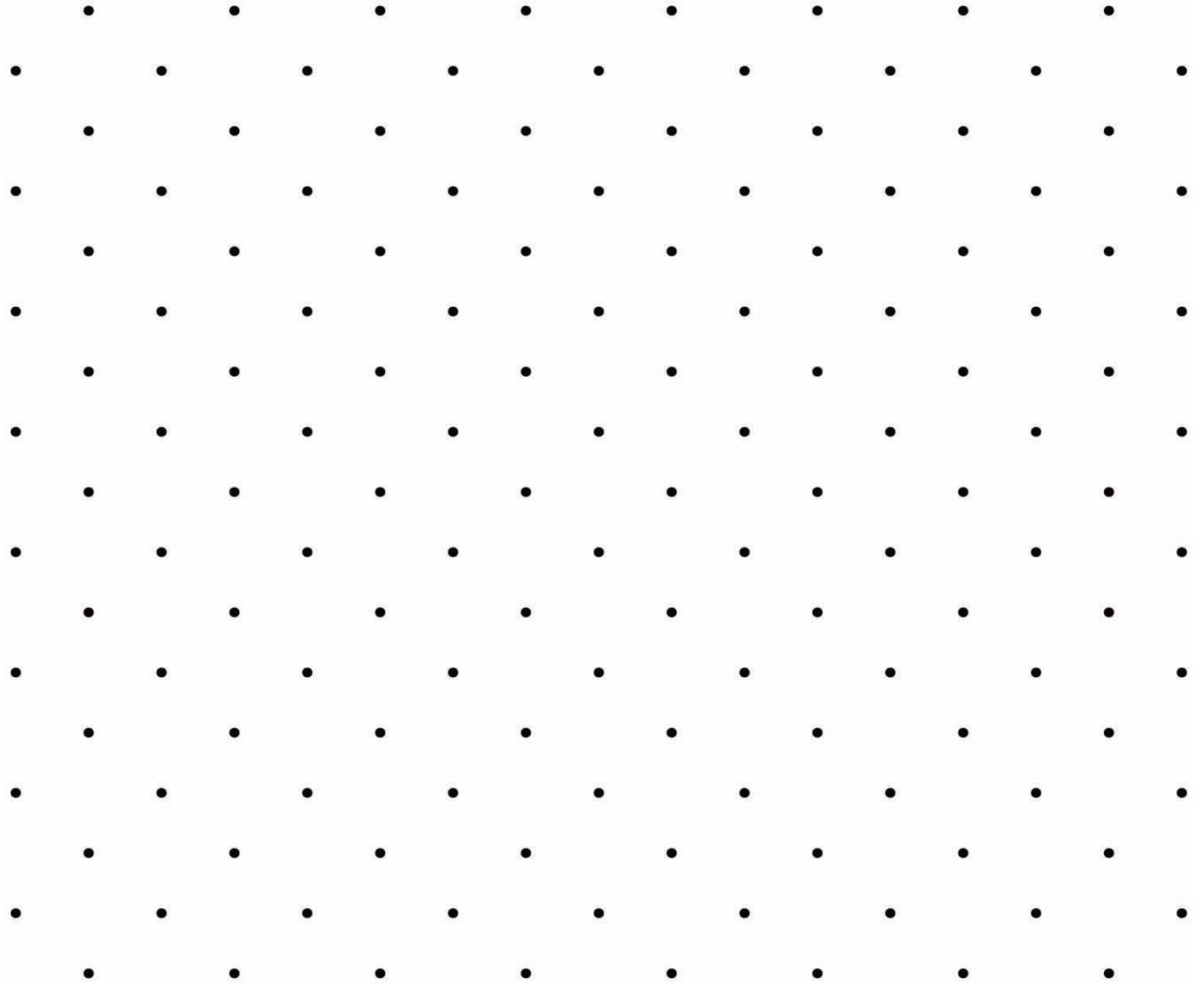
Yellow Hexagon   **Red Trapezoid**   **Blue Rhombus**   **Green Triangle**
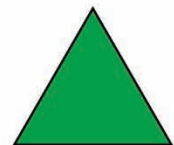
Click on the turn button if you need to turn your shape.

Click on the trash can and then click on the shape if you want to delete a shape.

Part C

Count all the colored shapes you used in your picture. Write the total number of each colored shape you used in the picture.

_____ yellow hexagon(s)   _____ blue rhombus (rhombi)

_____ red trapezoid(s)   _____ green triangle(s)

When all of the shapes of one color are combined, they represent a fraction or a mixed number of yellow hexagons. Complete the sentences below showing these fractions or mixed numbers.

_____ red trapezoid(s) represents _____yellow hexagon(s).

_____ blue rhombus (rhombi) represents _____yellow hexagon(s).

_____ green triangle(s) represents _____yellow hexagon(s).

This is the end of Session 1. You will not be able to go back to _Parts A, B,_ or _C_ once you click "Submit."

Session 2
Part D

For his art project, Carter used 2 yellow hexagons, 5 red trapezoids, 2 blue rhombi, and 7 green triangles. A picture of Carter's art project is shown below.
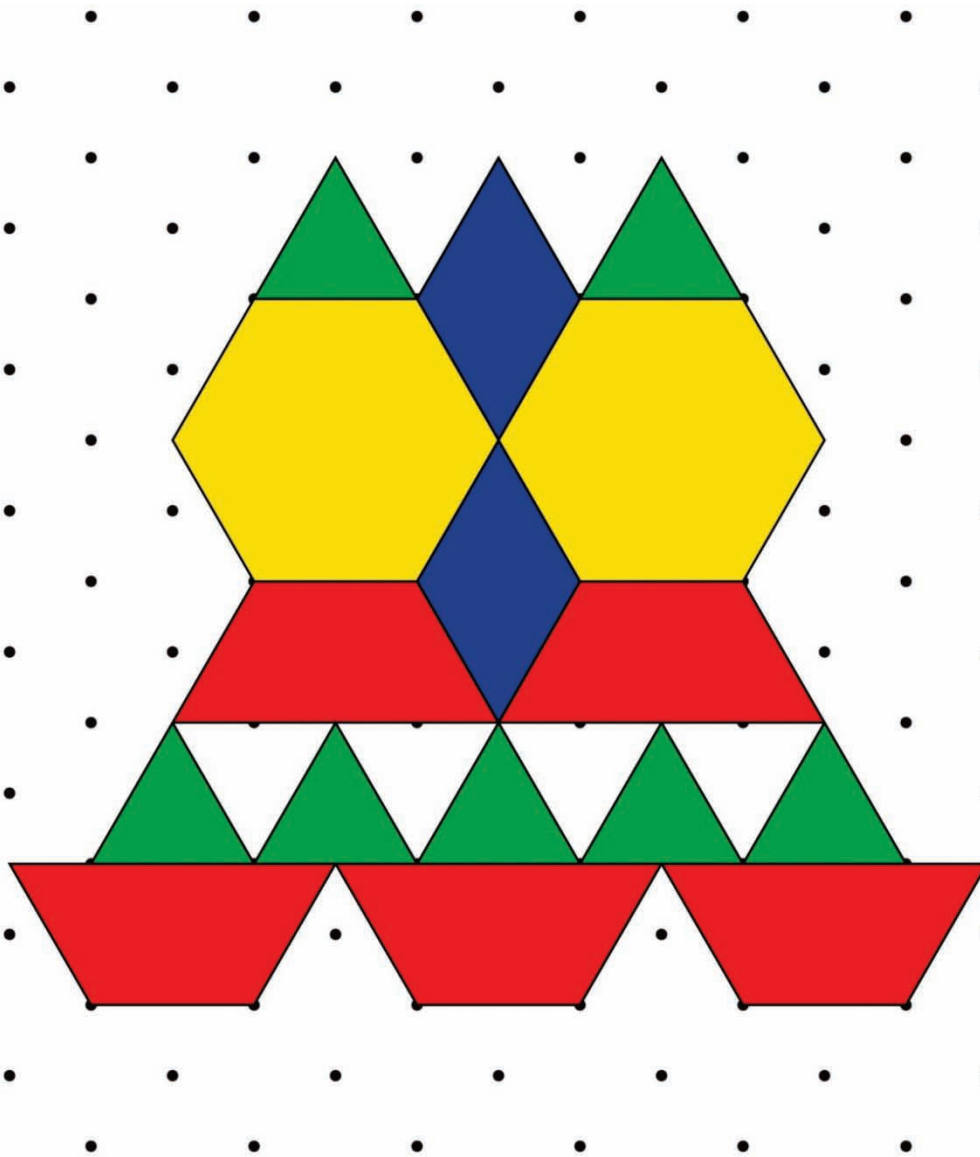
Carter thinks that he can use 7 green triangles and 2 blue rhombi to show that $\frac{7}{6}$ is greater than $\frac{2}{3}$ $\left(\frac{7}{6} > \frac{2}{3}\right)$. Use pictures, numbers, and/or words in the space below to show whether Carter's thinking is correct or not.

Carter also thinks he can use 2 yellow hexagons and 2 blue rhombi to show that $\frac{2}{1}$ is equal to $\frac{2}{3}$ $\left(\frac{2}{1} = \frac{2}{3}\right)$.

- He says that the sizes of the shapes do not matter.
- He counts the number of each shape and uses this number as the numerator in each fraction.
- He says that the fractions are equal because the numerators are equal.

Use pictures, numbers, and/or words in the space below to show whether Carter's thinking is correct or not.

Part E

Use the pattern block shapes to make a new picture. This picture <u>must</u> represent a value that is equal to $5\frac{1}{6}$ yellow hexagons.

The other rules still apply:

- At least one of each shape must be included in the picture.
- The shapes may touch the edges of other shapes.
- The shapes must <u>not</u> overlap each other.

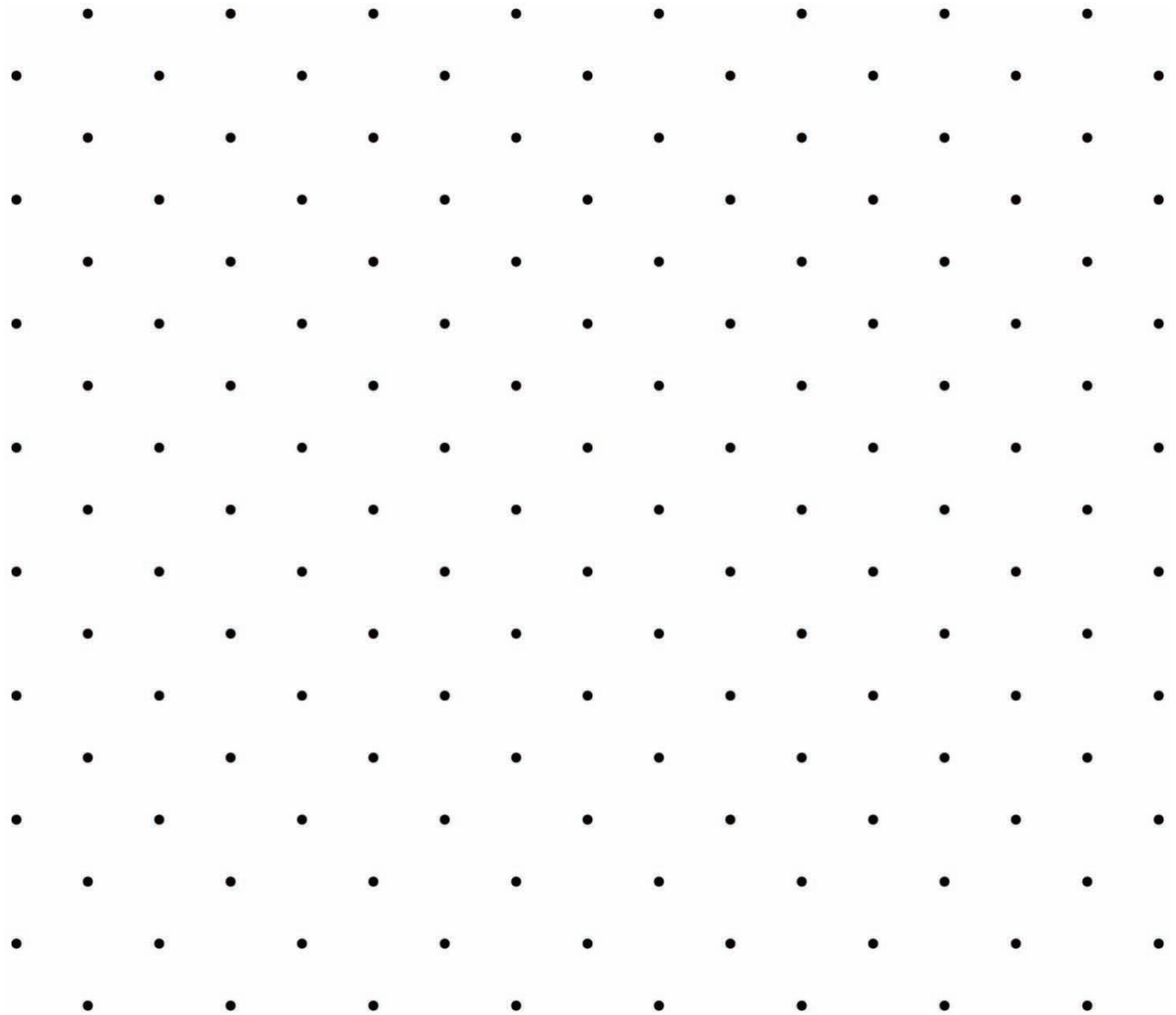Click on a shape and then click in the space below to put a shape in the picture. Continue as many times as necessary.
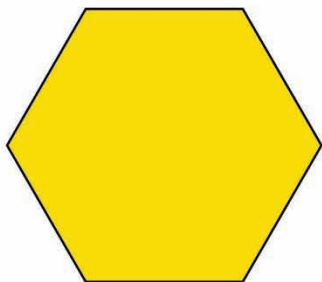
Yellow Hexagon   **Red Trapezoid**   **Blue Rhombus**   **Green Triangle**

Click on the turn button if you need to turn your shape.

Click on the trash can and then click on the shape if you want to delete a shape.

Explain how you know the shapes in your picture represent $5\frac{1}{6}$ yellow hexagons.

End of Session 2
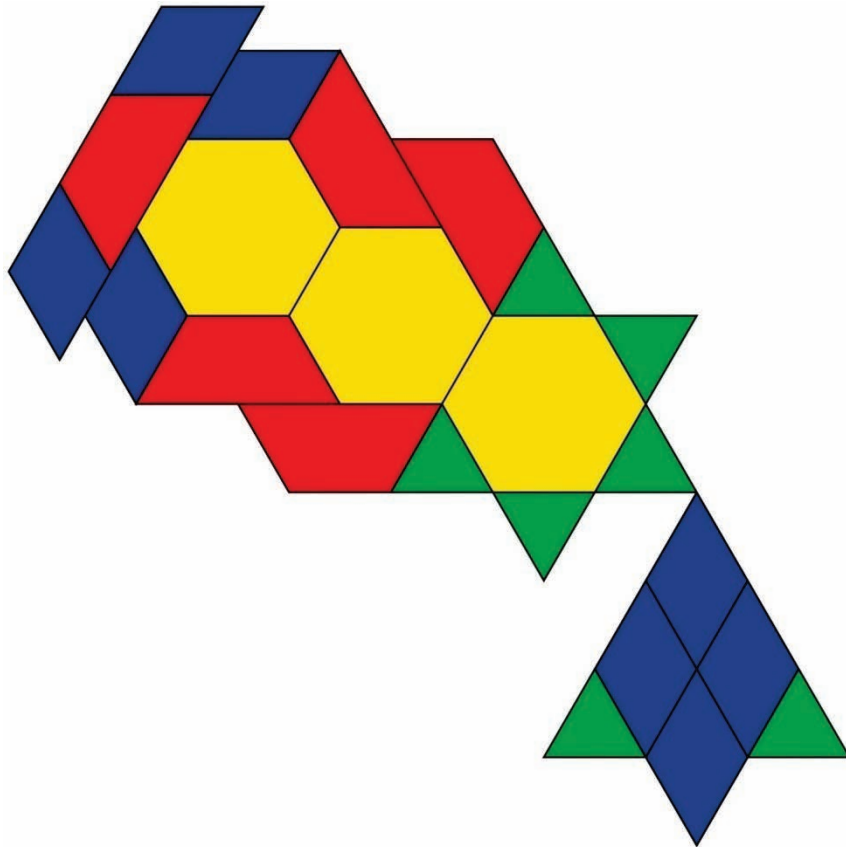
Sample Top-Score Response:

Part A

1 red trapezoid represents $\frac{1}{2}$

1 blue rhombus represents $\frac{1}{3}$

1 green triangle represents $\frac{1}{6}$

Part B

Not scored. The following illustration is an example top-score response only. Whatever the student constructs must be interpreted for *Part C*.

The example above uses 3 hexagons, 5 trapezoids, 8 rhombi, and 7 triangles.

Part C

5 red trapezoids is the same as $\frac{5}{2}$ (or $2\frac{1}{2}$)

8 blue rhombi is the same as $\frac{8}{3}$ (or $2\frac{2}{3}$)

7 green triangles is the same as $\frac{7}{6}$ (or $1\frac{1}{6}$)

Part D

I can show that Carter's thinking is correct and that $\frac{7}{6} > \frac{2}{3}$. It takes 6 triangles to make 1 whole hexagon. That leaves one extra or $\frac{1}{6}$. It takes 3 rhombi to make 1 whole hexagon. I have 2 rhombi, which is $\frac{2}{3}$. I know that $\frac{2}{3}$ is less than 1 whole, so it also has to be less than $\frac{7}{6}$.

I can show that Carter's thinking is not correct and that $\frac{2}{1}$ is not equal to $\frac{2}{3}$. The hexagons represent wholes, and the fraction $\frac{2}{1}$ means that there are 2 wholes. It would take 3 rhombi to make 1 whole. Carter is using 2 of them, which is less than 1 whole. That means Carter is wrong when he says 2 wholes is equal to $\frac{2}{3}$. Carter would need $\frac{6}{3}$ or 6 rhombi to equal 2 whole hexagons.

Part E

Creates a new picture that uses at least one of each colored shape with no overlap that represents $5\frac{1}{6}$ yellow hexagons. One example is shown below; however, there are many ways to correctly complete this part.
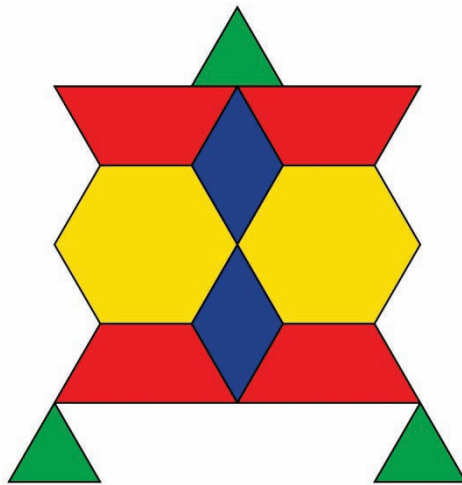
Explains how the picture represents a value that is equal to $5\frac{1}{6}$ yellow hexagons.

Example: "I know my picture equals $5\frac{1}{6}$ hexagons because it takes 2 trapezoids to make 1 hexagon, 3 rhombi to make 1 hexagon, and 6 triangles to make 1 hexagon. I started with 2 hexagons. Then I used 4 trapezoids, which equals 2 more hexagons. It takes 2 triangles to make 1 rhombus, so 2 triangles + 2 rhombi = 1 hexagon. That makes 5 hexagons. The remaining triangle is $\frac{1}{6}$ of a hexagon, so I have the same as $5\frac{1}{6}$ hexagons in my picture."

Scoring Notes:

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

Scoring Rubric:

Responses to this item will receive 0–14 points, based on the following:

Part A: 3 points (1 point for each correct fraction)

1 red trapezoid represents $\frac{1}{2}$

1 blue rhombus represents $\frac{1}{3}$

1 green triangle represents $\frac{1}{6}$

Part B: Not scored. While it is desirable that the student followed the directions to create a picture that uses at least one of each colored shape with no overlap, the resulting picture has no measureable value in terms of fractional sense and understanding areas with respect to shapes.

Part C: 3 points
Correctly writes the total number represented by each shape (1 point per shape)

Part D: 4 points (2 per explanation)
Correctly explains why Carter is correct in his first thought and incorrect in his second thought.

Part E: 4 points (2 point for the picture, 2 points for a thorough explanation)
Creates a picture that uses at least one of each colored shape with no overlap that represents 5 1/6. A single error can be made that is used consistently throughout the picture to earn 1 point for the picture. For example, the student can repeatedly use the blue rhombus as 1/4 of the yellow trapezoid (instead of 1/3).

Explains how the picture represents a value that is equal to $5\frac{1}{6}$ yellow hexagons. If an error is made in referencing the fraction of the yellow trapezoid that another shape is (like the blue rhombus being called $\frac{1}{4}$), full credit can still be earned for a thorough explanation, even with the error in value...as long as the parts still add up to $5\frac{1}{6}$ using the flawed fractional value.

MAT.04.PT.4.GROCE.A.074 Claim 4

Sample Item Id:	MAT.04.PT.4.GROCE.A.074
Title:	Grocery Store (GROCE)
Grade:	04
Primary Claim:	**Claim 4: Modeling and Data Analysis** 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	**Measurement and Data**
Secondary Content Domain(S):	Number and Operations Operations and Algebraic Thinking
Assessment Target(S):	4 A: Apply mathematics to solve problems arising in everyday life, society, and the workplace. 4 D: Interpret results in the context of a situation. 4 G: Identify, analyze and synthesize relevant external resources to pose or solve problems.
Standard(S):	4.OA.2, 4.OA.3, 4.NBT.4, 4.NBT.5, 4.NBT.6, 4.MD.2, 4.MD.3,4.NF.2, 3.NBT.2, 3.MD.3, 3.MD.6, 3.MD.7
Mathematical Practice(S):	1, 2, 3, 4, 5, 6, 7, 8
DOK:	3
Item Type:	PT
Score Points:	15
Difficulty:	H
How This Task Addresses The "Sufficient Evidence" For This Claim:	The student uses concepts of measurement and data, numbers and operations in base ten, and operations and algebraic thinking to accomplish tasks required of a grocery store manager opening a new store. The work is supported by calculations and explanations of reasoning.
Target-Specific Attributes (E.G., Accessibility Issues):	Accommodations may be necessary for students who have fine motor skills challenges and language processing challenges.
Stimulus/Source:	http://web.jjay.cuny.edu/~tflan/documents/101docs/FIS101OccupancyTypesandExits.pdf On the source, occupancy load for this type of building would be figured using gross floor area. In order to test the content intended, a comparable net floor area method for determining occupancy was used. This method produces an occupancy load that is similar to that of the original method but still within a reasonable range.
Notes:	Multi-part task
Task Overview:	The student assumes the role of a grocery store manager opening a new store. In a group and individually, the student completes tasks that lead up to the opening of the store. The

	student uses content from the domains of measurement and data, numbers and operations in base ten, and operations and algebraic thinking to accomplish these tasks.
Teacher Preparation / Resource Requirements:	Teacher preparation: Up to one week prior to administration of this task, students must be assigned a "prework" task that will be used to answer *Part C* of the task. The prework should be done as a class activity. In Session 1 of this performance task, *Part A* will also incorporate group work and will require the teacher to coordinate partner/group work for this part of the task, and then make sure *Part B* is completed independently. Session 2 will involve using the data that was collected and displayed during the prework in order to complete *Part C*, again followed by independent work in *Part D*. Resources: Materials/time to complete survey, blank grid paper to create the bar graph, and Store Layout grid paper (part of the assessment and included at the end of this sample).
Teacher Responsibilities During Administration:	Monitor individual student work; provide resources as necessary.
Time Requirements:	One prework session totaling no more than 60 minutes. One "mid-task" section incorporating group work that should total no more than 60 minutes. Two scored sections of the task totaling no more than 120 minutes.

Prework:
In preparation for this task, teachers must assign students the following task as a group/class activity at least 3 days prior to the administration of the performance task. ***Teacher says:*** Students, together we must survey a total of 50 adults about the times they usually shop in a grocery store. Tonight's assignment is for each of you to ask two adults to answer this question, "During which part of the day do you usually shop for groceries? In the morning, afternoon, or evening"? Tomorrow we will collect all or your results and use the data to make a bar graph. The next day, the teacher needs to facilitate the collection of all the data into a central location (like a white board) for students to be able to access the data in order to construct a bar graph within a smaller group (3-4 students). The teacher will generate additional data for the data set so it reflects exactly 50 surveyed adults. ***Teacher says:*** Work in your assigned groups to use the information we collected to create a bar graph that displays the number of adults that we surveyed who shop during each of the three parts of the day (morning, afternoon, evening). The teacher needs to provide grid paper and materials needed to create the bar graphs. A whole class discussion should occur after each group makes their bar graph, and the class should decide on the best display to use after sharing their work. The final "agreed-upon" bar graph will need to be copied and given out to students in order to complete *Part D* of the upcoming performance task. Have copies ready to hand out to each student at the appropriate time. A copy of this bar graph will also need to be included with student tasks that are turned in for scoring, so data used in *Part D* can be verified.

Preparing to Open a New Grocery Store

You are the manager for a new grocery store. The grocery store has been built, but it is not ready to open yet. Before the grocery store can open, the list of tasks below must be completed.

1. The store layout must be planned.
2. The pricing of different items must be set.
3. A plan for the number of workers at each time of day must be made.

[Part A should be completed as group work. Allowing the teacher/test administrator to read aloud this part of the task and facilitate the group work is desirable, but should be determined after piloting. A floor layout grid paper should be distributed to all students prior to starting the task.]

Part A
Store Layout

The floor of the store is a rectangle with a width of 30 yards and a length of 50 yards. The shapes shown below represent the top views of a shelf, a refrigerator, and a register area. These shapes must be arranged on the floor layout. The area not covered by these shapes will be the area customers use to walk around the store.

Each shelf measures 3 yards by 7 yards.

 = Shelf

Each refrigerator measures 3 yards by 9 yards.
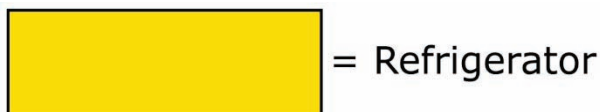
 = Refrigerator

Each register area measures 2 yards by 4 yards.

 = Register Area

Use the guidelines that follow to create a floor layout plan.

Floor Layout Guidelines:

1. Use exactly 6 refrigerators.
2. Use exactly 18 shelves.
3. Use exactly 5 register areas.
4. Each shape must be placed at least 2 yards away from each other shape and from the doors so there is a path for customers between the shapes.
5. Each register area must be exactly 2 yards away from another register area.

Click on a shape and then click on the floor to put a shape on the floor. Continue as many times as necessary.

Click on the turn button if you need to turn your shape.

Click on the trash can and then click on the shape if you want to delete a shape.

Shelf

Refrigerator

Register Area

Back Doors (Emergency Exit)

Front Doors

Part B

Store Layout (Letter to Fire Inspector)

Before the store can open, you must use the store layout to prepare a report for the fire inspector. The fire inspector needs to make sure all the people in the store can get out quickly enough in case of an emergency. The fire inspector has given you the directions below to figure out the greatest number of people who can safely be in the store at one time.

Directions:

1. Find the area of the store floor <u>not</u> covered by shelves, refrigerators, or register areas. This is the area of the floor customers will use to walk around the store.
2. Divide this area by 2.

This gives you the greatest number of people who can safely be in the store at one time.

Write a report to the fire inspector telling him the greatest number of people who can safely be in your store at one time. Explain to him how you found the area of the store floor that customers will use to walk around the store.

[Expand the area for a student's response as appropriate.]

Part C

Item Pricing

The last task you need to complete before the store opens is the item pricing. The table below shows the cost to buy each different item from a manufacturer. The table also shows the amount of money the store will earn when the store sells the item. The equation below shows how to find the price that the store must charge customers in order to earn the correct amount of money.

Cost from Manufacturer + Amount Earned = Price to Charge Customers

Use the equation to complete the table.

Item	Cost from Manufacturer	Amount Earned	Price to Charge Customers ($)
Milk	$2	$1	
Eggs	$3	$1	
Trash bags	$5	$1	
Cereal	$3	$2	
Peanut butter	$2	$2	
Lunch meat	$2	$2	

If a customer buys one of each of these items, what is the total price, in dollars, he or she will be charged? What is the total amount the store will earn? Show how you found your answer.

If each of 50 customers buys 1 of each item in the table, what is the total amount of money the store will earn? Show how you found your answer.

Part D

[Teacher must distribute copies of the bar graph created during the prework for this task.]

Plan for Workers

A manager of a different store surveyed 50 adult customers. She asked each customer to answer the question, "During which part of the day do you usually shop for groceries? In the morning, afternoon, or evening"? This is the same question we asked adults to get the data for our graph. The manager created the table shown below.

Manager's Survey Results

Part of the Day	Number of Customers Who Shop
Morning	5
Afternoon	15
Evening	30

Combine the data from the graph we completed in class with the data in this table to represent all 100 adults surveyed. Create a new bar graph below. Make sure to use an appropriate title and appropriate labels.

100
90
80
70
60
50
40
30
20
10
0
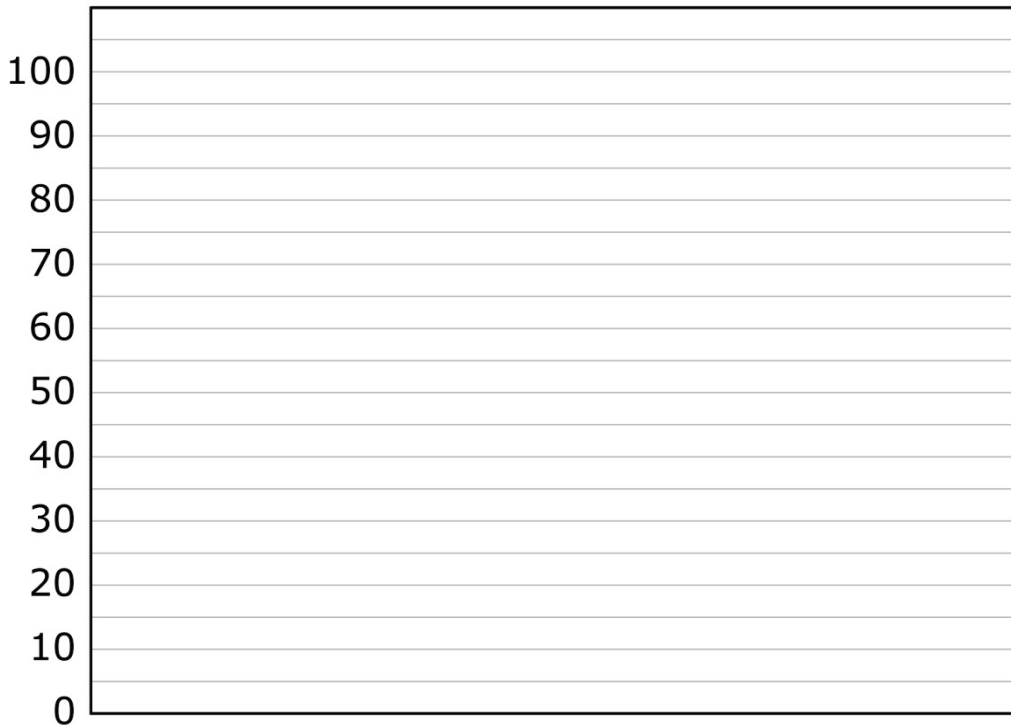
Write fractions to represent the adults out of the 100 adults surveyed who shop for groceries in the morning, the afternoon, and the evening.

$\dfrac{\square}{\square}$

$\dfrac{\square}{\square}$

$\dfrac{\square}{\square}$

Morning

Afternoon

Evening

Which part(s) of the day show fractions that are less than or equal to $\dfrac{1}{2}$? Show how you found your answer.

Look at the fractions you wrote for each part of the day. If a fraction is less than or equal to $\frac{1}{2}$, you will hire 16 workers for this part of the day. If a fraction is greater than $\frac{1}{2}$, you will hire 20 workers for this part of the day. Complete the table below with this information.
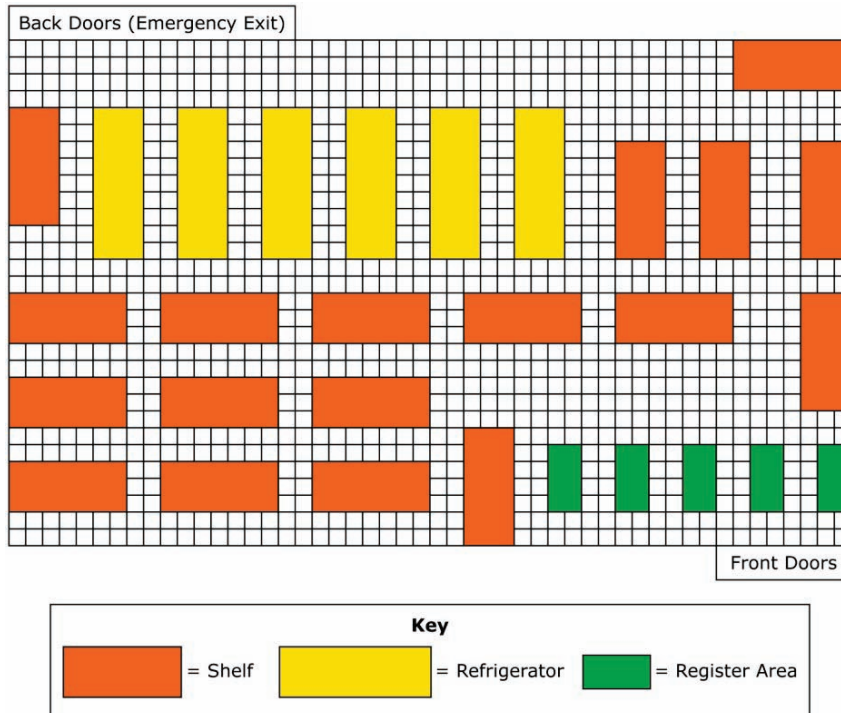
Workers to Hire

Part of the Day	Number of Workers to Hire
Morning	
Afternoon	
Evening	

Based on this table, what is the total number of workers you will hire for your grocery store? Show how you found your answer.

Sample Top-Score Response:

Part A. Floor Layout diagram follows all guidelines. (Not scored)

Back Doors (Emergency Exit)

Key

☐ = Shelf   ☐ = Refrigerator   ☐ = Register Area

Part B. The letter to the fire inspector includes information about the total area of the store floor (1,500 square yards), the area covered by shelves, refrigerators, and register areas (580 square yards), the area customers will use for walking (920 square yards), and a maximum occupancy of 460 people. The letter also includes detailed explanations of how areas were calculated.

Part C. The student completes the table as shown.

Item	Cost from Manufacturer	Amount Earned	Price to Charge Customers ($)
Milk	$2	$1	$3
Eggs	$3	$1	$4
Trash bags	$5	$1	$6
Cereal	$3	$2	$5
Peanut butter	$2	$2	$4
Lunch meat	$2	$2	$4

The student writes $26 for the price the customer will be charged, $9 for the amount the store will earn, and provides a correct explanation of work.

The student writes $450 and provides a correct explanation of work.

Part D. The student combines data graph created in class with data from table to create new bar graph. The bar graph shows an appropriate title and appropriate labels and shows combined data from class-created graph and table.

Shopping for Groceries
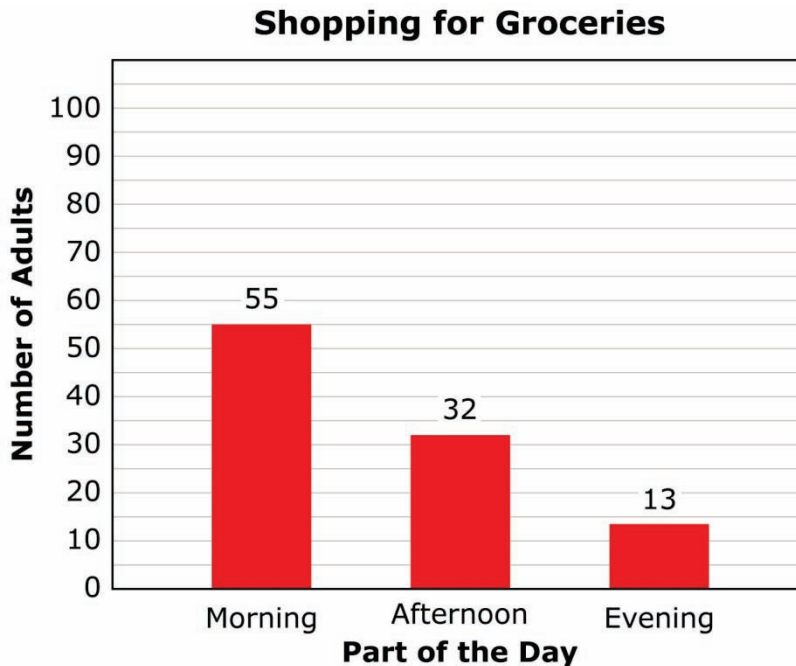
The student writes fractions that reflect a number out of 100 total adults surveyed for each part of the day. Data used determines these fractions and will vary dependent on initial data from class-created graph. Fractions from sample top-score response above are:

$\dfrac{55}{100}, \dfrac{32}{100},$ and $\dfrac{13}{100}$ or equivalent fractions.

The student indicates all fractions that represent fewer than $\dfrac{1}{2}$ of the 100 adults surveyed. For sample top-score response above, the student indicates $\dfrac{32}{100}$ and $\dfrac{13}{100}$.

The student correctly completes table for number of workers to hire using information from above.

Workers to Hire

Part of the Day	Number of Workers to Hire
Morning	20
Afternoon	16
Evening	16

The student correctly indicates total number of workers to hire from data in the table (52).

Scoring Notes:
Each scored portion of the task is evaluated individually. The total number of points is determined by adding the points assigned for each task.

Scoring Rubric:

Part A: not scored

Part B:

5 points: Thorough understanding of area using addition and subtraction to compare areas. Thorough understanding of division of a 3-digit number by a 1-digit number. The student correctly calculated 1500 square yards, 580 square yards, 920 square yards, and 460 people. The student also provided explanations of correct work in the letter to the fire inspector.

4 points: Solid understanding of area using addition and subtraction to compare areas. Partial understanding of division of a 3-digit number by a 1-digit number. The student made a minor error in calculation that led to an incorrect answer, but provided explanations of work that showed conceptual understanding. **OR** The student correctly calculated 1500 square yards, 580 square yards, 920 square yards, and 460 people, but did not provide explanations of work in the letter to the fire inspector.

3 points: Good understanding of area using addition and subtraction to compare areas. Partial understanding of division of a 3-digit number by a 1-digit number. The student made 2 errors in calculation that led to other incorrect answers, but provided explanations of work that showed conceptual understanding in the letter to the fire inspector. **OR** The student correctly completed 3 of the following (calculated 1500 square yards, 580 square yards, 920 square yards, 460 people, and provided explanations of work in the letter to the fire inspector).

2 points: Partial understanding of area using addition and subtraction to compare areas. Partial understanding of division of a 3-digit number by a 1-digit number. The student made 3 errors in calculation that led to other incorrect answers, but provided explanations of work

that showed conceptual understanding in the letter to the fire inspector. **OR** The student correctly completed 2 of the following (calculated 1500 square yards, 580 square yards, 920 square yards, 460 people, and provided explanations of work in the letter to the fire inspector).

1 point: Limited understanding of area using addition and subtraction to compare areas. Limited understanding of division of a 3-digit number by a 1-digit number. The student made 4 or more errors in calculation, but provided explanations of work that showed some conceptual understanding in the letter to the fire inspector. **OR** The student correctly completed 1 of the following (calculated 1500 square yards, 580 square yards, 920 square yards, and 460 people, provided explanations of work in the letter to the fire inspector).

0 points: No understanding of area using addition and subtraction to compare areas. No understanding of division of a 3-digit number by a 1-digit number. The student incorrectly calculated in all parts, and did not provide explanations of work in the letter to the fire inspector.

Part C:

4 points: Thorough understanding of using equations to model addition, addition of whole numbers, and multiplication with whole numbers. The student correctly completes all parts of the task and provides correct explanations of work where required.

3 points: Good understanding of using equations to model addition, addition of whole numbers, and multiplication with whole numbers. The student correctly completes 2 parts of the task and provides correct explanations of work for these tasks if required. **OR** The student completes all parts of the task, but does not provide thorough explanations of work where required. **OR** The student makes a mistake when completing the table, and correctly completes all other parts of the task using incorrect table data.

2 points: Partial understanding of using equations to model addition, addition of whole numbers, and multiplication with whole numbers. The student correctly completes 1 part of the task and provides correct explanations of work for these tasks if required. **OR** The student completes 2 parts of the task, but does not provide thorough explanations of work for some parts where required. **OR** The student makes a mistake when completing the table, and correctly completes 1 of the other parts of the task using incorrect table data.

1 point: Limited understanding of using equations to model addition, addition of whole numbers, and multiplication with whole numbers. Limited understanding of calculating and interpreting remainders in a contextual situation. The student correctly completes 1 part of the task with no correct explanation of work.

0 point: No understanding of using equations to model addition, addition of whole numbers, multiplication with whole numbers, and division of whole numbers. No understanding of calculating and interpreting remainders in a contextual situation. The student does not correctly complete any parts of the task.

Part D:

6 points: Thorough understanding of representing and interpreting data, fraction equivalence and ordering, and using operations with whole numbers to solve problems. The student correctly answered each section in *Part D* and provided clear and thorough explanations of work where required. Point distribution as shown below:

> 1 point: Completed graph with correct data
> 1 point: Completed graph with correct title and labels
> 1 point: 3 correct fractions reflecting data from each part of the day
> 1 point: All fractions less than ½ represented; explanation of work is included
> 1 point: Table is correctly completed with numbers of workers to be hired
> 1 point: Total number of workers is determined correctly; explanation of work is included

5 points: Solid understanding of representing and interpreting data, fraction equivalence and ordering, and using operations with whole numbers to solve problems. The student correctly answered each section in *Part D* but provided one or two incomplete or incorrect explanations of work. **OR** The student correctly answered 5 out of 6 sections from *Part D,* and provided clear and thorough explanations of work where required. **OR** The student made an error in an early section and carried that error out throughout the remaining sections of *Part D,* and provided clear and thorough explanations that showed evidence of understanding the concepts presented.

4 points: Good understanding of representing and interpreting data, fraction equivalence and ordering, and using operations with whole numbers to solve problems. The student correctly answered 4 out of 6 sections from *Part D,* and provided clear and thorough explanations of work where required. **OR** The student correctly answered 5 out of 6 sections from *Part D,* but provided one or two incomplete or incorrect explanations of work.*

3 points: Partial understanding of representing and interpreting data, fraction equivalence and ordering, and using operations with whole numbers to solve problems. The student correctly answered 3 out of 6 sections from *Part D,* and provided clear and thorough explanations of work where required. **OR** The student correctly answered 4 out of 6 sections from *Part D,* but provided one or two incomplete or incorrect explanations of work.*

2 points: Limited understanding of representing and interpreting data, fraction equivalence and ordering, and using operations with whole numbers to solve problems. The student correctly answered 2 out of 6 sections from *Part D,* and provided clear and thorough explanations of work where required. **OR** The student correctly answered 3 out of 6 sections from *Part D,* but provided one or two incomplete or incorrect explanations of work.*

1 point: Inconsistent understanding of representing and interpreting data, fraction equivalence and ordering, and using operations with whole numbers to solve problems. The student correctly answered 1 out of 6 sections from *Part D,* and provided clear and thorough explanations of work if required in this section. **OR** The student correctly answered 2 out of 6 sections from *Part D,* but provided one or two incomplete or incorrect explanations of work.*

0 points: No understanding of representing and interpreting data, fraction equivalence and ordering, and using operations with whole numbers to solve problems. The student incorrectly answers each section or does not attempt each section in *Part D.*

*If a minor error was made in an early section and carried out throughout the remaining sections of *Part D*, the error should only be counted one time. The scoring of the subsequent sections should only negatively impact the student if additional errors are made.

MAT.04.PT.4.ROBMK.A.043 Claim 4

Sample Item Id:	MAT.04.PT.4.ROBMK.A.043
Title:	Robot Maker (ROBMK)
Grade:	04
Primary Claim:	**Claim 4: Modeling and Data Analysis** 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	**Measurement and Data**
Secondary Content Domain(S):	Operations and Algebraic Thinking Numbers and Operations—Fractions Geometry
Assessment Target(S):	A: Apply mathematics to solve problems arising in everyday life, society, and the workplace. D: Interpret results in the context of a situation.
Standard(S):	4.MD.1, 4.MD.3, 4.OA.5, 4.G.2, 3.MD.1, 3.MD.5, 3.MD.6, 3.MD.7, 3.MD.8, 3.G.1, 3.NF.1, 2.G.1, 2.G.3, 2.MD.1
Mathematical Practice(S):	1, 2, 3, 4, 5, 6, 7
DOK:	3
Item Type:	PT
Score Points:	15
Difficulty:	M
How This Task Addresses The "Sufficient Evidence" For This Claim:	The student uses concepts of measurement, geometry, and fractions to design various features of a robot. The work is supported by calculations supporting determinations of area, perimeter, conversions, and generation of a pattern.
Target-Specific Attributes (E.G., Accessibility Issues):	Accommodations may be necessary for students who have fine-motor-skill and language-processing challenges.
Stimulus/Source:	
Notes:	Multi-part task
Task Overview:	Students are asked to develop various features of a robot given specific guidelines that must be followed.
Teacher Preparation/ Resource Requirements:	Sheets of 1-centimeter grid paper (at least 3 per student), pencil, AAA batteries (2 per student), centimeter ruler, student answer sheet.
Teacher Responsibilities During Administration:	Monitor individual student work; provide resources as necessary. Start by giving each student 2 sheets of grid paper, 2 AAA batteries (or paper cutouts that represent the true size of an AAA battery), a centimeter ruler, and a student answer sheet.
Time Requirements:	Two sessions totaling no more than 120 minutes. Tasks should be done in sequential order. Tasks 1 and 2 should be completed in the first day or session. Tasks 3 and 4 should be completed in the second day or session.

Robot Maker—Task 1

You work for a company that makes robots. Your boss has asked you to design a new robot. The robot will contain a head, a body, 2 arms, and 2 legs.

The first step is to draw what the front of your robot will look like. Use the practice grid paper provided to draw the front of your robot. Make sure to follow **all** of the guidelines below.

Guidelines:

1. The front of the body must be a rectangle with an area that is greater than 64 square centimeters but less than 140 square centimeters.

2. The front of the head must be a rectangle with a perimeter of 18 centimeters.

3. The front of each leg must be a quadrilateral that is **not** a rectangle.

4. The front of each arm must be a rectangle divided into equal parts with $\frac{3}{4}$ of the parts shaded.

5. Each eye must be shaped like a hexagon divided into equal parts with $\frac{1}{3}$ of the parts shaded.

The drawing must contain labels with any numbers and words that help your boss understand how you met each of the five guidelines.

When you are sure your drawing is complete, copy your drawing to the answer sheet provided.

Robot Maker—Task 2

Your boss wants you to continue with your robot drawing. He has given you guidelines for creating a drawing of the back of the robot's head and body. Use the practice grid paper provided to draw the back of your robot's head and body. Make sure to follow **all** of the guidelines below.

Guidelines:

1. The back of the body must be the same size and shape as the front of the body.

2. The back of the body must contain a rectangular opening that is big enough to fit 2 AAA batteries placed side by side. The perimeter of this opening must be less than 16 centimeters. Use the batteries and a centimeter ruler to help you.

3. The back of the body must contain an on/off switch shaped like a rhombus. The rhombus must have a perimeter of 8 centimeters. Use a centimeter ruler to help you.

4. The back of the head must be the same size and shape as the front of the head.

5. A code is needed to lock and unlock the robot. Make this code by creating a skip-counting number pattern that starts with the number 7. The number pattern must have 5 terms. Write this code beneath the drawing of your robot.

The drawing must contain labels with any numbers and words that help your boss understand how you met the five guidelines.

When you are sure your drawing is complete, copy your drawing to the answer sheet provided.

Robot Maker—Task 3

Your boss has asked you to add a feature to your robot. He wants you to program 3 measurement conversions for the robot to speak when a button is pushed. In order for the measurement conversions to be spoken, the robot must be programmed with the correct information. Use the guidelines below to complete this part of the design.

Guidelines:

1. Add 3 square buttons to the **front** of the body. Each button, when pushed, will control a different measurement conversion.

2. Pushing the first button will cause the robot to say one of two sentences about converting measurements from kilometers to meters. In the space below, finish the sentences the robot will say when the first button is pushed.

Conversion #1 Sentences

Two (2) kilometers equals _____ meters.

Eight (8) kilometers equals _____ meters.

3. Pushing the second button will cause the robot to say one of two sentences about converting from hours to minutes. In the space below, write two sentences that the robot will say when the second button is pushed.

Conversion #2 Sentences

_____ equals _____.

_____ equals _____.

4. Pushing the third button will cause the robot to say one of two sentences about converting from pounds to ounces. In the space below, write two sentences that the robot will say when the third button is pushed.

Conversion #3 Sentences

_____ equals _____.

_____ equals _____.

Robot Maker—Task 4

Your boss wants you to test a movement of the robot that is not working correctly. The movement should work as described below.

- When the robot's feet are placed at a starting point and the voice command "Start" is given, the robot moves in a straight line.
- When the voice command "Stop" is given, the robot stops.
- The robot travels 1 inch for every 1 second it moves.

When Start Command Is Given

One Second Later
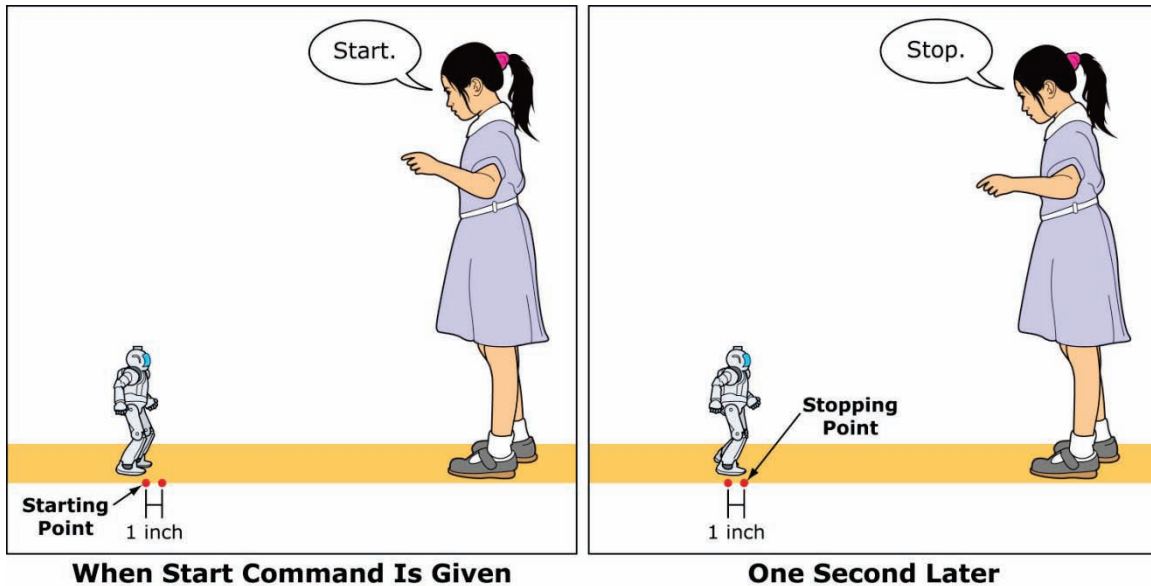
The table below shows the amounts of time and the distances the robot is currently traveling. For each amount of time, decide whether or not the robot is working correctly. If the distance is not correct, state the correct distance the robot should have traveled. Show your reasoning with numbers and words.

12 seconds: 1 foot
24 seconds: 1 yard
26 seconds: 2 feet 6 inches

Choose a name for your robot. Write the name of the robot below your drawing on the answer sheet.

Sample Top-Score Response:

Task 1:

The student will produce a drawing of a robot that meets the following guidelines:

1. The front of the body must be a rectangle with an area that is greater than 64 square centimeters but less than 140 square centimeters.

2. The front of the head must be a rectangle with a perimeter of 18 centimeters.

3. The front of each leg must be a quadrilateral that is **not** a rectangle.

4. The front of each arm must be a rectangle divided into equal parts with $\frac{3}{4}$ of the parts shaded.

5. The eyes must be shaped like hexagons with $\frac{1}{3}$ of each hexagon shaded.

Task 2:

The student will produce a drawing of a robot that meets the following guidelines:

1. The back of the body must be the same size and shape as the front of the body.

2. The back of the body must contain a rectangular opening that is big enough to fit 2 AAA batteries placed side by side. The perimeter of this opening must be less than 16 centimeters.

3. The back of the body must contain an on/off switch shaped like a rhombus with a perimeter of 8 centimeters. An error of +/− 0.5 is allowable in the drawing, as long as the labels indicate 2–centimeter side lengths.

4. The back of the head must be the same size and shape as the front of the head.

5. The student should have created a skip-number pattern starting with the number 7. The number pattern must have 5 terms and appear beneath the student's drawing of the robot.

Task 3:

The student's addition of three squares to represent the conversion buttons is not scored.

Conversion #1 Sentences

Two (2) kilometers equals <u>2000</u> meters.
Eight (8) kilometers equals <u>8000</u> meters.

Conversion #2 Sentences

<u>One (1) hour</u> equals <u>60 minutes</u>.
<u>Two (2) hours</u> equals <u>120 minutes</u>.

Sample Top-Score Response:

Conversion #3 Sentences

One (1) pound equals 16 ounces.
Two pounds equals 32 ounces.

Task 4:

1. Correct; accompanying reasoning showing that 1 foot is equivalent to 12 inches and $\dfrac{12\,\text{seconds}}{12\,\text{inches}} = \dfrac{1\,\text{second}}{1\,\text{inch}}$.

2. Incorrect; accompanying reasoning showing that 1 yard is equivalent to 36 inches and $\dfrac{36\,\text{seconds}}{36\,\text{inches}} = \dfrac{1\,\text{second}}{1\,\text{inch}}$.

3. Incorrect: accompanying reasoning showing that 1 foot 6 inches is equivalent to 30 inches and $\dfrac{30\,\text{seconds}}{30\,\text{inches}} = \dfrac{1\,\text{second}}{1\,\text{inch}}$.

Scoring Notes:

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

Scoring Rubric for Task 1:

5 points: Thorough understanding of attributes of two-dimensional shapes, area, perimeter, elapsed time, and partitioning shapes into parts with equal areas. All guidelines are fulfilled, and student work contains labels showing correct reasoning.

4 points: Good understanding of attributes of two-dimensional shapes, area, perimeter, elapsed time, and partitioning shapes into parts with equal areas. All guidelines are fulfilled, but the student is missing labels showing correct reasoning for 1 or 2 guidelines.
OR Only 4 of the 5 guidelines are fulfilled, and student work includes labels showing correct reasoning for these 4 guidelines.

3 points: Partial understanding of attributes of two-dimensional shapes, area, perimeter, elapsed time, and partitioning shapes into parts with equal areas. All guidelines are fulfilled, but the student is missing labels showing correct reasoning for 3 or 4 guidelines.
OR Only 3 of the 5 guidelines are fulfilled, and student work includes labels showing correct reasoning for these 3 guidelines.

2 points: Some understanding of attributes of two-dimensional shapes,

area, perimeter, elapsed time, and partitioning shapes into parts with equal areas. Only 2 of the 5 guidelines are fulfilled, and student work includes labels showing correct reasoning for these 2 guidelines.

1 point: Limited understanding of attributes of two-dimensional shapes, area, perimeter, elapsed time, and partitioning shapes into parts with equal areas. Only 1 of the 5 guidelines is fulfilled, and student work includes labels showing correct reasoning for this 1 guideline.

0 points: No understanding of attributes of two-dimensional shapes, area, perimeter, elapsed time, and partitioning shapes into parts with equal areas. No guidelines are fulfilled.

Scoring Rubric for Task 2:

3 points: Thorough understanding of attributes of two-dimensional shapes, measurement, and number patterns. Guidelines 2, 3, and 5 are fulfilled, and student work contains labels showing correct reasoning.

2 points: Partial understanding of attributes of two-dimensional shapes, measurement, and number patterns. Guidelines 2, 3, and 5 are fulfilled, but student work does not contain labels showing correct reasoning. **OR** Only 2 of Guidelines 2, 3, and 5 are fulfilled, and student work contains labels showing correct reasoning for these 2 guidelines.

1 point: Limited understanding of attributes of two-dimensional shapes, measurement, and number patterns. Only 1 of Guidelines 2, 3, and 5 is fulfilled, and student work contains labels showing correct reasoning for this 1 guideline.

0 points: No understanding of attributes of two-dimensional shapes, area, perimeter, elapsed time, and partitioning shapes into parts with equal areas. No guidelines are fulfilled.

Scoring Rubric for Task 3:

3 points: Thorough understanding of converting from a larger unit to a smaller unit. All six conversion sentences are correct.

2 points: Partial understanding of converting from a larger unit to a smaller unit. The sentences for two of the three types of conversions are correct.

1 point: Limited understanding of converting from a larger unit to a smaller unit. The sentences for one of the three types of conversions are

correct.

0 points: No understanding of converting from a larger unit to a smaller unit. There is no type of conversion for which both of the sentences are correct.

Scoring Rubric for Task 4:

3 points: Thorough understanding of number patterns and conversions. The student chooses Correct, Incorrect, and Incorrect, fills in correct distance in incorrect movements, and shows work that indicates sound reasoning.

2 points: Partial understanding of number patterns and conversions. The student makes mistakes on 1 of the 3 Correct/Incorrect decisions and shows flaws in reasoning.

1 point: Limited understanding of number patterns and conversions. The student makes mistakes on 2 of the 3 Correct/Incorrect decisions, and shows flaws in reasoning.
OR The student chooses Correct, Incorrect, and Incorrect but does not fill in correct distances in incorrect movements.

0 points: No understanding of number patterns and conversions. The student makes mistakes on 3 of the 3 Correct/Incorrect decisions and shows flaws in reasoning.

MAT.04.SR.1.0000G.L.038 C1 TL

Sample Item ID:	MAT.04.SR.1.0000G.L.038
Grade:	04
Claim(s):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	1 L: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
Content Domain:	Geometry
Standard(s):	4.G.2, 4.G.3
Mathematical Practice(s):	4, 7
DOK:	2
Item Type:	SR
Score Points:	2
Difficulty:	M
Key:	YNNN
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	Blind or low-vision students may have difficulty related to the visual discrimination of two-dimensional figures.
Notes:	Multi-part item

Andy drew a shape with the following properties.

- perpendicular line segments
- at least 1 line of symmetry
- <u>no</u> parallel line segments

For numbers 1a–1d, choose Yes or No to show whether each shape below appears to meet the properties of Andy's shape.
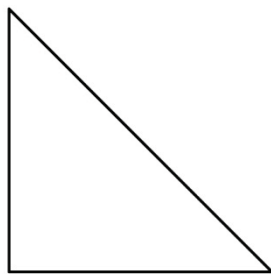
1a.   ○ Yes   ○ No
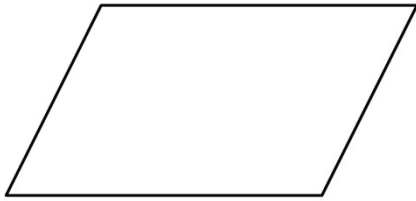
1b. ○ Yes ○ No
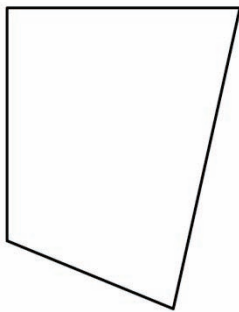
1c. ○ Yes ○ No
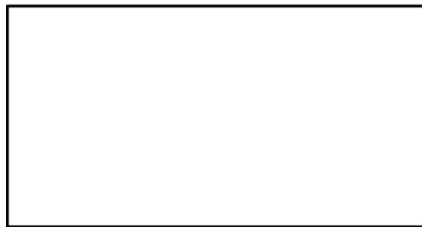
1d. ○ Yes ○ No

Scoring Rubric:

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

2 points: YNNN—Thoroughly understands parallel and perpendicular line segments and symmetry.

1 point: YNYN, YNNY—Accounted for two of the three properties. (YNNY—missed the no parallel part, YNYN—missed the symmetry part)

0 points: YYYY, YYYN, YNYY, YYNN, YYNY, NYYY, NYNY, NYYN, NNNN, NNNY, NNYY, NNYN, NYNN

MAT.04.SR.1.000NF.G.212 C1 TG

Sample Item Id:	MAT.04.SR.1.000NF.G.212
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 G: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
Content Domain:	Numbers and Operations—Fractions
Standard(S):	4.NF.4
Mathematical Practice(S):	1, 2, 6
DOK:	2
Item Type:	SR
Score Points:	1
Difficulty:	M
Key:	YNY
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Multi-part item

Kara wrote an expression that has a value of $\frac{12}{5}$.

For numbers 1a – 1c, choose Yes or No to indicate whether each expression has a value of $\frac{12}{5}$.

1a. $12 \times \frac{1}{5}$ ◯ Yes   ◯ No

1b. $12 \times \frac{5}{5}$ ◯ Yes   ◯ No

1c. $3 \times \frac{4}{5}$ ◯ Yes   ◯ No

MAT.04.SR.1.000NF.H.052 C1 TH

Sample Item Id:	MAT.04.SR.1.000NF.H.052
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 H: Understand decimal notation for fractions, and compare decimal fractions.
Content Domain:	Number and Operations—Fractions
Standard(S):	4.NF.5, 4.NF.6, 4.NF.7
Mathematical Practice(S):	1, 2, 4, 7
DOK:	2
Item Type:	SR
Score Points:	1
Difficulty:	M
Key:	YYN
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Multi-part

Model Z is shaded to represent a value that is less than 1 whole.
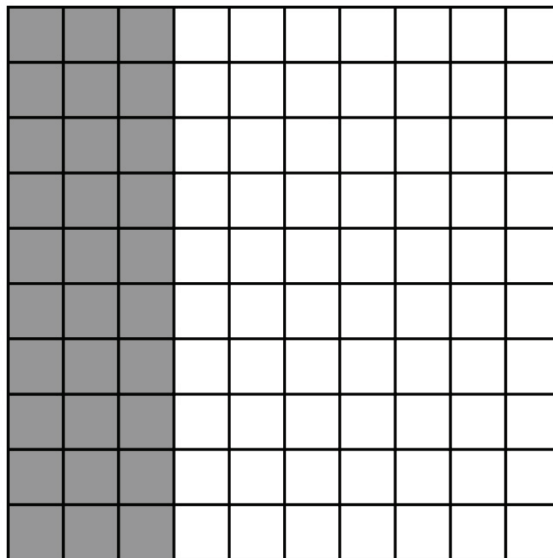
Model Z

For numbers 1a–1c, choose Yes or No to indicate whether the value is equivalent to the value of the shaded part of Model Z.

1a.	$\frac{30}{100}$	○ Yes	○ No
1b.	$\frac{3}{10}$	○ Yes	○ No
1c.	0.03	○ Yes	○ No

Scoring Rubric for Multi-Part Items:

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

MAT.04.SR.1.000NF.H.213 C1 TH

Sample Item Id:	MAT.04.SR.1.000NF.H.213
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 H: Understand decimal notation for fractions, and compare decimal fractions.
Content Domain:	Numbers and Operations—Fractions
Standard(S):	04.NF.5
Mathematical Practice(S):	1, 2, 6
DOK:	1
Item Type:	SR
Score Points:	1
Difficulty:	L
Key:	C
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	

Which equation is true?

(A) $\quad \dfrac{7}{100} + \dfrac{2}{10} = \dfrac{9}{100}$

(B) $\quad \dfrac{7}{100} + \dfrac{2}{10} = \dfrac{9}{10}$

(C) $\quad \dfrac{7}{100} + \dfrac{2}{10} = \dfrac{27}{100}$

(D) $\quad \dfrac{7}{100} + \dfrac{2}{10} = \dfrac{72}{100}$

Key and Distractor Analysis:

A   Added as if both fractions had denominators of 100
B   Added as if both fractions had denominators of 10
C   Correct
D   Multiplied numerator of first fraction by 10 instead of multiplying numerator of second fraction by 10

MAT.04.SR.1.OOOOA.A.027 C1 TA

Sample Item Id:	MAT.04.SR.1.OOOOA.A.027
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 A: Use the four operations with whole numbers to solve problems.
Content Domain:	Operations and Algebraic Thinking
Standard(S):	4.OA.2
Mathematical Practice(S):	2, 4
DOK:	2
Item Type:	SR
Score Points:	2
Difficulty:	M
Key:	YNY
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Multi-part item

Sarah is 12 years old.

- George is g years old.
- Sarah is 3 times as old as George.

For numbers 1a–1c, choose Yes or No to indicate whether each statement is true.

1a. George's age, in years, can be represented by the expression $12 \div 3$. ○ Yes ○ No

1b. George is 15 years old. ○ Yes ○ No

1c. George's age, in years, can be found by solving the equation $12 = 3 \times g$. ○ Yes ○ No

Scoring Rubric for Multi-Part Items:

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

2 points: YNY—The student thoroughly understands multiplicative comparison and how to use letters representing unknown values in multiplication/division situations.

1 point: YNN, NNY—The student understands how to interpret multiplicative comparison and represent using an expression, but does not understand how to use a variable to represent an unknown quantity. **OR** The student understands how to use a variable to represent an unknown quantity and interprets multiplicative comparison, but does not understand how to use related division operation to solve problems with multiplicative comparison.

0 points: YYY, YYN, NYY, NNN, NYN—The student demonstrates inconsistent or no understanding.

MAT.04.SR.1.000MD.I.066 C1 TI

Sample Item Id:	MAT.04.SR.1.000MD.I.066
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 I: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. 1 F: Extend understanding of fraction equivalence and ordering.
Content Domain:	Measurement and Data
Standard(S):	4.MD.1, 4.NF.2
Mathematical Practice(S):	1, 2, 6
DOK:	2
Item Type:	SR
Score Points:	1
Difficulty:	M
Key:	YNY
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Multi-part item

For numbers 1a–1c, choose Yes or No to indicate whether the measurement is equal to 3 feet, 6 inches.

1a. 1 yard, 6 inches ⭘ Yes ⭘ No

1b. 36 inches ⭘ Yes ⭘ No

1c. $3\frac{1}{2}$ feet ⭘ Yes ⭘ No

Key and Distractor Rationale:

1a. Yes (1 yard is equal to 3 feet)

1b. No (36 inches is only 3 feet; missing 6 more inches)

1c. Yes (1/2 foot is equal to 6 inches)

MAT.04.SR.1.00NBT.D.030 C1 TD

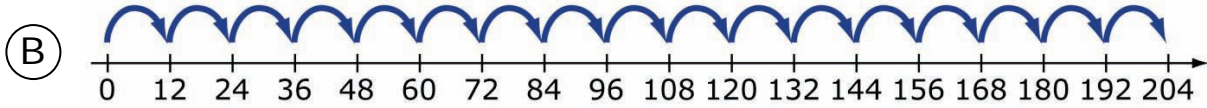|	
Sample Item Id:	MAT.04.SR.1.00NBT.D.030
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 D: Generalize place value understanding for multi-digit whole numbers.
Content Domain:	Numbers and Operations in Base Ten
Standard(S):	4.NBT.1, 4.NBT.2
Mathematical Practice(S):	1, 2, 4, 8
DOK:	2
Item Type:	SR
Score Points:	2
Difficulty:	M
Key:	YYYN
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	Blind or low-vision students may have difficulty with the stimulus.
Notes:	Multi-part item

This set of place-value blocks represents a number. The value of this number can be represented in many different ways.
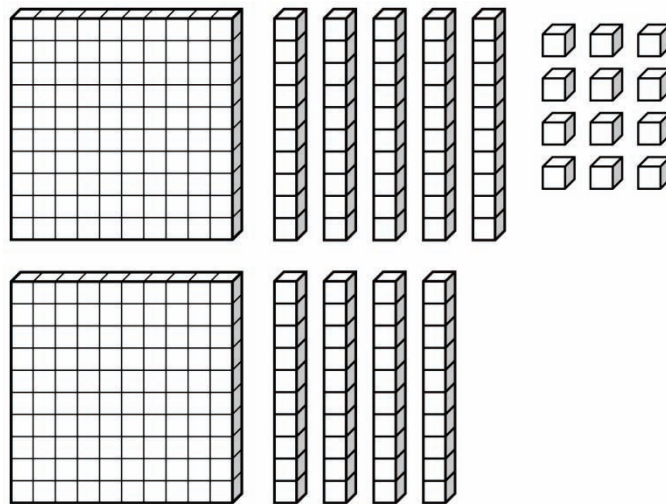
Key

◻ = 1

For numbers 1a–1d, choose Yes or No to show whether the value is equivalent to the number represented by the place-value blocks.

1a.	200 + 90 + 12	○ Yes	○ No
1b.	Three hundred two	○ Yes	○ No
1c.	1 hundred + 20 tens + 2 ones	○ Yes	○ No
1d.	300 + 12	○ Yes	○ No

Scoring Rubric:

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

2 points: YYYN—The student thoroughly understands place value in multi-digit whole numbers.

1 point: YYNN, YNYN, NYYN—The student partially understands place value in multi-digit whole numbers. The student does not fully understand that in multi-digit whole numbers values can be represented in word form, standard form, and expanded form, as well as in many other ways.

0 points: YYYY, YNNN, YNYY, YYNY, YNNY, NNNN, NYYY, NNYY, NNNY, NYNN, NNYN, NYNY—The student has little or inconsistent understanding of place value in multi-digit whole numbers. The student only answered one part correctly. **OR** The student thought the answer to 1d (which serves to confirm no understanding) was "Yes."

MAT.04.SR.1.00NBT.E.035 C1 TE

Sample Item Id:	MAT.04.SR.1.00NBT.E.035
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 E: Use place-value understanding and properties of operations to perform multi-digit arithmetic.
Content Domain:	Numbers and Operations in Base Ten
Standard(S):	4.NBT.5
Mathematical Practice(S):	1, 2, 4, 5, 8
DOK:	2
Item Type:	SR
Score Points:	2
Difficulty:	M
Key:	B, D
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	Multi-answer item

A multiplication problem is shown below.

$$17$$
$$\times 12$$

Which model(s) below could represent the solution to this problem? Click the letter next to <u>all</u> that apply.

(B)

0 12 24 36 48 60 72 84 96 108 120 132 144 156 168 180 192 204

(C) $(1 \times 1) + (1 \times 7) + (2 \times 1) + (2 \times 7)$

(D)

(E) $(17 \times 2) + (17 \times 1)$

(F)
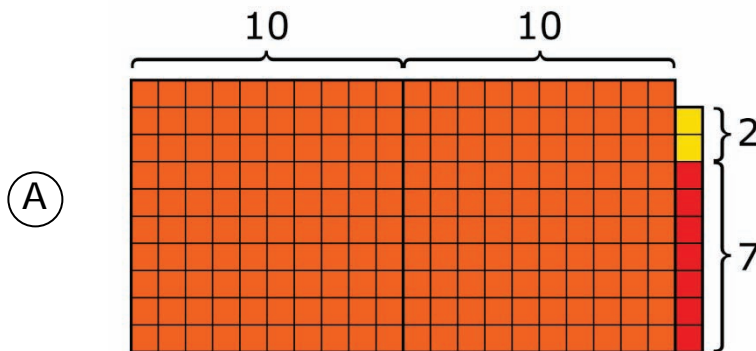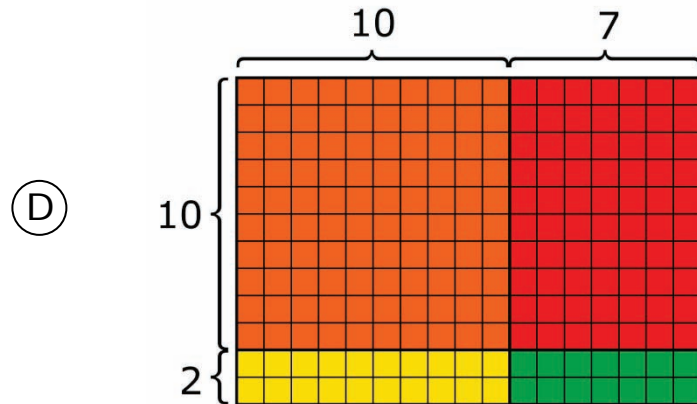
0   17   34   51
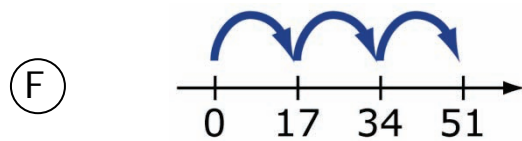
Key and Distractor Analysis:

A   Does not understand how to model multiplication of two two-digit numbers using
          area models
B   Correct
C   Did not account for the values of the digits in the tens places.
D   Correct
E   Did not understand that the 1 represents 10 in the multiplication problem
F   Showed multiplication of 17 and (1 + 2) instead of 17 and 12

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

2 points: B, D
1 point: Either B or D
0 points: Any other combination of selections

MAT.04.TE.1.0000G.L.094 C1 TL

Sample Item Id:	MAT.04.TE.1.0000G.L.094
Grade:	04
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.
Assessment Target(S):	1 L: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
Content Domain:	Geometry
Standard(S):	4.G.2
Mathematical Practice(S):	2, 3, 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):	
Notes:	Classification TE Template

Sort these four shapes. Use the characteristics labeled in the boxes below. Some shapes may belong in more than one box.

Rectangle   Rhombus   Right Triangle   Square

Click on a shape and then click inside a box to place the shape in the box. Continue as many times as necessary.

Shapes with at Least One Right Angle	Shapes with at Least One Pair of Perpendicular Sides	Shapes with at Least One Pair of Parallel Sides

Sample Top-Score Response:

Shapes with at Least One Right Angle	Shapes with at Least One Pair of Perpendicular Sides	Shapes with at Least One Pair of Parallel Sides
Right Triangle Square Rectangle	Right Triangle Square Rectangle	Square Rectangle Rhombus

Scoring Rubric:

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

2 points: The student demonstrates thorough understanding of the classification of two-dimensional shapes by the geometric characteristics of parallelism, perpendicularity, and right angles by correctly identifying each shape that demonstrates these characteristics. The student shows understanding that some shapes should be classified in more than one box as they have more than one of the characteristics. The student completes diagram with all correct classifications as shown in the Sample Top-Score Response.

1 point: The student demonstrates good understanding of the classification of two-dimensional shapes by the geometric characteristics of parallelism, perpendicularity, and right angles. However, the student makes one or two errors related to correctly placing a shape in the boxes that account for all of the characteristics. For example, the rectangle may be placed in the box for "Shapes with At Least One Right Angle" and "Shapes with At Least One Pair of Parallel Sides," but not in the box for "Shapes with At Least One Pair of Perpendicular Sides."

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0 points: The student demonstrates inconsistent or no understanding of the classification of two-dimensional shapes by the geometric characteristics of parallelism, perpendicularity, and right angles. If a shape is placed in a box that doesn't match any of its characteristics, then no points are earned.

TE Information:

Item Code: MAT.04.TE.1.0000G.L.094

Template: Classification

Interaction Space Parameters:
- A. Three images of the tables above (the three categories)
  - i. False (no limit on the number of content pieces that can be placed in each region)
- B. Four images of the shapes above (rectangle, rhombus, right triangle, square)
  - i. False (no limit on the number of content pieces that can be generated)

Scoring Data:
{Right Angle=Right Triangle, Square, Rectangle; Perpendicular = Right Triangle, Square, Rectangle; Parallel = Square, Rectangle, Rhombus}=2 points
{0 errors = 2 points} {1 error = 1 point} {2 errors = 1 point}
{Right Angle = Rhombus, *; Perpendicular = *; Parallel = *} = 0
{Right Angle = *; Perpendicular = Rhombus, *; Parallel = *} = 0
{Right Angle = *; Perpendicular = *; Parallel = Triangle, *} = 0

MAT.04.TE.1.0000G.L.246 C1 TL

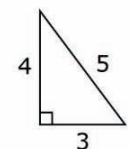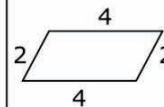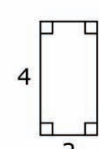|	
Sample Item Id:	MAT.04.TE.1.0000G.L.246
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 L: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
Content Domain:	Geometry
Standard(S):	4.G.3
Mathematical Practice(S):	1, 6, 7
DOK:	1
Item Type:	TE
Score Points:	1
Difficulty:	M
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-Specific Attributes (E.G., Accessibility Issues):	
Notes:	TE template: Classification

Each shape below has side lengths labeled in units. Determine the number of lines of symmetry for each shape. Put each shape in the correct box. Some boxes may have more than one shape. Some boxes may not have any shapes.
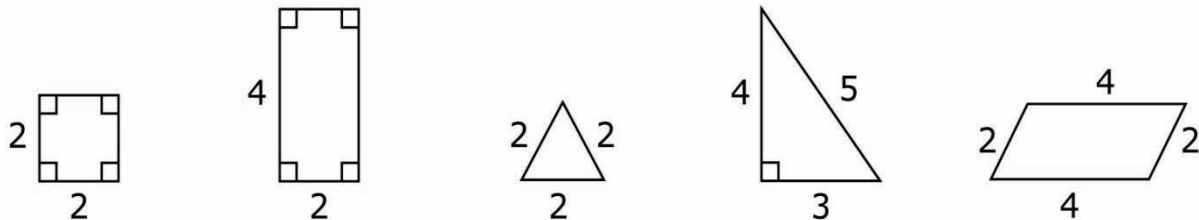
To place a shape in a box, click the shape, move the pointer over the box, and click again. To return all shapes to their original positions, click the Reset button.

Number of Lines of Symmetry	0	Only 1	Exactly 2	Exactly 3	Exactly 4	More Than 4
Shape						

Sample Top-Score Response:

Number of Lines of Symmetry	0	Only 1	Exactly 2	Exactly 3	Exactly 4	More Than 4
Shape						

TE Information:

Item Code: MAT.04.TE.1.0000G.L.246

Template: Classification

Interaction Space Parameters:
  A. The 6 columns in the table: 0, Only 1, Exactly 2, Exactly 3, Exactly 4, More than 4
  B. The following 5 shapes: square, rectangle, equilateral triangle, right triangle, parallelogram

Scoring Data:

{1=DE};{3=B};{4=C};{5=A};{0errors=1}
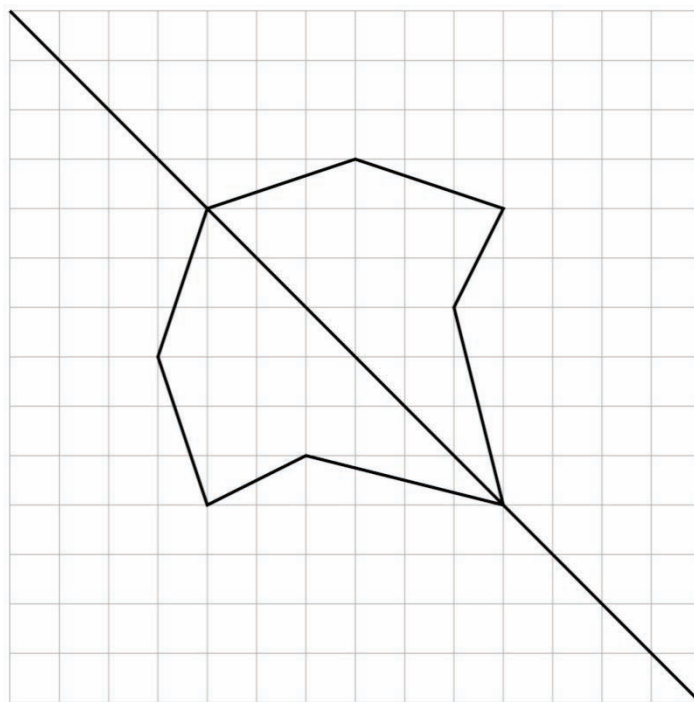
MAT.04.TE.1.0000G.L.250 C1 TL

Sample Item Id:	MAT.04.TE.1.0000G.L.250
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 L: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
Content Domain:	Geometry
Standard(S):	4.G.3
Mathematical Practice(S):	1, 6, 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):	Students with visual impairments may have difficulty with this item.
Notes:	TE template: Single Line

Draw a line of symmetry through the figure below.

Click on an intersection of grid lines to make the first point on the line. To make the second point, move the pointer and click on a different intersection of gridlines. The line will automatically be drawn between the two points. If you make a mistake, click on the Clear button.
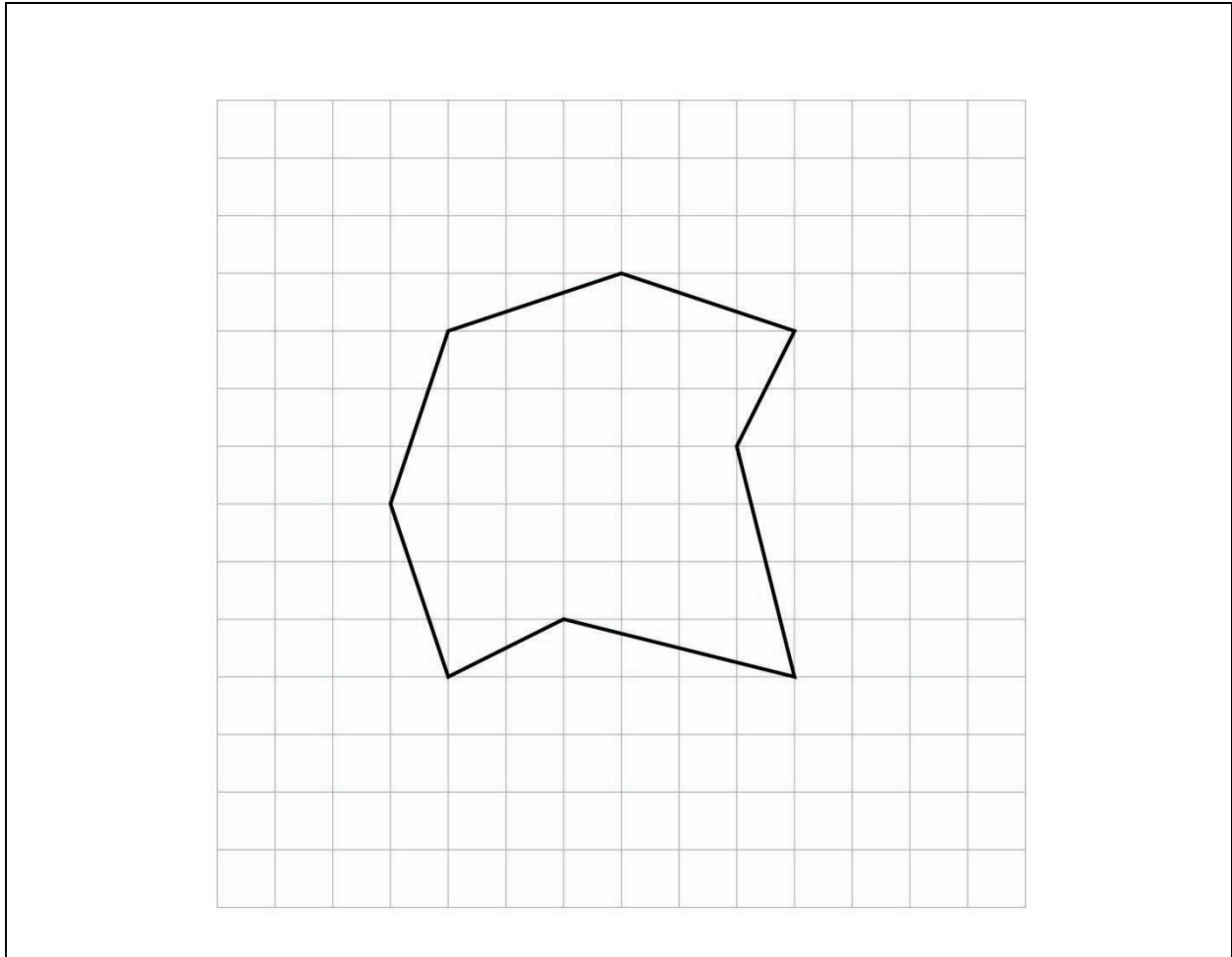
Sample Top-Score Response:

TE Information:

Item Code: MAT.04.TE.1.0000G.L.250

Template: Single Line

Interaction Space Parameters:
     A: False
     B: (1,1), (13,13), 1, no axes shown
     C: Make grid visible
     D: No labels
     E: True
     F: The points (4,10), (7,11), (10,10), (9,8), (10,4), (6,5), (4,4), (3,7), (4,10)
        connected with line segments in that order, as shown in the figure in the item
     G: True
     H: Draw an extended line with arrows on each end

Scoring Data:
     Start Point
          A: Do not consider
     End Point
          A: Do not consider
     x-Intercept

```
                A: Consider
                B: 14
                C: 0
    y-Intercept
                A: Consider
                B: 14
                C: 0
    Slope
                A: Consider
                B: −1
                C: 0
```

MAT.04.TE.1.000NBT.E.214 C1 TE

Sample Item Id:	MAT.04.TE.1.000NBT.E.214
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 E: Use place value understanding and properties of operations to perform multi-digit arithmetic.
Content Domain:	Numbers and Operations in Base Ten
Standard(S):	4.NBT.5
Mathematical Practice(S):	1, 2, 4, 5, 6, 7
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):	
Notes:	TEI Template: Tiling Requires TE to build model and AI to score typed-in response. Response box allows up to four digits.

Use these base-ten blocks to model 247×3.
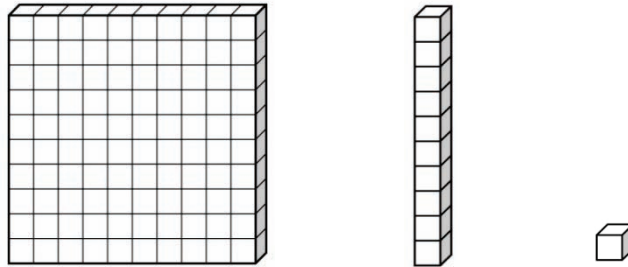
What is the product of 247 x 3?

Type your answer in the space provided.

Sample Top-Score Response:
Shows 6 hundreds, 12 tens and 21 ones   741

Scoring Rubric:

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

2 points: The student shows thorough understanding of multiplying a whole number using strategies based on place value and the properties of operations by doing the following:
- Shows a place-value model for 247 x 3 (For example: 7 hundreds, 4 tens, 1 one; 6 hundreds, 12 tens, 21 ones; 6 hundreds, 14 tens, 1 one)
- Writes 741

1 point: The student shows partial understanding of multiplying a whole number using strategies based on place value and the properties of operations by doing the following:
- Shows a place-value model for 247x3 (For example: 7 hundreds, 4 tens, 1 one; 6 hundreds, 12 tens, 21 ones; 6 hundreds, 14 tens, 1 one) **OR**
- Writes 741 **OR**
- Makes a representation error in model but follows through with the error in the answer.

0 points: The student shows little or no understanding of multiplying a whole number using strategies based on place value and the properties of operations.

TE Information:

Item Code: MAT.04.TE.2.000NBT.E.214

Template: Tiling

Interaction Space Parameters:
  A. The answer space where the base-ten blocks are put
      i.   False
      ii. N/A
  B. The 3 types of base-ten blocks: the hundreds flat, the tens rod, and the unit cube
      i.   False
      ii. N/A

Scoring Data:

    {1=AAAAAAABBBBC}=1
    {1=AAAAAABBBBBBBBBBBCCCCCCCCCCCCCCCCCCCCC}=1

MAT.04.TE.1.000NF.F.093 C1 TF

Sample Item Id:	MAT.04.TE.1.000NF.F.093
Grade:	04
Claim(S):	**Claim 1: Concepts and Procedures** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(S):	1 F: Extend understanding of fraction equivalence and ordering. 1 G: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
Content Domain:	Number and Operations—Fractions
Standard(S):	4.NF.1, 4.NF.2, 4.NF.3
Mathematical Practice(S):	1, 2, 4, 5, 6, 7
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):	
Notes:	TE templates: Selecting Points and Ranges on Number Lines and Tiling

Each of three people started at the same point and ran in the same direction.

- Quintrel ran $\frac{3}{4}$ mile and then stopped.

- Gregory ran $\frac{1}{8}$ mile and then stopped.

- Henry ran $\frac{1}{2}$ mile and then stopped.

Part A

Click on a person and then click on a point on the number line to show the distance he ran. Be sure to show the distance each person ran.

Quintrel

Gregory

Henry

[When the student clicks on the boy icon and then the tick mark on the number line, a line segment is generated from the icon to the place above the stopping tick mark on the number line. This segment is parallel to the number line.]
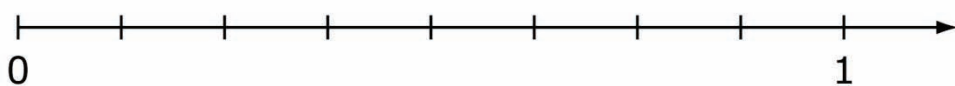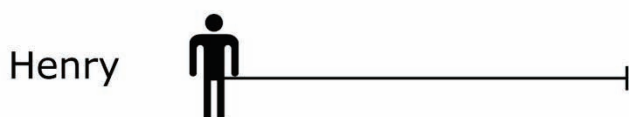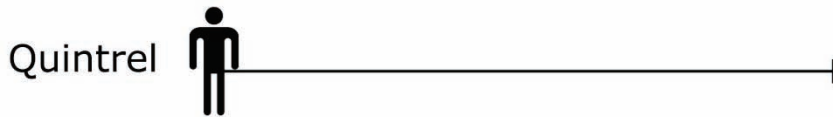
Part B

Use one of the symbols <, >, or = to compare the combined distance Gregory and Henry ran to the distance Quintrel ran. Click in the space below and then click on each button needed to complete your comparison. Click on the Undo button to start over.

$\frac{1}{8}$	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{4}{8}$	$\frac{5}{8}$	$\frac{6}{8}$	$\frac{7}{8}$	$\frac{8}{8}$
$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$	$\frac{4}{4}$	<	>	+	=
$\frac{1}{2}$	$\frac{2}{2}$	Undo					

Sample Top-Score Response:

Part A: Student generated answer as shown.

Part B: $\frac{5}{8} < \frac{3}{4}$

Scoring Rubric:

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

2 points: The student has thorough understanding of modeling fractions with different numerators and denominators, comparing fractions with different numerators and denominators, and adding fractions. The student correctly completed both parts of the task.

1 point: The student has partial understanding of modeling fractions with different numerators and denominators, comparing fractions with different numerators and denominators, and adding fractions. The student correctly completed one of the two parts of the task.

0 points: The student has limited or no understanding of modeling fractions with different numerators and denominators, comparing fractions with different numerators and denominators, and adding fractions. The student did not correctly complete any part of the task.

TE Information:

Item Code: MAT.04.TE.2.000NF.D.093 Part *A*

Template: Selecting Points and Ranges on Number Lines

Interaction Space Parameters:
   A. 3
   B. Used closed markers only (closed marker = True; open marker = False)
   C. Number line information
      i. 0
     ii. 1
    iii. $\dfrac{1}{8}$
    iv. Label the left-most point 0 and the right-most point 1; do not label any other points
     v. Whole numbers
    vi. True
   vii. 1
  viii. True
    ix. 1

Scoring Data:

$\{0:\text{closed}, \dfrac{3}{4}:\text{closed}\}$; $\{0\text{-}\dfrac{3}{4}\}$; $\{1/3\}$

$\{0:\text{closed}, \dfrac{1}{8}:\text{closed}\}$; $\{0\text{-}\dfrac{1}{8}\}$; $\{1/3\}$

$\{0:\text{closed}, \frac{1}{2}:\text{closed}\}; \{0-\frac{1}{2}\}; \{1/3\}$

NOTE: Item writer would like a line to extend from 0 to the point selected as soon as the point is selected. Students should not need to select regions in this item. This is a little different from the current template.

Item Code: MAT.04.TE.2.000NF.D.093 Part *B*

Template: Tiling

Interaction Space Parameters:
  A. The answer space where the numbers and symbol are put
      i. False
      ii. N/A
  B. The 18 tiles to choose from
      i. False
      ii. N/A

Scoring Data:

$\{1=\text{EMK}\}=1; \left(\frac{5}{8} < \frac{3}{4}\right)$

$\{1=\text{AODMK}\}=1; \left(\frac{1}{8} + \frac{4}{8} < \frac{3}{4}\right)$

$\{1=\text{DOAMK}\}=1; \left(\frac{4}{8} + \frac{1}{8} < \frac{3}{4}\right)$

$\{1=\text{AOQMK}\}=1; \left(\frac{1}{8} + \frac{1}{2} < \frac{3}{4}\right)$

$\{1=\text{QOAMK}\}=1; \left(\frac{1}{2} + \frac{1}{8} < \frac{3}{4}\right)$

$\{1=\text{AOJMK}\}=1; \left(\frac{1}{8} + \frac{2}{4} < \frac{3}{4}\right)$

$\{1=\text{JOAMK}\}=1; \left(\frac{2}{4} + \frac{1}{8} < \frac{3}{4}\right)$

$\{1=\text{KNE}\}=1; \left(\frac{3}{4} > \frac{5}{8}\right)$

$\{1=\text{KNAOD}\}=1; \left(\frac{3}{4} > \frac{1}{8} + \frac{4}{8}\right)$

$\{1=\text{KNDOA}\}=1; \left(\frac{3}{4} > \frac{4}{8} + \frac{1}{8}\right)$

$\{1=\text{KNAOQ}\}=1; \left(\frac{3}{4} > \frac{1}{8} + \frac{1}{2}\right)$

$\{1=\text{KNQOA}\}=1; \left(\frac{3}{4} > \frac{1}{2} + \frac{1}{8}\right)$

$\{1=KNAOJ\}=1; \ \left(\dfrac{3}{4} > \dfrac{1}{8} + \dfrac{2}{4} \right)$

$\{1=KNJOA\}=1; \ \left(\dfrac{3}{4} > \dfrac{2}{4} + \dfrac{1}{8} \right)$

MAT.04.TE.2.0000G.B.208 Claim 2

|	
Sample Item Id:	MAT.04.TE.2.0000G.B.208
Grade:	04
Primary Claim:	**Claim 2: Problem Solving** 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:	Geometry
Secondary Content Domain(S):	
Assessment Target(S):	2 B: Select and use appropriate tools strategically. 1 L: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
Standard(S):	4.G.3
Mathematical Practice(S):	1, 2, 4, 6
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):	
Notes:	Technology-enabled item

Part of a figure is shaded on the grid below. Complete the figure by shading squares. Lines *r* and *s* are lines of symmetry for the completed figure.
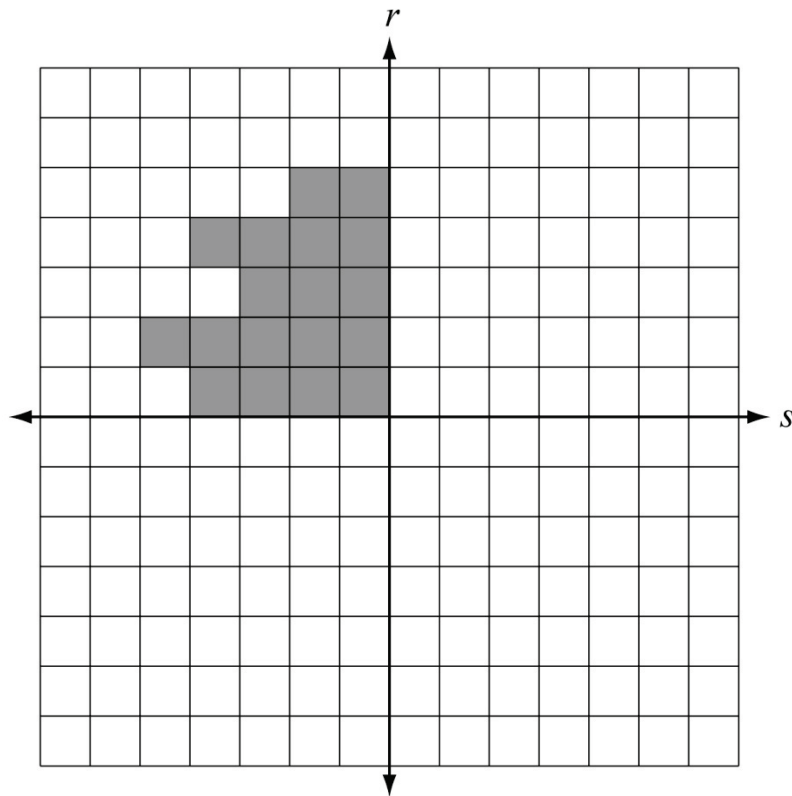
[Quadrant 2 will be locked so students are not able to shade additional squares.]

Shade squares to complete the figure. Click on a square to shade it. Click on the square again to remove the shading if you need to. Make sure that lines *r* and *s* are lines of symmetry for the completed figure.

Sample Top-Score Response:
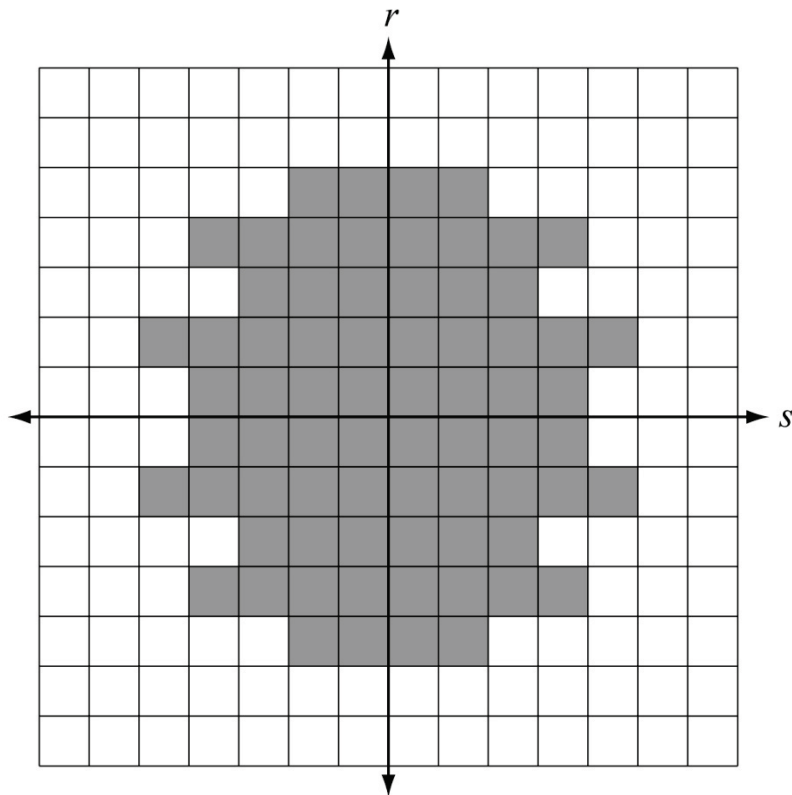
Scoring Rubric:

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

2 points: The student demonstrates thorough understanding of recognizing lines of symmetry by correctly completing the design with lines *r* and *s* as lines of symmetry as shown.

1 point: The student demonstrates partial understanding of recognizing lines of symmetry by completing the design with either line *r* or line *s* as a line of symmetry, but not both. **OR** The student demonstrates understanding of symmetry but makes an error in completing the figure by one or two squares.

0 points: The student demonstrates little or no understanding of recognizing lines of symmetry by completing the design with neither line *r* nor line *s* as a correct line of symmetry.

MAT.04.TE.2.00NBT.E.054 Claim 2

Sample Item ID:	MAT.04.TE.2.00NBT.E.054
Grade:	04
Primary Claim:	**Claim 2: Problem Solving** 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:	Numbers and Operations in Base Ten
Secondary Content Domain(s):	
Assessment Target(s):	2 D: Identify important quantities in a practical situation and map their relationships. 1 E: Use place value understanding and properties of operations to perform multi-digit arithmetic.
Standard(s):	4.NBT.6
Mathematical Practice(s):	1, 2, 4
DOK:	2
Item Type:	TE
Score Points:	2
Difficulty:	
Key:	See Sample Top-Score Response.
Stimulus/Source:	
Target-specific attributes (e.g., accessibility issues):	TEI Template Specification: Tiling
Notes:	Response box will accept up to three numeric entries.

There are 37 students in a class. Students go to a science lab in groups that contain no more than 7 students. Make a model to show the fewest number of science lab groups that will need to be formed with these 37 students.

Click on an oval to make a group. Continue as many times as necessary to make the correct number of groups.
[When an oval is clicked, an oval will be created in the working space.]

Click on a student and then click on an oval to put the student in a group. Continue as many times as necessary.
[When a student icon is clicked and then an oval is clicked, student icons snap to position in the oval to allow for multiple icons.]

What is the fewest number of science lab groups that will need to be formed with these 37 students?

[ ] lab groups

Sample Top-Score Response:
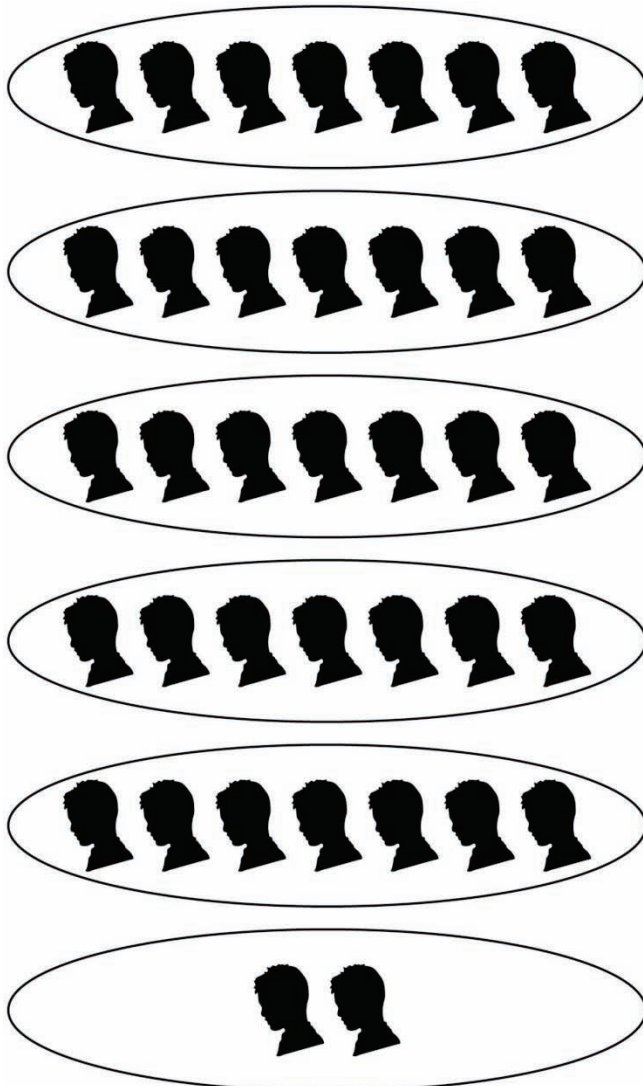
Student creates model with 6 groups containing a total of 37 students, with no more than 7 students in each group.

6 lab groups

Scoring Rubric:

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

2 points: The student has thorough understanding of finding whole-number quotients and remainders. The student creates a model that shows 6 groups containing a total of 37 students, with no more than 7 students in each group. The student also answers 6 to the question.

1 point: The student has partial understanding of finding whole-number quotients and remainders. The student's model contains a minor error but still shows understanding of modeling in a division situation. **OR** The student models only 5 equal groups, does not consider the remainder, and answers 5 to the question.

0 points: The student has little or no understanding of finding whole-number quotients and remainders. The student's model does not show understanding of division and remainders. The student does not answer 6 to the question.