VIRGINIA STANDARDS OF LEARNING

TEST ITEM SET

GEOMETRY

2009 Mathematics Standards of Learning

Released Spring 2015

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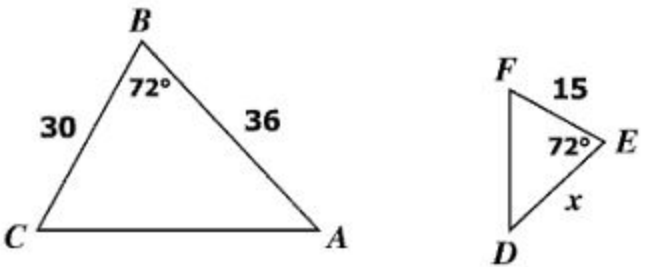
SAMPLE A

For what value of x is $\triangle ABC \sim \triangle DEF$?



- **A** 18
- **B** 21
- **C** 25
- **D** 72

Directions: Type your answer in the box.

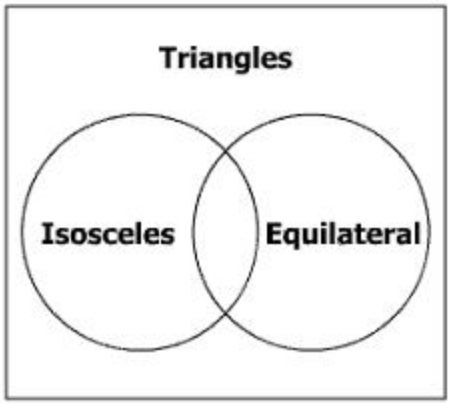
SAMPLE B

What is the total number of lines of symmetry for this figure?

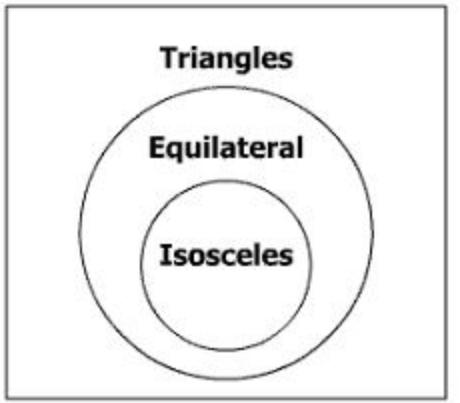
Which Venn diagram accurately represents the information in the following statement?

If a triangle is equilateral, then it is isosceles.

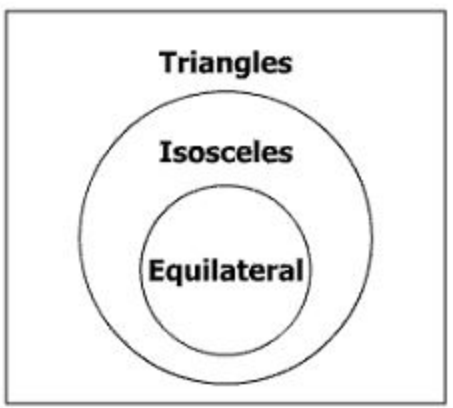
A



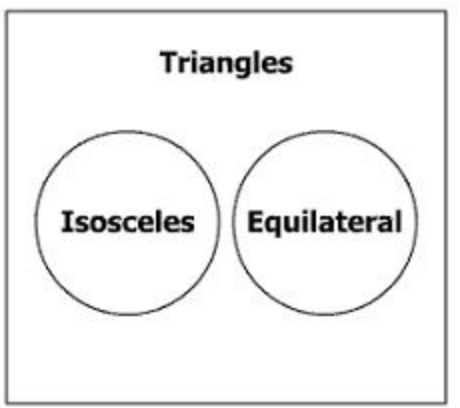
C



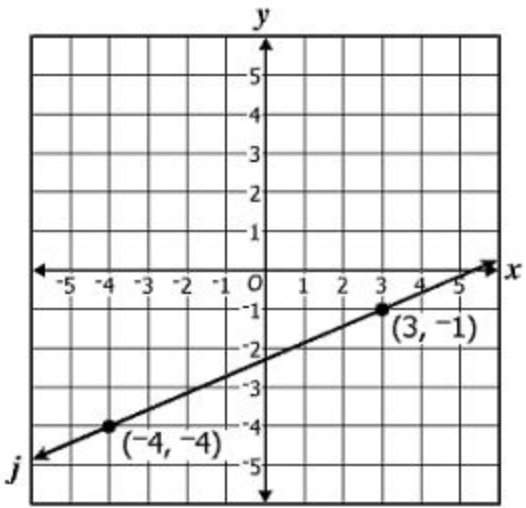
B



D



The graph of line j is shown.



Which ratio represents the slope of a line parallel to line j ?

- **A** $\frac{3}{7}$
- **B** $\frac{5}{7}$
- **C** $\frac{7}{5}$
- **D** $\frac{7}{3}$

Directions: Click and drag the answers to the correct boxes.

Let p represent
Brent works this summer.

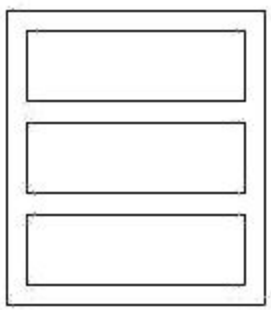
Let q represent
Brent takes a vacation.

Symbolically represent the following argument.

If Brent works this summer, then he will not take a vacation.

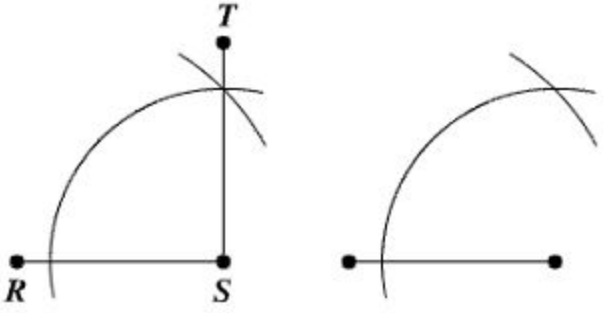
Brent takes a vacation.

Therefore, Brent does not work this summer.



$p \rightarrow q$	$\sim p \rightarrow q$	p	$\sim p$	$\therefore p$	$\therefore \sim p$
$\sim p \rightarrow \sim q$	$p \rightarrow \sim q$	q	$\sim q$	$\therefore q$	$\therefore \sim q$

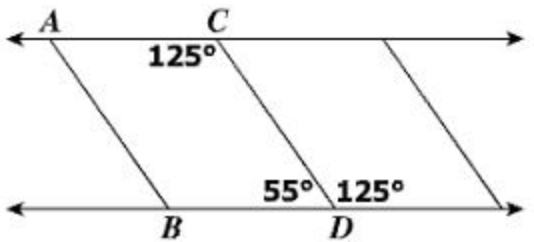
Which type of construction is illustrated in the figure?



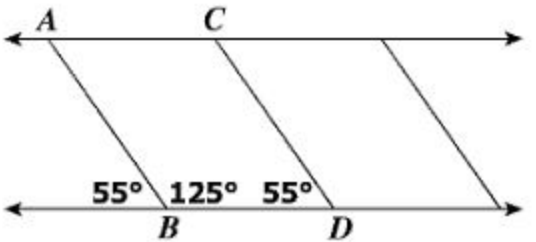
- **A** The bisector of a given angle
- **B** An angle congruent to a given angle
- **C** A line segment congruent to a given line segment
- **D** A line segment perpendicular to a given line segment

The diagrams represent the stripes used to mark parking spaces on a lot. Based only on the information given, which diagram could be used to prove $\overline{AB} \parallel \overline{CD}$ and $\overline{AC} \parallel \overline{BD}$?

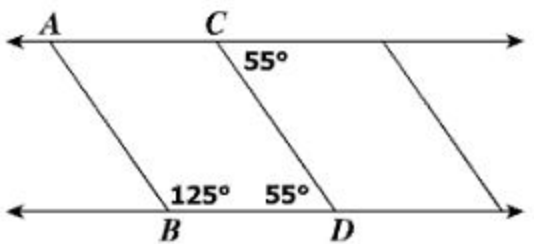
A



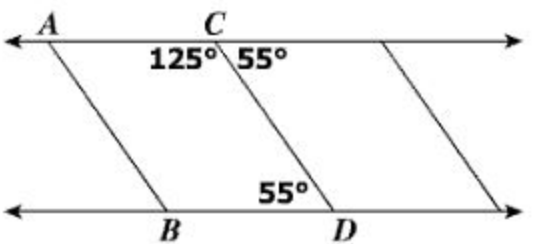
C



B



D



Given statements:

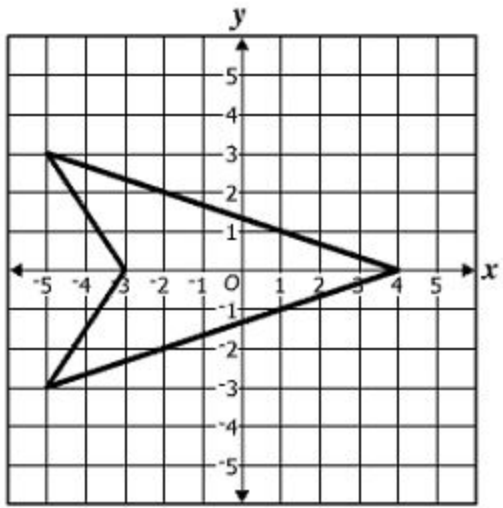
If a shape is a parallelogram, then opposite angles are congruent.
A rhombus is a parallelogram.

Which is a logical conclusion from the given statements?

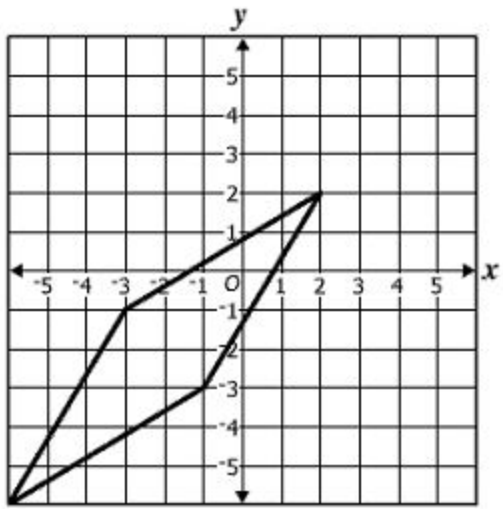
- **A** A rhombus has opposite angles that are congruent.
- **B** The opposite sides of a rhombus are congruent.
- **C** The diagonals of a rhombus are congruent.
- **D** A rhombus is a quadrilateral.

Which figure appears to have exactly two lines of symmetry?

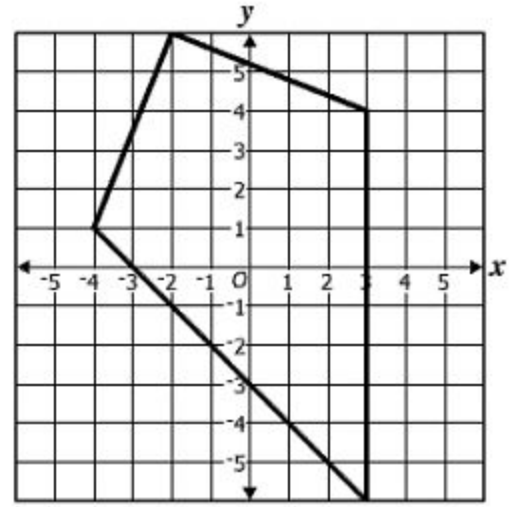
A



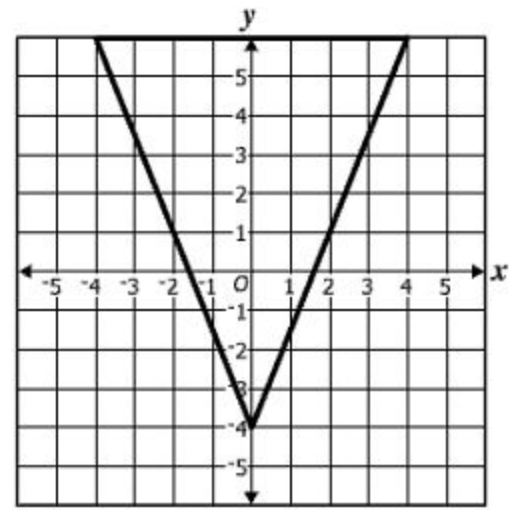
B



C



D

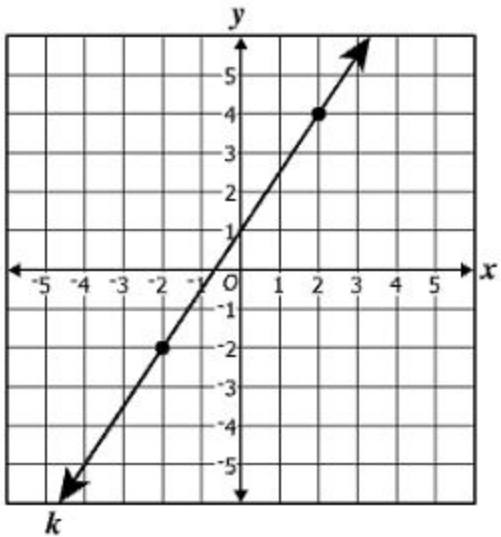


Which is the converse of the following statement?

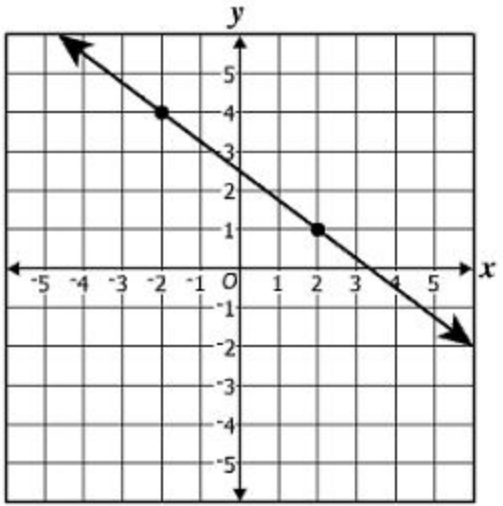
If $\frac{a}{b} = c$***, then*** $a = bc$**.**

- **A** If $\frac{a}{b} \neq c$, then $a \neq bc$.
- **B** If $a = bc$, then $\frac{a}{b} = c$.
- **C** If $a \neq bc$, then $\frac{a}{b} \neq c$.
- **D** If $\frac{a}{b} = c$, then $a \neq bc$.

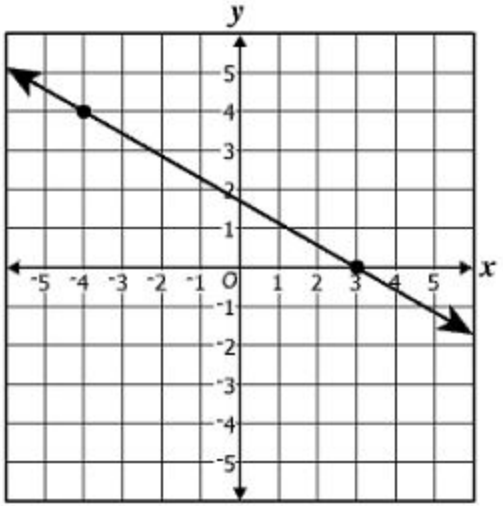
Which graph best represents a line perpendicular to line k ?



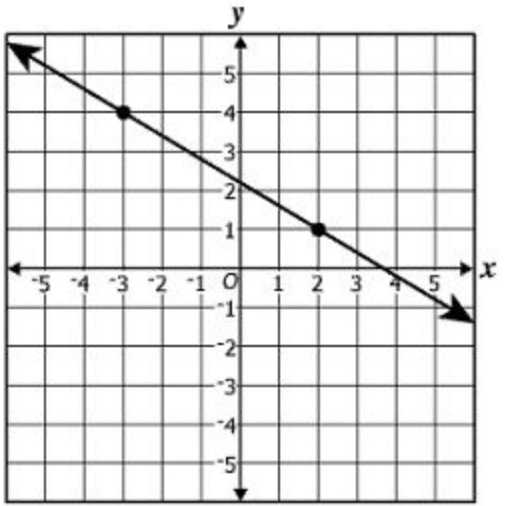
A



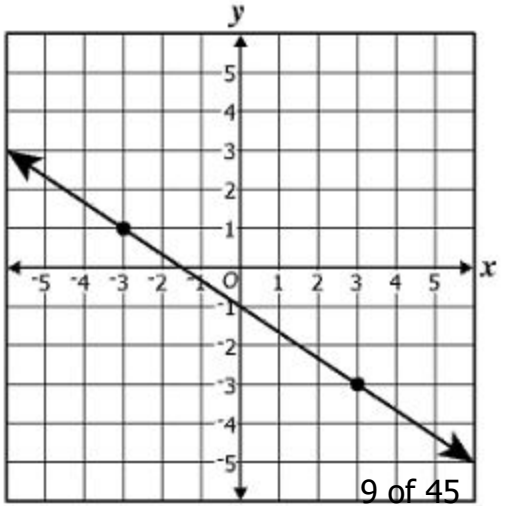
B



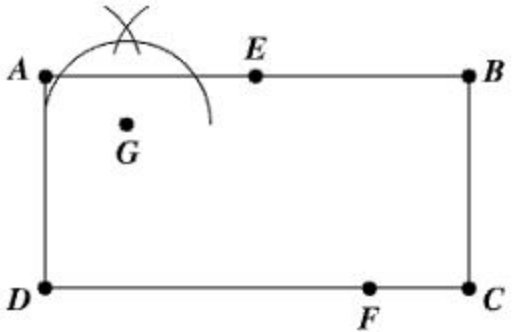
C



D

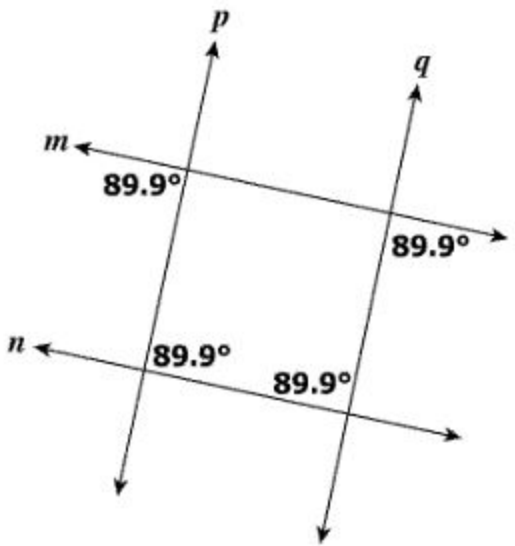


Which statement describes the construction being illustrated on the rectangle shown?



- **A** A bisector of $\overline{AB}$
- **B** A line segment congruent to $\overline{AB}$
- **C** A perpendicular to $\overline{AB}$ through point E on $\overline{AB}$
- **D** A perpendicular to $\overline{AB}$ through point G not on $\overline{AB}$

Four lines and four congruent angles are identified in the diagram.

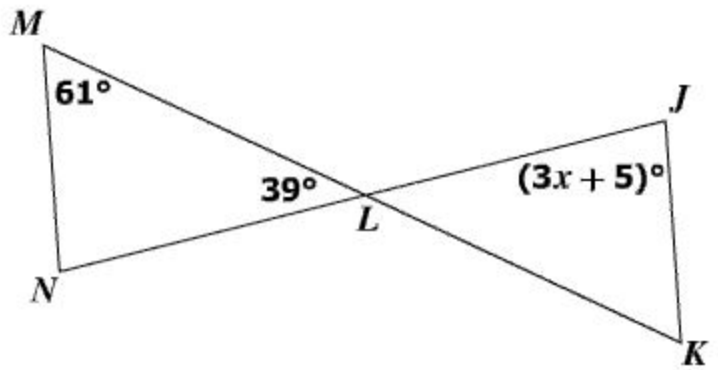


Which statement must be true?

- **A** Only $m \parallel n$
- **B** Only $p \parallel q$
- **C** $p \parallel q$ and $m \parallel n$
- **D** No pair of lines is parallel.

Directions: Type your answer in the box.

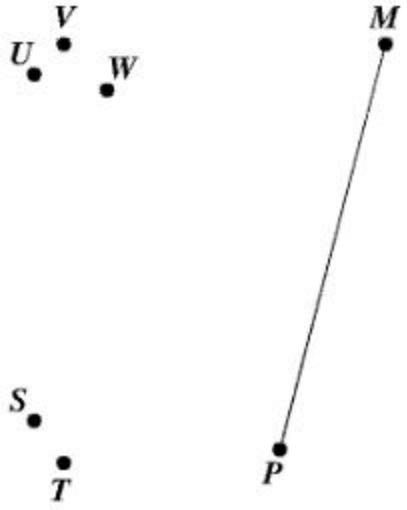
The figure shows $\overline{JN}$ and $\overline{KM}$ intersecting at point L.



What value of x proves $\overline{JK} \parallel \overline{MN}$?

$x =$ [ ]

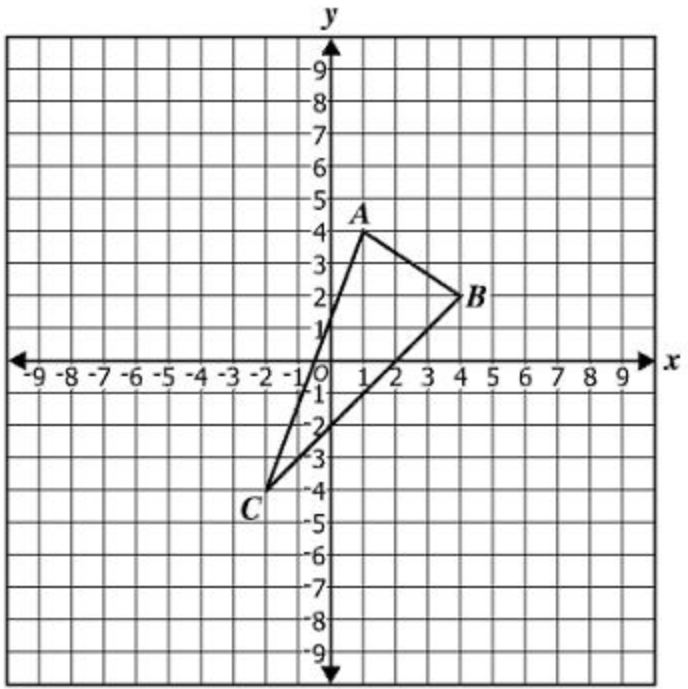
Given: $\overline{MP}$



Which segment is congruent to $\overline{MP}$ **?**

- A $\overline{SV}$
- B $\overline{SW}$
- C $\overline{TU}$
- D $\overline{TV}$

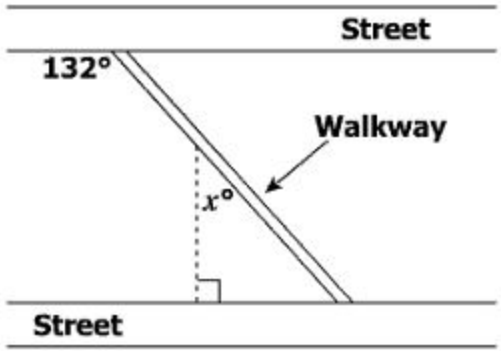
Triangle ABC is reflected across the x-axis and then reflected across the y-axis to create $\triangle A'B'C'$.



What are the coordinates of A' ?

- A $(-4, -1)$
- B $(-2, -4)$
- C $(-1, -4)$
- D $(-1, 4)$

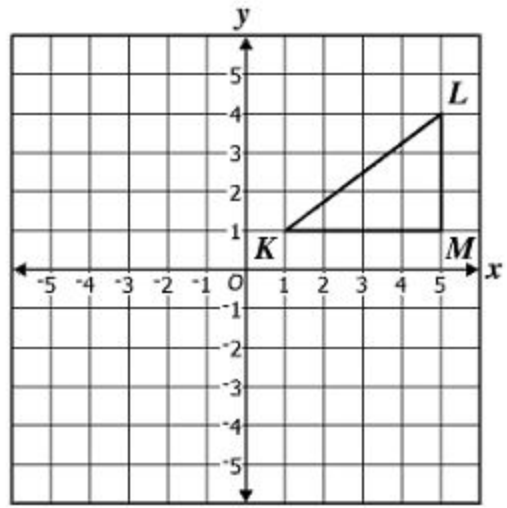
A diagonal walkway cuts through a park bordered by two parallel streets. The parks department plans to add an additional walkway as indicated by the dashed line segment in the figure.



What is the value of x ?

- **A** 42
- **B** 48
- **C** 90
- **D** 138

The coordinate values of the vertices of $\triangle KLM$ are integers.

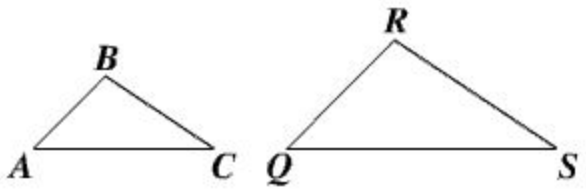


Which set of coordinate pairs could represent the vertices of a triangle congruent to $\triangle KLM$?

- **A** $\{(0, 0), (3, 4), (0, 5)\}$
- **B** $\{(0, 0), (-5, 0), (0, 4)\}$
- **C** $\{(-1, 1), (-4, 5), (-1, 5)\}$
- **D** $\{(-1, 1), (-1, 4), (2, 1)\}$

Directions: Click on the correct answers.

Given: $\triangle ABC$ and $\triangle QRS$



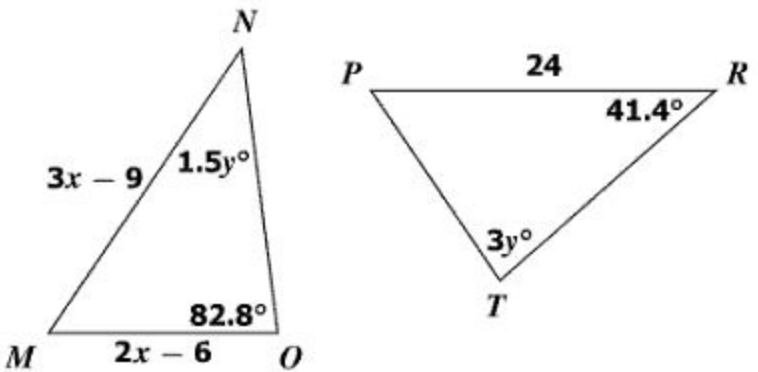
Select two relationships that would prove $\triangle ABC \sim \triangle QRS$ by the Side-Angle-Side (SAS) Similarity Theorem.

$\angle A \cong \angle Q$	$\angle C \cong \angle S$	$\angle B \cong \angle Q$	$\frac{AB}{QR} = \frac{BC}{RS}$	$\frac{AB}{QR} = \frac{AC}{QS}$	$\frac{AC}{QS} = \frac{BC}{QR}$

The diagonals of a square measure 14 cm. Which is the length of a side of the square?

- **A** $7\sqrt{2}$ cm
- **B** $7\sqrt{3}$ cm
- **C** $14\sqrt{2}$ cm
- **D** $14\sqrt{3}$ cm

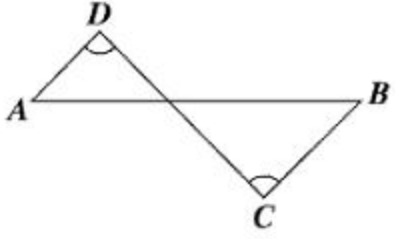
What values for x and y make $\triangle MNO \cong \triangle PRT$?



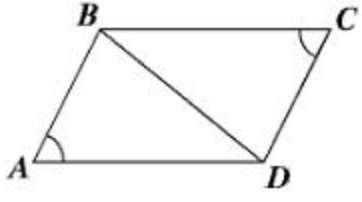
- **A** $x = 11,\ y = 13.8$
- **B** $x = 11,\ y = 27.6$
- **C** $x = 15,\ y = 13.8$
- **D** $x = 15,\ y = 27.6$

Based on the given information, which figure contains a pair of similar triangles?

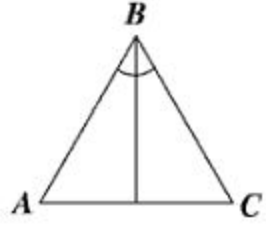
A Given: $\overline{AB}$ intersects $\overline{CD}$



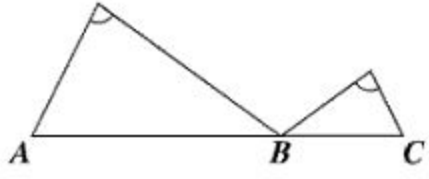
B Given: Quadrilateral $ABCD$



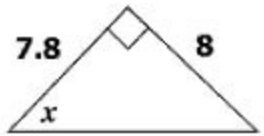
C Given: $\triangle ABC$



D Given: A, B, and C are collinear



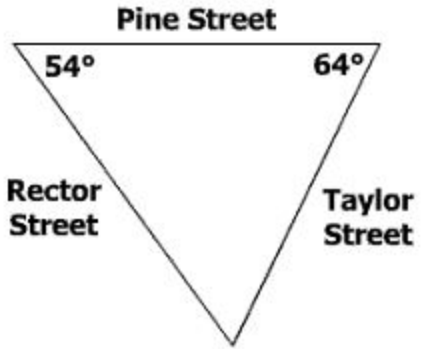
A right triangle is shown.



Which angle measure is closest to the value of x ?

- **A** 43.9°
- **B** 44.3°
- **C** 45.7°
- **D** 46.2°

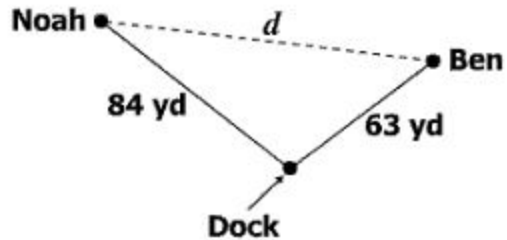
Pine Street, Rector Street, and Taylor Street intersect to form a triangular-shaped park as shown.



What is the correct order of the lengths of the streets from longest to shortest?

- **A** Pine, Taylor, Rector
- **B** Rector, Taylor, Pine
- **C** Rector, Pine, Taylor
- **D** Taylor, Pine, Rector

The diagram shows the locations of Noah and Ben after swimming in different directions from a dock. Let d be the distance from Noah to Ben, in yards.

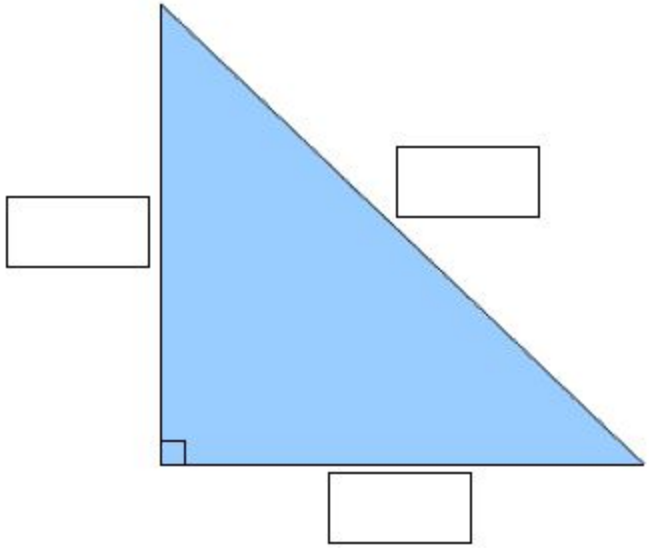


Which represents all the possible values, in yards, of d ?

- **A** $0 < d < 105$
- **B** $0 < d < 147$
- **C** $21 < d < 147$
- **D** $63 < d < 84$

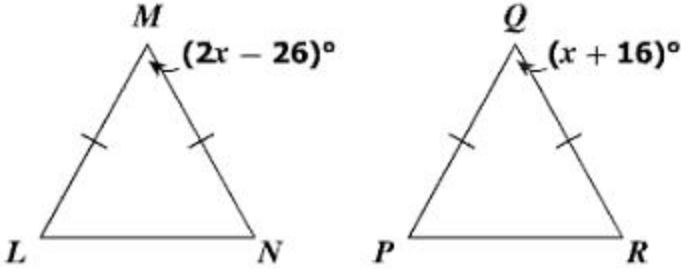
Directions: Click and drag the answers to the correct boxes.

Select the measures that could be the three side lengths of a right triangle.



17 cm	20 cm	21 cm	29 cm

Given: $\triangle LMN$ and $\triangle PQR$ are isosceles



What $m\angle P$ could be used to prove $\triangle LMN \cong \triangle PQR$?

- **A** 42°
- **B** 58°
- **C** 61°
- **D** 69°

Directions: Click and drag the answers to the correct boxes.

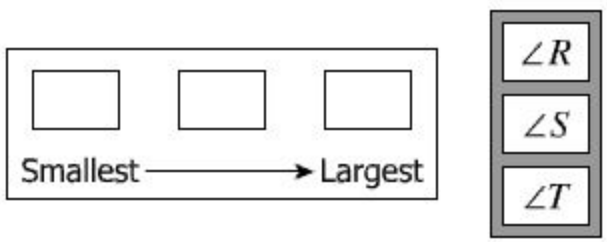
Given: $\triangle RST$

$RS = 14$ in.

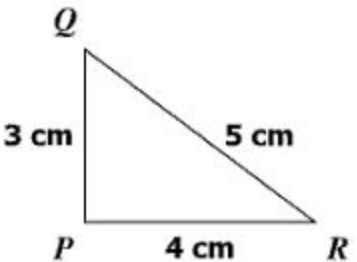
$ST = 10$ in.

$TR = 16$ in.

List the interior angles of $\triangle RST$ in order from smallest to largest.



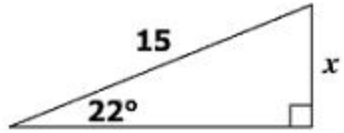
Triangle LMN is similar to triangle PQR.



Which of the following sets of side lengths could be those of triangle LMN?

- **A** 2 in., 3 in., 4 in.
- **B** 6 km, 7 km, 8 km
- **C** 8 ft, 15 ft, 17 ft
- **D** 9 m, 12 m, 15 m

A right triangle is shown.



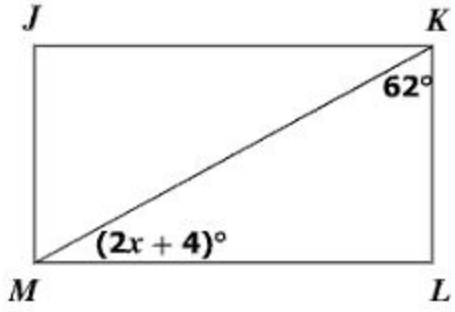
Which is closest to the value of x ?

- **A** 13.9
- **B** 9.0
- **C** 6.1
- **D** 5.6

A convex polygon has only the vertices A, B, C, D, and E. What is the sum of the measures of the interior angles of this polygon?

- **A** 360°
- **B** 540°
- **C** 900°
- **D** 1260°

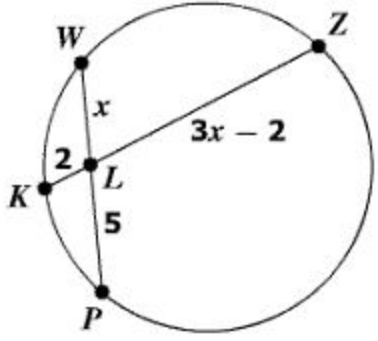
Rectangle $JKLM$ is shown.



What is the value of x ?

- **A** 12
- **B** 28
- **C** 29
- **D** 43

Chords $\overline{WP}$ and $\overline{KZ}$ intersect at point L in the circle shown.



What is the length of $\overline{KZ}$?

- **A** 7.5
- **B** 9
- **C** 10
- **D** 12

Directions: Type your answer in the box.

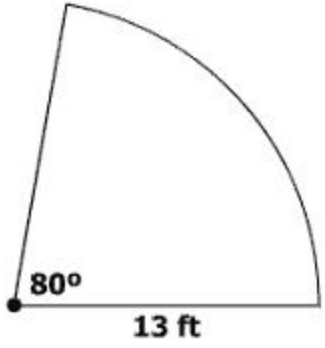
The height and radius of a cone are each multiplied by 3. What effect does this have on the volume of the cone?

The volume of the cone is multiplied by —

The equation $(x-1)^2+(y-3)^2=r^2$ represents circle A. The point $B(4, 7)$ lies on the circle. What is r, the length of the radius of circle A ?

- A $\sqrt{13}$
- B 5
- C $5\sqrt{5}$
- D $\sqrt{137}$

Rodrigo planted flowers in a section of a circular garden as shown.



Which is closest to the area of this section of the garden?

- **A** 118 sq ft
- **B** 82 sq ft
- **C** 29 sq ft
- **D** 18 sq ft

The height of a cylinder is 9.5 centimeters. The diameter of this cylinder is 1.5 centimeters longer than the height. Which is closest to the volume of the cylinder?

- **A** $1{,}150\pi$ cm^3
- **B** 287π cm^3
- **C** 165π cm^3
- **D** 105π cm^3

Which shape must have opposite sides that are parallel and congruent, and diagonals that are perpendicular bisectors of each other?

- **A** Parallelogram
- **B** Rectangle
- **C** Rhombus
- **D** Trapezoid

Directions: Click and drag the answers to the correct boxes.

A circle has a center at $(4, -7)$ and a radius of 4 units. Create the equation of this circle.

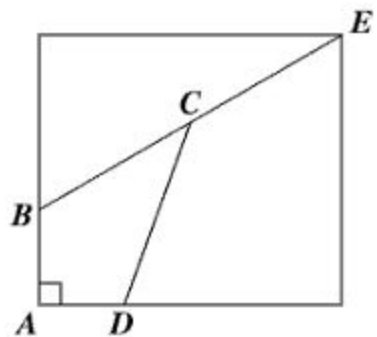
The Equation of the Circle

			=	

$(x - 4)$	$(x + 4)$
$(x - 4)^2$	$(x + 4)^2$
$(y - 7)$	$(y + 7)$
$(y - 7)^2$	$(y + 7)^2$
$+$	$-$
2^2	4^2

The figure represents the pattern for a quilt.

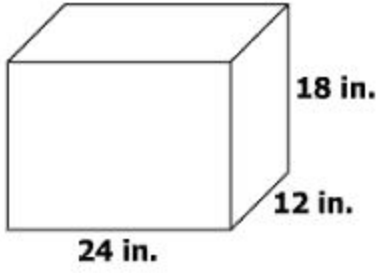
- $\angle ABC = 120°$
- $\angle ADC = (2x + 30)°$
- $\angle BCD = x°$



What is the measure of $\angle DCE$?

- **A** 150°
- **B** 140°
- **C** 120°
- **D** 110°

A rectangular prism is shown.



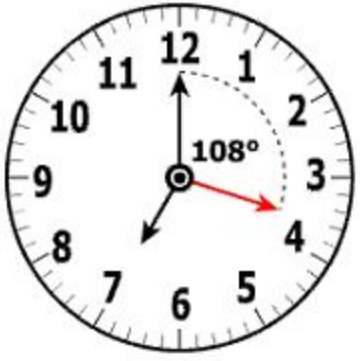
What is the surface area of the prism?

- **A** 156 sq in.
- **B** 936 sq in.
- **C** 1,872 sq in.
- **D** 5,184 sq in.

The volumes of two spheres are in a ratio of 1:8. What is the ratio of their radii?

- **A** 1:512
- **B** 1:64
- **C** 1:4
- **D** 1:2

The minute hand on a clock is 10 centimeters long and travels through an arc of 108° every 18 minutes.



Which measure is closest to the length of the arc the minute hand travels through during this 18-minute period?

- **A** 3 cm
- **B** 6 cm
- **C** 9.4 cm
- **D** 18.8 cm

Which point lies on the circle represented by the equation $(x-1)^2+(y-3)^2=7^2$?

- **A** $(-1, 4)$
- **B** $(0, 7)$
- **C** $(1, 3)$
- **D** $(8, 3)$

Directions: Click on all the correct answers.

Select each property that is valid about the diagonals of a square.

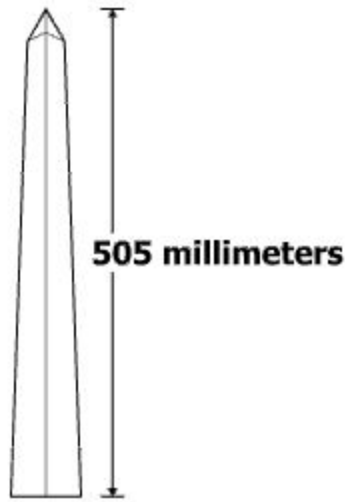
The diagonals of a square —

are perpendicular	bisect each other	are congruent
are not perpendicular	do not bisect each other	are not congruent

Sarah is filling a glass sphere with decorative sand. The radius of the sphere is 2 inches. Which is closest to the minimum amount of sand Sarah needs to completely fill the glass sphere?

- **A** 10.7 cu in.
- **B** 25.1 cu in.
- **C** 33.5 cu in.
- **D** 100.5 cu in.

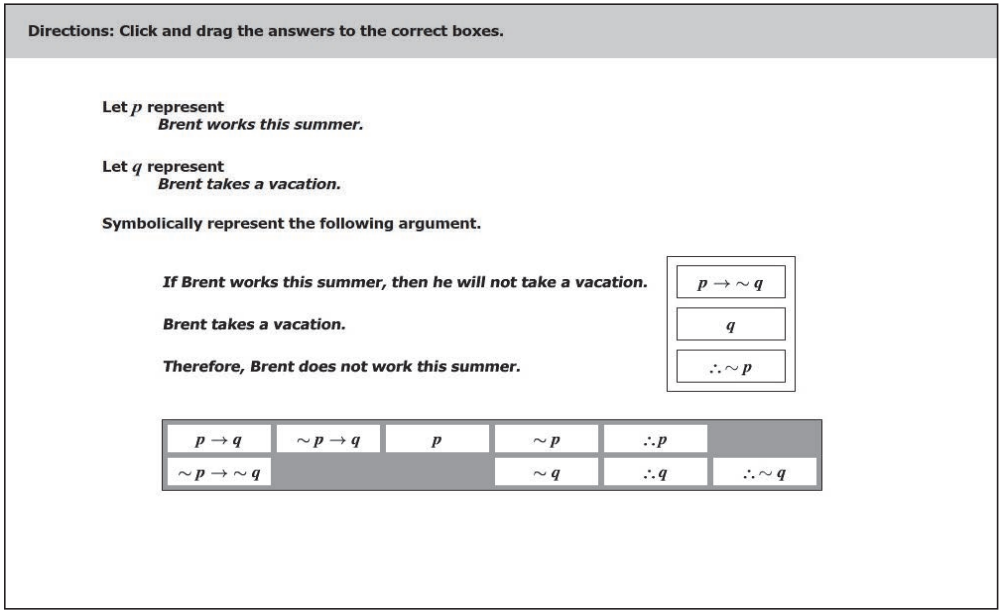
Aaron built a geometrically similar model of the Washington Monument. The height of the actual monument is nearly 555.5 feet. Aaron's model is 505 millimeters in height. The width of the base of the actual monument is 55 feet.

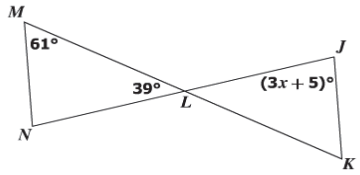


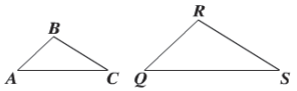
Which is closest to the width of the base of the model?

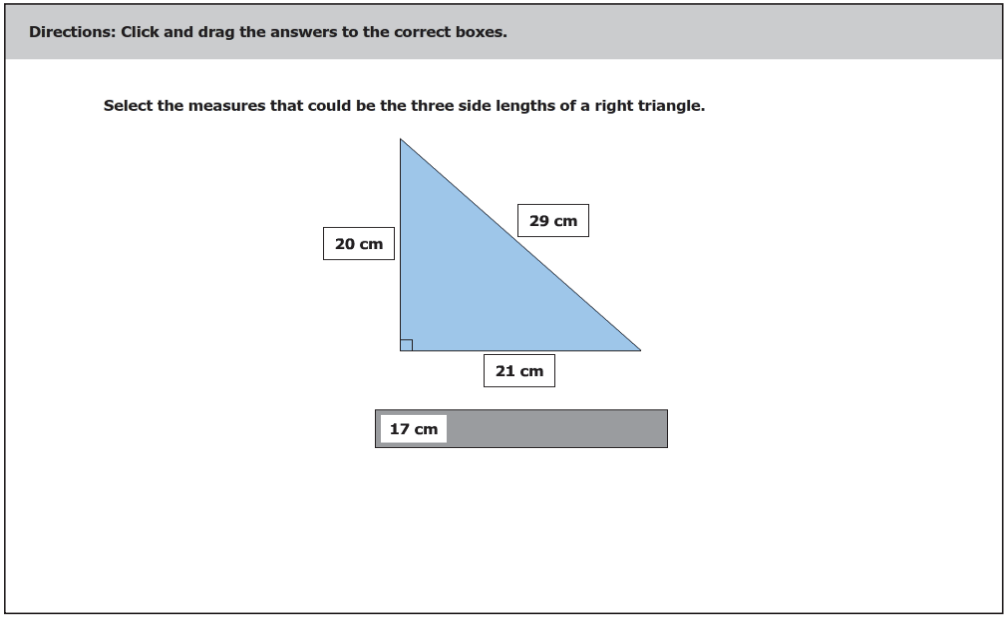
- **A** 5.05 mm
- **B** 50 mm
- **C** 55 mm
- **D** 60.5 mm

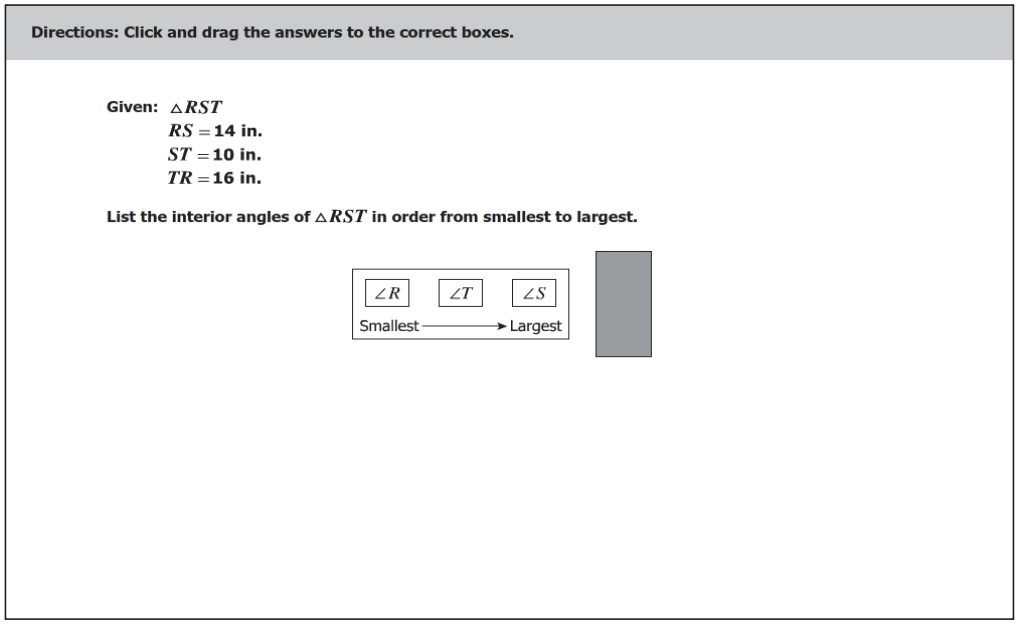
Geometry
Released Test Item Set Spring 2015
Answer Key

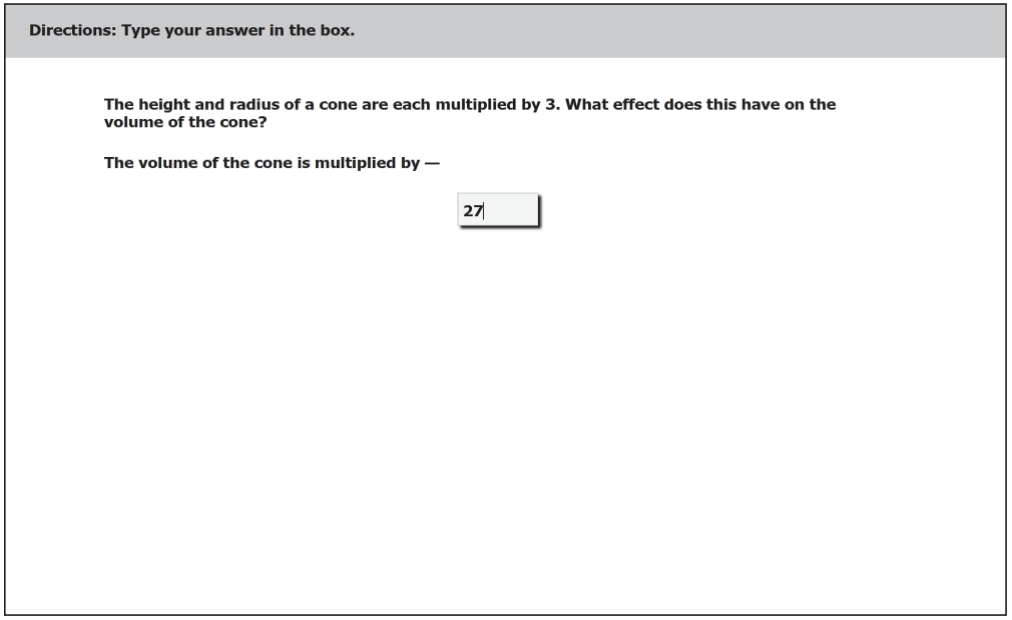
Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
1	MC	B	001	Reasoning, Lines, and Transformations
2	MC	A	001	Reasoning, Lines, and Transformations
3	TEI	Answers must be placed in this order from top to bottom: $p \rightarrow \sim q$ q $\therefore \sim p$ 	001	Reasoning, Lines, and Transformations
4	MC	B	001	Reasoning, Lines, and Transformations
5	MC	B	001	Reasoning, Lines, and Transformations

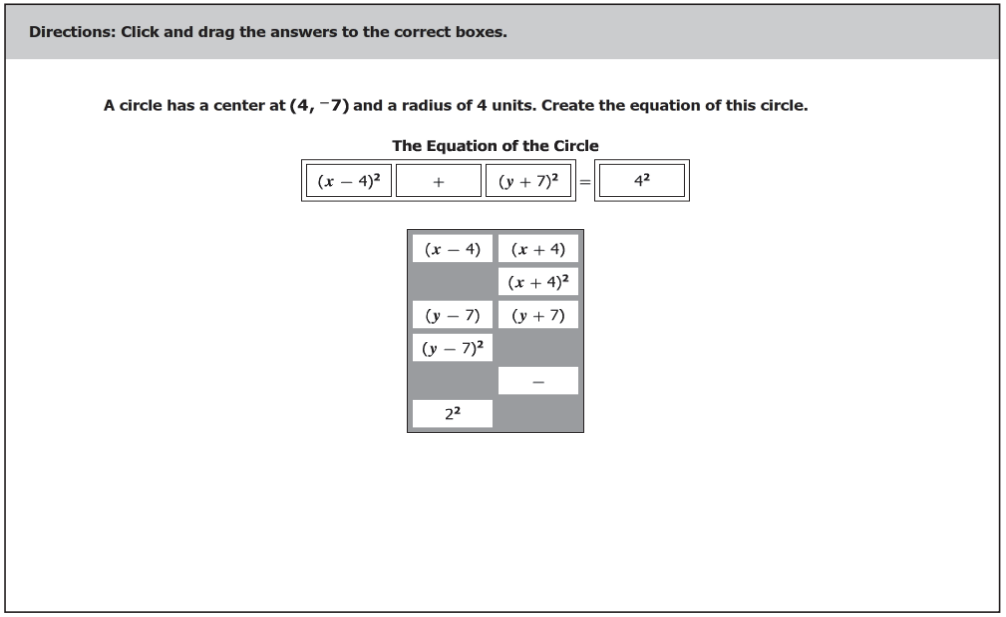
Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
6	MC	A	001	Reasoning, Lines, and Transformations
7	MC	B	001	Reasoning, Lines, and Transformations
8	MC	B	001	Reasoning, Lines, and Transformations
9	MC	D	001	Reasoning, Lines, and Transformations
10	MC	D	001	Reasoning, Lines, and Transformations
11	MC	A	001	Reasoning, Lines, and Transformations
12	TEI	Typed response: 25 (and all equivalent answers) **Directions: Type your answer in the box.** **The figure shows $\overline{JN}$ and $\overline{KM}$ intersecting at point L.**  **What value of x proves $\overline{JK} \parallel \overline{MN}$?** $x =$ 25	001	Reasoning, Lines, and Transformations
13	MC	D	001	Reasoning, Lines, and Transformations
14	MC	C	001	Reasoning, Lines, and Transformations
15	MC	A	001	Reasoning, Lines, and Transformations
16	MC	C	002	Triangles

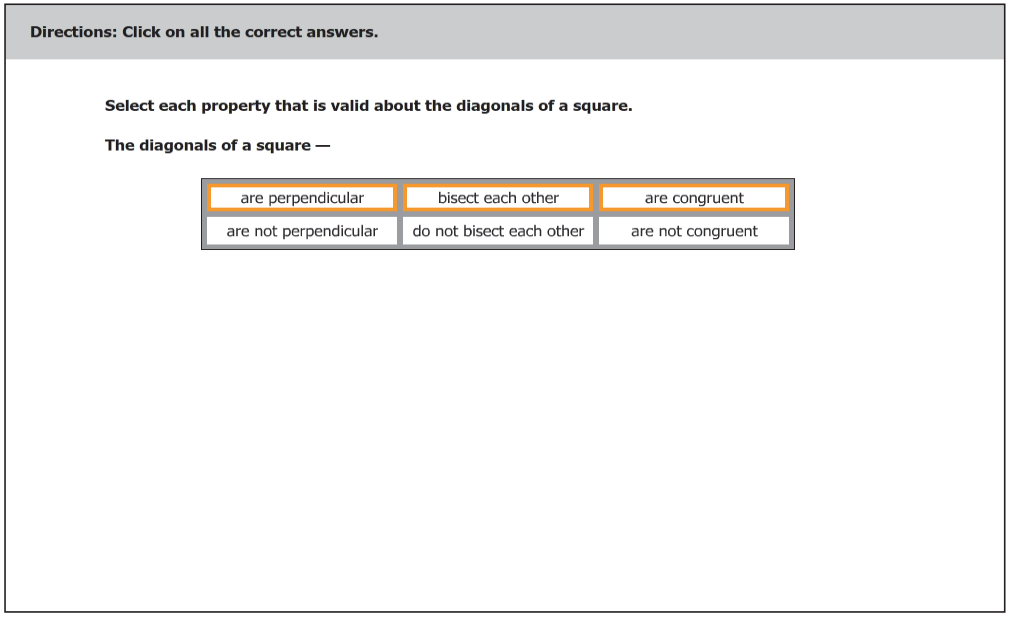
Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
17	TEI	$< A \cong < Q$ (the first box from the left) and $\frac{AB}{QR} = \frac{AC}{QS}$ (the fifth box from the left) Both of these answers, and only these answers, must be selected. **Directions: Click on the correct answers.** **Given:** $\triangle ABC$ **and** $\triangle QRS$  **Select two relationships that would prove** $\triangle ABC \sim \triangle QRS$ **by the Side-Angle-Side (SAS) Similarity Theorem.** $\angle A \cong \angle Q$ | $\angle C \cong \angle S$ | $\angle B \cong \angle Q$ | $\frac{AB}{QR} = \frac{BC}{RS}$ | $\frac{AB}{QR} = \frac{AC}{QS}$ | $\frac{AC}{QS} = \frac{BC}{QR}$	002	Triangles
18	MC	A	002	Triangles
19	MC	B	002	Triangles
20	MC	A	002	Triangles
21	MC	C	002	Triangles
22	MC	C	002	Triangles
23	MC	C	002	Triangles

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
24	TEI	Measures must be placed in the correct order from left to right, top to bottom: 20 cm; 29 cm; 21 cm OR 21 cm; 29 cm; 20 cm One of these answers is shown below.  	002	Triangles
25	MC	C	002	Triangles

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
26	TEI	Answers must be placed in the correct order from left to right: $< R;\ < T;\ < S$ 	002	Triangles
27	MC	D	002	Triangles
28	MC	D	002	Triangles
29	MC	B	003	Polygons, Circles, and Three-Dimensional Figures
30	MC	A	003	Polygons, Circles, and Three-Dimensional Figures
31	MC	D	003	Polygons, Circles, and Three-Dimensional Figures

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
32	TEI	Typed response: 27 (and all equivalent answers) 	003	Polygons, Circles, and Three-Dimensional Figures
33	MC	B	003	Polygons, Circles, and Three-Dimensional Figures
34	MC	A	003	Polygons, Circles, and Three-Dimensional Figures
35	MC	B	003	Polygons, Circles, and Three-Dimensional Figures
36	MC	C	003	Polygons, Circles, and Three-Dimensional Figures

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
37	TEI	$(x-4)^2+(y+7)^2=4^2$ OR $(y+7)^2+(x-4)^2=4^2$ One of these answers is shown below. 	003	Polygons, Circles, and Three-Dimensional Figures
38	MC	B	003	Polygons, Circles, and Three-Dimensional Figures
39	MC	C	003	Polygons, Circles, and Three-Dimensional Figures
40	MC	D	003	Polygons, Circles, and Three-Dimensional Figures
41	MC	D	003	Polygons, Circles, and Three-Dimensional Figures
42	MC	D	003	Polygons, Circles, and Three-Dimensional Figures

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
43	TEI	are perpendicular (first row, first column); bisect each other (first row, second column); are congruent (first row, third column) All of these answers, and only these answers, must be selected. 	003	Polygons, Circles, and Three-Dimensional Figures
44	MC	C	003	Polygons, Circles, and Three-Dimensional Figures
45	MC	B	003	Polygons, Circles, and Three-Dimensional Figures

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