

Smarter Balanced Assessment Consortium:

Mathematics Practice Test Scoring Guide Grade 8

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 8. A separate document is available that provides a grade 8 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	EE	B	1	8.EE.A.1	N/A

Enter the value of n for the equation $5^n = 5^{11} \cdot 5^3$.

←
→
↶
↷
✕

1	2	3
4	5	6
7	8	9
0	.	-

Key: 14

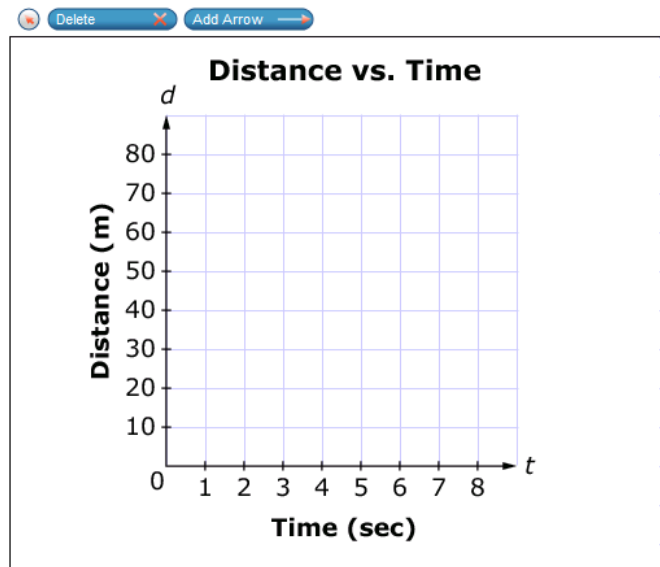
Rubric: (1 point) The student enters the correct value for n .

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#2	1	EE	C	1	8.EE.B.5	4

The distance (d) in meters a car travels in t seconds is shown in the table.

d	t
10	1
20	2
30	3
40	4
50	5

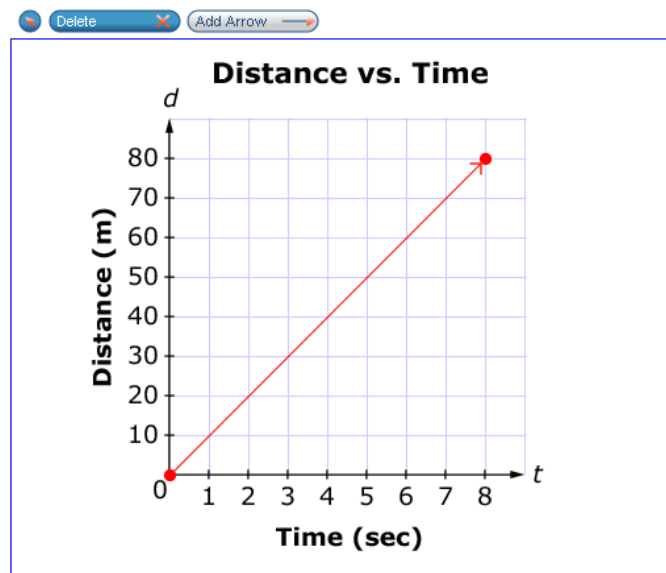
Use the Add Arrow tool to graph the proportional relationship between the distance (d) traveled by a car and the time (t).



Exemplar: (shown at right)

Rubric: (1 point) The student draws a ray that represents the proportional relationship.

Note: The ray does not need to extend past 5 seconds to be scored correctly.



Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#3	1	NS	A	1	8.NS.A.2	N/A

Select True or False to indicate whether each comparison is true.

	True	False
$\sqrt{37} < 5\frac{1}{4}$	☐	☐
$3\pi > 3\sqrt{3}$	☐	☐
$\sqrt{5} > \frac{5}{7}$	☐	☐
$\frac{15}{\sqrt{10}} > 8.38$	☐	☐

Key: F, T, T, F

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#4	1	EE	B	1	8.EE.A.2	N/A

Select **all** possible values for x in the equation $x^3 = 375$.

- ☐ $5^3\sqrt{3}$
- ☐ $\sqrt[3]{375}$
- ☐ $75^3\sqrt{5}$
- ☐ $125^3\sqrt{3}$

Exemplar: (shown at right)

Rubric: (1 point) The student correctly identifies all possible values for x .

- ☒ $5^3\sqrt{3}$
- ☒ $\sqrt[3]{375}$
- ☐ $75^3\sqrt{5}$
- ☐ $125^3\sqrt{3}$

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#5	1	NS	A	1	8.NS.A.1	N/A

Determine for each number whether it is a rational or irrational number.

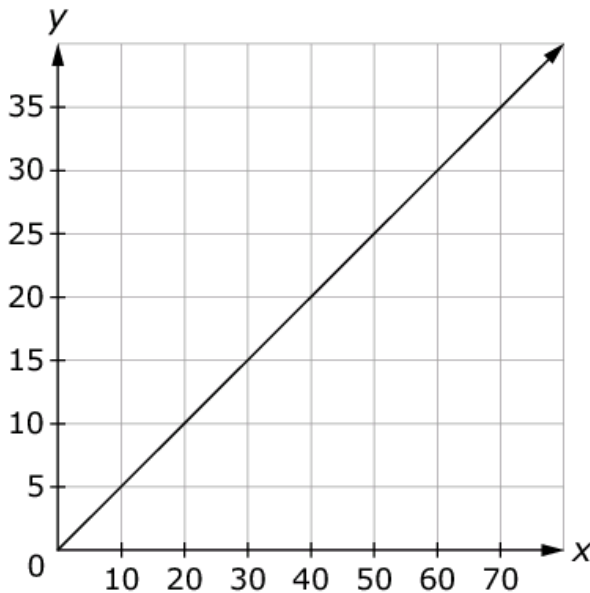
	Rational	Irrational
$\frac{1}{\sqrt{9}}$	☐	☐
$\sqrt{17}$	☐	☐
$-1\frac{2}{3}$	☐	☐
0.423	☐	☐

Key: R, I, R, R

Rubric: (1 point) The student correctly classifies each number as rational (R) or irrational (I).

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#6	1	EE	C	2	8.EE.B.6	4

Consider the line shown on the graph.



Enter the equation of the line in the form $y = mx$ where m is the slope.

←
→
↶
↷
✕

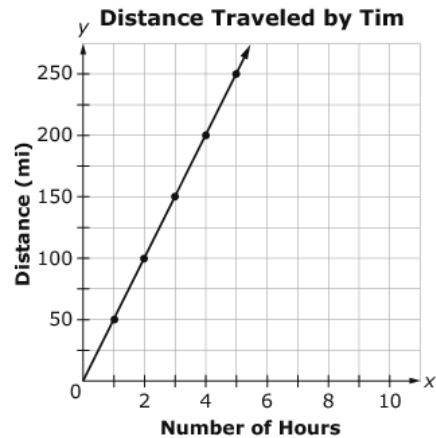
1	2	3	x	y
4	5	6	+	-
7	8	9	*	÷
0	.	-	<	≤
			=	≥
			>	
		$\frac{\square}{\square}$ $\square^\square$ () $\sqrt{\square}$ $\sqrt[\square]{\square}$ π		

Key: $y = \frac{1}{2}x$ or $y = 0.5x$ or equivalent

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#7	1	EE	C	2	8.EE.B.5	7

This graph shows a proportional relationship between the distance traveled by Tim on a road trip and the number of hours for which he traveled.



Which statement identifies the correct slope and the correct interpretation of the slope for this situation?

- (A) The slope of the line is $\frac{50}{1}$, so the distance traveled by Tim is 50 miles every hour.
- (B) The slope of the line is $\frac{50}{1}$, so the distance traveled by Tim is 1 mile every 50 hours.
- (C) The slope of the line is $\frac{1}{50}$, so the distance traveled by Tim is 50 miles every hour.
- (D) The slope of the line is $\frac{1}{50}$, so the distance traveled by Tim is 1 mile every 50 hours.

Key: A

Rubric: (1 point) The student selects the statement that best describes the graph.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#8	1	F	F	2	8.F.B.4	8

A leaf falls 18 feet from a branch to the ground at a rate of 5 feet every 2 seconds.

Determine whether each statement about the leaf is true. Select True or False for each statement.

	True	False
The initial height of the leaf is 18 feet.	☐	☐
The leaf falls at a rate of $\frac{2}{5}$ foot every 1 second.	☐	☐
The leaf is 3 feet above the ground after 6 seconds.	☐	☐

Key: T, F, T

Rubric: (1 point) The student correctly classifies each statement as true or false.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#9	1	EE	D	2	8.EE.C.7	3

Sally is solving the linear equation $13 + 4x - 9 = 7x + 7 - 3x$. Her final two steps are:

$$4 + 4x = 4x + 7$$

$$4 = 7$$

Select the statement that correctly interprets Sally's solution.

- Ⓐ The solution is $x = 0$.
- Ⓑ The solution is the ordered pair $(4, 7)$.
- Ⓒ There is no solution since $4 = 7$ is a false statement.
- Ⓓ There are infinitely many solutions since $4 = 7$ is a false statement.

Key: C

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#10	1	F	E	1	8.F.A.1	8

Which table of values can be defined by the function $y = 4x - 2$?

(A)

x	y
-4	-18
-2	-10
0	-2
2	6
4	14

(C)

x	y
-10	-2
-6	-1
-2	0
2	1
6	2

(B)

x	y
0	4
1	2
2	0
3	-2
4	-4

(D)

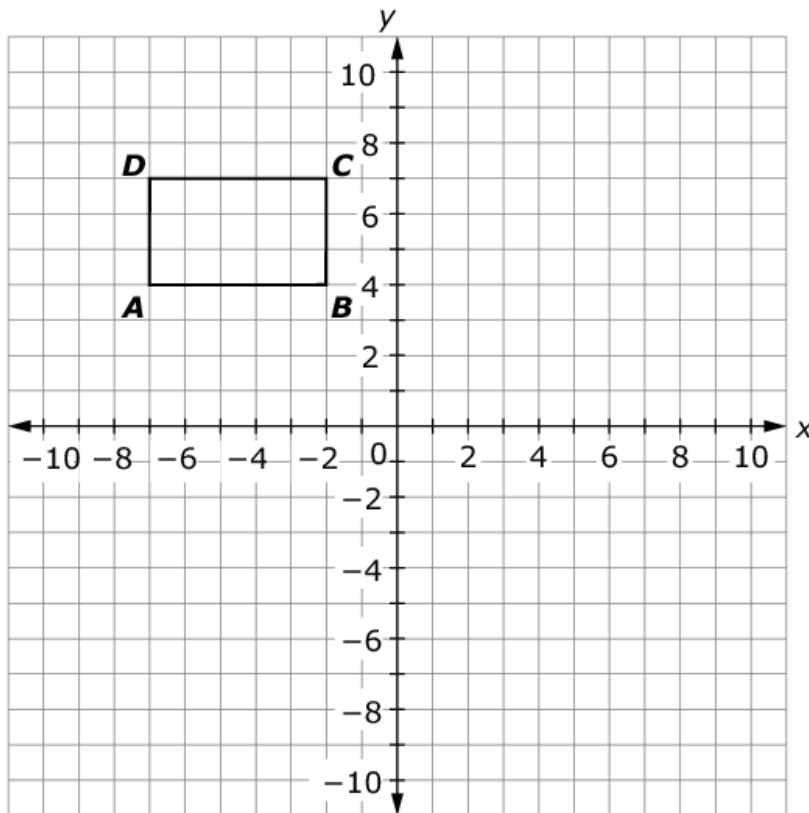
x	y
-2	4
0	2
2	0
4	-2
6	-4

Key: A

Rubric: (1 point) The student selects the correct table of values.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#11	1	G	G	1	8.G.A.1	N/A

Rectangle $ABCD$ is rotated by 90 degrees clockwise about the origin and then translated 3 units left and 2 units down to form $A'B'C'D'$.



What is the length, in units, of line segment $A'B'$ in the resulting figure?

←
→
↶
↷
✖

1	2	3
4	5	6
7	8	9
0	.	-

Key: 5

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#12	3	EE	A	2	8.EE.A.1	3, 7

Steven claims that when you multiply two powers with the same base, the new exponent is the product of the original exponents. He uses the example below to support his claim.

$$3^2 \cdot 3^2 = 3^{(2 \cdot 2)} = 3^4$$

Drag a number into each box to create an equation that shows Steven's claim is incorrect.

0
1
2
3
4
5
6
7
8
9

Delete

$3^{\square} \cdot 3^{\square} = 3^{\square}$

Exemplar: (shown at right)

Note: Other correct responses are possible such that any two exponents on the left side of the equation sum to the exponent on the right side of the equation.

Rubric: (1 point) The student enters three acceptable exponents.

0
1
2
3
4
5
6
7
8
9

Delete

$3^{\square 2} \cdot 3^{\square 3} = 3^{\square 5}$

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#13	4	F	E	3	8.F.B	1

David and Karen have a goal to read 10,000 pages together by the end of summer.

- David reads 80 pages every day.
- Karen reads 25% more pages every day than David reads.

David and Karen agree that the model $180d = 10,000$ will tell them how many days it will take them to read 10,000 pages, together, by the end of summer.

They invite Rick to read with them to get to their goal faster. Rick reads 35% fewer pages per day than Karen.

Which equation can be used to find how many days it will take David, Karen, and Rick to read 10,000 pages, together, by the end of summer?

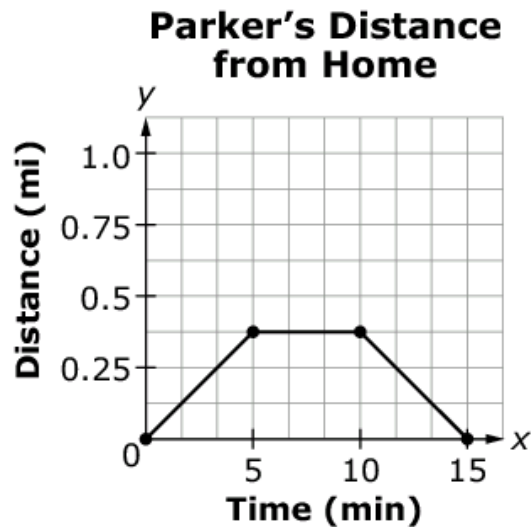
- Ⓐ $232d = 10,000$
- Ⓑ $245d = 10,000$
- Ⓒ $288d = 10,000$
- Ⓓ $315d = 10,000$

Key: B

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#14	1	F	F	2	8.F.B.5	1

The graph shows Parker's distance from home over time.



Based on the graph, determine whether each statement is true. Select True or False for each statement.

	True	False
Parker's distance from home is increasing between minute 1 and minute 4.	☐	☐
Parker's distance from home is constant between minute 6 and minute 7.	☐	☐
Parker's distance from home is increasing between minute 12 and minute 14.	☐	☐

Key: T, T, F

Rubric: (1 point) The student correctly classifies each statement as true or false.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#15	2	EE	A	2	8.EE.C.8	2

Mary is buying tickets for a movie.

- Each adult ticket costs \$9.
- Each child ticket costs \$5.
- Mary spends \$110 on tickets.
- Mary buys 14 total tickets.

Enter the total number of adult tickets and total number of child tickets she buys.

Adult tickets

Child tickets

←

→

↶

↷

✕

1	2	3
4	5	6
7	8	9
0	.	-

Key: 10 adult tickets, 4 child tickets

Rubric: (2 points) The student enters the correct number of adult tickets AND child tickets.

(1 point) The student enters the correct number of adult tickets OR child tickets.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#16	3	G	E	2	8.G.A.5	3

Marco says that the interior angles of a triangle add up to 180° . He claims that the interior angles of a hexagon must add up to 360° because a hexagon has twice as many vertices as a triangle and can be divided into two triangles. Therefore, its interior angles must sum to twice the value of those of a triangle.

Which statement, if any, explains Marco's error?

- Ⓐ A hexagon does not have 6 vertices.
- Ⓑ A hexagon can be divided into 4 triangles, not 2.
- Ⓒ The interior angles of a triangle do not add up to 180° .
- Ⓓ Marco's statement is correct and contains no error.

Key: B

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#17	2	EE	A	2	8.EE.C	2

Simone and Nang read a total of 23 books over the summer.
Simone read 5 more books than Nang.

Enter the number of books Nang read.

←
→
↶
↷
✖

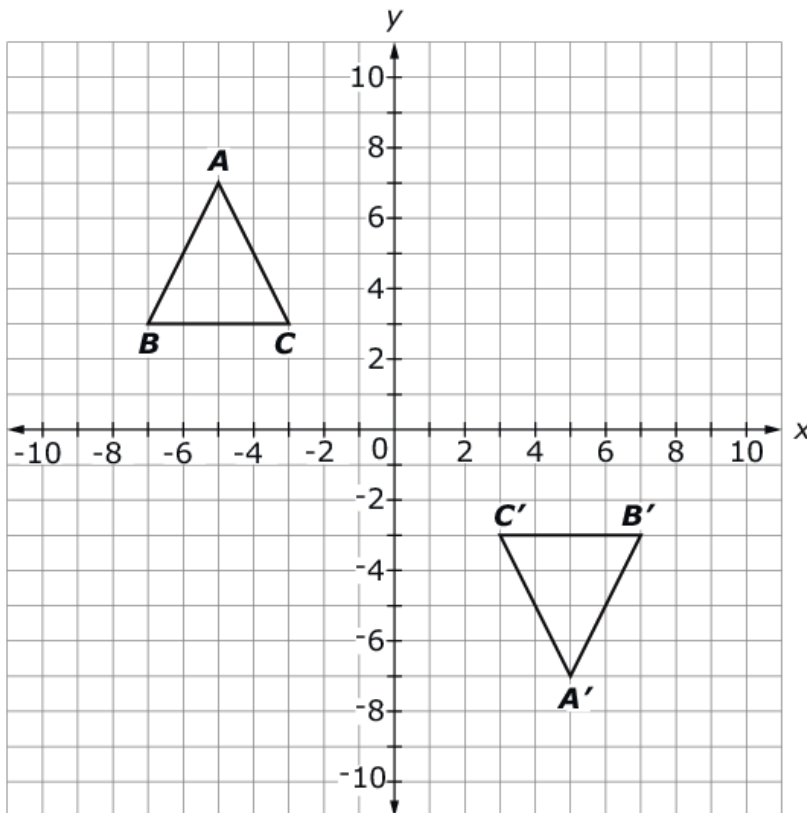
1	2	3
4	5	6
7	8	9
0	.	-

Key: 9

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#18	1	G	G	2	8.G.A.3	2

Given triangle ABC .



Select True or False for each statement about the sequences of transformations that can verify that triangle ABC is congruent to triangle $A'B'C'$.

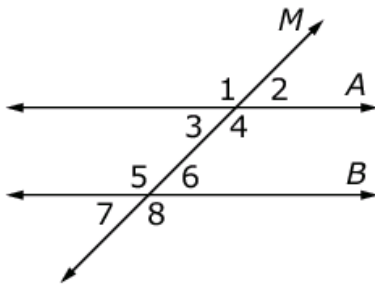
	True	False
Triangle ABC is reflected across the y -axis, followed by a reflection across the x -axis.	☐	☐
Triangle ABC is reflected across the x -axis, followed by a reflection across the y -axis.	☐	☐
Triangle ABC is reflected across the y -axis, followed by a translation 6 units down.	☐	☐

Key: T, T, F

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#19	3	G	D	2	8.G.A.5	7

Parallel lines A and B are cut by a transversal line M , as shown in the diagram.



The measure of $\angle 2$ is **less than** the measure of $\angle 4$.

For each comparison, select the symbol that makes the relationship between the first quantity and the second quantity true.

Exemplar: (shown at right)

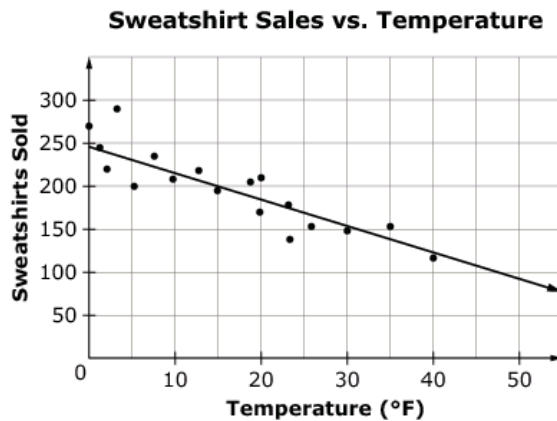
Rubric: (1 point) The student selects the symbols that make both comparisons true.

First Quantity	Comparison	Second Quantity
$m\angle 1$	☐ < ☐ > ☐ =	$m\angle 6$
$m\angle 3 + m\angle 5$	☐ < ☐ > ☐ =	$m\angle 7 + m\angle 8$

First Quantity	Comparison	Second Quantity
$m\angle 1$	☐ < ☒ > ☐ =	$m\angle 6$
$m\angle 3 + m\angle 5$	☐ < ☒ > ☐ =	$m\angle 7 + m\angle 8$

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#20	1	SP	J	2	8.SP.A.3	4

This scatter plot shows the relationship between the number of sweatshirts sold and the temperature outside.



The y -intercept of the estimated line of best fit is at $(0, b)$. Enter the approximate value of the b in the first response box.

Enter the approximate slope of the estimated line of best fit in the second response box.

y -intercept

slope

←
→
↶
↷
✖

1	2	3	+	-	*	÷			
4	5	6	<	≤	=	≥	>		
7	8	9	$\frac{\Box}{\Box}$	$\Box^\Box$	()		$\sqrt{\Box}$	$\sqrt[n]{\Box}$	π
0	.	-							

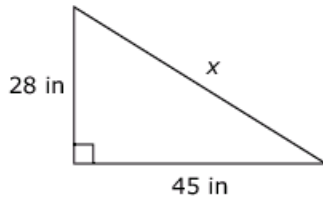
Key: y -intercept—any value from 240 to 250; slope—any value from -3 to -4

Rubric: (2 points) The student enters an acceptable y -intercept AND slope.

(1 point) The student enters an acceptable y -intercept OR slope.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#21	1	G	H	2	8.G.B.7	N/A

A cross section of a ramp is shown.



The length of the base is 45 inches and the height of the ramp is 28 inches.

Enter the length, x , of the ramp in inches.

← → ↶ ↷ ✖

1	2	3
4	5	6
7	8	9
0	.	-

Key: 53

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#22	3	EE	A,D	2	8.EE.C.7	3

Jamal states that $ax + b = a(x + c)$, given a , b , and c are not equal to 0.

What must be the value of c for Jamal's statement to be true?

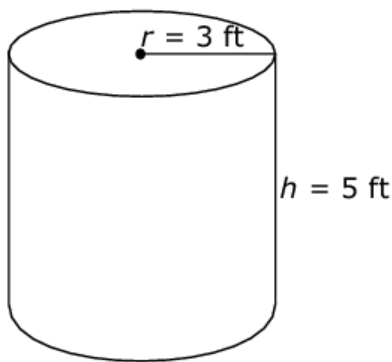
- (A) a
- (B) b
- (C) ac
- (D) $\frac{b}{a}$

Key: D

Rubric: (1 point) The student selects the correct value for c .

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#23	1	G	I	2	8.G.C.9	N/A

A cylinder with radius 3 feet and height 5 feet is shown.



Enter the volume of the cylinder, in cubic feet. Round your answer to the nearest hundredth.

← → ↶ ↷ ✖

1	2	3
4	5	6
7	8	9
0	.	-

Key: any response between 141.30 and 141.53 to allow for various approximations of pi

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#24	3	F	G	3	8.F.A.3	6

Select **all** the equations that can be represented by a straight line when graphed on the coordinate plane.

- ☐ $\frac{1}{x} + y = 9$
- ☐ $x = 16 + 3y$
- ☐ $x = -2y^2 + 7$
- ☐ $8x - 5y = 30$
- ☐ $y = -6(x + 10)$
- ☐ $y = x(3 - x) + 1$

Exemplar: (shown at right)

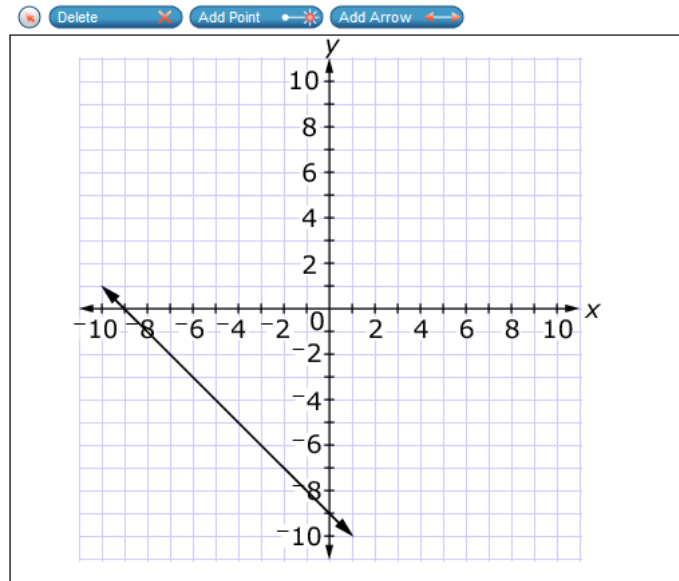
Rubric: (1 point) The student selects all of the linear equations.

- ☐ $\frac{1}{x} + y = 9$
- ☒ $x = 16 + 3y$
- ☐ $x = -2y^2 + 7$
- ☒ $8x - 5y = 30$
- ☒ $y = -6(x + 10)$
- ☐ $y = x(3 - x) + 1$

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#25	1	EE	D	2	8.EE.C.8	N/A

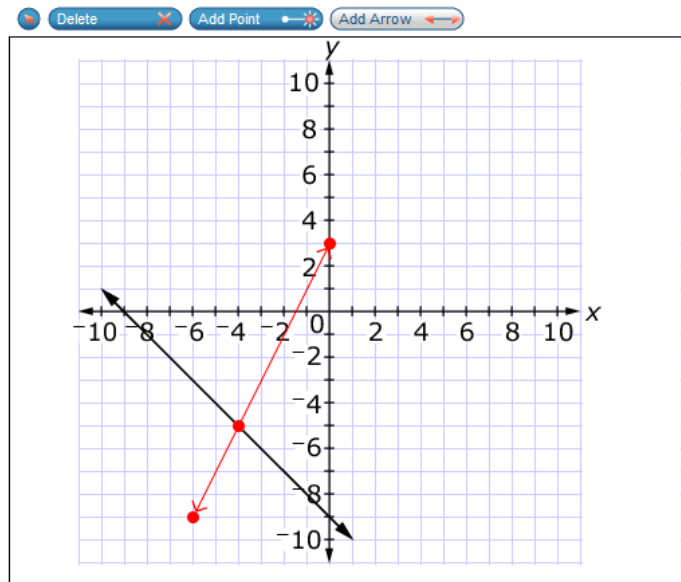
The graph of $x + y = -9$ is shown.

Use the Add Arrow tool to graph the equation $y = 2x + 3$ on the same coordinate plane. Use the Add Point tool to plot the solution to this system of linear equations.



Exemplar: (shown at right)

Rubric: (1 point) The student constructs a line that represents the equation, AND the student adds a point at $(-4, -5)$ to represent the solution of the system of equations.



Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#26	4	SP	A	3	8.EE.C	4

A biologist tracks the number of bacteria living in a water tank. The biologist used a function that represents the amount of a certain chemical solution that is added to the water.

- When the water has no chemicals, the number of bacteria (b) is 1200 per gallon.
- For each tablespoon of the chemical solution (c) added to each gallon of water, the number of bacteria decreases by 75 per gallon.

How much of the chemical, in tablespoons, must be added to a 500-gallon tank to reduce the bacteria count to a safe 300 bacteria per gallon?

← → ↶ ↷ ✖

1	2	3	b	c					
4	5	6	+	-	*	÷			
7	8	9	<	≤	=	≥	>		
0	.	-	$\frac{\Box}{\Box}$	$\Box^\Box$	()		$\sqrt{\Box}$	$\sqrt[\Box]{\Box}$	π

Key: 6000

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

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#27	4	SP	C	2	7.SP.C.8	6

Samantha gathered the following information on a given day at the dog park.

- There are 32 dogs playing at the dog park.
- 15 of the dogs are puppies.
- 11 of the dogs are not puppies and have long hair.
- There are 6 more dogs that have long hair than dogs that do not have long hair.

	Dogs That are Puppies	Dogs That are Not Puppies	Total
Dogs with Long Hair			
Dogs That Do Not Have Long Hair			
Total			

Fill in the table completely to represent Samantha's data.

Exemplar: (shown at right)

Rubric: (2 points) The student correctly fills in all 9 cells.

(1 point) The student correctly fills in 6–8 cells.

	Dogs That are Puppies	Dogs That are Not Puppies	Total
Dogs with Long Hair	8	11	19
Dogs That Do Not Have Long Hair	7	6	13
Total	15	17	32

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#28	1	EE	D	2	8.EE.C.8	N/A

Enter the y coordinate of the solution to this system of equations.

$$-2x + 3y = -6$$

$$5x - 6y = 15$$

←
→
↶
↷
✕

1	2	3
4	5	6
7	8	9
0	.	-

Key: 0

Rubric: (1 point) The student enters the correct y coordinate of the solution.

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#29	3	RP	C	2	7.RP.A.2	1

The ratios $a:b$ and $b:c$ are equivalent to one another.

Select **all** the statements that must be true.

- ☐ $a = c$
- ☐ $\frac{b}{a} = \frac{c}{b}$
- ☐ $b - a = c - b$
- ☐ $a < b$ and $b < c$
- ☐ if $a = b$, then $b = c$

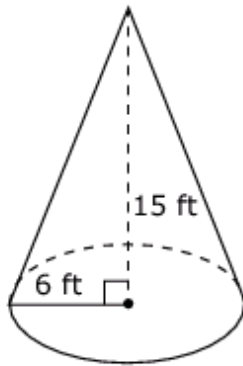
Exemplar: (shown at right)

Rubric: (1 point) The student correctly identifies all the true statements.

- ☐ $a = c$
- ☒ $\frac{b}{a} = \frac{c}{b}$
- ☐ $b - a = c - b$
- ☐ $a < b$ and $b < c$
- ☒ if $a = b$, then $b = c$

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#30	1	G	I	2	8.G.C.9	N/A

A cone with radius 6 feet and height 15 feet is shown.



Enter the volume, in cubic feet, of the cone. Round your answer to the nearest hundredth.

← → ↶ ↷ ✖

1	2	3
4	5	6
7	8	9
0	.	-

Key: 565.49

Rubric: (1 point) The student gives a correct value within a range to accommodate different acceptable values of pi (565.1 to 565.5).

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#31	2	EE, RP	D	3	8.EE.C.8, 6.RP.A.3	1

There are a total of 500 students in grades 1 through 5 in an elementary school.

- 17% of the total number of students are in 1st grade.
- 19% of the total number of students are in 4th grade.
- The number of 3rd-grade students is 9 less than the number of 4th-grade students.
- The number of 2nd-grade students is 10 less than the number of 5th-grade students.

Complete the table to show the number of students in each grade. Enter your answers in the table.

Elementary School Students

Grade	Number of Students
1st	
2nd	
3rd	
4th	
5th	

Exemplar: (shown at right)

Rubric: (2 points) The student enters the correct number of students for all five cells.

(1 point) The student enters the correct number of students for three or four of the cells.

Elementary School Students

Grade	Number of Students
1st	85
2nd	112
3rd	86
4th	95
5th	122



Smarter Balanced Assessment Consortium:

Stack of Cups Performance Task
Grade 8 Mathematics Practice Test
Scoring Guide
08/14/2019

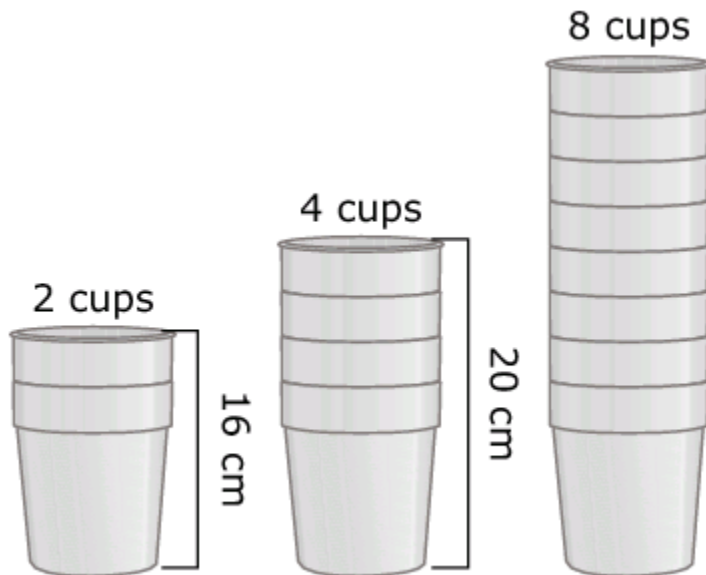


Grade 8 Mathematics

Stack of Cups Performance Task

Stacks of Cups

Your science classroom uses cups for many experiments. Your teacher ordered lots of cups from a catalog. The catalog is not very good. It has the following picture, but no other useful information.



Your teacher wants you to help her get organized for when the cups arrive next week. Using only the information shown in the picture, she asks you to figure out some other specific measurements.

Grade 8 Mathematics

Stack of Cups Performance Task

1

How tall, in cm, is the stack of 8 cups?

 cm

2

How tall, in cm, is 1 cup? Explain how you determined the height of 1 cup.

3

Your teacher thinks that instead of having to figure out these stacks each time, it would be useful to understand the general relationship.

Write an equation expressing the relationship between the height of the stack and the number of cups in the stack.

Let h represent the height of the stack, in cm, and n the number of cups in the stack.

Grade 8 Mathematics

Stack of Cups Performance Task

4

The catalog is advertising a stack of these cups that is 95 cm tall. Lori says, "That must be a misprint because a stack of that height is not possible."

Do you agree or disagree with Lori? Explain your reasoning.

5

Your class wants to sell School Spirit Cups with your school logo on them. Your teacher wants you to design this new cup such that a stack of 10 cups will be 125 cm tall.

Describe key measurements of the School Spirit Cups and explain how they will meet the required specifications.

1

How tall, in cm, is the stack of 8 cups?

cm

#1 Equation numeric – 1 point

Item	Claim	Domain	Target	DOK	Content	MP	Key
#1	2	EE	2D	2	6.EE.B.7	2	28

Rubric:

1 point: Student responds with a value of 28, or equivalent.

0 points: All other responses

Grade 8 Mathematics

Stack of Cups Performance Task

Commentary:

This question is purposely easy in order to provide an accessible ramp into the overall task. The purpose of this question is to determine whether students can identify and extend the growth pattern that is occurring by stacking additional cups. The stack of 8 cups has been chosen purposefully because the pattern is not proportional and this shows stronger evidence of understanding of the linear relationship.

Rationale for Content:

This item requires students to interpret a real-world context and extend a pattern. Although students are not required to set up and solve an equation, the mathematical thinking involved to calculate the height of the 8 cups can be represented algebraically.

Rationale for Claim:

This item draws on the diagram provided to extend the growth pattern of the height of cups. Because students could solve this in a variety of ways (i.e., calculate the height of one cup and then find the height of 8 or calculate the height added per cup), this item qualifies as a Claim 2, Target D.

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:

This is intended to be an entry-level question and maps onto DOK 2. From the *Depth of Thinking* chart:

ANALYZE: Extend a pattern

Because the students are not told which procedure to use, this moves beyond DOK 1 and qualifies as DOK 2.

Grade 8 Mathematics

Stack of Cups Performance Task

2

How tall, in cm, is 1 cup? Explain how you determined the height of 1 cup.

#2 Short text – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#2	2	EE	2D	2	7.EE.B.3	2	1 cup is 14 cm tall with explanation

Rubric:

2 points: Student correctly calculates the height of one cup and provides a mathematically logical explanation as to how he/she calculated the height.

1 point: Student correctly calculates the height of one cup and provides an explanation that is not mathematically logical OR the student *only* calculates the height of a single cup.

0 points: All other responses

Commentary:

The purpose of this item is to continue to provide a ramp into the task that nonetheless provides evidence of problem solving (Claim 2) because the student is required to make sense of the situation, identify the relevant quantities, and relate these quantities to determine the solution. There are multiple solution paths and no single procedure nor path is provided; the students must develop their own approach. The numbers have been specifically chosen to not provide an arithmetic barrier of complexity, but to provide an accessible problem-solving opportunity.

Rationale for Content:

Because students are asked to identify the salient quantities and express them numerically to derive a solution, this item provides adequate evidence to support the designated content standard.

7.EE.B.3: Solve multi-step, real-life, and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Grade 8 Mathematics

Stack of Cups Performance Task

Rationale for Claim:

To solve this problem, students must interpret and identify key values and measurements in the problem. They must do this in order to solve for the height of one single cup.

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:

This item requires students to both select a procedure and perform it and retrieve information to solve a problem. For this reason, this item is a DOK 2, aligning to the categories of Apply and Analyze.

What follows are sample responses and scoring annotations for Item 2.

Sample Response 2a

B

I

U

I_x

ABC

1 cup is 14 cm because if two cups is 16 and 4 cups is 20 then as cups stack 2 cm is added from each cup. To get to 20 from 16 its 4 cm. If only 2 cups are stacked, 16-2 is 14.

SCORE POINT

2

The student states the correct height for one cup and explains his/her method for determining the height.

Sample Response 2b

B

I

U

~~I_x~~

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

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

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

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

ABC

Ω

1 cup is 14cm. To find this I compared the 2 cups and 4 cups then I subtracted 16 from 20 to get 4 so knowing the length of the top part of the cup, which was 2, I subtracted 2 from 16 to get 14.

2

SCORE POINT

The student states the correct height for the cup and provides an explanation as to how he/she calculated the height.

Grade 8 Mathematics

Stack of Cups Performance Task

Sample Response 2c

14 cm. It looks like the top ridge is 2cm. So I subtracted 2 cm from 16cm and 14cm

SCORE POINT

1

The student states the correct height for the cup but does not provide a mathematically logical solution, and instead states, "It looks like the top ridge is 2cm."

Sample Response 2d

I believe that 1 cup is about 14 cm tall I determined this by estimating that each extra cup in the stack adds on about 2 cm so each time I divided them and subtracted 2 cm, I got 14 cm tall for each cup.

SCORE POINT

1

The student states the correct height for the cup but provides an explanation that is not mathematically grounded. The student "determined this by estimating."

Sample Response 2e

8 cm. If two are 16, divide by two to get the size of one.

SCORE POINT

0

Student incorrectly states the height and provides a mathematically incorrect approach for solving the problem.

Grade 8 Mathematics

Stack of Cups Performance Task

3

Your teacher thinks that instead of having to figure out these stacks each time, it would be useful to understand the general relationship.

Write an equation expressing the relationship between the height of the stack and the number of cups in the stack.

Let h represent the height of the stack, in cm, and n the number of cups in the stack.

#3 Equation numeric – 1 point

Item	Claim	Domain	Target	DOK	Content	MP	Key
#3	4	EE	4F, 4E	2	7.EE.B.4	2	$h=2n+12$, or equivalent

Rubric:

1 point: Student writes an equation of the form $h = 2n + 12$ or an equivalent form.

0 points: All other responses

Commentary:

The purpose of this item is to gather evidence of the students' ability to generalize a linear growth pattern given values and examples.

Rationale for Content:

Because students are asked to write an algebraic equation that expresses the relationship between the number of cups and the height of the stack, this item provides evidence directly supporting “construct simple equations...to solve problems by reasoning about the quantities.”

7.EE.B.4: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Grade 8 Mathematics

Stack of Cups Performance Task

Rationale for Claim:

This item asks students to identify the relationship between the number of cups and the height of the stack, which is why this item qualifies as a Claim 4, Targets F and E.

4F: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).

4E: Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.

Rationale for DOK:

Because students are asked to translate between a pictorial and algebraic representation, this item is DOK 2.

4

The catalog is advertising a stack of these cups that is 95 cm tall. Lori says, "That must be a misprint because a stack of that height is not possible."

Do you agree or disagree with Lori? Explain your reasoning.

#4 Short text – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#4	3	EE	3E	2	6.EE.B	3	See rubric

Rubric:

2 points: Student agrees with Lori and provides a valid mathematical explanation as to why a stack of cups could not reach 95 cm. For example, students could attend to the fact that all stacks are an even number of centimeters, or that when they plug in 95 for h to solve for n , it yields a non-whole number.

1 point: Student agrees with Lori, but provides a mathematical explanation that is incomplete.

0 points: Student disagrees with Lori, OR agrees with Lori, but does not offer any explanation for why.

Grade 8 Mathematics

Stack of Cups Performance Task

Note: There is a possible dependency on Item 3: If students did not write a correct equation in the previous item and this incorrect equation yields a whole number for n , students should be awarded full credit.

Commentary:

The purpose of this task is to assess the students' ability to communicate reasoning and their understanding of a quantity in context. In particular, the relationship between height of stack and number of cups yields a non-whole number of cups, corresponding to a height of 95 cm. In this context, that is not possible because we do not allow for parts of cups.

Rationale for Content:

Students are required to identify and make sense of quantities in a context, and reason about them. Namely, the relationship between height of stack and number of cups and the contextual restraint of the domain to whole numbers of cups.

6.EE.B: Reason about and solve one-variable equations and inequalities.

Rationale for Claim:

Because students are asked to directly agree or disagree with a conjecture and support their position, this item qualifies as Claim 3B.

Target B: Construct, autonomously, chains of reasoning that will justify or refute propositions or conjecture.

Rationale for DOK:

In this item, students need to "specify and explain relationships" as well as "make basic inferences or logical predictions." For these reasons, this item is a DOK 2.

5

Your class wants to sell School Spirit Cups with your school logo on them. Your teacher wants you to design this new cup such that a stack of 10 cups will be 125 cm tall.

Describe key measurements of the School Spirit Cups and explain how they will meet the required specifications.

Grade 8 Mathematics

Stack of Cups Performance Task

#5 Short text – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#5	4	EE	4A	3	7.EE.B.4	4	See sample responses

Rubric:

2 points: Student describes the key dimensions of the cup (height of cup, height of lip (if necessary)) and explains how 10 cups will reach a height of exactly 125 cm.

1 point: Student describes the key dimensions of the cup (height of cup, height of lip (if necessary)) that would satisfy the constraints, but does not explain how 10 cups will reach a height of exactly 125 cm.

0 points: Student does not describe key dimensions that would satisfy the constraints.

Commentary:

The purpose of this question is for students to design and describe a cup that when 10 of them are stacked, would reach a height of 125 cm. There are multiple solutions to this question, so it is imperative that students describe why their chosen dimensions meet the constraints.

Rationale for Content:

Although students do not necessarily have to set up an equation to solve this problem, students still need to reason about the quantities involved in the context. For that reason, this item addresses 7.EE.B.4.

7.EE.B.4: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Rationale for Claim:

This item satisfies Claim 4, Target A because the problem is not completely formulated. This falls under the construct of “design under constraints.”

Target A: Apply mathematics to solve problems arising in everyday life, society, and the workplace.

Rationale for DOK:

Because students need to “use concepts to solve non-routine problems” and “explain reasoning when more than one response is possible,” this item qualifies as DOK 3.

Grade 8 Mathematics

Stack of Cups Performance Task

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

Sample Response 5a



10 cm lips with 25 cm base is 35 cm tall each

The base of the cup is 25 cm, then 10 x 10cm for the lips will be 100cm for all of the lips. 100 +25 is 125 for the whole stack.

SCORE POINT
2

The student provides the key measurements of the cup ("lips" and "base") and describes how these dimensions meet the required specifications.

Sample Response 5b



To make the cups how Karmin wants them to be, you would make the cups 12.5 cm tall and it would make a stack of 10 at 125cm tall.

SCORE POINT
1

The student partially explains the dimensions but fails to explain how they will meet the required specifications.

Sample Response 5c



- must be @ least 15 cm tall, individually
- must be stirofoam
- must be able to be divided by the height to get #

SCORE POINT
0

Student does not describe key dimensions for the height.

Grade 8 Mathematics

Stack of Cups Performance Task

The hand-scored items in this guide are 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 hand-scoring 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.