

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC) Next Generations Assessments
MATHEMATICS SAMPLE ITEM SUMMARY

To access the Sample Item online, click on the title of the item. SBAC indicates that the sample items and tasks are compatible with the following Internet browsers: Internet Explorer 9, Chrome 18 or newer, Safari 4.1 or newer, Firefox 3.6 or newer. The recommended minimum screen resolution to view the sample items and tasks is 1024 x 750. Items may not display correctly on smaller screens.

Topic	Gr Band	Grade	Sample Item	Sample Item #	Question Type
Concept & Procedues	3-5	3	Fractions 1	43044	Read question. Selected response. Yes or No for each response.
Concept & Procedues	3-5	5	Multiplication and Division	43048	Read question. Selected response. True or False for each response.
Concept & Procedues	3-5	5	Fractions 3	42959	Read question. Selected response.
Concept & Procedues	6-8	6	Expressions and Equations 1	43045	Read question. Selected response. Yes or No for each response.
Concept & Procedues	6-8	7	Expressions and Equations 2	43053	Read question. Selected response. Yes or No for each response.
Concept & Procedues	6-8	8	Expressions and Equations 3	43056	Read question. Complete table.
Concept & Procedues	6-8	7	Integer Expressions	42960	Read question. Move expressions into correct locations.
Concept & Procedues	HS	HS	Rationals and Radicals	42906	Read question. Move expressions into correct locations.
Problem Solving	3-5	4	Fractions 2a	43328	Read question. Move expressions into correct locations.
Problem Solving	3-5	4	Fractions 2b	43051	Read question. Answer question by selecting numbers and symbols for answer.
Problem Solving	3-5	4	Rectangle 1	43022	Read question. Answer question in space provided. Explain how solved problem.
Problem Solving	3-5	4	Rectangle 2	43023	Read question. Answer question in space provided. Explain how solved problem.
Problem Solving	6-8	6	Sandbags 1	43026	Read question. Answer question in space provided. Providing explanation of answer.
Problem Solving	6-8	8	Sandbags 2	43027	Read question. Answer question in space provided. Providing explanation of answer.
Problem Solving	6-8	7	Calculator	42933/42961	Read question. Calculate sales tax using 3 different calculators. Move descriptions into correct locations.
Problem Solving	HS	HS	Circle 1	43046	Read question. Answer question in space provided. Show work or explain how solved problem.
Problem Solving	HS	HS	Circle 2	43049	Read question. Answer question in space provided. Show work or explain how solved problem.
Problem Solving	HS	HS	Used Car	43052	Read question. Answer question in space provided. Show work or explain how solved problem.
Problem Solving	HS	HS	Water Tank	42968	Read question. Move descriptions into correct locations.
Communicating Reasoning	3-5	4	The Contest	43081, 43082, 43083, 43084	Read questions. Answer questions by selecting numbers and symbols for answers OR answer question in space provided, showing work or explaining how solved problem.

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Topic	Gr Band	Grade	Sample Item	Sample Item #	Question Type
Communicating Reasoning	3-5	5	Swimmers	43025	Watch video. Answer question in space provided. Provide explanation of answer.
Communicating Reasoning	HS	HS	Room Wall	43027	Watch video. Answer question in space provided. Provide explanation of answer.
Communicating Reasoning	HS	HS	Decibels	43028	Read question. Answer question in space provided. Provide explanation.
Modeling and Data Analysis	HS	HS	eBooks	43028	Read question. Answer question in space provided. Provide explanation of answer.
Modeling and Data Analysis	HS	HS	Two-Second Rule	43060	Read question. Answer question in space provided. Provide explanation of answer.
Performance Tasks	3-5	4	Planting Tulips	---	performance task
Performance Tasks	6-8	6	Field Trip	---	performance task
Performance Tasks	HS	11	Crickets	---	performance task



SAMPLE ITEMS AND PERFORMANCE TASKS

Frequently Asked Questions

1. What is purpose of the sample items and performance tasks?

Smarter Balanced sample items and performance tasks are intended to help teachers, administrators, and policymakers implement the [Common Core State Standards \(CCSS\)](#) and prepare for the implementation of the [Smarter Balanced assessment system](#) in the 2014-15 school year. They provide an early look into the depth of understanding of the CCSS that will be measured by the Smarter Balanced assessments.

2. Will these items and tasks appear on the final assessments?

The sample items and tasks are meant to illustrate the rigor and complexity students will encounter on the Smarter Balanced assessments. They also show the different types of questions that will appear on the assessments, including: selected-response; constructed response; technology-enhanced; and performance tasks. While these items and tasks may be included in the non-secure interim assessment item bank, they will not be part of the secure summative assessment item bank. Smarter Balanced is working with educators to develop and test thousands of additional items and performance tasks in 2013 and 2014.

3. Can I administer these questions to my students?

The sample items and tasks are not intended to be used as practice tests. However, educators can use them to begin planning the shifts in instruction that will be required to help students meet the demands of the new assessments.

4. When will teachers and students be able to view complete assessments?

Teachers and students will have two opportunities to experience the assessments prior to implementation in the 2014-15 school year. All schools in Smarter Balanced member states will be eligible to participate in a Pilot Test of the assessment system beginning in February 2013. Additional information about how to participate in the Pilot Test will be made available to states in fall 2012.

In early 2014, a large-scale Field Test will be conducted across member states. The goal of the Field Test will be to ensure that administration, scoring, and reporting systems function correctly in preparation for the implementation of the assessment system in the 2014-15 school year.

5. What is a performance task?

Performance tasks are extended activities that measure a student's ability to integrate knowledge and skills across multiple standards—a key component of college and career readiness. Performance tasks will be used to better measure capacities such as depth of understanding, research skills, and complex analysis, which cannot be adequately assessed with selected- or constructed-response items. Some performance tasks can be scored automatically; many will be hand-scored by professionally trained readers.

These tasks will be delivered as part of the interim and summative components of the assessment system, with more extended tasks available in the digital library as part of the Smarter Balanced-developed exemplar instructional modules and inventory of currently available resources. The time and resource constraints for each performance task will be guided by its placement in the overall assessment system.

6. How were the sample items and performance tasks developed?

Smarter Balanced is working with educators from Governing States to write and review items and tasks. Detailed [item and task specifications](#)—along with [training modules](#) for item developers—ensure that each question is aligned with approved content claims, assessment targets, and the Common Core State Standards.

7. What tools are available for students with special needs?

Smarter Balanced is committed to providing valid, fair, and reliable measures of achievement and growth for English language learners and students with disabilities. The sample items and tasks do not include [accessibility tools and accommodations options](#) that will be available when the assessments are administered to students in the 2014-15 school year—such as Braille, translation options, and the ability to change font size, highlight text, or magnify portions of items. Over the next several months—guided by the Consortium’s [Accessibility and Accommodations Work Group](#) and [advisory committees](#) for English language learners and students with disabilities—Smarter Balanced will finalize the accessibility tools and accommodations options available through the test interface.

8. Why are some English language arts/literacy items missing a reading passage?

The sample English language arts/literacy items and performance tasks include a mixture of published and commissioned reading passages and sources. Smarter Balanced has not obtained permission to reprint copyrighted passages and source documents referenced in the sample items. As a result, several sample items and performance tasks—Planes on the Brain 1-3, Animal Defenses, and Garden—include only the citations for copyrighted material, rather than the complete text. For the operational assessment in the 2014-15 school year, Smarter Balanced intends to use primarily published passages—reflecting the emphasis in the Common Core on exposure to “high-quality, increasingly challenging literary and informational texts”—and the full text of these passages will be available to students.

9. What are the technology requirements for viewing the sample items and tasks?

The sample items and performance tasks are compatible with desktop and laptop computers with the following Internet browsers:

- Firefox 3.6 or newer
- Internet Explorer 8 or newer
- Chrome 18 or newer
- Safari 4.1 or newer

In addition, Android and iPad tablets with 9.5 inch screens (10 inch class) or larger are supported with the following Internet browsers:

- Chrome 18 or newer (Android)
- Safari 4.1 or newer (iPad)

It is important to note that these specifications do not reflect the minimum technology requirements for the operational Smarter Balanced assessment system in the 2014-15 school year. More information on the Consortium’s new hardware purchasing guidelines is available on the [Technology](#) page.

10. Can the sample items and tasks be scored?

Users can score most selected response and technology-enhanced items to receive instant feedback on their answers. Constructed response and performance tasks are not able to be automatically scored at this time, although scoring rubrics are provided under “About this Item.” In some cases, the range of possible answers for constructed response items must be validated through the Field



SAMPLE ITEMS AND PERFORMANCE TASKS

Test. In addition, Smarter Balanced is developing automated technologies to score written responses. Items and tasks that cannot be scored automatically will be evaluated by trained educators.

11. How can I submit comments or questions about the sample items?

Smarter Balanced welcomes comment and feedback on the sample items and performance tasks. Educators and interested stakeholders can submit feedback online at <http://www.smarterbalanced.org/sample-items-and-performance-tasks-questions-and-feedback/>.

ABOUT THIS ITEM

Fractions 1

Grade: 3

Claim 1: Concepts and Procedures

Target: 1F

CCSS: 3.NF.3a

This item demonstrates a shift in the standards, asking grade 3 students to understand that fractions are numbers, not just pizzas and pies.

RUBRIC

Not listed on website

FRACTIONS 1

Look at point P on the number line.



Look at number lines A – E. Is the point on each number line equal to the number shown by P ? Choose Yes or No.

QUESTION

- A. Yes No
- B. Yes No
- C. Yes No
- D. Yes No
- E. Yes No

SCORE STATUS

Your response earned __ points of a possible 1

All credit answer

The student correctly classified each value.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Concepts and Procedures

Grade Band: 3-5

Item Name: Multiplication and Division
Item #: 43048

ABOUT THIS ITEM

Multiplication and Division

Grade: 5

Claim 1: Concepts and Procedures

Target: 1d

CCSS: 5.NBT.5, 5.NBT.6

This item provides one example of the expected fluencies for grade 5.

RUBRIC

Not listed on website

QUESTION

Choose True or False for each equation.

A. $37 \times 4 = 1,480 \div 10$ True False

B. $215 \times 39 = 2,487 \div 3$ True False

C. $4,086 \times 7 = 32,202$ True False

D. $9,130 \times 86 = 785,180$ True False

SCORE STATUS

Your response earned ___ points of a possible 1

All credit answer

The student correctly classified each value.

Mathematics
Concepts and Procedures

Grade Band: 3-5

Item Name: Fractions 3
Item #: 42959

ABOUT THIS ITEM

Fractions 3

Grade: 5

Claim 1: Concepts and Procedures

Target: 1F

CCSS: 5.NF.7

This item builds on the progression of fractions from grades 3 and 4. Students are offered the number line in grade 5 as a tool to support problem solving, an extension of how the number line is used in earlier grades. These word problems would sometimes be presented without number lines or other models.

RUBRIC

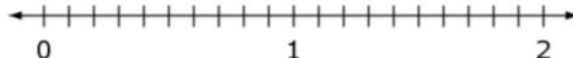
Not listed on website

QUESTION

Students are running in a relay race. Each team will run $\frac{1}{2}$ a total of 2 miles. Each member of a team will run $\frac{1}{5}$ of a mile.

How many students will a team need to complete the race? Choose the correct number.

Relay Race



How many students will a team need to complete the race?

$\frac{2}{5}$ $\frac{5}{2}$ 9 10 20

SCORE STATUS

Your response earned ___ points of a possible 1

All credit answer

The student correctly identified the number of runners needed to complete the race, showing the ability to divide a whole number by a fraction.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Concepts and Procedures

Grade Band: 6-8

Item Name: Expressions and Equations 1
Item #: 43047

ABOUT THIS ITEM

Expressions and Equations 1

Grade: 6

Claim 1: Concepts and Procedures

Target: 1F

CCSS: 6.EE.4

In grade 6 students generate equivalent algebraic expressions, in grade 7 these are expanded to include expressions with rational coefficients, and in grade 8 students use earlier strategies to solve increasingly complex equations.

RUBRIC

Not listed on website

QUESTION

Look at each expression. Is it equivalent to $36x + 24y$

Select Yes or No for expressions A – C.

A. $6(6x + 4y)$ Yes No

B. $30(6x - 6y)$ Yes No

C. $12(x + 2y + 2x)$ Yes No

SCORE STATUS

Your response earned ___ points of a possible 1

All credit answer

The student correctly classified each expression.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Concepts and Procedures

Grade Band: 6-8

Item Name: Expressions and Equations 2
Item #: 43053

ABOUT THIS ITEM

Expressions and Equations 2

Grade: 7

Claim 1: Concepts and Procedures

Target: 1c

CCSS: 7.EE.2

This item would likely have a high difficulty level. High difficulty items are essential for measurement precision of top-performing students. Work on equivalent expressions in grades 6 and 7 supports students' ability to solve increasingly complex equations in grade 8 and high school.

RUBRIC

Not listed on website

QUESTION

Look at each expression. Is it equivalent to $\frac{x+3y}{2}$

Select Yes or No for expressions A – D.

A. $\frac{4x + 3y}{8}$ Yes No

B. $\frac{5}{4} \left(\frac{2x + 6}{5} \right)$ Yes No

C. $\frac{1}{2} (x + 3y)$ Yes No

D. $\frac{2}{3} \left(\frac{5x}{6} + \frac{9y}{4} - \frac{x}{12} \right)$ Yes No

SCORE STATUS

Your response earned ___ points of a possible 1

All credit answer

The student correctly classified each expression.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Concepts and Procedures

Grade Band: 6-8

Item Name: Expressions and Equations 3
Item #: 43056

ABOUT THIS ITEM

Expressions and Equations 3

Grade: 8

Claim 1: Concepts and Procedures

Target: 1D

CCSS: 8.EE.7a

In grade 6 students generate equivalent algebraic expressions, in grade 7 these are expanded to include expressions with rational coefficients, and in grade 8 students use earlier strategies to solve increasingly complex equations.

RUBRIC

Not listed on website

QUESTION

For each linear equation in the table, select whether the equation has no solution, one solution, or infinitely many solutions.

Equation	No Solution	One Solution	Infinitely Many Solutions
$36x + 24 = 12(x + 2 + 2x)$			
$x = x + 1$			
$-12(x + 2) = -14x + 2$			

SCORE STATUS

Your response earned ___ points of a possible 1

All credit answer

The student correctly identified the number of solutions for each equation.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
 Concepts and Procedures

Grade Band: 6-8

Item Name: Integer Expressions
 Item #: 42960

ABOUT THIS ITEM

Integer Expressions
Grade: 7
Claim 1: Concepts and Procedures
Target: 1B
CCSS: 7.NS.1
 Students use the number line to add and subtract integers.

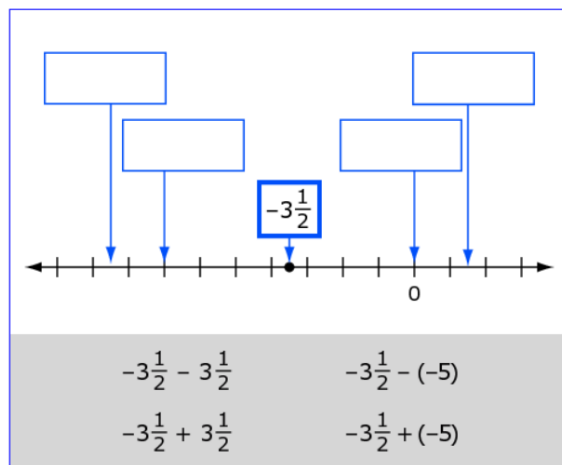
RUBRIC

Not listed on website

QUESTION

The point on the number line shows the location of $-3\frac{1}{2}$.

Move each expression into a box to show its correct location on the number line.



SCORE STATUS

Your response earned ___ points of a possible 2

All credit answer
The student correctly identified the location of $-3\frac{1}{2}$ plus (-5)
The student correctly identified the location of $-3\frac{1}{2} - 3\frac{1}{2}$
The student correctly identified the location of $-3\frac{1}{2}$ plus $3\frac{1}{2}$
The student correctly identified the location of $-3\frac{1}{2} - (-5)$

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Concepts and Procedures

Grade Band: High School

Item Name: Rationals and Radicals
Item #: 42906

ABOUT THIS ITEM

Rationals and Radicals

Grade: High School

Claim 1: Concepts and Procedures

Target: 1A

CCSS: N-RN.1, 8.NS.2

This non-calculator item assesses students' understanding of number and quantity, which in high school includes expressions using radicals and rational exponents.

RUBRIC

Not listed on website

QUESTION

$5\sqrt{7}$ Delete
 $\sqrt{13}$
 $\frac{3^8}{3^6}$
 $20 - \sqrt{20}$
 $(4^{-2})^{-\frac{1}{2}}$
 $8^{\frac{1}{3}}$

A. Three unique expressions whose sum is less than 10

B. Three unique expressions whose sum is between 10 and 20

C. Three unique expressions whose sum is greater than 20

SCORE STATUS

Your response earned ___ points of a possible 2

All credit answer

The student selected three values that sum to less than 10, showing the ability to combine rational and irrational numbers.

The student selected three numbers that sum to more than 10 but less than 20, showing the ability to combine rational and irrational numbers.

The student selected three values that sum to greater than 20, showing the ability to combine rational and irrational numbers.

Mathematics
Problem Solving

Grade Band: 3-5

Item Name: Fractions 2a
Item #: 43328

ABOUT THIS ITEM

Fractions 2a
Grade: 4
Claim 2: Problem Solving
Target: 2A
CCSS: 4.NF.4c

This item maintains focus on fractions as numbers, asking students to determine in the context of a problem whether there is a whole number that can be multiplied by a given fraction so that the product is between two consecutive whole numbers.

RUBRIC

Not listed on website

QUESTION

Jared is testing how much weight a bag can hold. He plans to put juice bottles into three bags. He wants each bag to have a total weight within the given range.

- Drag juice bottles into each bag so that the weight is within the given range.
- Leave the bag empty if the given range is not possible using juice bottles.

The interface shows a 'Delete' button at the top left. Below it is a juice bottle icon with a label '3/4 gal 1 lb'. To the right are three bags. Below each bag is a weight range: 'Between 6 lb and 7 lb', 'Between 10 lb and 11 lb', and 'Between 14 lb and 15 lb'.

SCORE STATUS

Your response earned ___ points of a possible 1

All credit answer

The student identified 0 bottles for 6-7 pounds, showing evidence of the ability to operate on mixed numbers to solve real world problems.

The student identified 3 bottles for 10-11 pounds, showing evidence of the ability to operate on mixed numbers to solve real world problems.

The student identified 4 bottles for 14-15 pounds, showing evidence of the ability to operate on mixed numbers to solve real world problems.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Problem Solving

Grade Band: 3-5

Item Name: Fractions 2b
Item #: 43051

ABOUT THIS ITEM

Fractions 2b
Grade: 4
Claim 2: Problem Solving
Target: 2A, 2D
CCSS: 4.NF.3

By grade 4, students should understand that each sandwich in this problem represents the same whole, and therefore operations with fractions can be used in solving this problem.

RUBRIC

Not listed on website

QUESTION

Five friends ordered 3 large sandwiches.

James ate $\frac{3}{4}$ of a sandwich.

Katya ate $\frac{1}{4}$ of a sandwich.

Ramon ate $\frac{3}{4}$ of a sandwich.

Sienna ate $\frac{2}{4}$ of a sandwich.

How much sandwich is left for Oscar?

1	2	3
4	5	6
7	8	9
0	.	/
Delete		

SCORE STATUS

Your response earned ___ points of a possible 1

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Problem Solving

Grade Band: 3-5

Item Name: Rectangle 1
Item #: 43022

ABOUT THIS ITEM

Rectangle 1

Grade: 4

Claim 2: Problem Solving

Target: 2A, 2C

CCSS: 4.MD.3

This item is the less difficult of two for the same assessment target. Smarter Balanced is exploring different student response formats for items of this type.

QUESTION

A rectangle is 6 feet long and has a perimeter of 20 feet.

What is the width of this rectangle? Explain how you solved this problem.



RUBRIC

Sample Top-Score Response:

$$20 - 6 - 6 = 8 \text{ feet}$$

Half of 8 feet is 4 feet, so the width is 4 feet long.

Full credit (2 points):

The response demonstrates a full and complete understanding of problem solving. The response contains the following evidence:

- The student determines that 4 feet is the width of the rectangle with a correct process clearly demonstrated.

Partial credit (1 point):

The response demonstrates a partial understanding of problem solving. The response contains the following evidence:

- The student determines 4 feet is the width, but does not show sufficient work to support this conclusion.
- OR
- The student begins a correct process for determining the missing width, but ends up with an incorrect solution due to an incomplete process, computational mistake, or other mechanical error in the process.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Problem Solving

Grade Band: 3-5

Item Name: Rectangle 2
Item #: 43023

ABOUT THIS ITEM

Rectangle 1

Grade: 4

Claim 2: Problem Solving

Target: 2A, 2C

CCSS: 4.MD.3

This item is the less difficult of two for the same assessment target. Smarter Balanced is exploring different student response formats for items of this type.

RUBRIC

Sample Top-Score Response:

$$20\frac{1}{3} - 6 - 6 = 8\frac{1}{3} \text{ feet} = \frac{25}{3} \text{ feet}$$

Half of this is $\frac{25}{3}$ feet, which is $4\frac{1}{6}$ feet.

Full credit (2 points):

The response demonstrates a full and complete understanding of problem solving. The response contains the following evidence:

- The student determines that $4\frac{1}{6}$ feet is the width of the rectangle with a correct process clearly demonstrated.

Partial credit (1 point):

The response demonstrates a partial understanding of problem solving. The response contains the following evidence:

- The student determines $4\frac{1}{6}$ feet is the width, but does not show sufficient work to support this conclusion.
OR
- The student begins a correct process for determining the missing width, but ends up with an incorrect solution due to an incomplete process, computational mistake, or other mechanical error in the process.

QUESTION

A rectangle is 6 feet long and has a perimeter of $20\frac{1}{3}$ feet.

What is width of this rectangle? Explain how you solved this problem.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Problem Solving

Grade Band: 6-8

Item Name: Sandbags 1
Item #: 43026

ABOUT THIS ITEM

Sandbags 1

Grade: 6

Claim 2: Problem Solving

Target: 2A

CCSS: 6.SP.3

This item connects students work with operations of earlier grades to their work with measures of central tendency in grade 6. A slightly more difficult version of this item is also available for viewing.

RUBRIC

Sample Top-Score Response:

Since the mean is less than 50, $\frac{57+41}{2} = 49$ pounds, it is possible to move sand between bags so that each sandbag weighs 49 pounds.

For full credit (1 point):

The response demonstrates a full and complete understanding of solving problems of this type. The response contains the following evidence:

- Student provides sufficient support for the conclusion that it is possible to have less than 50 pounds in each sandbag, (e.g., applying the mean, explaining how much weight would need to be transferred, or other valid supporting explanation).

QUESTION

Jamal is filling bags with sand. All of the bags are the same size. Each bag must weigh less than 50 pounds. One sand bag weighs 57 pounds and another sand bag weighs 41 pounds. Explain whether Jamal can pour sand from one bag into the other so that the weight of each bag is less than 50 pounds.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

ABOUT THIS ITEM

Sandbags 2

Grade: 8

Claim 2: Problem Solving

Target: 2A

CCSS: 6.SP.3

This item connects students work with operations of earlier grades to their work with measures of central tendency in grade 6. A slightly less difficult version of this item is also available for viewing.

RUBRIC

Sample Top-Score Response:

Since the mean is more than 50, $\frac{58 + 41 + 53}{3} = 50\frac{2}{3}$ pounds, it is possible to move sand between bags so that each sandbag weighs no more than 50 pounds.

For full credit (1 point):

The response demonstrates a full and complete understanding of solving problems of this type. The response contains the following evidence:

- Student provides sufficient support for the conclusion that it is not possible to have less than 50 pounds or less in each sandbag, (e.g., applying the mean, explaining how much weight cannot be transferred, or other valid supporting explanation.

QUESTION

Claire is filling bags with sand. All the bags are the same size. Each bag must weigh less than 50 pounds. One sand bag weighs 58 pounds, another sand bag weighs 41 pounds, and another sand bag weighs 53 pounds. Explain whether Claire can pour sand between sand bags so that the weight of each bag is less than 50 pounds.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Problem Solving

Grade Band: 6-8

Item Name: Calculator
Item #: 42933/42961

ABOUT THIS ITEM

Calculator
Grade: 7
Claim 2: Problem Solving
Target: 2A, 2B
CCSS: 6.RP.3

Online calculators and other applications are common in the 21st century. Today's students should understand that the mathematics they learn supports many of the tools designed to make our lives easier. More sophisticated calculator simulations will be used to measure some of the high school standards.

RUBRIC

Not listed on website.

42933

Different states have different sales tax rates. Three states have online calculators to compute sales tax on a purchase. Use the following steps to match each calculator with the correct state.

- Select Calculator A, B, or C.
- Enter a purchase price.
- Then select "Find Sales Tax" to compute the sales tax for that purchase price.

You may use the calculators as many times as you need to solve the problem to the right.

Select a Calculator <input type="radio"/> Calculator A <input type="radio"/> Calculator B <input type="radio"/> Calculator C	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Calculator</th> <th style="width: 30%;">Purchase Price</th> <th style="width: 50%;">Sales Tax</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	Calculator	Purchase Price	Sales Tax									
Calculator	Purchase Price	Sales Tax											
Purchase Price <input style="width: 100%;" type="text"/>													
<input type="button" value="Find Sales Tax"/>													

42961

Different states and their sales tax rates are shown.

Drag each calculator into the correct row to show which state can use it to calculate sales tax.

	State	Sales Tax Rate	Calculator
Calculator A	Illinois	6.250%	
	Indiana	7.000%	
Calculator B	Kansas	6.300%	
	Maine	5.000%	
Calculator C	Maryland	6.000%	
	Minnesota	6.875%	

SCORE STATUS

Your response earned ___ points of a possible 2

All credit answer

The student correctly identified the state for each calculator, showing the ability to work with percentages in problem solving situations.

The student correctly identified the state for two calculators, showing the ability to work with percentages in problem solving situations.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Problem Solving

Grade Band: High School

Item Name: Circle 1
Item #: 43046

ABOUT THIS ITEM

Circle 1

Grade: High School

Claim 2: Problem Solving

Target: 2A, 2C

CCSS: 8.G.8, 8.EE.6

This item is the less difficult of two items designed to assess the same content. It lends itself to multiple approaches, including the proportional reasoning from grade 7, distance between points in the coordinate plane from grade 8, and the trigonometric approaches in high school. Smarter Balanced is exploring different student response formats for items of this type.

RUBRIC

Sample Top-Score Response:

The slope between the center of the original circle and the point (1, 4) is $\frac{3}{5}$. Since the area of the circle that is tangent is equal to the area of the original circle, then the radius is also equal. The circles are tangent, so the centers of each circle lie on the same line with the same slope. The coordinates of the center of the second circle are $(1 - 5, 4 - 3) = (-4, 1)$.

Full credit (2 points):

The response demonstrates a full and complete understanding of solving problems of this type. The response contains the following evidence:

- The student determines the center of the second circle at $(-4, 1)$.

AND

- The student provides sufficient reasoning to support this conclusion.

Partial credit (1 point):

The response demonstrates a partial understanding of solving problems of this type. The response contains the following evidence:

- The student determines the center of the second circle at $(-4, 1)$ but, the student does not provide sufficient reasoning to support this conclusion.

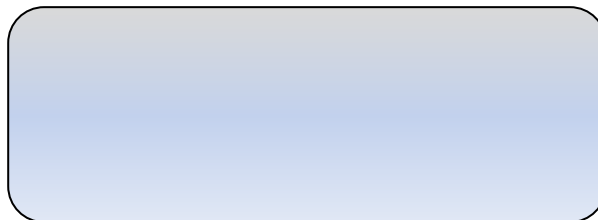
OR

- The student determines an incorrect center of the second circle due to a minor error in calculation.

QUESTION

A circle has its center at (6, 7) and goes through the point (1, 4). A second circle is tangent to the first circle at the point (1, 4) and has the same area.

What are the coordinates for the center of the second circle? Show your work or explain how you found your answer.



SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Problem Solving

Grade Band: High School

Item Name: Circle 2
Item #: 43049

ABOUT THIS ITEM

Circle 1

Grade: High School

Claim 2: Problem Solving

Target: 2A, 2C

CCSS: 8.G.8, 8.EE.6

This item is the more difficult of two items designed to assess the same content. It lends itself to multiple approaches, including the proportional reasoning from grade 7, distance between points in the coordinate plane from grade 8, and the trigonometric approaches in high school. Smarter Balanced is exploring different student response formats for items of this type.

RUBRIC

Sample Top-Score Response:

The slope between the center of the larger circle and the point (1, 4) is $\frac{3}{5}$. Since the area of the smaller circle is one-fourth the area of the larger circle, then the radius of the smaller circle is half of the radius of the larger circle.

The slope will be the same, but both distances will be half, so $\frac{3}{5}$ becomes $\frac{1.5}{2.5}$. So, the coordinates of the center of the smaller circle are $(1 - 2.5, 4 - 1.5) = (-1.5, 2.5)$.

Full credit (2 points):

The response demonstrates a full and complete understanding of solving problems of this type. The response contains the following evidence:

- The student determines the center of the second circle at $(-1.5, 2.5)$.

AND

- The student provides sufficient reasoning to support this conclusion.

Partial credit (1 point):

The response demonstrates a partial understanding of solving problems of this type. The response contains the following evidence:

- The student determines the center of the smaller circle at $(-1.5, 2.5)$ but, the student does not provide sufficient reasoning to support this conclusion.

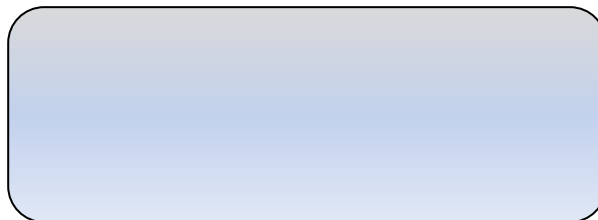
OR

- The student determines an incorrect center of the smaller circle but provides reasoning to support this answer that contains a minor conceptual or computation error.

QUESTION

A circle has its center at (6, 7) and goes through the point (1, 4). A second circle is tangent to the first circle at the point (1, 4) and has one-fourth the area.

What are the coordinates for the center of the second circle? Show your work or explain how you found your answer.



SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Problem Solving

Grade Band: High School

Item Name: Used Car
Item #: 43052

ABOUT THIS ITEM

Used Car

Grade: High School

Claim 2: Problem Solving

Target: 2A, 2C

CCSS: A.CED.1, A-REI.3

This item is a straightforward example of assessing problem solving. Smarter Balanced is exploring different student response formats for items of this type.

RUBRIC

Sample Top-Score Response:

For Car A it will cost $\$3200 + 700 + (200 \text{ miles/month} \times 48 \text{ months} \times \$3.70/\text{gallon} \times 1 \text{ gallon}/18 \text{ miles}) = \5873.33

For Car B it will cost $\$4700 + 300 + (200 \text{ miles/month} \times 48 \text{ months} \times \$3.70/\text{gallon} \times 1 \text{ gallon}/24 \text{ miles}) = \6480

Tony will spend less money if he buys Car A.

Full credit (2 points):

The response demonstrates a full and complete understanding of solving problems of this type. The response contains the following evidence:

- The student determines Car A will cost the least.

AND

- The student provides sufficient reasoning to support this conclusion.

Partial credit (1 point):

The response demonstrates a partial understanding of solving problems of this type. The response contains the following evidence:

- The student determines Car A will cost the least; however, the student does not provide sufficient reasoning to support this conclusion.

OR

- The student selects Car B but provides reasoning to support this answer that contains a minor conceptual or computation error.

QUESTION

Tony is buying a used car. He will choose between two cars. The table below shows information about each car.

Car	Cost	Miles Per Gallon (MPG)	Estimated Immediate Repairs
Car A	\$3200	18	\$700
Car B	\$4700	24	\$300

Tony wants to compare the total costs of buying and using these cars.

- Tony estimates he will drive at least 200 miles per month.
- The average cost of gasoline per gallon in his area is \$3.70.
- Tony plans on owning the car for 4 years.

Calculate and explain which car will cost Tony the least to buy and use.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

Mathematics
Problem Solving

Grade Band: High School

Item Name: Water Tank
Item #: 42968

ABOUT THIS ITEM

Used Car

Grade: High School

Claim 2: Problem Solving

Target: 2A, 2B

CCSS: 8.G.9, A-REI.4

This innovative model can be adapted for use in multiple grades by changing the shapes of the containers. Even in early grades, this type of item can be used to ask, "How much liquid is left in container A?" after some has been removed.

RUBRIC

Not listed on website.

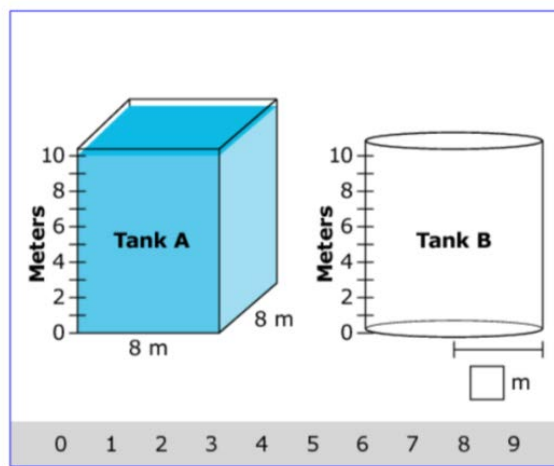
QUESTION

Two water tanks are shown. Tank A is a rectangular prism and Tank B is a cylinder. The tanks are not drawn to scale.

Tank A is filled with water to the 10-meter mark.

Click Tank A to change the water level. The volume of water that leaves Tank A is transferred to Tank B, and the height of the water in Tank B is shown.

Drag one number into the box to show the approximate radius of the base of Tank B.



SCORE STATUS

Your response earned ____ points of a possible 1

The student used the relationship between the volumes to calculate the radius of the base of the cylinder

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Communicating Reasoning

Grade Band: 3-5

Item Name: The Contest
Item #: 43081, 43082, 43083, 43084

ABOUT THIS ITEM

The Contest

Grade: 4

Claim 3: Communicating Reasoning

Target: 3B, 2D

CCSS: 3.OA.2, 4.OA.3, 4.OA.4

This item taps student understanding of factoring, divisibility, and interpreting a remainder. Although the primary alignment is to grade 4, this item may also be available to students in adjacent grades.

RUBRIC

Sample Top-Score Response:

- 12
- 8
- 6
- The five-eyed aliens can only make groups with eyes in a multiple of 5. 5, 10, 15, 20, 25. They will not be able to make a group with 24 eyes.

Full credit (3 points):

The response demonstrates a full and complete understanding of communicating reasoning. The response contains the following evidence:

- The student correctly identifies the correct number of two-, three-, and four-eyed aliens needed to make a group with 24 eyes.

AND

- The student correctly explains that the five-eyed aliens cannot make a group with 24 eyes because 5 is not a factor of 24 or because the groups of eyes can only be multiples of 5.

Partial credit (2 points):

The response demonstrates a reasonable understanding of communicating reasoning. The response contains the following evidence:

- The student identifies one or two correct numbers of the two-, three-, or four-eyed aliens needed to make a group with 24 eyes.

AND

- The student correctly explains that the five-eyed aliens cannot make a group with 24 eyes because 5 is not a factor of 24 or because the groups of eyes can only be multiples of 5.

OR

- The student identifies the correct number of two-, three-, and four-eyed aliens needed to make a group with 24 eyes.

OR

- The student correctly explains that the five-eyed aliens cannot make a group with 24 eyes because 5 is not a factor of 24 or because the groups of eyes can only be multiples of 5.

Partial credit (1 point):

The response demonstrates a partial understanding of communicating reasoning. The response contains the following evidence:

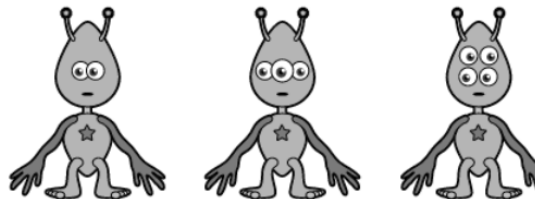
- The student identifies one or two of the correct numbers of two-, three-, or four-eyed aliens needed to make a group with 24 eyes.

OR

- The student does not provide explanation for why the five-eyed aliens cannot make a group with 24 eyes.

QUESTION

The two-eyed space creatures, three-eyed space creatures, and four-eyed space creatures are having a contest to create a group with 24 total eyes.



43081

How many two-eyed space creatures are needed to make a group with 24 total eyes?

1	2	3
4	5	6
7	8	9
0		
Delete		

43082

How many three-eyed space creatures are needed to make a group with 24 total eyes?

1	2	3
4	5	6
7	8	9
0		
Delete		

43083

How many four-eyed space creatures are needed to make a group with 24 total eyes?

1	2	3
4	5	6
7	8	9
0		
Delete		

43084

Somebody told the five-eyed space creatures that they could not join the contest. Explain why five-eyed space creatures cannot make a group with 24 eyes?

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

Mathematics
Communicating Reasoning

Grade Band: 3 - 5

Item Name: Swimmers
Item #: 43025

ABOUT THIS ITEM

Swimmers

Grade: 5

Claim 3: Communicating Reasoning

Target: 43D, 3F

CCSS: 5.NBT.3

A short animation is used to reduce the amount of text in this item and to help students understand the information presented.

Smarter Balanced will evaluate this item type during pilot testing.

RUBRIC

Sample Top-Score Response:

There would be three swimmers with the same time, and the other two swimmers would also have the same time. Instead of having one clear winner, there would be a tie for first place.

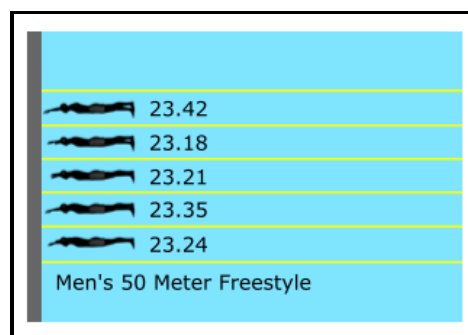
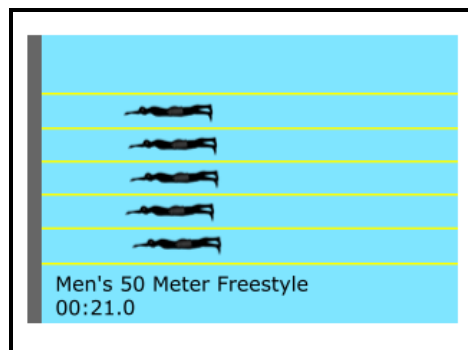
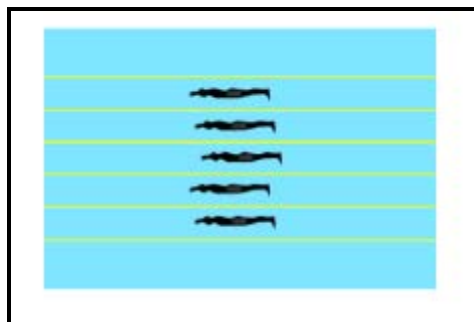
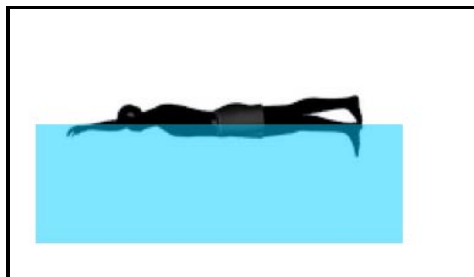
Full credit (1 points):

The response demonstrates a full and complete understanding of communicating reasoning. The response contains the following evidence:

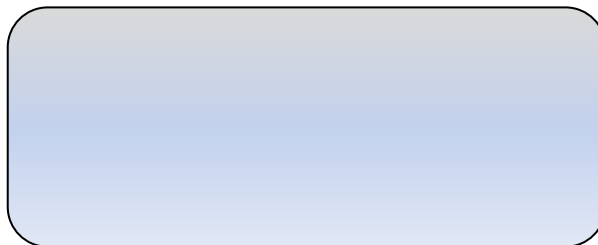
- The student explains how the race results would change (e.g., three swimmers would tie for first place).

QUESTION

Five swimmers compete in the 50-meter race. The finish time for each swimmer is shown in the video.



Explain how the results of the race would change if the race used a clock that rounded to the nearest tenth.

A large, empty, rounded rectangular box with a light blue gradient, intended for the student to write their answer to the question.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

PLEASE NOTE

SBAC indicates that the sample items and tasks are compatible with the following Internet browsers: Internet Explorer 9, Chrome 18 or newer, Safari 4.1 or newer, Firefox 3.6 or newer. The recommended minimum screen resolution to view the sample items and tasks is 1024 x 750. Items may not display correctly on smaller screens.

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Communicating Reasoning

Grade Band: High School

Item Name: Room Wall
Item #: 43027

ABOUT THIS ITEM

Room Wall

Grade: High School

Claim 3: Communicating Reasoning

Target: 3A, 3B

CCSS: 8.EE.6

A short animation is used to reduce the amount of text in this item and to help students understand the information presented. Smarter Balanced will evaluate this item type during pilot testing. Smarter Balanced is exploring different student response formats for items of this type.

RUBRIC

Sample Top-Score Response:

Two right triangles can be formed by extending a line from point F that is perpendicular to the beam that ends at point H.

Now you have a right triangle with a height of 6 and a base of 3 and a smaller right triangle with a height of x and a base of 1.

The larger triangle and the smaller triangle are similar since they are both right triangles and share an angle. The proportion $3:1 = 6:x$ can be used to find the smaller portion of the beam ending at point G. Solving this proportion gives $x = 2$. The remaining portion of the beam is 6 feet so the length of the beam that ends at point G is 8 feet.

Full credit (2 points):

The response demonstrates a full and complete understanding of communicating reasoning. The response contains the following evidence:

- The student determines the height of the beam that ends at point G is 8 feet.

AND

- The student provides sufficient reasoning to support this conclusion.

Partial credit (1 points):

The response demonstrates a partial understanding of communicating reasoning. The response contains the following evidence:

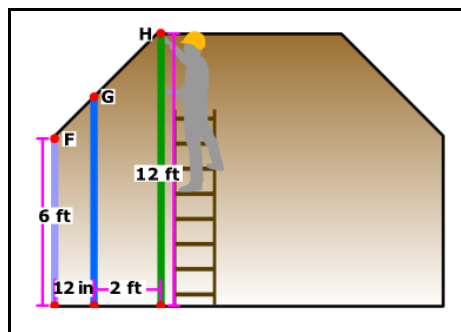
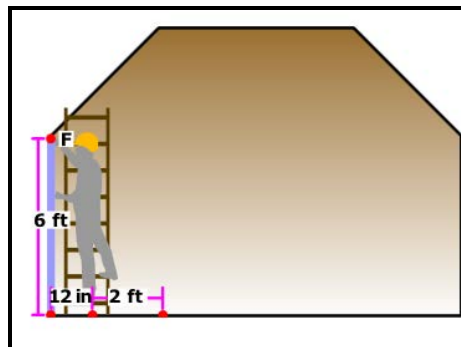
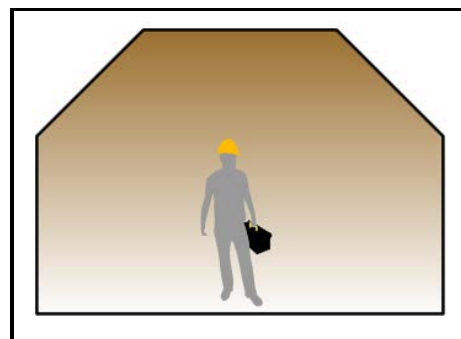
- The student determines the height of the beam that ends at point G is 8 feet but, the student does not provide sufficient reasoning to support this conclusion.

OR

- The student determines an incorrect length of the beam that ends at point G but provides reasoning to support this answer that contains a minor conceptual or computation error.

QUESTION

A construction worker is using wooden beams to reinforce the back wall of a room.



Determine the height, in feet, of the beam that ends at point G. Explain how you found your answer.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

PLEASE NOTE

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Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)
SAMPLE ITEM

Mathematics
Communicating Reasoning

Grade Band: High School

Item Name: Decibels
Item #: 43028

ABOUT THIS ITEM

Decibels

Grade: High School

Claim 3: Communicating Reasoning

Target: 3E, 2A

CCSS: A-CED.1

This application item asks students to explain flawed reasoning, one of the task models used for measuring students' ability to communicate mathematical reasoning.

RUBRIC

Sample Top-Score Response:

Rafael is not correct because the dB level does not decrease by at least $(6)(4) = 24$. The decibel level decreases by 6 every time the distance is doubled starting from 10 feet. At 10 feet from the speakers, the volume is 100 dB. At 20 feet, it is $100 - 6 = 94$ dB. At 40 feet, it is $94 - 6 = 88$ dB. At 80 feet, it is $88 - 6 = 82$ dB. Since the property line is 70 feet from the speakers, Rafael is wrong. The volume will be greater than 82 dB.

Full credit (2 points):

The response demonstrates a full and complete understanding of communicating reasoning. The response contains the following evidence:

- The student determines Rafael is incorrect.

AND

- The student provides sufficient reasoning to support this conclusion.

Partial credit (1 point):

The response demonstrates a partial understanding of communicating reasoning. The response contains the following evidence:

- The student determines Rafael is incorrect but does not provide sufficient reasoning to support this conclusion.

OR

- The student determines Rafael is correct but provides reasoning to support this conclusion that contains a minor conceptual or computation error.

QUESTION

The noise level at a music concert must be no more than 80 decibels (dB) at the edge of the property on which the concert is held.

Melissa uses a decibel meter to test whether the noise level at the edge of the property is no more than 80 dB.

- Melissa is standing 10 feet away from the speakers and the noise level is 100 dB.
- The edge of the property is 70 feet away from the speakers.
- Every time the distance between the speakers and Melissa doubles, the noise level decreases by about 6 dB.

Rafael claims that the noise level at the edge of the property is no more than 80 dB since the edge of the property is over 4 times the distance from where Melissa is standing. Explain whether Rafael is or is not correct.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

PLEASE NOTE

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ABOUT THIS ITEM

eBooks

Grade: High School

Claim 4: Modeling and Data Analysis

Target: 4A, 4B, 4D, 4F

CCSS: 6.RP.3

This item demonstrates how students use data to make decisions.

RUBRIC

Sample Top-Score Response:

Tyler should spend \$60 on monthly advertising. The slope of the line from \$0 to \$20 is $\frac{40}{20} = 2$. Since he earns \$3 for every book sold, he makes $2(3) = \$6$ for every dollar spent on advertising. The slope of the line from \$20 to \$60 is $\frac{15}{40} = \frac{3}{8}$. So, he earns $\frac{3(3)}{8} = \frac{9}{8} \approx \1.13 for every dollar spent on advertising. The slope of the line from \$60 to \$140 is $\frac{5}{80} = \frac{1}{16} \approx \0.94 for every dollar spent on advertising. So, he will earn the most profits by spending \$60 per month. He will earn \$135 in profits, which is \$5 more than spending \$20 on advertising. If he spends more than \$60, then he will be spending more on advertising than he is making on sales.

Full credit (2 points):

The response demonstrates a full and complete understanding of modeling scenarios of this type. The response contains the following evidence:

- The student indicates either \$20 or \$60 (or indicates that any value in this range is acceptable) should be spent on advertising.
- AND
- The student provides sufficient support for this conclusion.

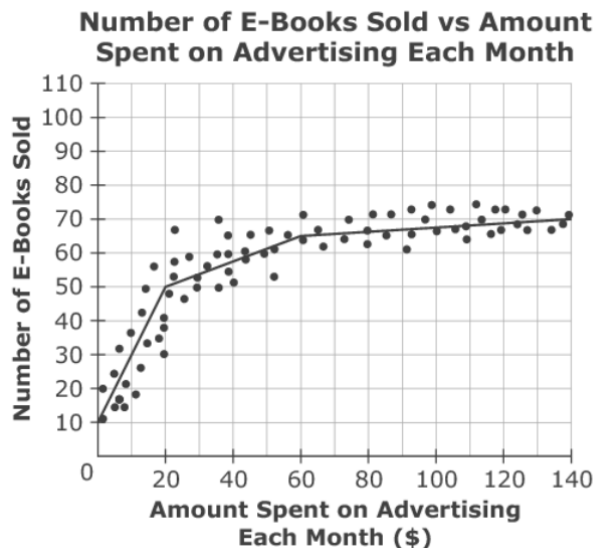
Partial credit (1 point):

The response demonstrates a partial understanding of modeling scenarios of this type. The response contains the following evidence:

- The student provides work or explanations demonstrating a clear understanding of how to analyze the profits in the scenario, but does not resolve the analysis into a final recommendation.
- OR
- The student indicates an incorrect amount of money should be spent on advertising, but provides reasoning to support this conclusion that contains a minor conceptual or calculation error.

QUESTION

Tyler earns \$3.00 for every e-book he sells on his website. (E-books are books that are available electronically.) He investigated the relationship between the amount spent on advertising each month and the number of e-books sold. He used this information to determine the lines of best fit shown in this graph.



What is the greatest amount Tyler should spend on advertising each month? Show your work or explain how you found your answer.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.

ABOUT THIS ITEM

Two-Second Rule

Grade: High School

Claim 4: Modeling and Data Analysis

Target: 4E

CCSS: F-BF.1a, F-LE.1b

This modeling item asks students to discuss the mathematical underpinnings of a concept used to support safe driving. Smarter Balanced is exploring different student response formats for items of this type.

RUBRIC

Sample Top-Score Response:

The minimum following distance is determined by the formula $d = rt$, where d is the minimum following distance, r is the rate (or speed), and t is the time. The “two-second rule” says that the time needed between cars traveling at the same speed remains constant at 2 seconds, so as the speed of the cars increases by a certain factor, then the minimum following distance must increase by the same factor. Since the speed of the cars is measured in miles per hour, and the “two-second rule” measures time in seconds, I used the formula shown below to determine the minimum following distance, in feet.

$$d = r \cdot \left(\frac{5280}{1} \right) \cdot \left(\frac{1}{3600} \right) \cdot 2$$

For cars traveling at 30 miles per hour, the minimum following distance is 88 feet. For cars traveling at 60 miles per hour, the minimum following distance is 176 feet.

Full credit (2 points):

The response demonstrates a full and complete understanding of analyzing real-world scenarios. The response contains the following evidence:

- The student describes the correct relationship between speed and minimum following distance as proportional (e.g., as the speed increases, the minimum following distance needs to increase by the same factor).

AND

- The student determines the correct minimum following distances at 30 miles per hour and 60 miles per hour.

Partial credit (1 point):

The response demonstrates a partial understanding of communicating reasoning. The response contains the following evidence:

- The student describes the correct relationship between speed and minimum following distance as proportional (e.g., as the speed increases, the minimum following distance needs to increase by the same factor).

OR

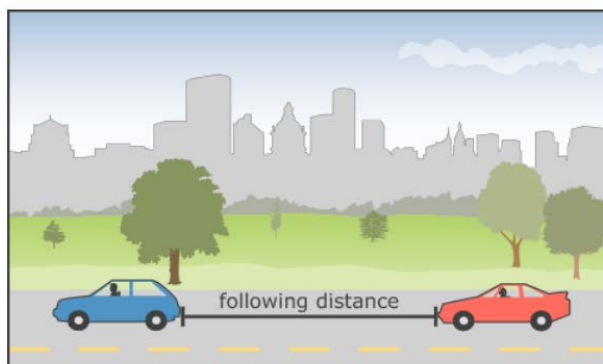
- The student determines the correct minimum following distances at 30 miles per hour and 60 miles per hour.

OR

- The student determines an incorrect minimum following distance but provides correct relationship between speed and minimum following distance as proportional.

QUESTION

The “two-second rule” is used by a driver who wants to maintain a safe following distance at any speed. A driver must count two seconds from when the car in front of him or her passes a fixed point, such as a tree, until the driver passes the same fixed point. Drivers use this rule to determine the minimum distance to follow a car traveling at the same speed. A diagram representing this distance is shown.



As the speed of the cars increases, the minimum following distance also increases. Explain how the “two-second rule” leads to a greater minimum following distance as the speed of the cars increases. As part of your explanation, include the minimum following distances, in feet, for cars traveling at 30 miles per hour and 60 miles per hour.

SCORE STATUS

This item is not currently scored automatically. Please see item rubric.



Grade 4 Performance Task

Planting Tulips

1. Classroom Activity
2. Student Task
3. Task Specifications
4. Scoring Rubric



Grade 4 Performance Task

Classroom Activity

Note:

Since performance tasks span different parts of the assessment system (summative, interim, and as part of the digital library of resources), here are some suggestions for turning "Planting Tulips" into a rich, classroom-based learning task:

- Bring in actual bulbs for students to examine. Since they are three-dimensional, have a discussion about how you would measure them to determine their "width."
- Show a short video to demonstrate the planting process.
- Use colored tape to make the outline for the tulip garden on the floor. Have students determine actual spacing within that area and model where tulips should go within that space. Alternatively (and if permissible), plant an actual garden that requires using mathematics to determine spacing and depth of plants.

Setting the Context

Teacher: "Our school has decided to build planters in front of the school and plant flowers in them. A planter is a container used to grow plants. The principal would like the entrance of the school to be in full bloom for the Spring Fair event.

Teacher: "As a class, we have been selected to determine the type of flower, the shape of the planters, and how many plants we will need to fill the container."

Teacher asks: "Does anyone know what types of flowers bloom in the spring?" [Give students an opportunity to make a list of all the flowers they know. Write the names of the flowers on the board or ask a student to record the flowers on the overhead or whiteboard.]

Teacher: "Many people plant bulbs in the fall and they bloom in the spring. [Write the word bulb on the board.] Who can tell me what a 'bulb' is or what it looks like?"

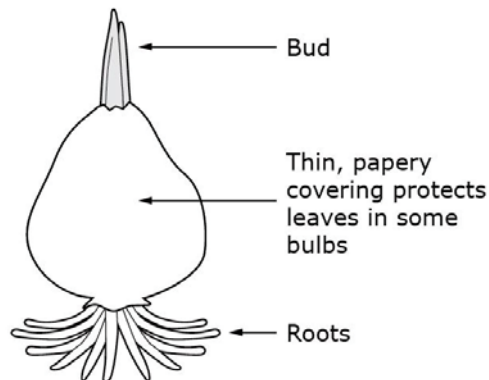
[Let students share their ideas or their personal experiences with bulbs.]

Teacher: "Let's look at a diagram of a tulip bulb. [Using the overhead, show the class the diagram of a bulb. Be sure to say and point to each part of the diagram.]



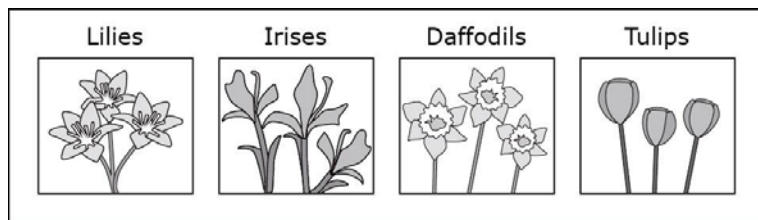
Grade 4 Performance Task

Sprouting Bulb



Teacher asks: "What is the purpose of the bulb? Why do you think these types of plants need to have a bulb?" [Let students share their ideas. If no one responds, explain that bulbs are produced by plants to either store food or for protection from animals (daffodil bulbs/flowers taste bad to animals) or harsh weather. In very hot or cold climates, the bulb provides a protective covering for the stem that will grow and push through the ground when the conditions are just right.]

Teacher: "Bulbs like the one shown in this diagram sprout different flowers like those shown in this picture." [Tell the students the name of each flower and show the picture.]



Teacher: "These flowers come from bulbs of different sizes. It is important that we measure the bulbs before we plant them, because bulbs need space to grow. Why do you think space is necessary?" [Let students share ideas and/or personal experiences planting flowers or vegetables.]



Grade 4 Performance Task

Measurement

Teacher: "What tool can we use to measure the different sizes of the bulbs?" [Students will suggest the use of a ruler. If they don't, tell them.]

[Follow this by asking a student to volunteer to help measure the tulip in the diagram on the overhead. Help the student measure the bulb in the diagram (from the top of the roots to the base of the bud) using a ruler, and record its height and width on the overhead or whiteboard.]

Teacher: "Now we will see how this measurement can be used to plant the bulbs."

Calculations

Teacher: "Suppose we decide to plant tulips. We will need to learn the planting guidelines for tulips."

Teacher: "For tulips, the planting guideline for the space between bulbs is 3 times the width of the bulb. In other words, you need to measure the width of the bulb and multiply it by 3 to determine the space between the bulbs. There does not need to be any space between the bulb and the side of the container."

"For example, if the bulb is 2 inches in width, what would the space between bulbs need to be?" [Have students figure out the space between bulbs. Then write on the overhead or whiteboard:]

$$2\text{-inch bulb width} \times 3 = 6 \text{ inches of space between the bulbs}$$

Teacher: "A common mistake for new gardeners is that they forget to calculate the total space needed. The total space includes the width of the bulb plus the space needed between the bulbs. Suppose we had several tulip bulbs to plant. In our example, how much total space would be needed to plant a bulb that is 2 inches in width?" [Have students figure out the total space, and then write on the overhead or whiteboard:]

$$2\text{-inch bulb width} + 6 \text{ inches between bulbs} = \text{total space of 8 inches for each bulb}$$

Teacher: "Let's practice calculating the space between bulbs and the total space needed." [Put the table on the overhead or whiteboard. Ask students to work in pairs to complete the table. Check students' answers.]

Tulip	Width of Bulb (in)	Spacing between Bulbs (in)	Total Space Needed (in)
A	1		
B	2		
C	3		
D	4		



Grade 4 Performance Task

[After 5 minutes. Show students the solution to the table as shown here.]

Teacher: "Okay, your time is up. Here are the correct answers for the total space needed for planting bulbs of different sizes."

Tulip	Width of Bulb (in)	Spacing between Bulbs (in)	Total Space Needed (in)
A	1	3	4
B	2	6	8
C	3	9	12
D	4	12	16

Teacher: "In the Planting Tulips task, you will need to determine the space of a planter and how many tulips can be planted in each container."



Grade 4 Performance Task

Student Task

PLANTING TULIPS PERFORMANCE TASK

In this task, your class is helping the principal to plant flowers in front of the school. You will help decide the shape of the planter and how many tulips can fit into the container. Remember to calculate the total space needed, which includes the space between the tulip bulbs and the width of the tulip bulb.

Working with Measurements

1. Bernard and Sara recommend a rectangular planter that is 5 feet long and 2 feet wide. Bernard says that it will be easier to figure out how many tulips to plant if the measurements are in inches.



Fill in the blanks to show the number of inches for each measurement.

Length: 5 feet = _____ inches

Width: 2 feet = _____ inches

Figuring Out Digging Depth

2. The class will need to dig a hole to a depth of at least twice the length of the tulip bulb. Rosa measures the length of two different tulip bulbs. She finds one is $1\frac{1}{2}$ inches long and the other is $2\frac{1}{2}$ inches long.

Sam thinks that they should dig all of the holes 3 inches deep, but Rosa says that 3 inches is not deep enough. Who do you think is correct? Explain your reasoning.

Bulbs in the Rectangular Planter

3. The class finds a bag containing bulbs that are each $1\frac{1}{2}$ inches wide and decides to use them in their rectangular planter. Following the planting guidelines, answer the questions and show your calculations.

PLANTING GUIDELINES: The distance between tulip bulbs should be 3 times the width of the bulb.

- A. This picture shows a tulip bulb that is $1\frac{1}{2}$ inches wide. Use your ruler and mark an "X" where the next bulb could be planted.



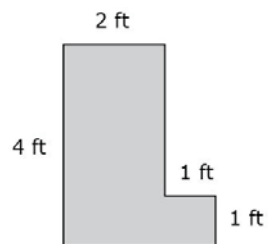
Grade 4 Performance Task



- B. Using your drawing, calculate the total length of space that is needed for each bulb with a $1\frac{1}{2}$ -inch width. Your answer should include the width of the bulb shown.
- C. How many tulip bulbs with a $1\frac{1}{2}$ -inch width can be planted in a single row that is 5 feet long?
- D. How many tulip bulbs with a $1\frac{1}{2}$ -inch width can be planted in a single column that is 2 feet long?
- E. How many total tulip bulbs with a $1\frac{1}{2}$ -inch width can be planted in the 5-foot by 2-foot rectangular planter? Explain or show your reasoning.

Selecting a Planter

4. Edward thinks that the L-shaped planter shown will hold more tulip bulbs than the 5-foot by 2-foot planter.



Following the same planting guidelines, how many tulip bulbs with a $1\frac{1}{2}$ -inch width can the L-shaped planter hold?
Which planter shape (rectangle or L-shaped) holds more tulip bulbs? Explain or show your reasoning.



Grade 4 Performance Task

Task Specifications

Item Id:	MAT.04.TULIPS.PT
Title:	Planting Tulips
Grade:	4
Content Domain(s):	Operations and Algebraic Thinking; Number and Operations—Fractions; Measurement and Data
Assessment Target(S):	<p>Claim 1, Target I: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.</p> <p>Claim 3, Target E: Distinguish correct logic or reasoning from that which is flawed and—if there is a flaw in the argument—explain what it is.</p> <p>Claim 3, Target B: Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.</p> <p>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).</p> <p>Claim 2, Target B: Select and use appropriate tools strategically.</p> <p>Claim 2, Target A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.</p> <p>Claim 3, Target A: Test propositions or conjectures with specific examples.</p> <p>Claim 3, Target D: Use the technique of breaking an argument into cases.</p>
Score Points:	See Scoring Rubric
Task Purpose:	The purpose of this task is to assess student's ability to problem solve with fractions in the context of area/space.



Grade 4 Performance Task

Scoring Rubric

Scoring Criteria for Planting Tulips Task

Scorable Parts	Points	Claims
1. Bernard says that it will be easier to figure out how many tulips to plant if the measurements are in inches.	0–2 Points Full credit for correctly converting feet to inches for both lengths. Accept other valid responses.	Contributes evidence to Claim 1, Concepts and Procedures
2. Sam thinks that they should dig all of the holes 3 inches deep, but Rosa says that 3 inches is not deep enough. Who do you think is correct? Explain your reasoning.	0–2 Points Full credit for stating Rosa is correct because the $2\frac{1}{2}$ -inch bulb will need a hole 5 inches deep. Three inches is not deep enough.	Contributes evidence to Claim 3, Communicating Reasoning
3. A. Use your ruler and mark an “X” where the next bulb could be planted. B. Using your drawing, calculate the total length of space that is needed for each bulb with a $1\frac{1}{2}$ -inch width. C. How many tulip bulbs with a $1\frac{1}{2}$ -inch width can be planted in a single row that is 5 feet long? D. How many tulip bulbs with a $1\frac{1}{2}$ -inch width can be planted in a single column that is 2 feet long? E. How many total tulip bulbs with a $1\frac{1}{2}$ -inch width can be planted in the 5-foot by 2-foot rectangular planter? Explain or show your reasoning.	0–6 Points Full credit for: Marking an “X”. There should be 3 inches between the edge of the bulb and the edge of “X”. Finding 6 inches as the total length of space needed per bulb. Finding 10 bulbs will fit in a 5-foot long row. Finding 4 bulbs will fit in a 2-foot long column. Finding 40 total bulbs will fit in the 5-foot by 2-foot planter.	Contributes evidence to Claim 2, Problem Solving



Grade 4 Performance Task

4. Following the same planting guidelines, how many tulip bulbs with a $1\frac{1}{2}$ -inch width can the L-shaped planter hold? Which planter shape (rectangle or L-shaped) holds more tulip bulbs? Explain or show your reasoning.	0–3 Points Finding 36 bulbs will fit in the L-shaped planter. Full credit is given for stating the rectangular planter will hold more bulbs and showing all supporting calculations for this answer. Responses should include the calculating of the number of bulbs for the L-shaped planter and comparing this to the number of bulbs for the rectangular planter (found in question 3 E).	Contributes evidence to Claim 3, Communicating Reasoning
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Grade 6 Performance Task

Taking a Field Trip

1. Classroom Activity
2. Student Task
3. Task Specifications
4. Scoring Rubric



Grade 6 Performance Task

Classroom Activity

Note:

Since performance tasks span different parts of the assessment system (summative, interim, and as part of the digital library of resources), here are some suggestions for turning "Taking a Field Trip" into a rich, classroom-based learning task:

- Change the information to reflect locations that are within driving distance of your school.
- Ask students to collect the necessary information to inform the important variables.
 - How far is each location?
 - How many does a bus hold? What is the cost?
 - How much will we have to pay to enter? Are teachers and other adults free?
- Collect student data on preferences for these locations similar to the provided data in the task.

Setting the Context

Teacher: "Today, we are going to complete a task about planning a field trip."

Teacher asks: "Have you ever been on a field trip with your school or a youth group? Or perhaps a trip to an interesting place with your family?" [For example, a museum or an aquarium, a natural park or an amusement park, a zoo, etc.]

Teacher: "Think back to the last time you went on a field trip with your school or on a trip with your family. What were the things that you liked best about the field trip? If you have not been on a field trip, what are some of the things you think would be fun about going someplace with your school class or your family?" [Teacher: Ask the class for volunteer responses or do a 2-minute pair share and then ask students to share some of their ideas.] For example:

- Being with friends
- Being with family
- Learning something new
- Seeing new places
- Getting out of school

Teacher asks: "What are some of the places you think you would like to go on a field trip?"

[Teacher: Record students' responses on the board or ask one or more students to help record the list on the board or an overhead (whatever is the tool of choice in that classroom) while you are managing the discussion.]



Grade 6 Performance Task

Modeling a Process

After writing the list of places on the board or overhead, Teacher asks: "Let's assume our class is going on a field trip. Looking at this list, I would like to know for each of you, what would be your first choice for a place to go and what would be your second choice. You can vote two times. As I call out each of these possible places to go on a field trip, I'll ask you to raise your hand if it is your first choice."

[Teacher: Show the chart below on the overhead or chalkboard]

Teacher: "Then I'll ask again for you to raise your hand if it is your second choice." [Teacher: Ask for first and second choices for each destination and record (or ask a student to record) the first and second choices.]

Teacher: "I'm curious about the things that we might base our decision on. Let's talk about the top choices here. What are some of the reasons you voted for particular destinations? We call those things 'criteria' for making a decision."

[For each of the top 2 or 3 choices, ask students why they voted for that choice.] Teacher: "What did you particularly like about that destination?" [Teacher: Record reasons on a separate list.]

Teacher: "There are other things we might need to consider in taking a field trip. What do you think some of the other things are that the school and the students and parents might need to consider?" [Let students brainstorm—teacher can add these to the list. Issues like proximity, safety, and costs may come up. If costs don't come up, the teacher will introduce it.]

Teacher: "Among the things we have to think about is how much it costs. We may need to do fund-raising to afford to go on a field trip. What will we have to pay for? [Take suggestions if there are some.] If not mentioned, the teacher should include: "We will have to pay for the cost of getting to the destination and the cost of admission, if there is one."

Teacher says: "There are many ways to make decisions about where we would go on a field trip based on the information we have talked about. This will be part of the thinking you will need to do to complete the Taking a Field Trip task."

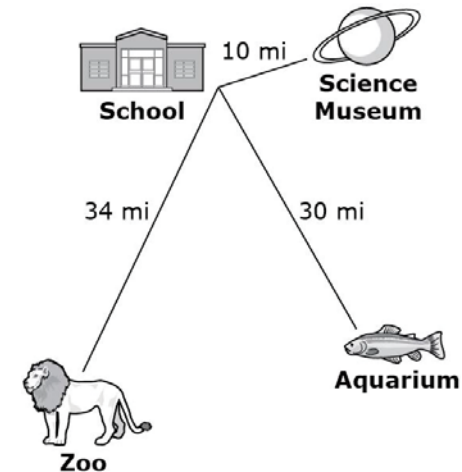


Grade 6 Performance Task

Student Task

Your class and your teacher are going on a field trip. There are three possible choices for the field trip: an aquarium, a science museum, or a zoo. Your teacher asked students to write down their first and second choices. In this task, you will determine where the class should go on the field trip based on the survey results and the cost per student.

This is a map of your school and the three different field trip locations.





Grade 6 Performance Task

The class voted on which place to visit. These tables show the results.




Name	First Choice	Second Choice
Olivia	Zoo	Science Museum
Grace	Science Museum	Aquarium
Jessica	Aquarium	Zoo
Ruby	Zoo	Science Museum
Emily	Science Museum	Aquarium
Sophie	Aquarium	Zoo
Chloe	Aquarium	Science Museum
Lucy	Aquarium	Science Museum
Lily	Science Museum	Aquarium
Ellie	Science Museum	Aquarium
Ella	Zoo	Science Museum
Charlotte	Science Museum	Aquarium
Katie	Science Museum	Aquarium
Mia	Zoo	Science Museum
Hannah	Zoo	Science Museum

Name	First Choice	Second Choice
Jack	Aquarium	Zoo
Thomas	Zoo	Aquarium
Joshua	Zoo	Aquarium
Oliver	Science Museum	Aquarium
Harry	Aquarium	Zoo
James	Zoo	Science Museum
William	Science Museum	Science Museum
Samuel	Zoo	Aquarium
Daniel	Zoo	Science Museum
Charlie	Aquarium	Aquarium
Benjamin	Science Museum	Zoo
Joseph	Zoo	Aquarium
Callum	Zoo	Aquarium
George	Aquarium	Science Museum
Jake	Science Museum	Aquarium



Grade 6 Performance Task

Here are some more facts about the trip.

	 Aquarium	 Science Museum	 Zoo
Distance from School (one way)	30 miles	10 miles	34 miles
Bus Charge	\$6 per mile	\$6 per mile	\$6 per mile
Entrance fee	\$6 per person	\$10 per person	\$2.50 per person

- o The teacher and parent helpers do not pay an entrance fee.
- o There are 30 students in the class.
- o Only 1 bus is needed.
- o The bus charge is for the entire busload of students (not for each student).
- o Each student will pay the same amount.
- o The school fund will pay the first \$200 of the trip.

1. Based only on the results of the class votes, where would you recommend the class go on the field trip? Show your work or explain how you found your answer.

2. Now we will think about the costs of the trip. How much will each student pay to go on each trip? Show your work or explain how you found your answer.
3. Daniel thinks that it will cost less to go to the zoo because the entrance fee is only \$2.50 per person. Explain why you agree or disagree with Daniel's thinking.
4. Write a short note to your teacher stating where you think the class should go on its field trip, based on how you would evaluate all the different factors, including student votes, costs, distance, and what you think would be fun.



Grade 6 Performance Task

Task Specifications

Item Id:	MAT.6.FIELDTRIP.PT
Title:	Taking a Field Trip
Grade:	6
Content Domain(s):	Ratios and Proportional Relationships
Assessment Target(S):	<p>Claim 2, Target A: Apply mathematics to solve problems arising in everyday life, society, and the workplace.</p> <p>Claim 2, Target C: Interpret results in the context of a situation.</p> <p>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).</p> <p>Claim 3, Target C: State logical assumptions being used.</p> <p>Claim 3, Target F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions.</p> <p>Claim 4, Target D: Interpret results in the context of a situation.</p>
Score Points:	See Scoring Rubric
Task Purpose:	The purpose of this task is to assess students' ability to use mathematics to make a decision based on understanding of proportional reasoning, including application of unit rates.



Grade 6 Performance Task

Scoring Rubric

Scoring Criteria for Field Trip Task

Scorable Parts	Points	Claims
1. Based only on the results of the class votes, where would you recommend the class go on the field trip? Show your work or explain how you found your answer.	<p>0-1 Point</p> <p>Full credit for correctly answering "Zoo" based on total 1st place votes OR correctly answering "Aquarium" based on total 1st and 2nd place votes OR correctly answering "Science Museum" based on a weighted total for votes.</p> <p>Accept other valid responses.</p>	Contributes evidence to Claim 3, Communicating Reasoning
2. Now we will think about the costs of the trip. How much will each student pay to go on each trip? Show your work or explain how you found your answer.	<p>0-4 Points</p> <p>Full credit for total cost per destination calculated, award 1 point. Total distance per destination calculated, award 1 point. Cost per student per destination calculated, award 1 point. Final answer expressed in correct units, award 1 point.</p> <p>For minor errors (omitting roundtrip mileage, school fund) deduct 1 point for this section.</p>	Contributes evidence to Claim 2, Problem-solving
3. Daniel thinks that it will cost less to go to the zoo because the entrance fee is only \$2.50 per person. Explain why you agree or disagree with Daniel's thinking.	<p>0-1 Point</p> <p>Full credit for using the calculations in the response above; the student would disagree with Daniel and make the argument that the Zoo option is \$2.10 more than the Science Museum option.</p> <p>Full credit for correct reasoning based on incorrect #2.</p>	Contributes evidence to Claim 4, Modeling



Grade 6 Performance Task

<p>4. Write a short note to your teacher stating where you think the class should go on its field trip, based on how you would evaluate all the different factors, including student votes, costs, distance, and what you think would be fun.</p>	<p>0-1 Point</p> <p>Full credit for a note that includes a recommendation based on reasoning that includes votes, costs, distance, and personal opinion.</p>	<p>Contributes evidence to Claim 3, Communicating Reasoning</p>
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Grade 11 Performance Task

Thermometer Crickets

1. Classroom Activity
2. Student Task
3. Task Specifications
4. Scoring Rubric



Grade 11 Performance Task

Classroom Activity

Note:

Since performance tasks span different parts of the assessment system (summative, interim, and as part of the digital library of resources), here are some suggestions for turning "Thermometer Crickets" into a rich, classroom-based learning task:

- Use available online resources to explore crickets chirping (e.g., counting chirps in sound clips or using apps designed to perform the calculations).
- Ask students to determine how changing to Celsius would affect the interpretations.
- Collect all of the different formulas available for predicting temperature based on the number of cricket chirps.
 - Discuss similarities and differences. For which values of the independent variable are the different formulas more and less discrepant? (assumes the same variables and measurement units)
 - Seek global understanding of why data can lead to different formulas for the same phenomenon.

Setting the Context

Teacher: "Have you ever heard crickets chirping? When do you tend to hear this? What does it sound like? [Let students respond and share information.]

Teacher: "Interestingly, the speed at which crickets chirp has been found to be related to the temperature. In fact, a number of different people have developed formulas over the years to predict the temperature based on how fast crickets are chirping. In this activity, you will learn more about this relationship."

Teacher: "You will be working in small groups to learn some background information about crickets. Each group will be given a 'cricket fun facts' sheet and a slip of paper with one question about crickets. Your group will have approximately 5 minutes to review the cricket fun facts sheet and to answer your question. Please be prepared to share your findings with the rest of the class."

[As an interim task, students should research the answers to the questions themselves. As a summative task, this information would be contained in a 'cricket fun facts' sheet.]



Grade 11 Performance Task

Building Background Knowledge about Crickets

Questions in **bold** for small groups

- **Only male crickets chirp. Why do they chirp?**
[Answers below]
 - to attract females
 - to act as a warning to other male crickets to stay out of their territory
 - to warn other male crickets to stay away from their females

- **Crickets chirp primarily at night. Why?**
[Answers below]
 - Crickets are nocturnal insects.
 - They sometimes eat in the daytime.

- **Male crickets rub their wings, not their legs, to chirp. How do crickets make sounds with their wings?**
[Answers below]
 - The underside of a male cricket's wing is rough and the top side is contoured differently. When rubbed together, they make a chirping sound.

- **Crickets will not chirp if the temperature is below 40 degrees Fahrenheit (°F) or above 100 degrees Fahrenheit (°F). Why?**
[Answers below]
 - Crickets do not survive in temperatures below 40°F.
 - Crickets cannot live in temperatures above 100°F.

Data Collection

[Teacher: Show "Number of Chirps Data" to students.]

Teacher: "Look at the table of data that represents the chirping of a snowy tree cricket in two different conditions. In the first section of the table, a male cricket was recorded in a room that had a warm temperature. The same cricket was recorded in a much cooler room, as shown in the second section of the table. Each of the cricket recordings shown here lasted 20 seconds."

	Number of Chirps in Recording 1	Number of Chirps in Recording 2	Number of Chirps in Recording 3	Number of Chirps in Recording 4	Average Number of Chirps in 1 minute
Warm	66	62	65	69	
Cool	40	38	42	39	



Grade 11 Performance Task

Teacher: "Using scratch paper, calculate the average number of chirps in one minute for each condition, using the data in the table shown. Remember that each recording lasted 20 seconds."

Teacher [after 3 minutes, say]: "Okay time is up, here is the correct response." [Show this table on the overhead projector.]

	Number of Chirps in Recording 1	Number of Chirps in Recording 2	Number of Chirps in Recording 3	Number of Chirps in Recording 4	Average Number of Chirps in 1 minute
Warm	66	62	65	69	196.50
Cool	40	38	42	39	119.25

Teacher: "What do you notice about the consistency of the data across the different recordings?" [Students should notice that under a specific condition, the data are similar but not identical.] "And what do you notice about the chirping rates of the snowy tree cricket in the two different temperature conditions?"

Teacher: "These kinds of patterns have encouraged many people to try to develop ways of predicting the temperature by measuring the speed of crickets chirping. Now you will work by yourself on an assessment task that allows you to explore the relationship between cricket chirps and temperature in greater detail."



Grade 11 Performance Task



Grade 11 Performance Task

Student Task

THERMOMETER CRICKETS PERFORMANCE TASK

In this task, you will organize and analyze data to model the relationship between temperature and the chirping rates of snowy tree crickets. You will develop an equation to describe the relationship, and you will compare your mathematical model to another formula.

Data Set

This table shows data about snowy tree crickets. Each data point in the table represents the average number of chirps per minute at a specific temperature.

Average Number of Chirps (per min)	Temperature (°F)
45	40°
60	47°
75	50°
80	45°
95	55°
110	50°
125	60°
140	55°
140	80°
150	65°
165	70°
180	65°
185	75°

Developing and Analyzing a Model

- Using the data table, create a scatter plot of the temperature and number of chirps per minute for snowy tree crickets. [Note: The online delivery and response format for these types of questions is still being evaluated.]
 - Explain the patterns you observe on the graph.
- Estimate the line of best fit for the data points on the graph, and graph this line.
 - Write an equation to represent the line.
 - Write an interpretation of the slope of your equation (mathematical model) in terms of the context of chirping rates and temperature.
- Describe how well your mathematical model fits the given observation data on cricket chirps and temperature, using correlation coefficient, R^2 , and/or plots of residuals.

Comparing a Model

Amos Dolbear developed an equation in 1897 called Dolbear's law. He arrived at the relationship between number of chirps per minute of a snowy tree cricket and temperature. You can use this law to approximate the temperature, in degrees Fahrenheit, based on the number of chirps heard in one minute.

$$\text{Dolbear's law: } T = 50 + \frac{N - 40}{4}$$

where T = temperature (°Fahrenheit)

N = number of chirps per minute

- Plot the line that represents Dolbear's Law on the same graph as your line of best fit.
 - What are the differences between this model and the one you developed earlier? (Include a discussion of their slopes and y-intercepts in your answer.) Interpret what these differences mean in the context of chirping rates and temperature.
- Explain the differences between the results of Dolbear's formula and what you see in the observation data for determining the temperature depending on the number of times a cricket chirps. Support your conclusion using four data points. Why do you think these differences could occur?

Saddleback Valley Unified School District
Smarter Balanced Assessment Consortium (SBAC)

SAMPLE ITEM

Mathematics Performance Task

Grade Band: High School

Item Name: Crickets



Grade 11 Performance Task



Grade 11 Performance Task

Task Specifications

Sample Item Id:	MAT.HS.CRICKETS.PT
Title:	Thermometer Crickets
Content Domain(s):	Modeling; Algebra; Functions; Statistics and Probability
Assessment Target(S):	<p>Claim 2, Target A: Apply mathematics to solve problems arising in everyday life, society, and the workplace.</p> <p>Claim 2, Target C: Interpret results in the context of a situation.</p> <p>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).</p> <p>Claim 3, Target C: State logical assumptions being used.</p> <p>Claim 3, Target F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions.</p> <p>Claim 4, Target D: Interpret results in the context of a situation.</p> <p>Claim 4, Target E: Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.</p>
Score Points:	See Scoring Rubric
Task Purpose:	The purpose of this task is to assess students' ability to use new data to challenge the assumptions of an existing mathematical formula.

Scoring Rubric

Scoring Criteria for Thermometer Crickets Task

Scorable Parts	Points	Claims
<p>1.</p> <p>A. Using the data table, create a scatter plot of the temperature and number of chirps per minute for snowy tree crickets.</p> <p>B. Explain the patterns you observe on the graph.</p>	<p>0–2 Points</p> <p>Full credit for correctly plotting data points. Students might note a possible linear relationship between the two variables. Accept other valid responses.</p>	<p>Contributes evidence to Claim 2, Problem-solving</p>
<p>2.</p> <p>A. Estimate the line of best fit for the data points on the graph, and graph this line.</p> <p>B. Write an equation to represent the line.</p> <p>C. Write an interpretation of the slope of your equation (mathematical model) in terms of the context of chirping rates and temperature.</p>	<p>0–3 Points</p> <p>Full credit for providing a line of best of fit approximating $y = 0.23x + 31$, depending on tools used. Possible interpretation of slope would be that “for every one unit increase in the rate of chirping, there is an average increase of 0.23 degrees in temperature (°F).” Accept other valid responses. See sample graph on last page of this document.</p>	<p>Contributes evidence to Claim 4, Modeling</p>
<p>3. Describe how well your mathematical model fits the given observation data on cricket chirps and temperature, using correlation coefficient, R^2, and/or plots of residuals.</p>	<p>0–3 Points</p> <p>Full credit for reporting on Pearson correlation coefficient, approximately $r = 0.85$, indicating a strong positive association. Informal residual analysis supports the appropriateness of linear model. Accept other valid responses.</p>	<p>Contributes evidence to Claim 4, Modeling</p>



Grade 11 Performance Task



Grade 11 Performance Task

<p>4.</p> <p>A. Plot the line that represents Dolbear's Law on the same graph as your line of best fit.</p> <p>B. What are the differences between this model and the one you developed earlier? (Include a discussion of their slopes and y-intercepts in your answer.) Interpret what these differences mean in the context of chirping rates and temperature.</p>	<p>0-4 Points</p> <p>Full credit for noting that the both Dolbear's formula and the constructed model have positive slopes, but differ slightly (0.25 and 0.23). One interpretation of this could be that compared to Dolbear's formula predictions, the observed crickets in the data table seemed to have a slightly slower rate of temperature change for every unit change in number of chirps. Responses also note that y-intercepts for the two models also differ, 40 and 31. Accept other valid responses.</p>	<p>Contributes evidence to Claim 4, Modeling, and to Claim 3, Communicating Reasoning</p>
<p>5. Explain the differences between the results of Dolbear's formula and what you see in the observation data for determining the temperature depending on the number of times a cricket chirps. Support your conclusion using four data points. Why do you think these differences could occur?</p>	<p>0-2 Points</p> <p>Full credit is given for noting that in all but one case, Dolbear's formula overestimated the temperature of the observed crickets in the data table. Responses should include the calculating of four data points using Dolbear's formula to support explanation. <i>(Students may speculate about the discrepancy in Dolbear's formula and the data collected in terms of measurement error, possible different species of crickets, other environmental variables [e.g., humidity], proximity to mating season, other valid response.)</i></p>	<p>Contributes evidence to Claim 3, Communicating Reasoning</p>

