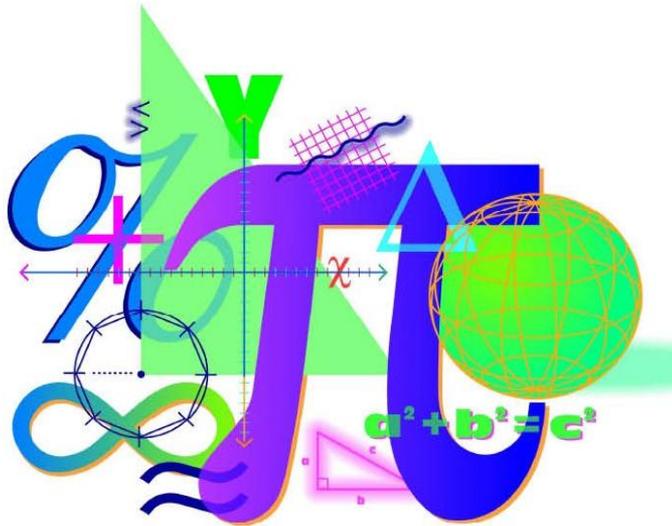# Spring 2012 Student Performance Analysis

Grade 8 Mathematics Standards of Learning

Presentation may be paused and resumed using the arrow keys or the mouse.

Describing the Real Number System

SOL 8.2

The student will describe orally and in writing the relationships between the subsets of the real number system.

Suggested Practice for SOL 8.2

Students need additional practice illustrating the relationships among the subsets of the real number system.

Which classifications of the real number system describe all numbers in the set? (Real, Rational, Irrational, Integer, Whole, Natural)

$$\left\{0.5, -17, \frac{2}{3}, 4\frac{1}{8}, 9^2\right\}$$

Real, Rational

$$\left\{-\sqrt{25}, 0, 75\%\right\}$$

Real, Rational

$$\left\{-1, 1, 0, \frac{14}{2}, \sqrt{25}\right\}$$

Real, Rational, Integers

$$\left\{208, \frac{1}{2}, \sqrt{1}\right\}$$

Real, Rational

$$\{7, 13, 19, 25\}$$

Real, Rational, Integers, Whole, Natural

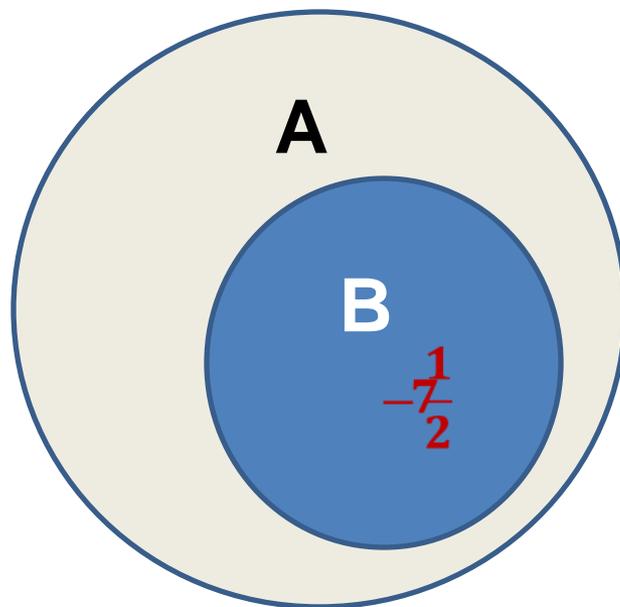$$\left\{\sqrt{3}, \pi, 0.341672 \ldots\right\}$$

Real, Irrational

Suggested Practice for SOL 8.2

Students need additional practice illustrating the relationships among the subsets of the real number system using graphic organizers.

This diagram represents the relationship between two sets of the real number system. Which classifications of the real number system could A and B represent?

A

B

$-7\frac{1}{2}$

Sample answers:

A: Real, B: Rational

A: Real, B: Integer

A: Rational, B: Integer

A: Rational, B: Whole

A: Integer, B: Whole

A: Whole, B: Natural

Solving Practical Problems Involving Rational Numbers

SOL 8.3

The student will

a)   solve practical problems involving rational numbers, percents, ratios, and proportions; and

b) determine the percent increase or decrease for a given situation.

Suggested Practice for SOL 8.3

Students need additional practice solving multistep practical problems with fractions and percents and finding the percent increase or decrease for a practical problem.

The Smiths purchased 6 containers of ice cream for a party. Each container holds 9 cups of ice cream. Before the party, their sons ate 3 cups of ice cream altogether. One serving is $\frac{3}{4}$ cup of ice cream.

a) How many servings of ice cream do the Smiths have left for their party? **68 servings**

b) What fraction of the original amount of ice cream purchased did the Smiths' sons eat? $\frac{1}{18}$

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Suggested Practice for SOL 8.3

This table represents the market value of a house at the end of each year.

Year	Market Value of House ($)
2009	363,000
2010	418,500
2011	568,200
2012	?

a) What is the percent increase in the market value of the house from 2009 to 2010? **Approximately 15.29%**

b) If the market value of the house decreased in value 22.28% from 2011 to 2012, what is the market value of the house at the end of 2012? Round your answer to the nearest dollar. **$441,605**

Suggested Practice for SOL 8.3

Jonah buys lunch each day from the school cafeteria. In September, Jonah spent $45.00 on school lunches.   In October, he spent $51.75 on school lunches.

a) What is the percent increase in the amount of money Jonah spent on school lunches in October compared to the amount of money he spent in September? **15%**

b) When compared to October, Jonah had a 10% increase in school lunch spending in November.   How much did he spend on school lunches in November? **$56.93**

Evaluating Algebraic Expressions

SOL 8.4

The student will apply the order of operations to evaluate algebraic expressions for given replacement values of the variables.

Suggested Practice for SOL 8.4

Students need additional practice substituting values into an expression with fractions and cubes.

Evaluate each expression.

a) $4a^2 + 3a - \dfrac{3}{2}$ when $a = -\dfrac{3}{4}$ $\dfrac{-3}{2}$

b) $\dfrac{7}{9}x^3 + 5$ when $x = -3$ -16

c) $\dfrac{3}{2}n\left(\dfrac{3}{4}n\right)^3$ when $n = 8$ $2,592$
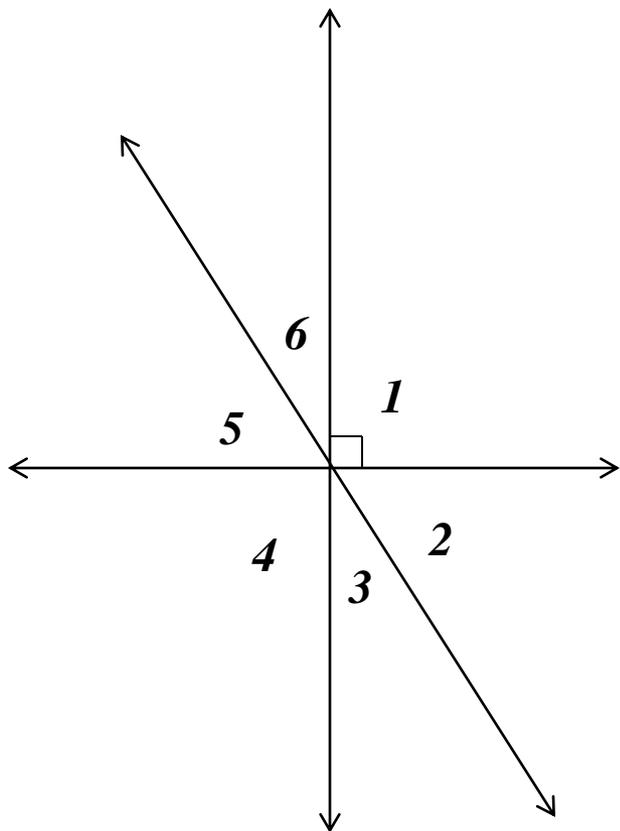
Describing Angle Relationships

SOL 8.6

The student will

a) verify by measuring and describe the relationships among vertical angles, adjacent angles, supplementary angles, and complementary angles; and

b)   measure angles of less than 360°.

Suggested Practice for SOL 8.6

Students need additional practice recognizing angle relationships, given a diagram.

a) Name the pairs of vertical angles in the figure.

$\angle 5$ and $\angle 2$, $\angle 6$ and $\angle 3$, $\angle 1$ and $\angle 4$,

b) Which two angles are supplementary?

$\angle 1$ and $\angle 4$

c) Name an angle in the figure that is adjacent to angle 2.

$\angle 1$ or $\angle 3$

d) Which pairs of angles are complementary?

$\angle 5$ and $\angle 6$, $\angle 2$ and $\angle 3$, $\angle 2$ and $\angle 6$, $\angle 5$ and $\angle 3$

Solving Problems Involving Volume and Surface Area

SOL 8.7

The student will

a) investigate and solve practical problems involving volume and surface area of prisms, cylinders, cones, and pyramids; and

b) describe how changing one measured attribute of the figure affects the volume and surface area.

Suggested Practice for SOL 8.7

**Students need additional practice calculating the surface area and volume of a three-dimensional figure.**
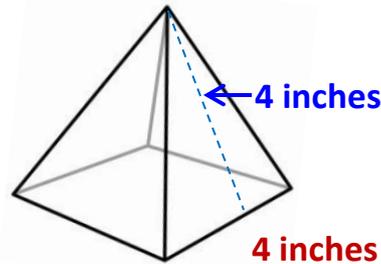
4 inches

4 inches

Brian purchased a trophy in the shape of a square pyramid for the most valuable player on his lacrosse team. The trophy had a slant height of 4 inches, and each side of its base measured 4 inches. Brian wanted to engrave text on the four sides of the trophy, but not on the base of the trophy. How many square inches of the trophy were available for engraving?

32 square inches

Suggested Practice for SOL 8.7

A paper weight mold in the shape of a square pyramid is filled with molten glass. How many cubic inches of molten glass are needed to fill the paper weight?
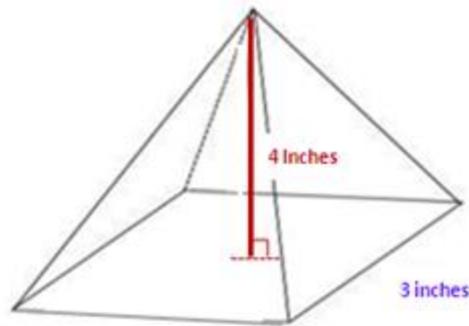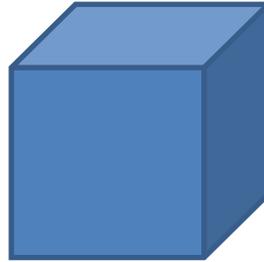

4 Inches

3 inches

Height of the mold= 4 inches

Side length of mold base = 3 inches

12 cubic inches

Suggested Practice for SOL 8.7

4 inches

Megan wrapped a present inside a cube-shaped box. The box had an edge length of 4 inches. How many square inches of paper were needed to wrap the box, if there was no overlap?

96 square inches

Suggested Practice for SOL 8.7

Anna built a prism (Prism A) in the shape of a cube out of wood. The side length of the cube measured 18 inches in length.   Anna built another prism (Prism B) with the same dimensions as the cube, except she doubled its height.

h

$2h$

18 inches

Prism A

18 inches
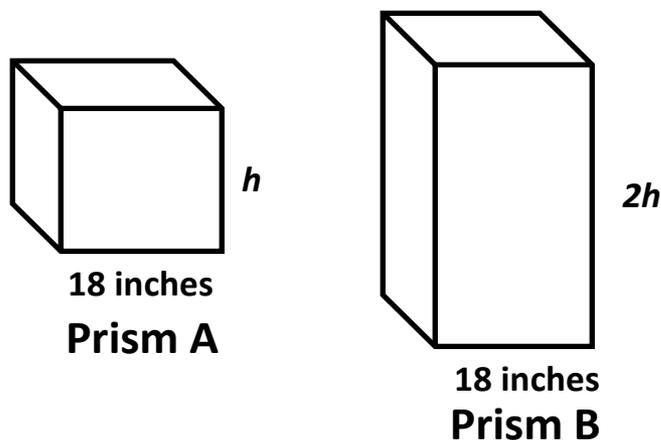
Prism B

a) **How does the volume of the two prisms compare?**

The volume of Prism B is twice the volume of Prism A.

b) **How does the surface area of the two prisms compare?**

The surface area of Prism B is greater than the surface area of Prism A. The surface area of the four sides of Prism B are twice the surface area of the four sides of Prism A, and the surface area of the two bases of Prism A and the two bases of Prism B are the same.

c) **Find the volume and surface area of Prism A and Prism B.**

Volume of Prism A $= 5,832$ in^3 S. A. of Prism A $= 1,944$ in^2

Volume of Prism B $= 11,664$ in^3 S. A. of Prism B $= 3,240$ in^2

# Relating Three-Dimensional Models with Two-Dimensional Views

SOL 8.9

The student will construct a three-dimensional model, given the top or bottom, side, and front views.

Suggested Practice for SOL 8.9

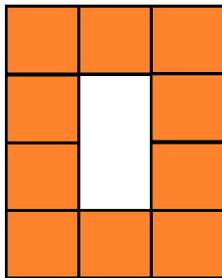**Students need additional practice matching a three-dimensional figure to its two-dimensional views.**

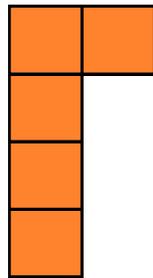**Which could represent the front view of this figure?**

Left side

Front side

a)

b)

c)

d)
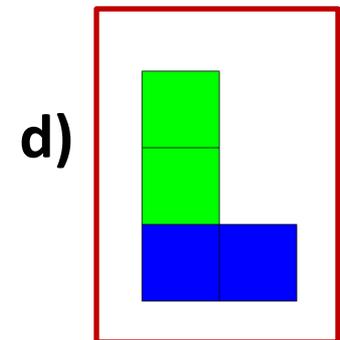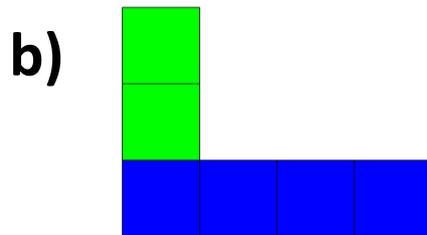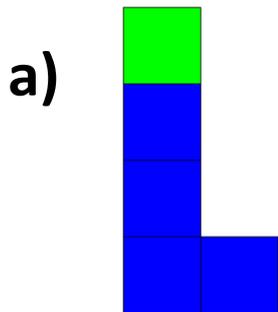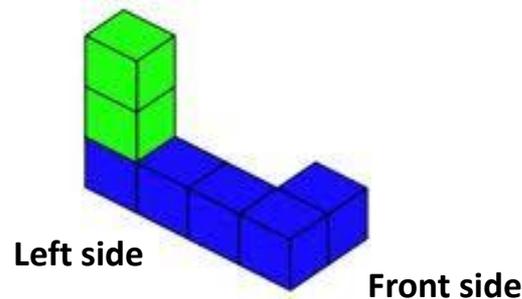
Suggested Practice for SOL 8.9

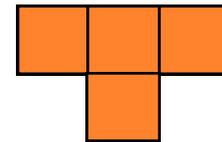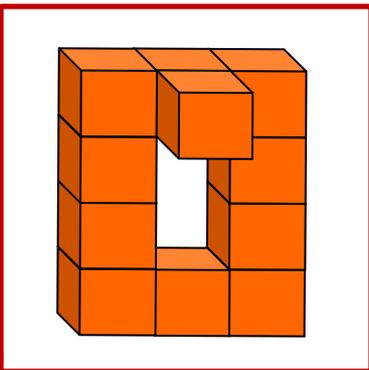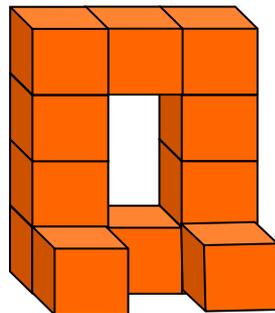**What three dimensional figure could be represented by these three views?**
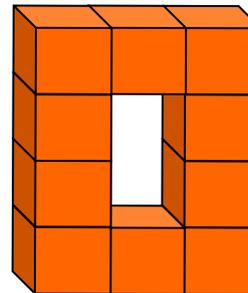
Front View

Left View

Top View

a)

b)

c)

d)
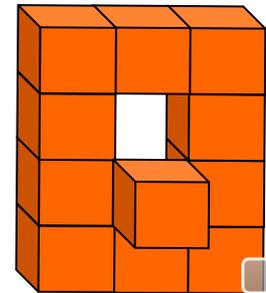
Solving Composite Figure Problems

SOL 8.11

The student will solve practical area and perimeter problems involving composite plane figures.

Suggested Practice for SOL 8.11

Students need additional practice using addition and subtraction to calculate area and perimeter in problems involving composite plane figures.
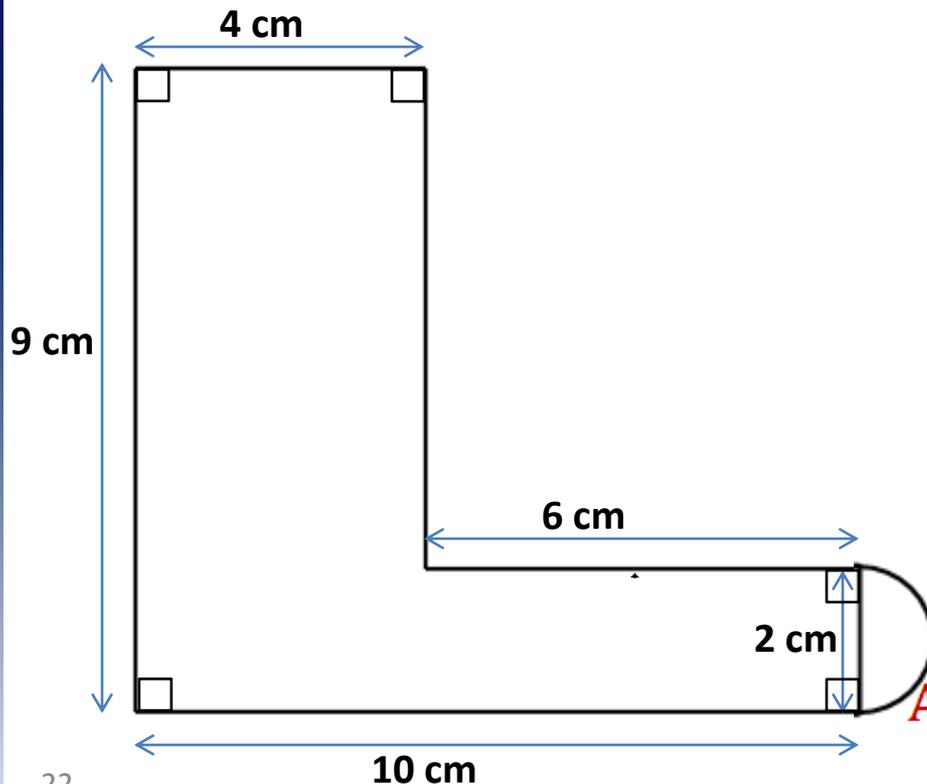
a) Find the area and perimeter of this composite figure.

$$A = 48 \text{ cm}^2 \qquad P = 38 \text{ cm}$$

b) A semicircle with a diameter of 2 centimeters is added to the side of the figure labeled 2 cm. Find the approximate area and perimeter of the new figure after this addition.

$$A = 49.57 \text{ cm}^2 \text{ and } P = 39.14 \text{ cm}$$

Suggested Practice for SOL 8.11

An artist created a geometric design on a wall. She began by painting a blue circle and then painting a yellow isosceles right triangle on top of the blue circle. This figure shows the artist's beginning steps.
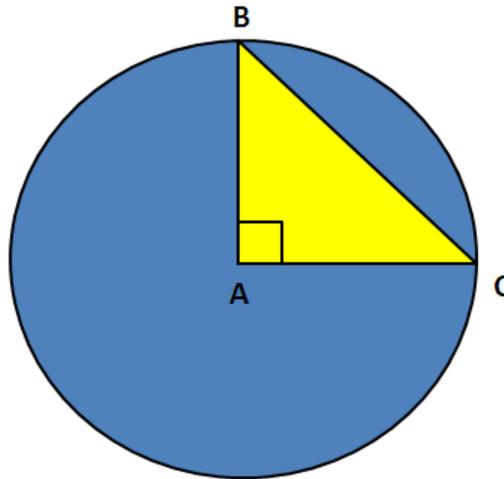
Point A is the center of the circle. Points B and C lie on the circle. The diameter of the circle is 12 feet.

What is the area of the interior of the circle not covered by triangle ABC, rounded to the nearest whole number?

$$A = 95 \text{ ft}^2$$

Determining Probability

SOL 8.12

The student will determine the probability of independent and dependent events with and without replacement.

Suggested Practice for SOL 8.12

Students need additional practice calculating probability of independent and dependent events with and without replacement.

a) Sue flips a fair coin three times. What is the probability that the coin will land on tails all three times?

$$\frac{1}{8}$$

b) If the spinner for a game is spun once, there is a 20% chance it will land on red. What is the chance that it will NOT land on red on both the first and second spin in a game? Plot the value of this probability on the number line and label it.

0          $\frac{1}{2}$ $0.64\ or\ \frac{16}{25}$ 1
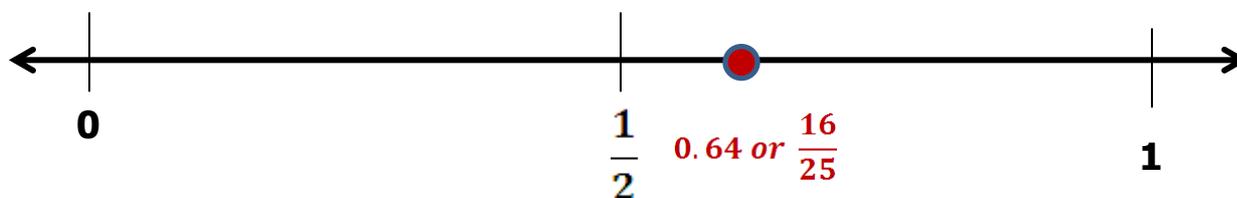
Suggested Practice for SOL 8.12

- **Juan has a bag of candy with 20 pieces that are the same shape and size.**
- **40% of the pieces are only chocolate.**
- **20% of the pieces are only caramel.**
- **The remainder of the pieces are only toffee.**

Juan eats 1 piece of caramel candy from the bag and then gives the bag to her friend Susanna. If Susanna takes one piece of candy from the bag without looking, what is the probability the piece she takes will be chocolate?

$$\frac{8}{19} \text{ or } \textbf{Approximately 42.1\%}$$

Suggested Practice for SOL 8.12

Olivia has hard pieces of candy in a bowl. They are all the same size and shape. There are 1 green, 4 blue, and 5 red pieces of candy in the bowl.

a) Olivia picks two pieces of candy without looking. What is the probability that Olivia will pick a red piece of candy and then a blue piece of candy? $\dfrac{2}{9}$

b) Olivia picks two pieces of candy without looking. What is the probability that Olivia will pick a red piece of candy, put it back into the bowl, and then pick a blue piece of candy? $\dfrac{1}{5}$

Suggested Practice for SOL 8.12

A spinner is divided into eight equal sections as shown.
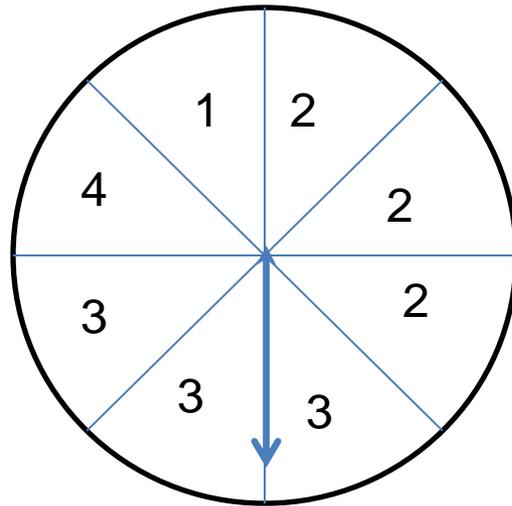
What is the probability that the spinner will NOT land on a section labeled 2 on the first spin and will land on a section labeled 2 on the second spin?

$$\frac{15}{64}$$

Analyzing Graphs

SOL 8.13

The student will

a) **make comparisons, predictions, and inferences, using information displayed in graphs; and**

b) **construct and analyze scatterplots.**

Suggested Practice for SOL 8.13

Students need additional practice interpreting the information displayed in graphs.

This graph displays the high temperatures for Hampton, VA over five days in September.

High Temperatures in Hampton, VA
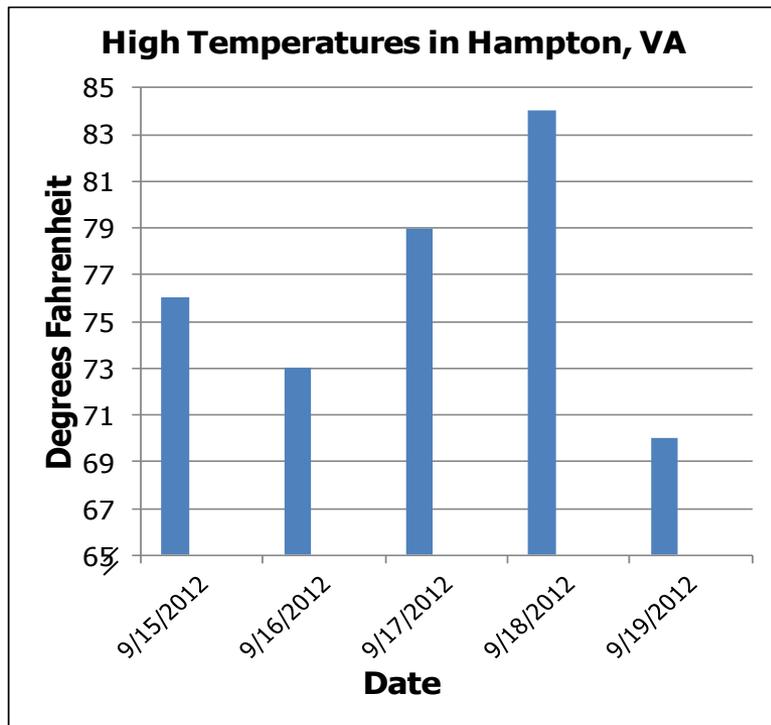
The mean high temperature in Bristol, VA for these same dates was 89°F.

What is the difference in the mean high temperatures of Bristol and Hampton for these five days, rounded to the nearest degree?

13°F

Making Connections Between Representations of a Relationship

SOL 8.14

The student will make connections between any two representations (tables, graphs, words, and rules) of a given relationship.

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Suggested Practice for SOL 8.14

Students need additional practice translating a word problem into an algebraic equation.

The school store sells t-shirts and sweatshirts each Friday.

- **Sales totaled $565.00 last Friday.**
- **Let *t* represent t-shirts, which sold for $10 each.**
- **Let *w* represent sweatshirts, which sold for $25 each.**

Write an equation using *t* and *w* to represent the total sales for last Friday. $10t + 25w = 565$

Solving Equations and Inequalities

SOL 8.15
The student will

a) **solve multistep linear equations** in one variable on one and two sides of the equation;

b) **solve two-step linear inequalities and graph the results on a number line**; and

c) **identify properties** of operations used to solve an equation.

Suggested Practice for SOL 8.15

Students need additional practice solving multistep linear equations.

Solve each linear equation.

a) $2 + 13n = -8 + 8n$ $n = -2$

b) $5(2.9 + x) = 8.3$ $x = -1.24$

c) $\dfrac{k}{-5} + 7 = 22$ $k = -75$
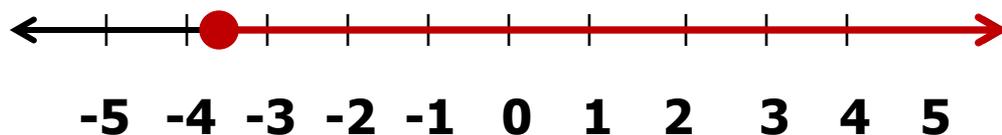
d) $-2m = 3(m - 10)$ $m = 6$

Suggested Practice for SOL 8.15

Students need additional practice solving two-step inequalities and graphing the solution on a number line.
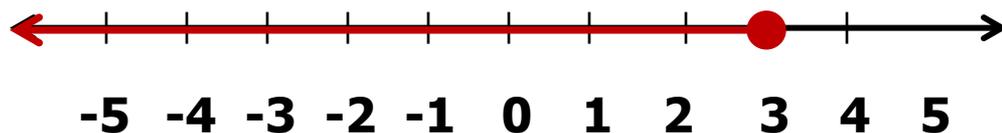
Suggested Practice for SOL 8.15

a) Graph the solution to $-5a - 7 \leq 12$ on a number line.

$$a \geq -3.8$$

b) Graph the solution to $5 \leq -3w + 14$ on the number line.

$$3 \geq w$$

Suggested Practice for SOL 8.15

Students need additional practice identifying properties.

Select each equation that illustrates the commutative property of multiplication. Select all equations that are correct.

$$5 \cdot (4 + 3) = (4 + 3) \cdot 5$$

$$6(2 + 7) = 6(2) + 6(7)$$

$$(8 \cdot 3) \cdot (6) = (8) \cdot (3 \cdot 6)$$

$$12 \cdot \left(4\frac{3}{4}\right) = 12 \cdot (4) + 12 \cdot \left(\frac{3}{4}\right)$$

$$3\left(\frac{-2}{3}\right) = \left(\frac{-2}{3}\right)3$$

Suggested Practice for SOL 8.15

Which property best justifies the work between step 2 and step 3?

Step 1	$5a = -15$	Given
Step 2	$\dfrac{1}{5} \cdot 5a = -15 \cdot \dfrac{1}{5}$	Multiplication Property of Equality
Step 3	$1 \cdot a = -15 \cdot \dfrac{1}{5}$	Inverse Property of Multiplication
Step 4	$a = -15 \cdot \dfrac{1}{5}$	Identity Property of Multiplication
Step 5	$a = -3$	Substitution

a) Identity Property of Multiplication
b) Inverse Property of Multiplication
c) Multiplication Property of Equality
d) Commutative Property of Multiplication

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Identifying Domain, Range, Independent and Dependent Variables

SOL 8.17

The student will identify the domain, range, independent variable or dependent variable in a given situation.

Suggested Practice for SOL 8.17

Students need additional practice identifying independent and dependent variables in practical situations, and identifying domain and range in varied representations.

Suggested Practice for SOL 8.17

Lisa's monthly cell phone charges are listed separately on the

bills from her cell phone company provider.

- Mobile-to-mobile calls cost $0.03 per minute.

- Mobile-to-land line calls cost $0.05 per minute.

- Unlimited text messaging is $45.00 per month.

- The monthly service charge of $9.95.

- The total bill is taxed at a rate of 5%.

Identify the independent variable(s) and dependent variable(s)

in this situation.

Dependent variable: Total Monthly Cost
Independent variables: Minutes for mobile-to-mobile calls and minutes for mobile-to-land line calls
Total monthly cost is dependent on the number of minutes for all calls. The unlimited text messaging charge, monthly service charge and tax rate are constants.

Suggested Practice for SOL 8.17

Select each table that represents a relation with a domain of {-1, 2, 3} .

x	y
-1	3
2	4
2	5
3	5

x	y
-2	-1
0	-1
4	2
5	3

x	y
-1	-1
2	3
3	2
5	4

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

Suggested Practice for SOL 8.17

Which table represents a relation with a domain of {-1, 2} and a range of {3,5} ?

a)

x	y
-1	3
2	4
2	5
2	6

b)

x	y
-1	3
-1	5
2	3
2	5

c)

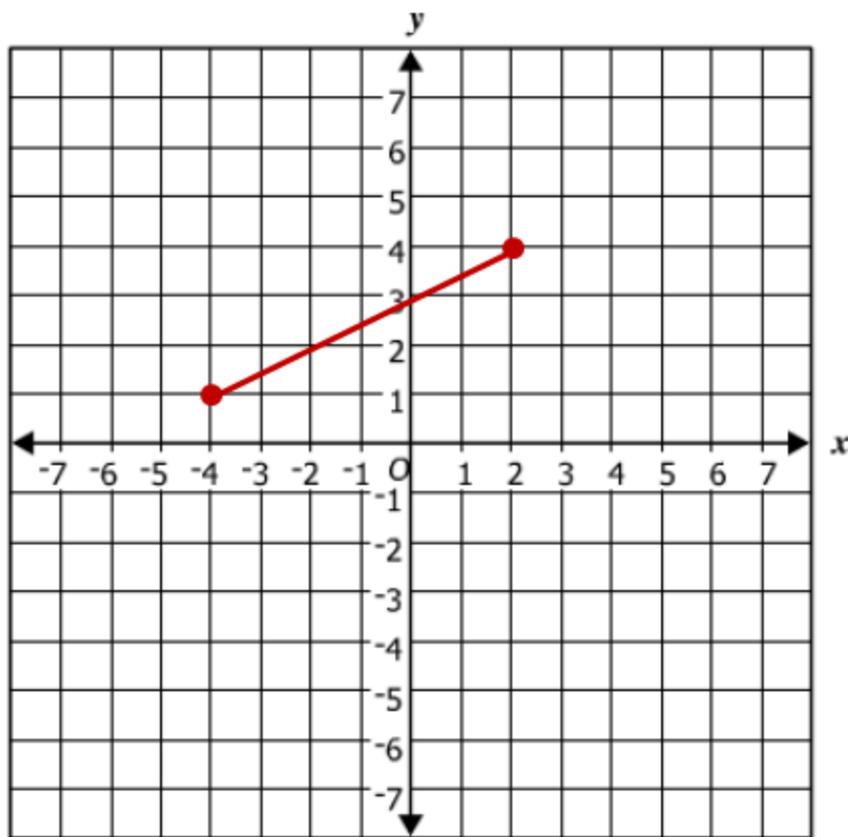| x	y
-1	2
2	-1
3	5
5	3

d)

x	y
3	-1
3	2
5	-1
5	2

Suggested Practice for SOL 8.17

For which sets is this statement true?

All elements are members of the domain of the graphed function.

$\{0, 1, 2\}$ $\{-4, 2, 3\}$

$\{1, 2, 3, 4\}$ $\{-4, 0, 0.5\}$

$\{1, 2, 2.5, 3\}$

Practice Items

This concludes the student performance information for the spring 2012 Grade 8 Mathematics SOL test.

Additionally, test preparation practice items for Grade 8 Mathematics can be found on the Virginia Department of Education Web site at:

http://www.doe.virginia.gov/testing/sol/practice_items/index.shtml#math