

Smarter Balanced Assessment Consortium:

Mathematics Practice Test Scoring Guide Grade 5

08/14/2019



About the Practice Test Scoring Guides

The Smarter Balanced Mathematics Practice Test Scoring Guides provide details about the items, student response types, correct responses, and related scoring considerations for the Smarter Balanced Practice Test items. The items selected for the Practice Test are designed to reflect

- a broad coverage of claims and targets that closely mirror the summative blueprint.
- a range of student response types.
- a breadth of difficulty levels across the items, ranging from easier to more difficult items.

It is important to note that all student response types are not fully represented on every practice test, but a distribution can be observed across all the practice tests. The items presented are reflective of refinements and adjustments to language based on pilot test results and expert recommendations from both content and accessibility perspectives.

Within this guide, each item is presented with the following information¹:

- Claim: statement derived from evidence about college and career readiness
- Domain: a broad content area that contains related targets and standards (i.e., Geometry)
- Target: statement that bridges the content standards and the assessment evidence that supports the claim
- Depth of Knowledge (DOK): measure of complexity considering the student's cognitive process in response to an item. There are four DOK levels, a 4 being the highest level.
- Common Core State Standards for Mathematical Content (CCSS-MC)
- Common Core State Standards for Mathematical Practice (CCSS-MP)
- Static presentation of the item: static presentation of item from test administration system
- Static presentation of student response field(s): static presentation of response field from test administration system
- Answer key or exemplar: expected student response or example response from score point value
- Rubric and applicable score points for each item: score point representations for student responses

The following items are representative of the kinds of items that students can expect to experience when taking the Computer Adaptive Test (CAT) portion of the summative assessment for grade 5. A separate document is available that provides a grade 5 sample performance task and scoring guide.

¹ Most of these terms (Claim, Domain, Target, DOK, etc.) are defined in various other Smarter Balanced documents, as well as the Common Core State Standards for Mathematics. Refer to the *Content Specifications for the Summative Assessment of the Common Core State Standards for Mathematics* for more information.

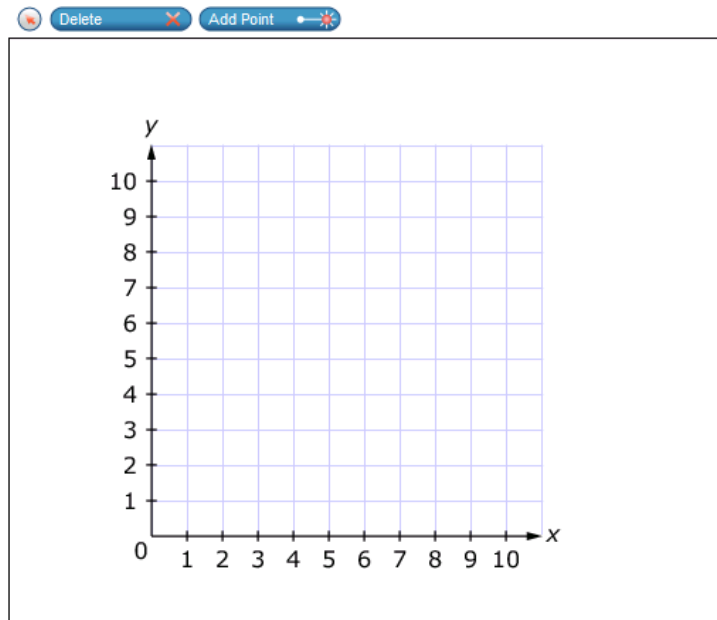
Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#1	1	G	J	1	5.G.A.2	N/A

Use the Add Point tool to plot each point on the coordinate plane.

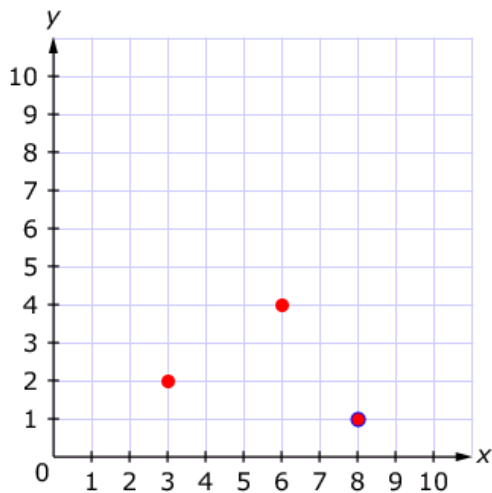
Part A: Plot the point (3, 2).

Part B: Plot the point (6, 4).

Part C: Plot the point (8, 1).



Exemplar: (shown below)



Rubric: (1 point) The student plots all three points correctly.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#2	3	NBT	E	2	5.NBT.B	3

Chevon is using a calculator to multiply 5426 and 30. He enters 5426×300 by mistake.

What can Chevon do to correct his mistake?

- Ⓐ add 270 to the product
- Ⓑ subtract 270 from the product
- Ⓒ multiply the product by 10
- Ⓓ divide the product by 10

Key: D

Rubric: (1 point) The student selects the action that would correct Chevon's mistake.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#3	1	OA	A	1	5.OA.A	N/A

Which expression correctly shows the sum of the product of 9 and 5 and the difference of 24 and 6?

- Ⓐ $9 + (5 \times 24) - 6$
- Ⓑ $(9 \times 5) + (24 - 6)$
- Ⓒ $(9 \times 5) - (24 + 6)$
- Ⓓ $9 - (5 \times 24) + 6$

Key: B

Rubric: (1 point) The student selects the correct expression.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#4	1	NBT	D	1	5.NBT.B.6	N/A

Which equation has the same unknown value as $405 \div 15 = \square$?

- ☐ A $405 \times \square = 15$
- ☐ B $\square \div 405 = 15$
- ☐ C $15 \times \square = 405$
- ☐ D $\square \div 15 = 405$

Key: C

Rubric: (1 point) The student selects the correct equation.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#5	3	NBT	A	2	5.NBT.A.2	3

Lisa claims that when multiplying **any** number between 0 and 10 by 100, the product is **greater** than 100.

What is a possible number that can be multiplied by 100 to show that Lisa's claim is not correct? Enter your answer in the response box.

← → ↶ ↷ ✕

1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: any number less than or equal to 1 and greater than 0 (e.g., $\frac{1}{6}$, 0.5, 1)

Rubric: (1 point) The student enters a correct number.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#6	1	NF	F	2	5.NF.B.5	8

Enter a positive value for n that makes this statement true:
 $1 \times n$ is less than 1 but greater than 0.

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1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: any value between 0 and 1, exclusive

Rubric: (1 point) The student enters a correct value.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#7	1	NF	F	1	5.NF.B.3	N/A

Which expression is equal to $\frac{7}{8}$?

Ⓐ $7 \div 8$

Ⓑ 8×7

Ⓒ $8 \div 7$

Ⓓ 7×8

Key: A

Rubric: (1 point) The student selects the correct expression.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#8	2	MD	A	2	5.MD.C.5	7

A rectangular prism has a volume of 42 cubic units. The length is 3 units. The width is 2 units. What is the height?

- Ⓐ 6 units
- Ⓑ 7 units
- Ⓒ 14 units
- Ⓓ 21 units

Key: B

Rubric: (1 point) The student selects the correct height.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#9	1	NBT	D	1	5.NBT.B.5	N/A

Enter the product.

$$2684 \times 24$$

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1	2	3
4	5	6
7	8	9
0	.	$\frac{\square}{\square}$

Key: 64,416

Rubric: (1 point) The student enters the correct product.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#10	1	NF	F	2	5.NF.B.7	N/A

There are 7 math folders on a classroom shelf. This is $\frac{1}{3}$ of the total number of math folders in the classroom.

Enter the total number of math folders in the classroom.

← → ↶ ↷ ✕

1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: 21

Rubric: (1 point) The student enters the correct number of folders.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#11	4	NF	E	2	5.NF.B.7	4

Which situation can be represented by this equation?

$$4 \div \frac{1}{8} = \square$$

- (A) Jack has 4 pieces of fabric. Each piece is $\frac{1}{8}$ of a yard long. How many yards of fabric does Jack have?
- (B) Jack has 4 pieces of fabric. He gets $\frac{1}{8}$ more yards of fabric. How many yards of fabric does Jack have now?
- (C) Jack has 4 yards of fabric. He gives away $\frac{1}{8}$ of his pieces of fabric. How many pieces of fabric does Jack have left?
- (D) Jack has 4 yards of fabric. He cuts the fabric into pieces $\frac{1}{8}$ of a yard long. How many pieces of fabric does Jack have?

Key: D

Rubric: (1 point) The student identifies the correct situation.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#12	1	NF	E	1	5.NF.A.1	N/A

Roland's family drove $4\frac{6}{10}$ kilometers from their home to the gas station.

They drove $2\frac{30}{100}$ kilometers from the gas station to the store.

Which expression can be used to determine the number of kilometers Roland's family drove altogether?

Ⓐ $6 + \frac{180}{1000}$

Ⓑ $4 + 2 + \frac{36}{110}$

Ⓒ $6 + \frac{6}{100} + \frac{30}{100}$

Ⓓ $4 + 2 + \frac{60}{100} + \frac{30}{100}$

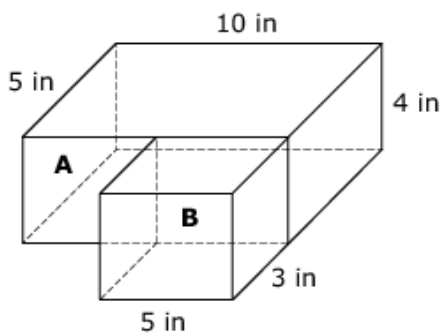
Key: D

Rubric: (1 point) The student selects the correct expression.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#13	1	MD	I	2	5.MD.C.5	N/A

Megan arranges Box A and Box B on her study table.

- The dimensions of Box A are 10 by 5 by 4 inches.
- The dimensions of Box B are 5 by 3 by 4 inches.



Enter the combined volume, in cubic inches, of both boxes.

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✕

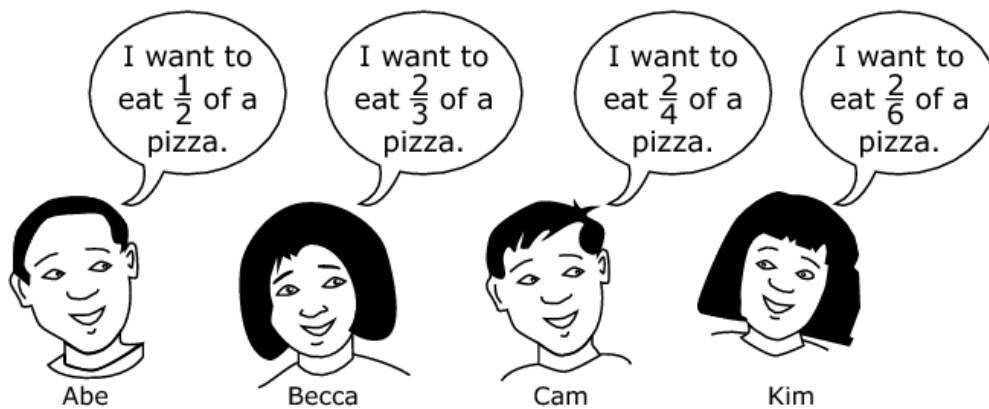
1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: 260

Rubric: (1 point) The student enters the correct number of cubic inches.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#14	3	NF	D	3	5.NF.A.2	1

Four students plan to share the cost for ordering pizza. Each student says how much of a whole pizza they want to eat, as shown.



- Abe and Becca only want pepperoni pizza.
- Cam and Kim only want cheese pizza.
- Cheese and pepperoni pizzas can only be ordered as whole pizzas.

What is the **minimum** number of whole pizzas they must order so that each student has as much of the kind of pizza they say they want to eat?

← → ↶ ↷ ✖

1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: 3

Rubric: (1 point) The student enters the correct minimum number of pizzas.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#15	2	NBT	A	2	5.NBT.B.7	6

Use this table to solve the problem.

Item	Cost per Package
Napkins	\$1.89
Forks	\$1.79

Allie buys 2 packages of napkins and 3 packages of forks for a class party. She gives the store clerk \$10.00. What is the total amount of money that Allie should receive back from the clerk?

← → ↶ ↷ ✖

1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: 0.85 or .85

Rubric: (1 point) The student enters the correct amount of money.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#16	1	NBT	C	1	5.NBT.3	7

Which expression is equal to 5,007.992?

- Ⓐ $5 \times 1,000 + 7 \times 1 + 9 \times \left(\frac{1}{10}\right) + 9 \times \left(\frac{1}{100}\right) + 2 \times \left(\frac{1}{1,000}\right)$
- Ⓑ $5 \times 1,000 + 7 \times 1 + 9 \times 10 + 9 \times 100 + 2 \times 1,000$
- Ⓒ $5 \times 1,000,000 + 7 \times 1,000 + 9 \times \left(\frac{1}{1}\right) + 9 \times \left(\frac{1}{10}\right) + 2 \times \left(\frac{1}{100}\right)$
- Ⓓ $5 \times 1,000,000 + 7 \times 1,000 + 9 \times 100 + 9 \times 10 + 2 \times 1$

Key: A

Rubric: (1 point) The student selects the correct expression.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#17	3	G	F	3	5.G.B	2

A **regular polygon** is a polygon with:

- all sides the same length, and
- all angles the same size.

Decide if each shape is always, sometimes, or never a regular polygon. Click in the table to respond.

	Always a Regular Polygon	Sometimes a Regular Polygon	Never a Regular Polygon
Acute triangle	☐	☐	☐
Obtuse triangle	☐	☐	☐
Right triangle	☐	☐	☐
Rectangle	☐	☐	☐
Square	☐	☐	☐

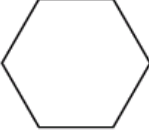
Exemplar: (shown at right)

Rubric: (1 point) The student selects the correct designations for each polygon.

Always a Regular Polygon	Sometimes a Regular Polygon	Never a Regular Polygon
☐	☒	☐
☐	☐	☒
☐	☐	☒
☐	☒	☐
☒	☐	☐

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#18	1	G	K	2	5.G.B.3	N/A

Determine which category each polygon belongs to. Select **all** boxes that apply. Shapes may belong to more than one category. If the polygon is **not** a square, parallelogram, or quadrilateral, select None of These.

	Square	Parallelogram	Quadrilateral	None of These
 Trapezoid	☐	☐	☐	☐
 Hexagon	☐	☐	☐	☐
 Rhombus	☐	☐	☐	☐

Exemplar: (shown at right)

Rubric: (1 point) The student correctly and completely indicates the shape(s) that classify each polygon shown.

	Square	Parallelogram	Quadrilateral	None of These
 Trapezoid	☐	☐	☒	☐
 Hexagon	☐	☐	☐	☒
 Rhombus	☐	☒	☒	☐

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#19	4	MD	A	3	5.MD.C.5	6

Justin is packing a container with books.

- The dimensions of each book are 8 inches by 6 inches by 2 inches.
- The dimensions of the container are 16 inches by 12 inches by 12 inches.
- All of the books and the container are rectangular prisms.

Part A

How many books can fit in the container if the books are packed so that there is no unused space in the container?

Enter your response in the first response box.

Part B

Each book weighs 2 pounds. The maximum weight the container can hold is 40 pounds.

What is the greatest number of books that can fit in the container without going over the container's weight limit?

Enter your response in the second response box.

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1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: 24 and 20

Rubric: (2 points) The student enters a correct number of books in each response box.

(1 point) The student enters a correct number of books in only one response box.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#20	1	NF	F	2	5.NF.B.6	N/A

A rattlesnake at a zoo is $5\frac{1}{2}$ feet long. A corn snake at a zoo is $\frac{3}{4}$ of that length.
Enter the length, in feet, of the corn snake.

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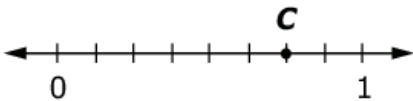
1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: 33/8 or 4 1/8 or equivalent

Rubric: (1 point) The student enters the correct length.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#21	1	NF	E	2	5.NF.A.2	N/A

Chris and Ben walked home from school. The distance Chris walked, in miles, is represented by point C on the number line.



Ben walked $\frac{1}{4}$ mile less than Chris walked.

Enter the distance, in miles, Ben walked.

← → ↶ ↷ ✕

1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: $\frac{1}{2}$ or equivalent

Rubric: (1 point) The student enters the correct distance.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#22	3	NF	C	2	5.NF.B	1, 6

Gordon has paper strips that are all equal in length. He lines them up end to end.

When the line of paper strips is 3 feet long, Gordon says there are 12 paper strips.

What is the length, **in feet**, of one paper strip if Gordon is correct?

← → ↶ ↷ ✖

1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: $\frac{3}{12}$ or $\frac{1}{4}$ or equivalent

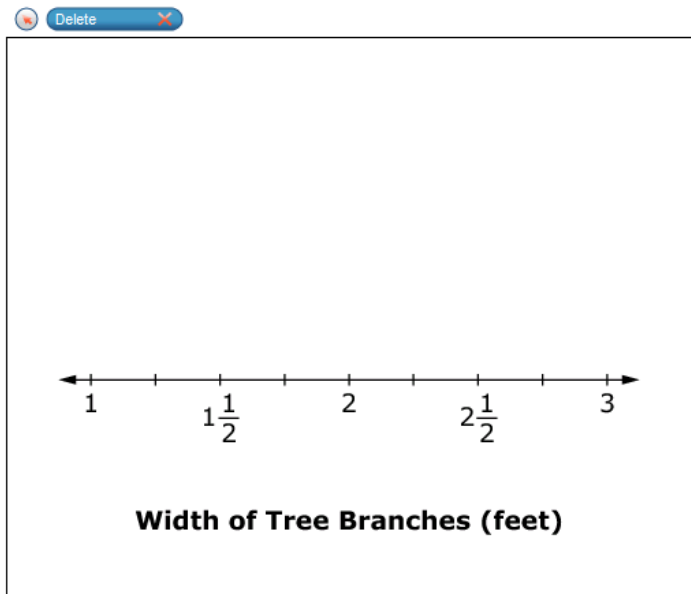
Rubric: (1 point) The student enters the correct length of one paper strip.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#23	4	MD	F	2	5.MD.B.2	5

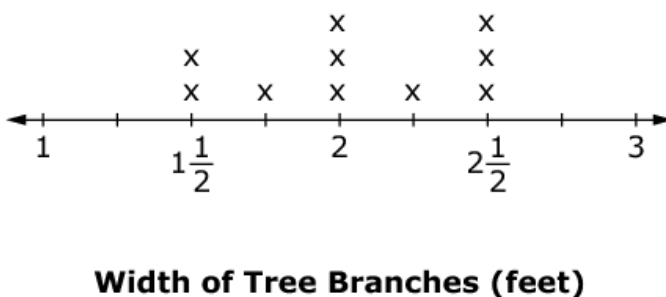
A scientist measures the width of ten different tree branches, **in inches**.

The results, in inches, are 18, 24, 27, 30, 21, 18, 24, 30, 30, and 24.

Complete the line plot to represent all of the results, **in feet**, by clicking above each tick mark to make an X appear.



Exemplar: (shown below)



Rubric: (1 point) The student correctly completes the line plot.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#24	3	NBT	B	3	5.NBT.B	8

Sam multiplies a number, n , by a two-digit number.

Which statement is true?

- Ⓐ When n is a one-digit number, the product will always have three digits.
- Ⓑ When n is a two-digit number, the product will have four or five digits.
- Ⓒ When n is a three-digit number, the product will always have four digits.
- Ⓓ When n is a four-digit number, the product will have five or six digits.

Key: D

Rubric: (1 point) The student identifies the statement that **must** be true.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#25	1	MD	I	1	5.MD.C.5	4

Jonas has a file cabinet in the shape of a right rectangular prism.

- The area of the base of the file cabinet is 450 square inches.
- The height of the file cabinet is 53 inches.

Enter the volume, in cubic inches, of the file cabinet.

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→
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✕

1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: 23,850

Rubric: (1 point) The student enters the correct volume in cubic inches.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#26	1	NBT	C	2	5.NBT.A.3	N/A

Determine if each comparison is true or false. Select True or False for each comparison.

	True	False
$8.81 > 8.9$	☐	☐
$11.34 < 11.340$	☐	☐
$7.634 > 7.67$	☐	☐

Key: F, F, F

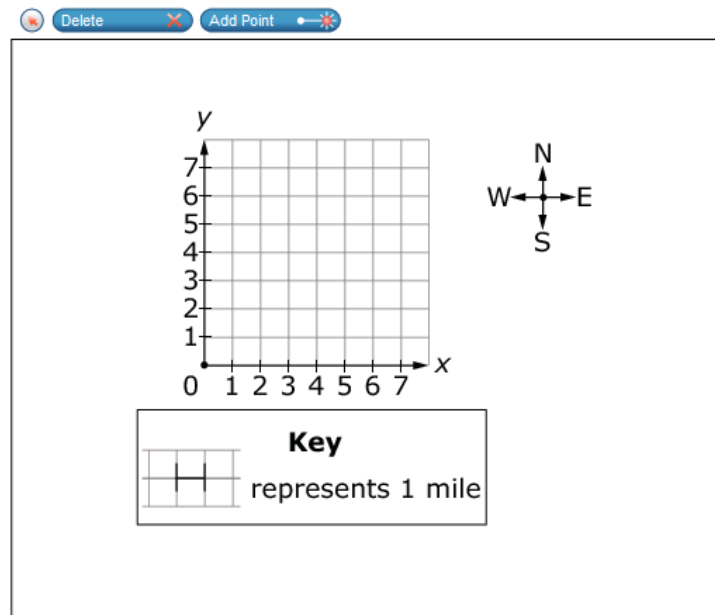
Rubric: (1 point) The student correctly identifies each comparison as true or false.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#27	2	G	C	2	5.G.A.1	4

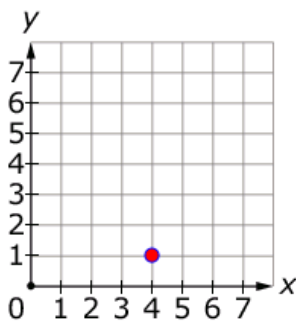
Calvin and Shana are in the same school.

- The school is located at $(0, 0)$.
- Calvin travels 2 miles east and 1 mile north to get home from school.
- Shana travels twice the number of miles east and the same number of miles north as Calvin to get home.

Use the Add Point tool to plot Shana's house.



Exemplar: (shown below)



Rubric: (1 point) The student plots the correct point at $(4, 1)$.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#28	1	MD	G	1	5.MD.A.1	N/A

Enter the number of **quarts** equal to 48 cups.

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→
↶
↷
✕

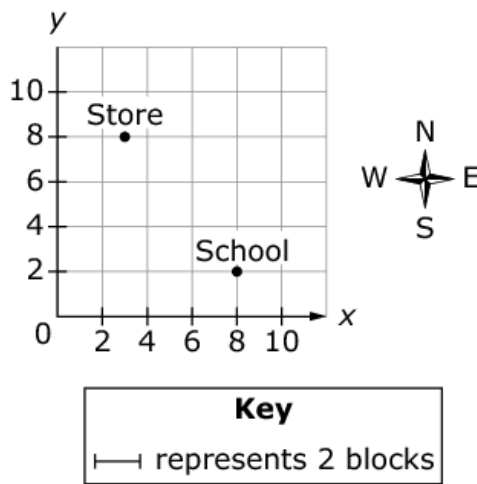
1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: 12

Rubric: (1 point) The student enters the correct number of quarts.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#29	3	G	E	3	5.G.A.2	3

Lisa and Kara go to the same school. After school, they plan to walk to the store. The location of the store and the school are plotted on the coordinate grid.



Lisa says, "I think we should walk 6 blocks north and 5 blocks west to get to the store."

Kara says, "No, I think it's shorter if we walk 3 blocks west, 4 blocks north, 2 blocks west, and then 2 more blocks north."

Whose route is the shortest?

- (A) Lisa, because her route is the most direct from the school to the store.
- (B) Kara, because her route takes short cuts from the school to the store.
- (C) Both Lisa and Kara, because each of their routes are the same distance.
- (D) Neither Lisa nor Kara, because their routes do not end with them arriving at the store.

Key: C

Rubric: (1 point) The student identifies the shortest route.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#30	1	NF	E	1	5.NF.A.1	N/A

Enter the sum.

$$\frac{17}{9} + \frac{5}{3}$$

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1	2	3
4	5	6
7	8	9
0	.	$\frac{\Box}{\Box}$

Key: 32/9 or 3 5/9 or equivalent

Rubric: (1 point) The student enters the correct sum.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#31	3	MD	A	2	5.MD.C.5	2

Isiah uses exactly 60 cubes to build a rectangular prism. Each cube has side lengths of 1 unit.

Part A

Drag numbers to show the dimensions Isiah could use to make a prism with one side length of 10 units.

Part B

Drag numbers to show the dimensions Isiah could use to make a prism **without** any side lengths of 10 units.

1
2
3
4
5
6
10
12

Delete

Part A

Length = units

Width = units

Height = units

Part B

Length = units

Width = units

Height = units

Key: For Part A: any combination of factors that equal 60 and include 10 as one of the factors (e.g., 10, 6, 1 or 10, 2, 3)

For Part B: any combination of factors that equal 60 and do not include 10 as one of the factors (e.g., 2, 5, 6 or 1, 5, 12 or 3, 4, 5).

Rubric: (2 points) The student completes both sets of dimensions correctly.

(1 point) The student completes only one set of dimensions correctly.



Smarter Balanced Assessment Consortium:

Clay Pottery Performance Task
Grade 5 Mathematics Practice Test
Scoring Guide
08/14/2019



Clay Pottery

Lizzie and Zela are interested in making pottery. The following chart shows how much clay is needed to make different projects.

Project	Pounds of Clay Needed
 Small Plate	$2\frac{1}{2}$
 Small Bowl	$1\frac{1}{2}$
 Large Bowl	$3\frac{1}{4}$
 Dinner Plate	$4\frac{1}{2}$
 Mug	$\frac{3}{4}$

1

Which project needs the most clay?

- A. Small Plate
- B. Small Bowl
- C. Large Bowl
- D. Dinner Plate
- E. Mug

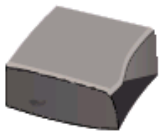
2

How much more clay, in pounds, is needed to make a large bowl than a small bowl?

pounds

3

Zela wants to make a set of 6 mugs. The clay **only** comes in 1-pound blocks.



What is the **least** number of blocks of clay Zela will need to make 6 mugs?

Explain how you figured out your answer.

Note: Zela knows that leftover clay from each block can be squished together and used.

4

Lizzie has 12 pounds of clay and wants to use all of it. She does not need to make all of the projects, and may make more than one of any project.

Describe a plan for Lizzie to use 12 pounds of clay making projects from the chart.

Show how you know she will use **exactly** 12 pounds of clay with this plan.

5

Zela is making a plan to use her 12 pounds of clay. She still wants to make 6 mugs. She also wants to make 6 small bowls.

Lizzie says:

"12 pounds is not enough to make 6 mugs and 6 small bowls. I know because I did the math."

Zela says:

"It is enough if I make the bowls smaller!"

Make a plan for Zela to use no more than 12 pounds of clay to make 6 mugs and 6 bowls that are **smaller** than the bowls in the chart.

In the plan, state how much clay she should use for each of her smaller bowls. Her bowls should all be the same size.

Zela does **not** care about using **exactly** 12 pounds, but she does want to use as much of the clay as possible.

1

Which project needs the most clay?

- A. Small Plate
- B. Small Bowl
- C. Large Bowl
- D. Dinner Plate
- E. Mug

#1 Multiple choice – 1 point

Item	Claim	Domain	Target	DOK	MP	Key
#1	2	NF	2A	1	1	D - Dinner plate

Key (1 point): The student selects option D - Dinner plate.

Commentary: The first two questions are entry level questions to ramp into the work of the task. The purpose of these questions are primarily to assess whether the student (1) understands the context and the representation (a table) and (2) can identify and infer relevant quantities and perform typical calculations (compare magnitudes).

The context is reasonably authentic. Many students have taken an art class or have interacted with clay in other settings. Understanding that different projects require different quantities of clay can be applied to many contexts besides art. These questions are about understanding which projects use more or less clay.

Rationale for Content:

The content is securely held, as this question assesses a 4th-grade standard. Students are asked to determine which project needs the most clay, which in essence is asking them to compare four fractions. This is why the content standard is 4.NF.A.2.

4.NF.A.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual fraction model.

Rationale for Claim:

The fact that the student must extract the quantities and compare them is what makes this a Claim 2, Target A.

Claim 2, Target A: Apply mathematics to solve well-posed problems in pure mathematics and those arising in everyday life, society, and the workplace.

Rationale for DOK:

This is a straightforward DOK 1. From the *Depth of Thinking* chart:

ANALYZE (DOK 1):

-Retrieve information from a table or graph to answer a question.

2

How much more clay, in pounds, is needed to make a large bowl than a small bowl?

 pounds

#2 Equation numeric – 1 point

Item	Claim	Domain	Target	DOK	Content	MP	Key
#2	2	NF	2A, 2D	2	5.NF.A.2; 4.NF.A.2	1	$1\frac{3}{4}$ or 1.75 or equivalent

Key (1 point): $1\frac{3}{4}$ or 1.75 or equivalent

Rationale for Content:

The content is part of the progression of standards in the NF domain that leads to understanding how to use equivalent fractions as a strategy to subtract fractions. This is why the primary content standard is 5.NF.A.2. However, the problem can be solved using the strategies linked to 4.NF.A.2 as well.

5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result $\frac{2}{5} + \frac{1}{2} = \frac{3}{7}$, by observing that $\frac{3}{7} < \frac{1}{2}$.

4.NF.A.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual fraction model.

Rationale for Claim:

The fact that the student must extract the quantities, choose the procedure, and calculate the answer to solve this problem is what makes this a Target 2A (primary target) and Target 2D (secondary target).

Claim 2, Target A: Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace.

Claim 2, Target D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).

Rationale for DOK:

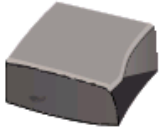
Since the student needs to retrieve information from the context and select a procedure (in this case, subtraction), it meets the requirement for DOK 2. From the *Depth of Thinking* chart:

APPLY (DOK 2):

- Select a procedure and perform it
- Solve a routine problem applying multiple concepts or decision points
- Retrieve information to solve a problem

3

Zela wants to make a set of 6 mugs. The clay **only** comes in 1-pound blocks.



What is the **least** number of blocks of clay Zela will need to make 6 mugs?

Explain how you figured out your answer.

Note: Zela knows that leftover clay from each block can be squished together and used.

#3 Short answer – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#3	4	NF	4D	2	4.NF.A.4c	2, 3, 4	See sample responses

Rubric:

2 points: Student **develops** an approach to determine the number of pounds of clay needed to make 6 mugs AND provides an **explanation** as to why 5 blocks are needed.

1 point: Student correctly calculates the amount of clay needed, but does not provide an explanation why. Or, student provides the correct answer but with a flawed justification.

0 points: All other responses

Commentary: Although the purpose of this question is to have students solve a problem in a real-life context, it has been designed to focus on *interpreting results* in such a context. This is achieved by making the amount of clay needed to be 4.5 pounds and requiring clay to be sold in 1-pound increments only. If the amount needed had been, for example, 4 pounds of clay, then this would not have necessitated the same degree of interpretation.

Rationale for Content:

This content is securely held, being essentially 4th grade.

4.NF.B.4c Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat $\frac{3}{8}$ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

Rationale for Claim:

There are a variety of approaches. Students may create a list or make a table showing the amount of clay needed for a set of 6 mugs. This requires understanding of the context, correctly calculating the amount of clay, and interpreting the result in context. Because clay only comes in 1-pound increments, students must correctly explain what to do with the 4.5 pounds of clay needed. This is what makes this a Claim 4, as is explicitly called out in the specifications:

Claim 4, Target D: Interpret results in the context of a situation. Tasks used to assess this target should ask students to link their answer(s) back to the problem's context. In early grades, this might include a judgment by the student of whether to express an answer to a division problem using a remainder or not based on the problem's context. In later grades, this might include a rationalization for the domain of a function being limited to positive integers based on a problem's context (e.g., understanding that the number of buses required for a given situation cannot be $32\frac{1}{2}$, or that the negative values for the independent variable in a quadratic function modeling a basketball shot have no meaning in this context).

Rationale for DOK:

This question has two parts that qualify as DOK 2. From the *Depth of Thinking* chart:

APPLY DOK 2: Select a procedure and perform it

And from Smarter Balanced specifications:

ANALYZE DOK 2: Interpret results in the context of a situation

What follows are sample responses and scoring annotations for Item 3.

Sample Response 3a

B I U T_x **☰ ☷ ☹ ☺** **✂ ☞ ☰ ☱** **↶ ↷** **ABC** **Ω**

$$\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = 4 \frac{1}{2}$$

Zela will need 5 blocks of clay to make a set of 6 mugs. Since the clay blocks only come in one pound blocks you need to round 4 1/2 up.

SCORE

2

The student correctly calculated that 4 ½ pounds of clay would be needed to create a set of 6 mugs. The student then explained that because clay only comes in one-pound blocks, Zela would need to buy 5 blocks of clay. The response contains evidence of the student's competence in problem solving to the full extent that these processes apply to this item.

Sample Response 3b

B I U T_x **☰ ☷ ☹ ☺** **✂ ☞ ☰ ☱** **↶ ↷** **ABC** **Ω**

Each mug takes 3/4 pounds of clay. And 6 times 3/4 is 18/4 which is 4 2/4.

So Zela needs more than 4 pounds of clay, but less than 5 pounds.

She will need to squish together the left over pieces of each block, but she should be able to make all 6 cups with 5 1-pound blocks.

SCORE

2

The student correctly calculated that to make 6 mugs, Zela needs 4 2/4 pounds of clay. He/she states that Zela needs more than 4 pounds, but less than 5 pounds, implying that he/she understands the clay only comes in 1-pound blocks. The student also understands that leftover pieces of each block will need to be combined to make all 6 mugs with 5 blocks of clay. The response contains evidence of the student's competence in problem solving to the full extent that these processes apply to this item.

Sample Response 3c

B I U I_x $\frac{1}{2} =$ $\frac{3}{4} =$ $\frac{5}{6} =$ $\frac{7}{8} =$       

$$.75 \times 6 \text{ mugs} = 4.5$$

She needs 5 blocks.

SCORE

1

The student correctly calculated that 6 mugs times 0.75 is 4.5 and even stated that Zela needs 5 blocks of clay. However, he/she did not provide an explanation as to why 5 blocks are needed. The student has demonstrated only a **partial** understanding of the mathematical content and practices essential to this item.

Sample Response 3d

B I U I_x $\frac{1}{2} =$ $\frac{3}{4} =$ $\frac{5}{6} =$ $\frac{7}{8} =$       

$$\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{18}{4}$$

Zela needs $\frac{18}{4}$ of clay to make 6 mugs.

SCORE

1

The student correctly calculated that Zela needs $\frac{18}{4}$ pounds of clay to make 6 mugs. However, he/she didn't take into account the fact that the clay only comes in 1-pound blocks. The student has demonstrated only a **partial** understanding of the mathematical content and practices essential to this item.

Sample Response 3e

1 mug = $\frac{3}{4}$
 $\frac{3}{4} \times 6 = \frac{18}{24}$
 I multiplied $\frac{3}{4} \times 6$ and then it equaled $\frac{18}{24}$.

SCORE

0

The student showed initial understanding of the mathematics required, but he/she did not execute the multiplication correctly, nor provide an adequate explanation. The explanation given is not a justification for the amount of clay, rather it is a description of the process used. No evidence is present that demonstrates the student's competence in problem solving related to the specified task.

Sample Response 3f

I think Zela will need 6 blocks of clay.

SCORE

0

The student has demonstrated merely an acquaintance with the topic in that he/she at least attempted to answer the question. However, the response contains no support for the answer of 6 blocks by way of work or explanation. No evidence is present that demonstrates the student's competence in problem solving related to the specified task.

4

Lizzie has 12 pounds of clay and wants to use all of it. She does not need to make all of the projects, and may make more than one of any project.

Describe a plan for Lizzie to use 12 pounds of clay making projects from the chart.

Show how you know she will use **exactly** 12 pounds of clay with this plan.

#4 Short answer – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#4	3	NF	B	3	4.NF.A.4c	2, 3, 4	See sample responses

Rubric:

2 points: Student describes a plan by which Lizzie uses all 12 pounds of clay making projects from the chart. A valid explanation is one that connects to the context. Numeric computations with no explanation are not considered valid.

1 point: Student provides either a correct explanation with incorrect calculations or has incorrect calculations that total 12, but has a valid explanation.

0 points: All other responses

Commentary:

This question is about planning which combinations of projects can be made that require exactly 12 pounds of clay (which, mathematically, reduces to finding certain combinations of given fractions that add up to 12) and justifying the solution.

Rationale for Content:

This content is securely held, being essentially 4th grade.

4.NF.4c: Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat $\frac{3}{8}$ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed?*

Between what two whole numbers does your answer lie?

Rationale for Claim:

Because the problem is asking for an explanation, the expectation is that students connect the meaning of the context to suitable operations and show, mathematically, that conditions are met. Providing numeric calculations with no connections to the context does not comprise an explanation and is therefore not sufficient. It is this aspect that pushes it into Claim 3 from Claim 2.

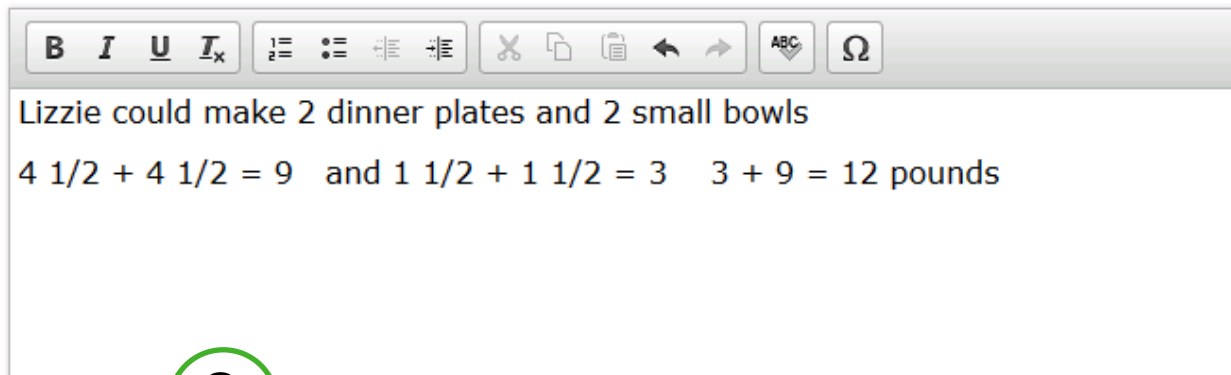
Rationale for DOK:

This is a straightforward DOK 3 problem. From the *Depth of Thinking* chart:

DOK 3, UNDERSTAND:

- Use concepts to solve non-routine problems
- Explain reasoning when more than one response is possible

What follows are sample responses and scoring annotations for Item 4.



B I U I_x **$\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{7}{8}$** **✂** **📄** **📋** **↶** **↷** **ABC** **Ω**

Lizzie could make 2 dinner plates and 2 small bowls

$4 \frac{1}{2} + 4 \frac{1}{2} = 9$ and $1 \frac{1}{2} + 1 \frac{1}{2} = 3$ $3 + 9 = 12$ pounds

SCORE**2**

The student described a correct combination of projects and showed the appropriate computation to support the total is 12 pounds. The student demonstrated a full and complete understanding of all mathematical content and practices essential to this task.

Sample Response 4b

If she makes all of the projects it would take $2.5 + 1.5 + 3.25 + .75 + 4.5 = 12.5$.
That doesn't work. So she should make 2 sm plats and 2 sm bowls instead of the dinner plate. That takes exactly 12 pounds of clay.

SCORE

2

The student added up what it would take to make one of each project (even though he/she did not include the names of the projects, it is clear that the numbers match the projects in the same order given in the table). The student then realized that taking away the dinner plate (4.5) and making 2 small plates and 2 small bowls (instead of 1 each) would take exactly 12 pounds of clay. The student did not explicitly restate the calculations; however, the student demonstrated enough understanding of the mathematical content and practices essential to this task in order to earn full credit.

Sample Response 4c

2 large bowls = 6 1/2 lb

2 small bowls = 3 lb

2 mugs = 1 1/2 lb

This means Lizzie has used all 12 lbs of clay.

SCORE

1

The student correctly indicated what it would take to make 2 each of the large bowls, small bowls, and mugs. However, the student incorrectly stated that all 12 pounds of clay was used (it adds to only 11 pounds). This computational error prevents the response from receiving full credit.

Sample Response 4d

B I U I_x **$\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{7}{8}$** **✂** **📄** **📋** **↶** **↷** **ABC** **Ω**

small plate + small bowl = $4 \times 3 = 12$

SCORE

1

The student appears to have indicated that Lizzie can make 3 small plates and 3 small bowls and it would total 12 pounds. However, the response doesn't actually contain enough information for scorers to make this determination. The item specifically states "Describe a plan..." and the student failed to provide a description of the plan. Therefore, the response can only earn partial credit.

Sample Response 4e

B I U I_x **$\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{7}{8}$** **✂** **📄** **📋** **↶** **↷** **ABC** **Ω**

Lizzie would use all 12 pounds of clay if she makes all five projects.

SCORE

0

The student has demonstrated merely an acquaintance with the topic in that he/she at least attempted to answer the question. However, the response contains no support for the answer of using all 12 pounds of clay if Lizzie makes all five projects by way of work or explanation. No evidence is present that demonstrates the student's competence in problem solving, reasoning, and/or modeling related to the specified task.

5

Zela is making a plan to use her 12 pounds of clay. She still wants to make 6 mugs. She also wants to make 6 small bowls.

Lizzie says:

"12 pounds is not enough to make 6 mugs and 6 small bowls. I know because I did the math."

Zela says:

"It is enough if I make the bowls smaller!"

Make a plan for Zela to use no more than 12 pounds of clay to make 6 mugs and 6 bowls that are **smaller** than the bowls in the chart.

In the plan, state how much clay she should use for each of her smaller bowls. Her bowls should all be the same size.

Zela does **not** care about using **exactly** 12 pounds, but she does want to use as much of the clay as possible.

#5 Short answer – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#5	4	NF	F	3	3.NF.A.3, 4.NF.B.4c	2, 3, 4	See sample responses

Rubric:

2 points: The student describes an amount of clay that meets the criteria (6 mugs $\times \frac{3}{4}$ and 6 bowls times a value between 1 and $1\frac{1}{2}$) AND gives a valid explanation for how this value meets the criteria.

1 point: The student's response contains some of the attributes of an appropriate response but lacks convincing evidence that the student fully comprehends the essential mathematical ideas addressed by this task. Such deficits may include evidence of insufficient mathematical knowledge; errors in fundamental mathematical procedures; and/or lack of explanation or clarity in the response.

0 points: All other responses

Note: If the student uses an incorrect amount of clay from item #3 in the response to determine the amount of clay needed, the response can still earn full credit.

Commentary:

The purpose of the question is to provide a "design under constraint" type problem. This entails multiple steps: (1) Students must make sense of the constraints, (2) determine a value that satisfies the constraints, and (3) explain why this value works. We view this as a modeling task, hence Claim 4. There is also, by design, a non-routine quality to mathematical work expected of the students in that 5th-grade students will not have algebraic tools to tackle this in generality, hence must devise their own strategy. In addition, there is no scaffolding, so even though the numbers involved are (by design) not too messy, the depth of knowledge is increased to level 3.

Rationale for Content:

The content is securely held; the numeric comparisons of fractions are a Grade 3 content standard.

3.NF.3: Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

Rationale for Claim:

This question aligns with Claim 4, Target F because this problem asks students to design under constraints. This particular question is asking students to design bowls by (1) specifying values of essential parameters given, and (2) giving an explanation of how these values satisfy the constraint.

Claim 4, Target F: Identify important quantities in a practical situation and map their relationships.

Rationale for DOK:

This question is DOK 3 for the following reasons. From the *Depth of Thinking* chart:

UNDERSTAND (DOK 3):

- Use concepts to solve non-routine problems
- Explain reasoning when more than one response is possible

What follows are sample responses and scoring annotations for Item 5.

Sample Response 5a

I alredy know it takes $4\frac{1}{2}$ pounds of clay to make 6 mugs so i have $7\frac{1}{2}$ pounds left to make the bowls. 6 bowls $\times$ $1\frac{1}{2}$ is 9. I don't have enough. zela can make them smaller. I think if she just takes 7 pounds and divides by 6, it will work. So $7/6$ pounds per bowl. She'll have some left over, but not much.

SCORE

2

The student used the exact amount of clay needed to make 6 mugs (which could have been taken from his/her work on item #3). The student correctly indicated how much clay was available to make the small bowls ($7\frac{1}{2}$ lbs) and knew that 9 pounds would be needed if using the amount from the table. Although the student didn't divide $7\frac{1}{2}$ by 6 to determine the amount needed for each bowl, he/she did recognize that he/she only needed to be close to 12 pounds without going over. The student demonstrated a full and complete understanding of all mathematical content and practices essential to this task.

Sample Response 5b

Since I need 5 blocks of clay to make 6 mugs, I have 7 blocks left to make 6 bowls. If I use 1 block for each bowl, instead of $1\frac{1}{2}$ blocks it will work. I know it means I have 1 block left over, so I could make another small bowl or maybe another mug to use as much clay as possible.

SCORE

2

The student refers to blocks rather than pounds, but they essentially reflect the same amount. The indication that 5 blocks of clay was needed for 6 mugs is likely a comment back to item #3, so it is taken as a correct amount amount (even though it could be considered a minor flaw that the student didn't mention the amount of clay that would be left over – $\frac{1}{2}$ pound). The student correctly indicated how much clay was available to make the small bowls (7 blocks) and knew that the bowls would need less than $1\frac{1}{2}$ blocks each in order to work. The student recommended 1 block per bowl and even declared there would be enough left over to make another mug or bowl. The student demonstrated enough understanding of the mathematical content and practices essential to this task to receive full credit.

Sample Response 5c

$12 - 4 \frac{1}{2} \text{ (mugs)} = 7 \frac{1}{2}$
 $1 \frac{1}{2} + 1 \frac{1}{2} + 1 \frac{1}{2} + 1 \frac{1}{2} + 1 \frac{1}{2} + 1 \frac{1}{2} = 6 \text{ wholes and } 6 \frac{1}{2}\text{s}$
 $6 \frac{1}{2}\text{s} = 3$
 Zela needs $6 + 3 = 9$ lbs to make the bowls and only has $7 \frac{1}{2}$. So she can't make the bowls without making them smaller.

SCORE

1

The student clearly shows that it will take $4\frac{1}{2}$ pounds of clay for the mugs and when subtracting from 12 it leaves $7\frac{1}{2}$ pounds to make the bowls. Furthermore, the student shows that by using the amount for each bowl given in the table ($1\frac{1}{2}$), it will take a total of 9 pounds of clay. While the student recognizes that Zela doesn't have enough clay, he/she does not attend to the part of the problem that required the students to address the amount of clay that Zela could use if she made the bowls smaller. The student demonstrated only a **partial** understanding of the mathematical content and practices essential to this task.

Sample Response 5d

Zela does not need to make smaller bowls. She only needs 9 clay to make 6 bowls. $6 \text{ times } 1 \frac{1}{2} = 9$ So I have 3 pounds left from the 12.

SCORE

1

The student seems to have missed one of the constraints of the problem, in that Zela still wants to make 6 mugs as well as 6 small bowls. While it is clear that a major component of the problem was overlooked, the student demonstrated enough understanding of the mathematical content and practices essential to this task to receive partial credit.

Sample Response 5e

B I U I_x

1= : =

✂ **📄** **📋** **↶** **↷**

ABC **Ω**

she could use 11 1/2 pounds to make the mugs and bowls

SCORE

0

The student has demonstrated merely an acquaintance with the topic in that he/she at least attempted to answer the question. However, no evidence is present that demonstrates the student's competence in problem solving, reasoning, and/or modeling related to the specified task.

Sample Response 5f

B I U I_x

1= : =

✂ **📄** **📋** **↶** **↷**

ABC **Ω**

Lizzie is correct because she did the math. Zela doesn't have enough clay to make 6 mugs and 6 bowls.

SCORE

0

The student has merely restated what was in the prompt. No evidence is present that demonstrates the student's competence in problem solving, reasoning, and/or modeling related to the specified task.

The handscored items in this guide are both 2-point short-text items. The general rubric that is used as a basis for scoring all 2-point short-text items is shown below. Although item-specific rubrics are also provided to scorers to facilitate the handscoring of short-text items, every response should be able to map back to this general rubric in a consistent and reliable manner.

Smarter Balanced Mathematics General Rubric for 2-Point Items

Score	Description
2	The student has demonstrated a full and complete understanding of all mathematical content and practices essential to this task. The student has addressed the task in a mathematically sound manner. The response contains evidence of the student's competence in problem solving, reasoning, and/or modeling to the full extent that these processes apply to the specified task. The response may, however, contain minor flaws that do not detract from a demonstration of full understanding.
1	The student has demonstrated a partial understanding of the mathematical content and practices essential to this task. The student's response contains some of the attributes of an appropriate response but lacks convincing evidence that the student fully comprehends the essential mathematical ideas addressed by this task. Such deficits include evidence of insufficient mathematical knowledge; errors in fundamental mathematical procedures; and other omissions or irregularities that bring into question the student's competence in problem solving, reasoning, and/or modeling related to the specified task.
0	The student has demonstrated merely an acquaintance with the topic, or provided a completely incorrect or uninterpretable response. The student's response may be associated with the task, but contains few attributes of an appropriate response. There are significant omissions or irregularities that indicate a lack of comprehension in regard to the mathematical content and practices essential to this task. No evidence is present that demonstrates the student's competence in problem solving, reasoning, and/or modeling related to the specified task.