New York State Testing Program

Mathematics

Common Core Sample Questions

Grade 6

Domain: Ratios and Proportional Relationships
Item: MC

1 A grocery store sign indicates that bananas are 6 for $1.50, and a sign by the oranges indicates that they are 5 for $3.00. Find the total cost of buying 2 bananas and 2 oranges.

A $0.85
B $1.70
C $2.25
D $4.50

Key: B

Aligned CCLS: 6.RP.3b, 6.RP.2

Commentary: This question aligns to CCLS 6.RP.3b and 6.RP.2 because students must find the unit price of each banana and each orange to determine the total cost of two of each item.

Rationale: Option B is correct; two bananas cost $0.50 and two oranges cost $1.20. Option A is the sum of the unit price of a banana and the unit price of an orange. Option C is half the sum of the given sale prices. Option D is the sum of the given sale prices.

Domain: Ratios and Proportional Relationships
Item: MC

2 Jeremy has two 7-foot-long boards. He needs to cut pieces that are 15 inches long from the boards. What is the greatest number of 15-inch pieces he can cut from the two boards?

A 5
B 10
C 11
D 12

Key: B

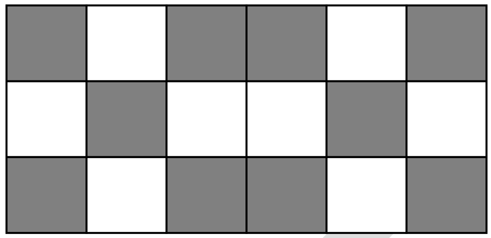
Aligned CCLS: 6.RP.3d

Commentary: This question aligns to CCLS 6.RP.3d because it assesses a student's ability to use ratios for converting measurement units and to use reasoning skills and proportional thinking to make sense of the problem.

Rationale: Option B is correct**.** Converting from feet to inches, the length of one of the boards is $7 \times 12 = 84$ inches. Thus, the largest number of 15-inch-long pieces that Jeremy can cut from one board is 5, because dividing 84 by 15 yields a quotient of 5 and a remainder of 9. It follows that the greatest number of pieces that Jeremy can cut from the two boards is $5 + 5 = 10$. Option A is the number of sections from one board. Options C and D represent miscalculations and/or not understanding the context.

Domain: Ratios and Proportional Relationships
Item: CR

3 The new floor in the school cafeteria is going to be constructed of square tiles that are either gray or white and in the pattern that appears below:



Part A: What is the ratio of gray tiles to white tiles?

Answer: ____________________

Part B: What is the ratio of white tiles to the total number of tiles in the pattern?

Answer: ____________________

Part C: If the total cost of the white tiles is $12, what is the unit cost per white tile?

Answer: $____________________

Key:

Part A: 10 to 8, 5:4, or other equivalent ratio
Part B: 8 to 18, 4:9, or other equivalent ratio
Part C: $1.50 per white tile

Aligned CCLS: Part A and Part B: 6.RP.1; Part C: 6.RP.2

Commentary: This question aligns to CCLS 6.RP.1 and 6.RP.2 as it assesses a student's ability to apply the concept of ratio in a real-world situation. It requires that the student understand the concept and make sense of the situation.

Rationale:

Part A: The correct answer is a ratio of 10 gray tiles to 8 white tiles, or simplified, the ratio will be 5 gray tiles to 4 white tiles.
Part B: The correct answer is a ratio of 8 white tiles to 18 total tiles, or simplified, the ratio will be 4 white tiles to 9 tiles, in total.
Part C: Counting the tiles by color in the pattern above, it is found that there are 8 white tiles. If 8 white tiles cost $12, then the cost per white tile is $1.50.

Domain: Ratios and Proportional Relationships
Item: CR

4 A clothing store offers a 30% discount on all items in the store.

Part A: If the original price of a sweater is \$40, how much will it cost after the discount?

Show your work.

Answer: ____________________

Part B: A shopper bought three of the same shirt and paid \$63 after the 30% discount. What was the original price of one of the shirts?

Show your work.

Answer: ____________________

Part C: Every store employee gets an additional 10% off the already discounted price. If an employee buys an item with an original price of \$40, how much will the employee pay?

Show your work.

Answer: ____________________

Key:
Part A: \$28
Part B: \$30
Part C: \$25.20

Aligned CCLS: 6.RP.3c

Commentary: This question aligns to CCLS 6.RP.3c because it assesses a student's ability to work with percents, namely, finding a percent of a quantity in a contextual situation.

Rationale:

Part A: The correct answer is \$28. Since 30% of 40 is $\frac{30}{100}(40) = 12$, the cost of the sweater after the 30% discount is \$40 – \$12 = \$28.

Part B: The 30% discount means the shopper pays 70% of the price, or 0.7, so $\frac{63}{.7}$ = \$90. Since the original price of three shirts is \$90, the original price of one shirt would be \$30. The correct answer is \$30.

Part C: The correct answer is \$25.20. As shown in Part A's rationale, applying a 30% discount on an item that originally cost \$40 brings the price of the item down to \$28. Applying the additional 10% employee discount on the already reduced price will further reduce the price by $\frac{10}{100}(28)$ = \$2.80, and so the final price of the item will be \$28 – \$2.80 = \$25.20.

Domain: Expressions and Equations
Item: MC

5 Represent the following expression algebraically:

A number, x, decreased by the sum of 2x and 5

A $(2x + 5) - x$
B $x - (2x + 5)$
C $x - 2x + 5$
D $(x + 2x) - 5$

Key: B

Aligned CCLS: 6.EE.2a, 6.EE.2b

Commentary: This question aligns to CCLS 6.EE.2a and 6.EE.2b because it requires the translation from words to a multi-step algebraic expression. It also requires the conceptualization of part of the expression as a single entity using parentheses.

Rationale: Option B is correct and is consistent with the relationship between the minuend (x) and subtrahend ($2x + 5$). The expression in Option A confuses the minuend and subtrahend, identifying the minuend incorrectly as ($2x + 5$). The expression in Option C is incorrect and does not take into account the expression *the sum of 2x and 5* as a single entity ($2x + 5$), joined through subtraction. The expression ignores the subtraction of each term in the subtrahend, not just the term $2x$. The expression in Option D incorrectly identifies *the sum of x and 2x* as an expression.

Domain: Expressions and Equations
Item: MC

6 The expression $6^3 \times 4^2$ is equivalent to which of the following numerical expressions?

A 18×8
B $(6 \times 4)^5$
C 24^6
D 216×16

Key: D

Aligned CCLS: 6.EE.1

Commentary: This question aligns to CCLS 6.EE.1 because it assesses a student's ability to translate mathematical statements that include exponents in equivalent form.

Rationale: Option D is correct. The mathematical expression in Option D correctly interprets the exponential form of each factor: $6^3 = 216$ and $4^2 = 16$. Option A uses exponents as the multiplier. Option B confuses the order of operations. Option C misuses both the base and exponent.

Domain: Expressions and Equations
Item: CR

7 What is the value of $2x^3 + 4x^2 - 3x^2 - 6x$ when $x = 3$?

Show all work.

Answer: ______________________

Key: 45

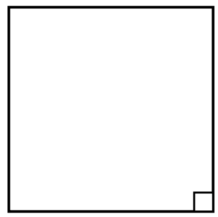
Aligned CCLS: 6.EE.2c

Commentary: This question aligns to CCLS 6.EE.2c because it assesses a student's ability to evaluate an algebraic expression when the variable is defined.

Rationale: Substituting $x = 3$ into the expression yields $2(3^3) + 4(3^2) - 3(3^2) - 6(3)$, which simplifies to 45.

Domain: Expressions and Equations
Item: CR

8 The figure below is a square with dimensions given.



$2x - 1$ in.

Part A: What is the perimeter of the square in terms of x?

Perimeter = ________

Part B: If the length of each side of the square is doubled, what would be the perimeter of this new square, in terms of x?

Perimeter = ________

Part C: If $x = 5$, what would be the ratio of the area of the original square to the area of the new square?

Answer: ______________________

Key:

Part A: $8x - 4$ or $4(2x - 1)$

Part B: $16x - 8$ or $4(4x - 2)$

Part C: 81:324, 1:4, or any equivalent ratio

Aligned CCLS: 6.EE.2a, 6.EE.2c, 6.EE.3, 6.EE.7, 6.RP.1

Commentary: This question aligns to CCLS 6.EE.2a, 6.EE.2c, 6.EE.3, 6.EE.7, and 6.RP.1 because it assesses a student's understanding of the simplification of algebraic expressions as well as the concept of a ratio and the use of ratio language to describe the relationship between two quantities. While the concept of perimeter and area is assessed at the third-grade level, using the concept within an algebraic form creates an on-grade-level question.

Rationale:

Part A: Since the length of each side of the square is $2x - 1$, the perimeter of the square is the sum of the lengths of the sides of the square, or 4 times the length of each side. So the perimeter of the square would be $4(2x - 1) = 8x - 4$.

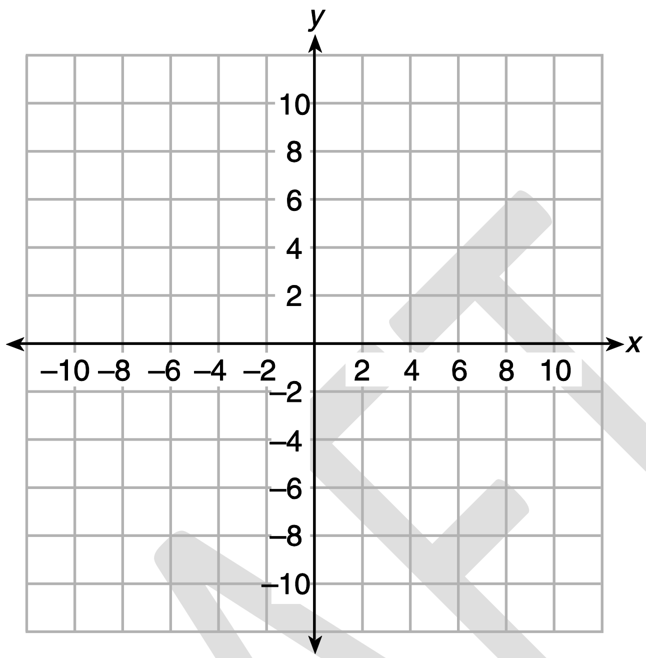
Part B: If the length of each side of the square is doubled, the length of each side of the new square would be $2(2x - 1)$, or $4x - 2$ inches. The perimeter would be 4 times the length of each side, so the perimeter of the new square would be $4(4x - 2) = 16x - 8$.

Part C: If $x = 5$, the length of each side of the original square would be 9 inches. The area of the square is equal to 9×9, or 81 square inches. The length of each side of the new square is 18 inches, so the area of the new square is 324 square inches. The ratio of the area of the original square to the area of the new square is 81:324 or $\frac{81}{324}$.

This could also be represented in simplified form as 1:4, 1 to 4, or $\frac{1}{4}$.

Domain: Geometry
Item: MC

9 Triangle *PQR* and triangle *QRS* have vertices *P*(–9,7), *Q*(4,7), *R*(4,–3), and *S*(10,–3).



What is the area, in square units, of quadrilateral *PQSR* which is formed by the two triangles?

A 30
B 65
C 95
D 190

Key: C

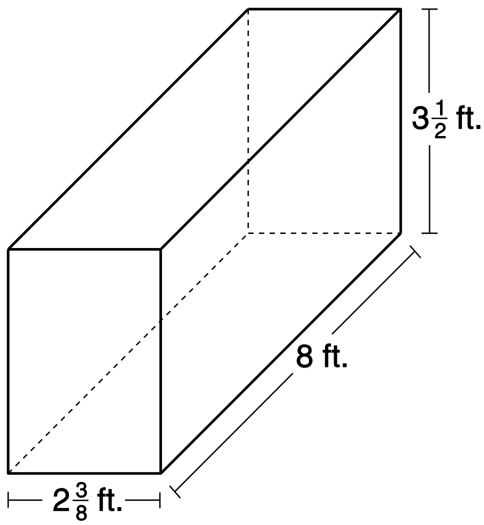
Aligned CCLS: 6.G.1, 6.G.3

Commentary: This question aligns to CCLS 6.G.1 and 6.G.3 because it requires students to determine the length of a side joining points with the same first coordinate or the same second coordinate, and to use these side lengths to find the areas of the two triangles.

Rationale: Option C is correct. Option A is the area of triangle *QRS*. Option B is the area of triangle *PQR*. Option D is the incorrect area of the trapezoid (created by both triangles) mistakenly found by (6 + 13) × 10.

Domain: Geometry
Item: MC

10 Find the volume, in cubic feet, of the right rectangular prism pictured below.



A $8\frac{5}{16}$

B 19

C $48\frac{3}{16}$

D $66\frac{1}{2}$

Key: D

Aligned CCLS: 6.G.2

Commentary: This question aligns to CCLS 6.G.2 because it asks students to find the volume of a right rectangular prism with fractional edge lengths.

Rationale: Option D correctly identifies the volume of the prism ($2\frac{3}{8} \times 8 \times 3\frac{1}{2}$). Option A is the area of the front or rear face. Option B is the area of the top or bottom face. Option C is what students might find if they were to work with the whole numbers and fractions separately.

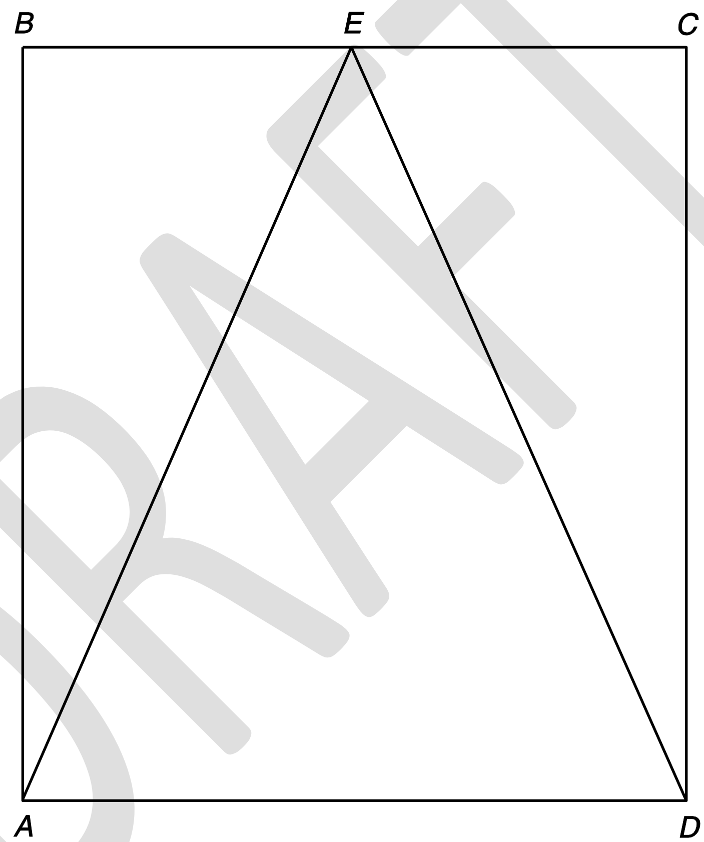
Domain: Geometry
Item: CR

11 Triangle *ADE* is inside rectangle *ABCD*. Point *E* is halfway between points *B* and *C* on the rectangle. Side *AB* is 8 cm and side *AD* is 7 cm.

Part A: What is the area of triangle *ADE*? **Show your work.**

Part B: What is the ratio of the area of triangle *ABE* to the area of triangle *ADE*?

Part C: What is the ratio of the area of triangle *CDE* to the area of rectangle *ABCD*?



(Not drawn to scale)

Key:

Part A: 28 sq cm

Part B: 14 to 28, 1:2, or other equivalent answer

Part C: 14 to 56, 1:4, or other equivalent answer

Aligned CCLS: 6.G.1, 6.RP.1

Commentary: This question aligns to CCLS 6.G.1 and 6.RP.1 because it assesses a student's ability to decompose polygons and use the information given to determine the area of a part of the polygon. The question also assesses a student's ability to use ratio language to describe a ratio relationship between two quantities.

Rationale:

Part A: Using the formula to find the area of the triangle, the base of triangle *ADE* is 8 cm and its height is 7 cm. The area is $\frac{1}{2}(7 \times 8) = 28$ sq cm.

Part B: The area of triangle *ABE* is 14 sq cm and the area of triangle *ADE* is 28 sq cm. The ratio of the area of triangle *ABE* to the area of triangle *ADE* is 14:28, 1:2, or other equivalent ratio.

Part C: The area of triangle *CDE* is 14 sq cm and the area of rectangle *ABCD* is 56 sq cm. The ratio of the area of triangle *CDE* to the area of rectangle *ABCD* can be represented by 14:56, 1:4, or other equivalent ratio.

Domain: Geometry
Item: CR

12 A closed box in the shape of a rectangular prism has a length of 13 cm, a width of 5.3 cm, and a height of 7.1 cm.

Part A: Draw a net of the box and find its surface area in square centimeters.

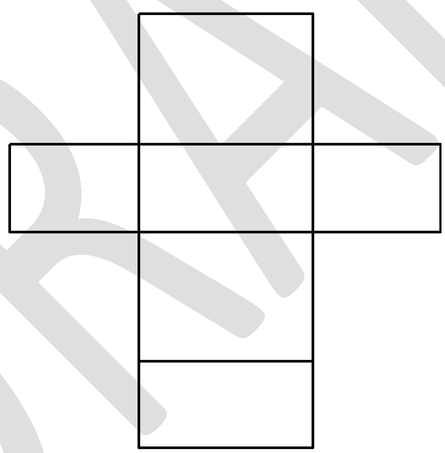
Answer: ____________________

Part B: A smaller box has dimensions that are half the measurements of the original. Find the ratio of the surface area of the original box to the surface area of the smaller box.

Answer: ____________________

Key:

Part A: Answers may vary but should display figures similar to the diagram below:



Surface area: $2(13 \times 5.3) + 2(13 \times 7.1) + 2(5.3 \times 7.1) = 397.66 \text{ cm}^2$

Part B: 4:1

Aligned CCLS: 6.G.4, 6.RP.1, 6.RP.2

Commentary: This question aligns to CCLS 6.G.4, 6.RP.1, and 6.RP.2 because it asks students to draw and use the net of a solid polyhedron to determine its surface area, and then to find the ratio of this surface area to the surface area of a box with dimensions that are half the size of the original.

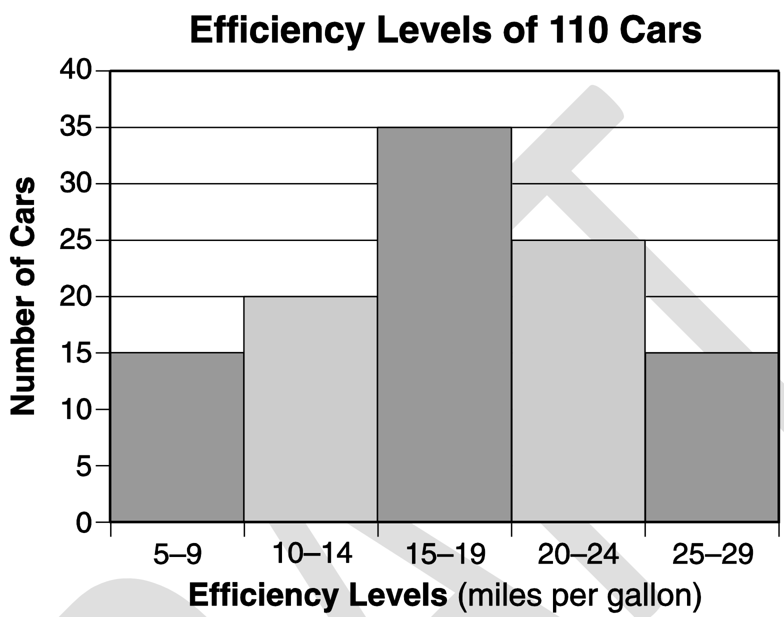
Rationale:

Part A: The net can be represented in a variety of configurations, as long as there are four long rectangles all connected with two small rectangles each connected to one of the longer rectangles. The surface area is the sum of the areas of all the faces of the rectangular prism.

Part B: The surface area of the smaller box is 99.415 cm^2. Students may use this measure in a ratio with the surface area of the original box and divide out the common factors. Other valid processes that result in 4:1 are also acceptable.

Domain: Statistics and Probability
Item: MC

13 Fuel efficiency can be measured by how far, in miles, a car can travel using a gallon of gas. The histogram below shows the fuel efficiency levels, in miles per gallon, of 110 cars. What is the closest percentage of cars with an efficiency level greater than or equal to 20 miles per gallon?



A 25%
B 36%
C 40%
D 44%

Key: B

Aligned CCLS: 6.SP.4, 6.RP.3c

Commentary: This question aligns to CCLS 6.SP.4 and 6.RP.3c because it is about analyzing data from a histogram. In this process, the ability to find a percentage of a quantity is also tested.

Rationale: Based on the data shown in the histogram, of the 110 cars considered, there are 25 + 15 = 40 cars that have efficiency levels greater than or equal to 20 miles per gallon. Thus, the percentage of these cars is

$\frac{40}{110}$ = 0.363636… = $36.\overline{36}$%. Option B, 36%, is the closest one. Options A and C count the frequency instead of the percentage. Option D is a misread of the histogram.