

# Spring 2014 Student Performance Analysis

## Geometry Standards of Learning



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

# Determining and Verifying Parallelism

## SOL G.2

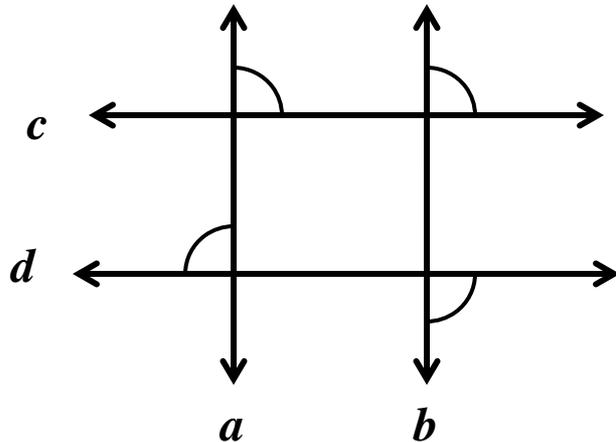
The student will use the relationships between angles formed by two lines cut by a transversal to

- a) **determine whether two lines are parallel;**
- b) **verify the parallelism, using algebraic and coordinate methods as well as deductive proofs; and**
- c) **solve real-world problems involving angles formed when parallel lines are cut by a transversal.**

## Suggested Practice for SOL G.2

Students need additional practice determining and using parallelism from given information on a figure.

This figure has more than one transversal and markings to indicate congruent angles.



Which statement about the figure shown must be true?

**A. Only  $a \parallel b$**

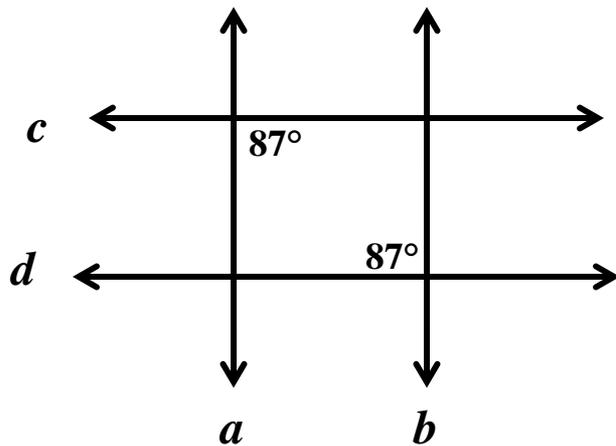
B. Only  $c \parallel d$

C. Both  $a \parallel b$  and  $c \parallel d$

D. No lines are parallel.

## Suggested Practice for SOL G.2

This figure has more than one transversal. Two angle measurements are shown. (Figure is not drawn to scale.)

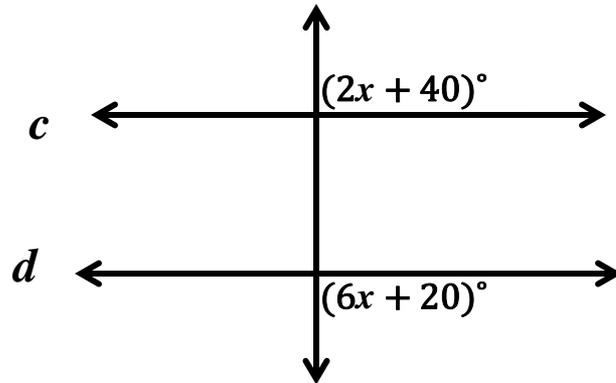


Based only on the information given, which statement about the figure shown must be true?

- A. Only  $a \parallel b$
- B. Only  $c \parallel d$
- C. Both  $a \parallel b$  and  $c \parallel d$
- D. No lines are parallel.

## Suggested Practice for SOL G.2

In the figure shown, line  $c$  and line  $d$  are cut by a transversal. (Figure is not drawn to scale.)



For what value of  $x$  will line  $c$  be parallel to line  $d$  ?

- A. 5
- B. 15**
- C. 20
- D. 30

# Identifying Parallel and Perpendicular lines

## SOL G.3

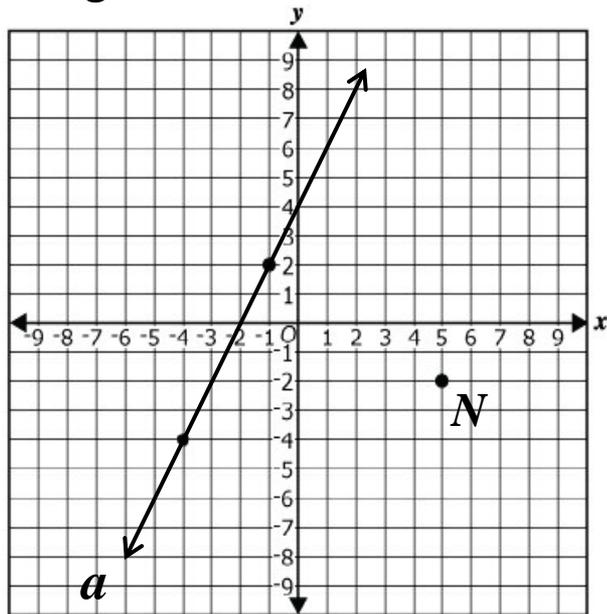
The student will use pictorial representations, including computer software, constructions, and **coordinate methods**, to solve problems involving symmetry and transformation. This will include

- a) **investigating** and using formulas for finding distance, midpoint, and **slope**;
- b) **applying slope to verify and determine whether lines are parallel or perpendicular**;
- c) **investigating symmetry and determining whether a figure is symmetric with respect to a line or a point; and**
- d) **determining whether a figure has been translated, reflected, rotated, or dilated, using coordinate methods.**

# Suggested Practice for SOL G.3

Students need additional practice applying the relationship between slopes of parallel and perpendicular lines to given situations.

Use this graph to answer the questions. All points have integral coordinates.



1. Find the coordinates of a point on the graph that lies on a line which passes through point  $N$  and is parallel to line  $a$ .

**Possible answers:**

$(6, 0)$ ,  $(7, 2)$ ,  $(8, 4)$ ,  $(9, 6)$ ,  $(10, 8)$ ,  
 $(4, -4)$ ,  $(3, -6)$ ,  $(2, -8)$ ,  $(1, -10)$

2. Find the slope of a line which passes through point  $N$  and is perpendicular to line  $a$ .  
 $-\frac{1}{2}$
3. The coordinates of a point that lies on a line which passes through point  $N$  and is perpendicular to line  $a$  are represented by  $(-3, y)$ . What is the value of the  $y$ -coordinate?  
 $2$



# Proving Triangles Congruent

## SOL G.6

The student, given information in the form of a figure or statement, will **prove two triangles are congruent, using algebraic and coordinate methods** as well as deductive proofs.

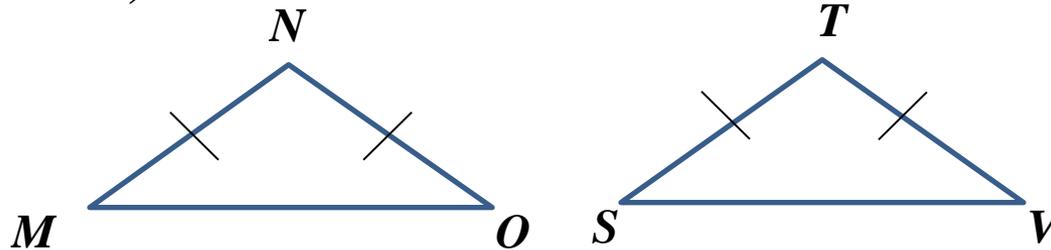
# Suggested Practice for SOL G.6

Students need additional practice proving triangles congruent using algebraic methods.

Given:  $\triangle MNO$  and  $\triangle STV$  are isosceles.

$$m\angle N = (2x - 28)^\circ$$

$$m\angle T = (x + 22)^\circ$$



What measure of  $\angle S$  could be used to prove  $\triangle MNO \cong \triangle STV$ ?

A  $50^\circ$  ←

Some students choose this answer because it is the value of  $x$ .

**B  $54^\circ$**

Still, other students choose this answer because they use 50 as the degree measure for angles  $N$  and  $T$ , subtract 50 from 180 and divide by 2.

C  $65^\circ$  ←

D  $72^\circ$  ←

Other students choose this answer because it is the measure of angles  $N$  and  $T$ .

# Proving Triangles Similar

## SOL G.7

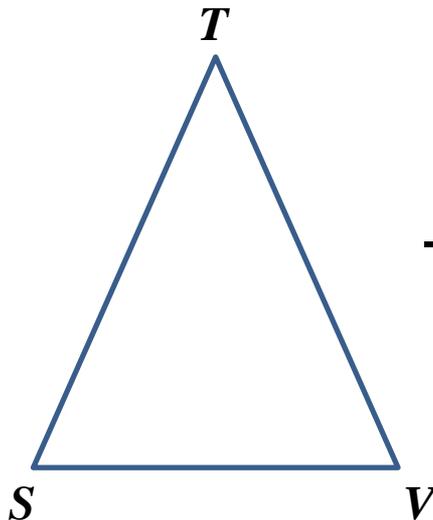
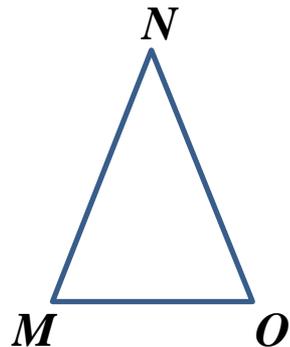
The student, given information in the form of a figure or statement, will **prove two triangles are similar, using algebraic and coordinate methods as well as deductive proofs.**

# Suggested Practice for SOL G.7

Students need additional practice proving triangles similar when specific measurements are not given.

Given:  $\triangle MNO$  and  $\triangle VTS$

Select two relationships that together would prove  $\triangle MNO \sim \triangle VTS$  by the Side-Angle-Side (SAS) Similarity Theorem.



$$\angle N \cong \angle T$$

$$\angle M \cong \angle S$$

$$\angle M \cong \angle V$$

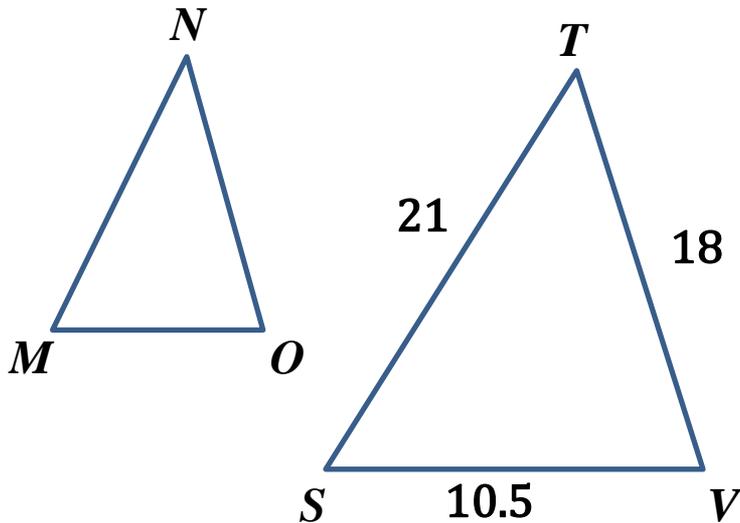
$$\frac{MN}{ST} = \frac{SV}{MO}$$

$$\frac{MN}{VT} = \frac{MO}{VS}$$

# Suggested Practice for SOL G.7

Students need additional practice using the ratios of the sides of similar triangles.

Given:  $\triangle MNO \sim \triangle STV$



Select each set of numbers that could represent the side lengths of  $\triangle MNO$ .

7, 6, 2.5

16, 13, 5.5

14, 12, 7

2.1, 1.8, 1.05

10.5, 9.5, 5.5

4.2, 3.6, 2.1

# Verifying Properties of Quadrilaterals

## SOL G.9

The student will verify characteristics of quadrilaterals and use properties of quadrilaterals to solve real-world problems.

# Suggested Practice for SOL G.9

Students need additional practice with practical problems involving quadrilaterals.

Sasha built a window for her dollhouse in the shape of a quadrilateral. She knows the opposite sides of the window are parallel but she wants to be sure it is in the shape of a rectangle. Which of these can she use?

- A. The consecutive angles of the window are supplementary.
- B. The opposite sides of the window are congruent.
- C. The diagonals of the window bisect each other.
- D. The diagonals of the window are congruent.**

## Suggested Practice for SOL G.9

Students need additional practice identifying the properties of a quadrilateral that is inscribed in a circle.

Andy inscribed quadrilateral  $ABCD$  in a circle. Line segment  $BD$  is a diameter of the circle.

Based on this information, select each statement that must be true.

Line segment  $AC$  is a diameter of the circle.

Angle  $C$  is a right angle.

The sum of the measures of  $\angle B$  and  $\angle D$  is  $180^\circ$ .

The sum of the measures of  $\angle A$  and  $\angle B$  is  $180^\circ$ .

# Finding Arc Lengths and Measures of Chords, Tangents, and Secants

## SOL G.11

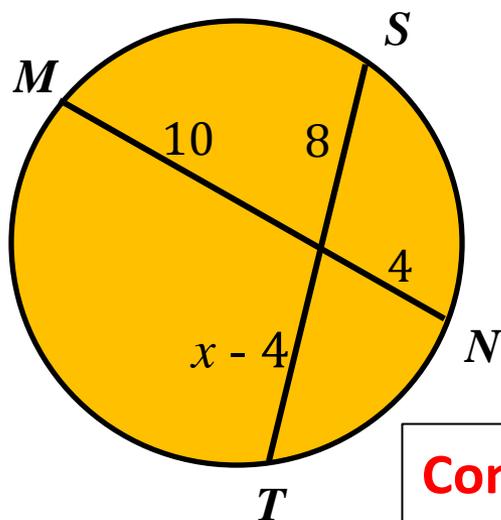
The student will use angles, arcs, chords, tangents, and secants to

- a) investigate, verify, and apply properties of circles;
- b) solve real-world problems involving properties of circles; and
- c) find arc lengths and areas of sectors in circles.

# Suggested Practice for SOL G.11

Students need additional practice solving real-world problems involving chords.

This figure represents a design for a stained glass window. The window is divided by chords  $\overline{MN}$  and  $\overline{ST}$ .



1. What is the value of  $x$ ?

9

2. What is the length of  $\overline{ST}$ ?

$(9 - 4) + 8$

13

**Common Errors:**

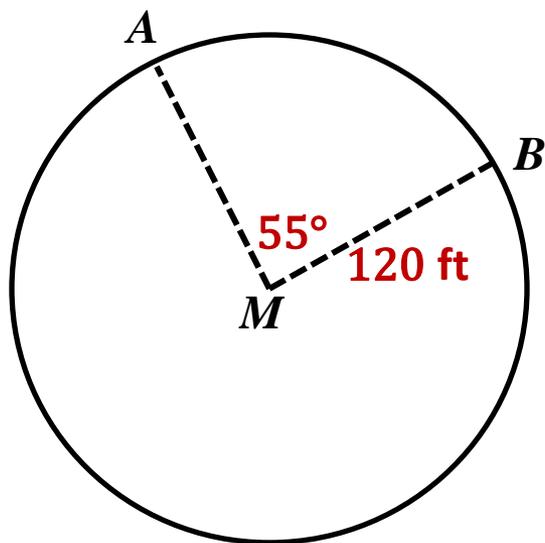
$$5 = 9 - 4$$

$$40 = (9 - 4) \cdot 8$$

## Suggested Practice for SOL G.11

Students need additional practice solving real-world problems using properties of circles.

Circle  $M$  represents a circular race track. The radius of this race track is 120 feet. Juan will start at point  $A$  and run in a clockwise direction to point  $B$ . Angle  $AMB$  measures  $55^\circ$ .



Which is closest to the number of feet Juan will run from point  $A$  to point  $B$ ?

A. 55 ft

B. 58 ft

C. 115 ft

D. 120 ft

$$\leftarrow \frac{55}{360} (754) \approx 115.2 \text{ ft}$$

Circumference of the circle  
 $\approx 754 \text{ ft}$

# Writing and Using Equations of Circles

## SOL G.12

The student, given the coordinates of the center of a circle and a point on the circle, **will write the equation of the circle.**

Students should have experiences that require them to determine any of the following from given information:

- the coordinates of the center;
- the length of a radius;
- coordinate endpoints of a radius;
- the length of a diameter;
- coordinate endpoints of a diameter;
- **the coordinates of a point on the circle; and/or**
- **the equation of a circle.**

# Suggested Practice for SOL G.12

Students need additional practice determining the equation of a circle when several steps are necessary.

Write the equation of a circle, in standard form, that has a diameter with endpoints at  $(-4, 3)$  and  $(0, -5)$ .

First, find the midpoint of the diameter which is the center of the circle.

$$\left( \frac{-4 + 0}{2}, \frac{3 + -5}{2} \right) = (-2, -1)$$

Next, find the length of the radius using the center and one of the points on the circle.

$$\sqrt{(-2 - 0)^2 + (-1 - (-5))^2} = \sqrt{20}$$

$$(x + 2)^2 + (y + 1)^2 = 20$$

## Suggested Practice for SOL G.12

Students need additional practice determining points that lie on a circle when given the equation or enough information to find the equation.

Which of these points lie on the circle represented by this equation?  $(x - 4)^2 + (y + 3)^2 = 10^2$

$(-4, 3)$

$(-6, 3)$

$(4, 7)$

$(4, -3)$

$(10, 5)$

# Surface Area and Volume

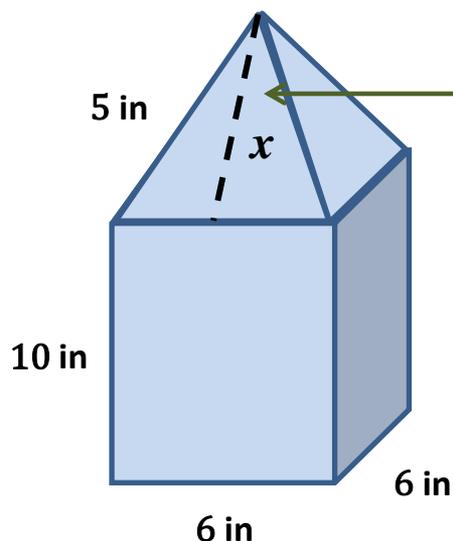
## SOL G.13

The student will use formulas for surface area and volume of **three-dimensional objects** to solve real-world problems.

## Suggested Practice for SOL G.13

Students need additional practice determining surface area and volume of three dimensional composite figures.

A statue consists of a square pyramid and a rectangular prism with congruent bases. Specific measurements of the statue are shown in this figure.



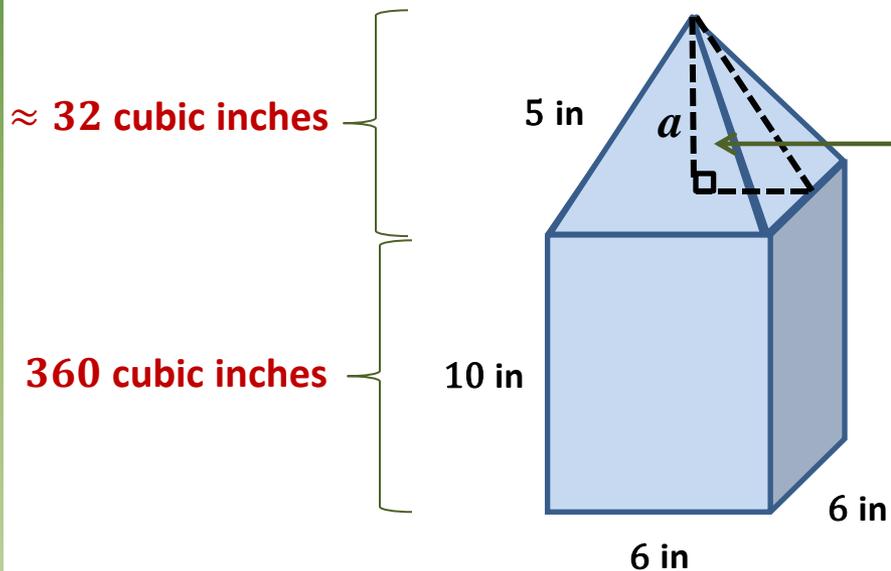
Slant height can be found using the Pythagorean Theorem:

$$3^2 + x^2 = 5^2$$
$$x = 4$$

What is the total surface area of the statue represented by this composite figure? [Figure is not drawn to scale.]

# Suggested Practice for SOL G.13

What is the volume of this figure rounded to the nearest cubic inch?



The height,  $a$ , can be calculated using the Pythagorean Theorem, where 3 is half the length of the base and 4 is the slant height:

$$a^2 + 3^2 = 4^2$$

$$a \approx 2.65$$

$\approx 32$  cubic inches

360 cubic inches

**Total volume  $\approx 392$  cubic inches**

# Changes in Length, Area, and Volume

## SOL G.14

The student will use similar geometric objects in two- or three-dimensions to

- a) compare ratios between side lengths, perimeters, areas, and volumes;
- b) determine how changes in one or more dimensions of an object affect area and/or volume of the object;
- c) determine how changes in area and/or volume of an object affect one or more dimensions of the object; and
- d) solve real-world problems about similar geometric objects.

# Suggested Practice for G.14

Students need additional practice developing an understanding of the relationship between the linear, area, and volume ratios of similar geometric objects.

**Given:** Objects A and B are three-dimensional. Object A is similar to object B.

The height of object A is 24 inches and the height of object B is 36 inches.

1. What is the ratio of the surface area of object A to the surface area of object B in simplest form?

**4:9**

2. What is the ratio of their volumes in simplest form?

**8:27**

## Suggested Practice for G.14

Students need additional practice using any given ratio of a pair of similar figures (linear, surface area, or volume) to determine the other two ratios.

Pyramid S is similar to Pyramid T. If the ratio of the volume of Pyramid S to Pyramid T is 64:125, complete the table by finding the ratio of their side lengths and the ratio of their surface areas.

	Pyramid S		Pyramid T
Side Length	4	to	5
Surface Area	16	to	25
Volume	64	to	125

# Suggested Practice for G.14

The ratio of the surface areas of two spheres is 1:9.

1. What is the ratio of the lengths of their radii? What is the ratio of their volumes?

The ratio of the lengths of the radii is 1:3 and the ratio of the volumes is 1:27.

2. If the volume of the smaller sphere is 64 cubic inches, what is the volume of the larger sphere?

The volume of the larger sphere is 1,728 cubic inches.

# Practice Items

This concludes the student performance information for the spring 2014 Geometry SOL test.

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

[http://www.doe.virginia.gov/testing/sol/practice\\_items/index.shtml#math](http://www.doe.virginia.gov/testing/sol/practice_items/index.shtml#math)

# Contact Information

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