VIRGINIA STANDARDS OF LEARNING

Released Test

GEOMETRY

2009 Mathematics Standards of Learning

Released Spring 2014

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Let p represent

Two angles are vertical angles.

Let q represent

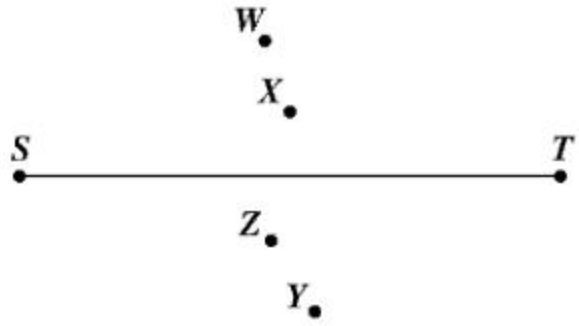
The angles are congruent.

What is the symbolic representation of the following statement?

If two angles are congruent, then the angles are vertical angles.

- **A** $q \rightarrow p$
- **B** $p \rightarrow q$
- **C** $\sim q \rightarrow \sim p$
- **D** $\sim p \rightarrow \sim q$

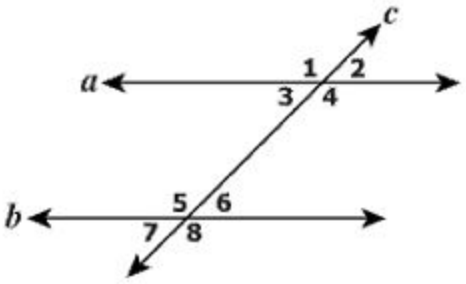
Beth is drawing the perpendicular bisector of $\overline{ST}$.



Which point is on the perpendicular bisector of $\overline{ST}$?

- **A** W
- **B** X
- **C** Y
- **D** Z

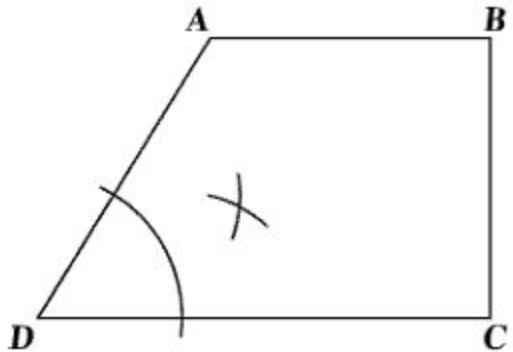
In this figure, parallel lines a and b are intersected by line c.



Which pair of angles is NOT supplementary?

- **A** $\angle 1$ and $\angle 6$
- **B** $\angle 3$ and $\angle 8$
- **C** $\angle 2$ and $\angle 7$
- **D** $\angle 4$ and $\angle 6$

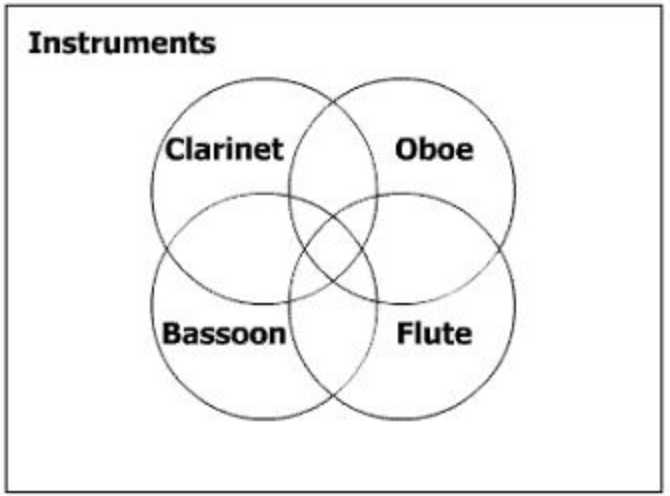
What type of construction is illustrated in the figure?



- **A** The bisection of $\angle D$
- **B** The bisection of $\overline{BD}$
- **C** An angle congruent to $\angle D$
- **D** A line segment congruent to $\overline{AB}$

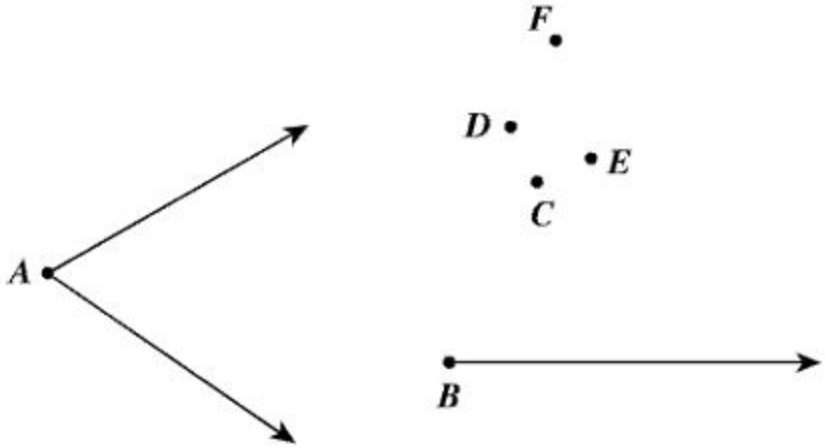
Directions: Click on the diagram to place a " * " in each region you want to select. You must select all correct regions.

This Venn diagram represents students who play instruments in the orchestra.



Identify each region of the Venn diagram that represents students who play only the flute and the oboe.

An angle congruent to angle A is being constructed.

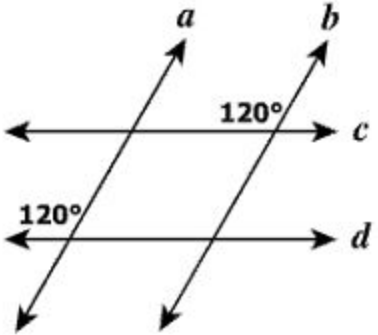


Which ray could be drawn to construct an angle congruent to $\angle A$?

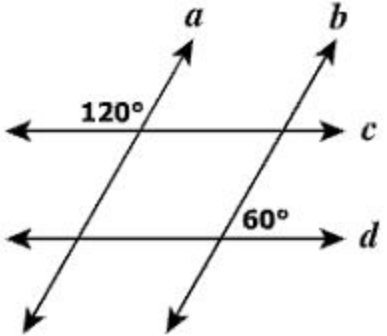
- A $\overrightarrow{BC}$
- B $\overrightarrow{BD}$
- C $\overrightarrow{BE}$
- D $\overrightarrow{BF}$

Which diagram shows a pair of angle measures that prove lines a and b are parallel?

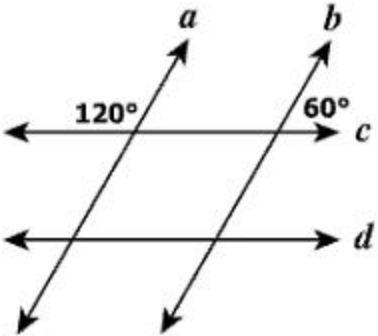
A



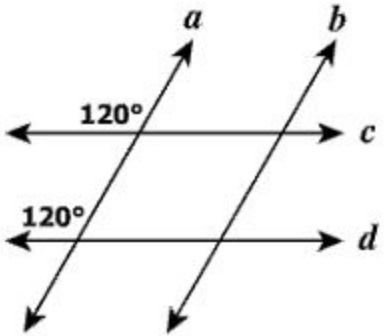
C



B



D

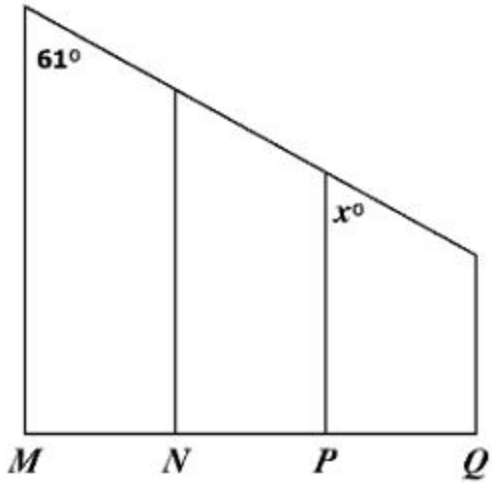


Which is a valid conclusion that can be drawn from these statements?

If a quadrilateral is a rhombus, then it is a parallelogram.
If a quadrilateral is a parallelogram, then its opposite angles are congruent.

- **A** Every quadrilateral is a rhombus.
- **B** Every parallelogram is a rhombus.
- **C** Opposite angles of a rhombus are congruent.
- **D** Opposite angles of a quadrilateral are congruent.

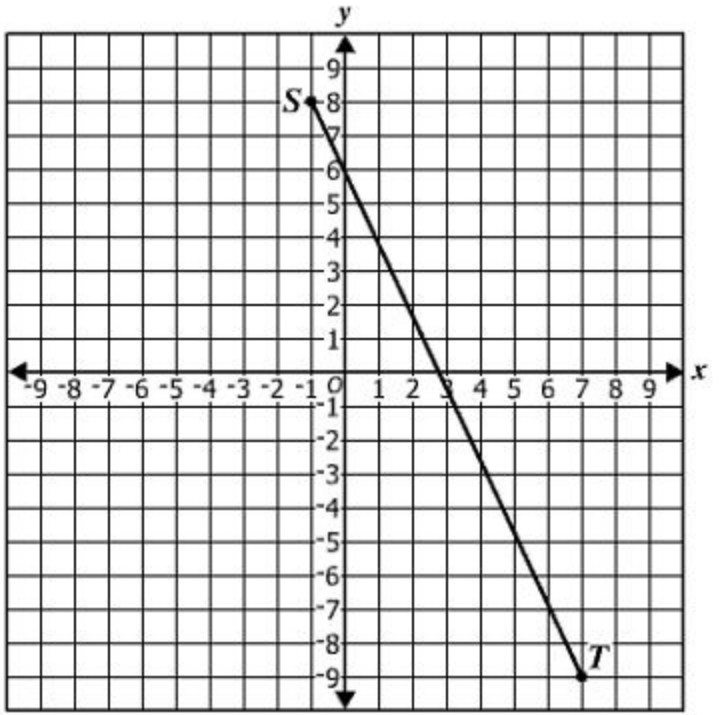
This figure shows parallel stair railings through points M, N, P, and Q.



What is the value of x ?

- **A** 29
- **B** 45
- **C** 61
- **D** 119

Given: $S(-1, 8)$ and $T(7, -9)$

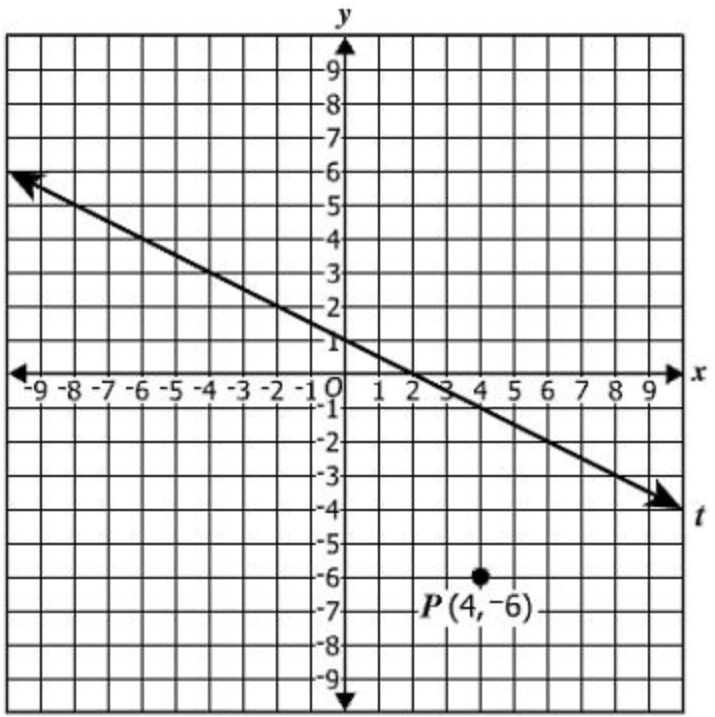


What is the length of $\overline{ST}$?

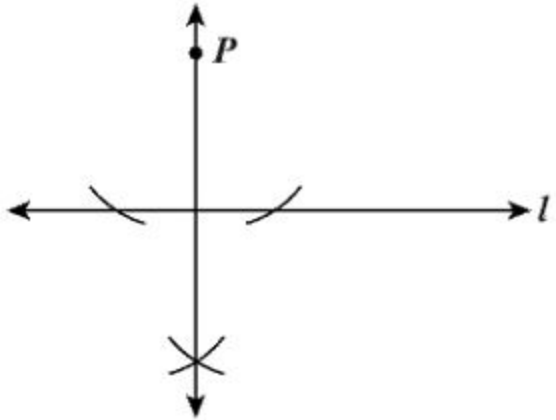
- **A** $\sqrt{23}$
- **B** 5
- **C** $5\sqrt{13}$
- **D** $\sqrt{353}$

Directions: Click on the grid to plot the point you want to select. You must plot a point other than point P.

Line t contains the points $(-8, 5)$ and $(8, -3)$. Plot a point other than point P with integral coordinates that is on a line parallel to t and passes through point P.



Which best describes the construction in the diagram shown?



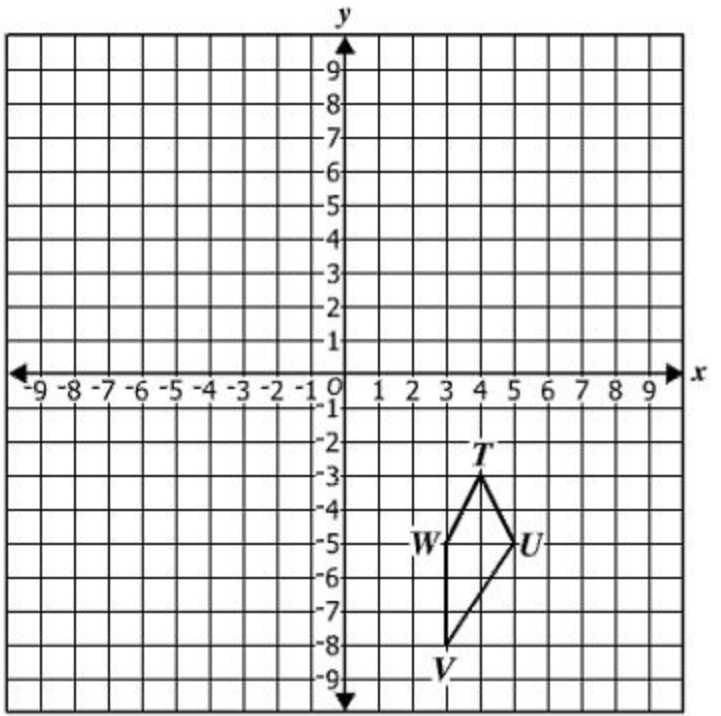
- **A** The bisector of a line segment
- **B** A line segment congruent to a given line segment
- **C** A perpendicular to a given line at a point on the line
- **D** A perpendicular to a given line from a point not on the line

Which is the inverse of the following statement?

If the measure of an angle is 90°, then it is a right angle.

- **A** If the measure of an angle is not 90°, then it is not a right angle.
- **B** If the measure of an angle is not 90°, then it is a right angle.
- **C** If an angle is not a right angle, then its measure is not 90°.
- **D** If an angle is a right angle, then its measure is 90°.

Quadrilateral $TUVW$ is shown.

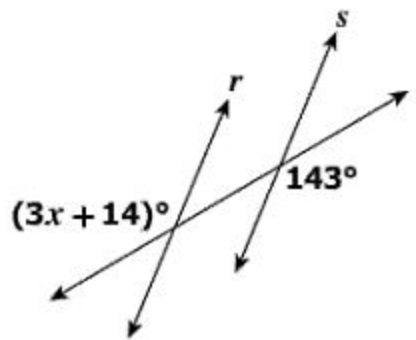


If $TUVW$ is reflected across the line $y = x$, what are the coordinates of V' ?

- **A** (8, −3)
- **B** (3, 8)
- **C** (−3, −8)
- **D** (−8, 3)

Directions: Type your answer in the box.

Lines r and s are cut by a transversal.



What value of x proves that $r \parallel s$?

$x =$ [ ]

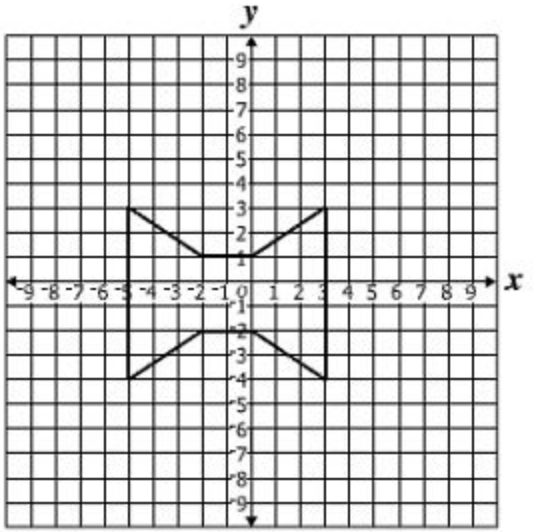
Given: $P(5, 7)$ and $T(-3, 3)$

What is the slope of $\overleftrightarrow{PT}$?

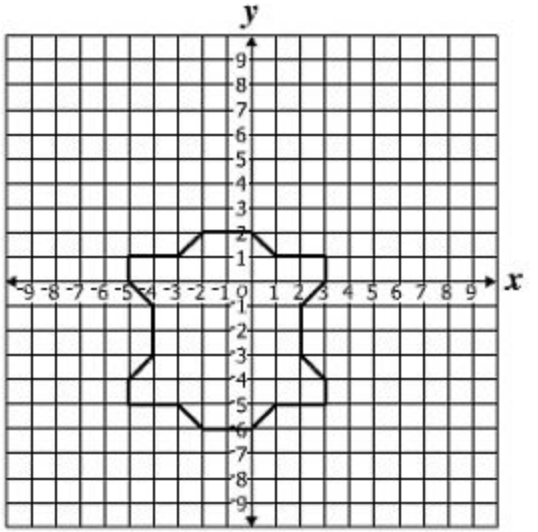
- **A** -2
- **B** $\frac{-1}{2}$
- **C** $\frac{1}{2}$
- **D** 2

For which polygon are both $x = -1$ and $y = -2$ lines of symmetry?

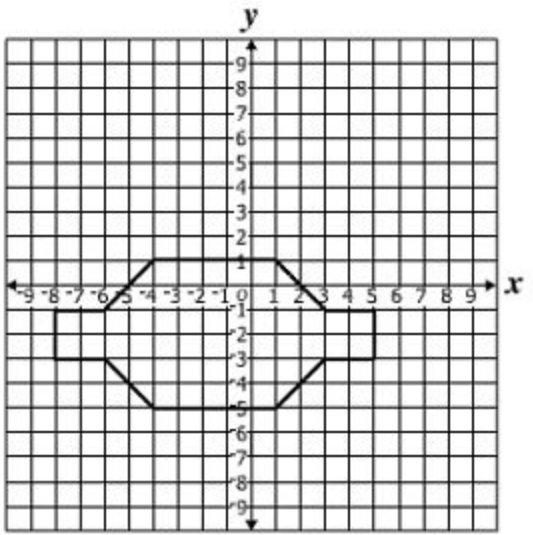
A



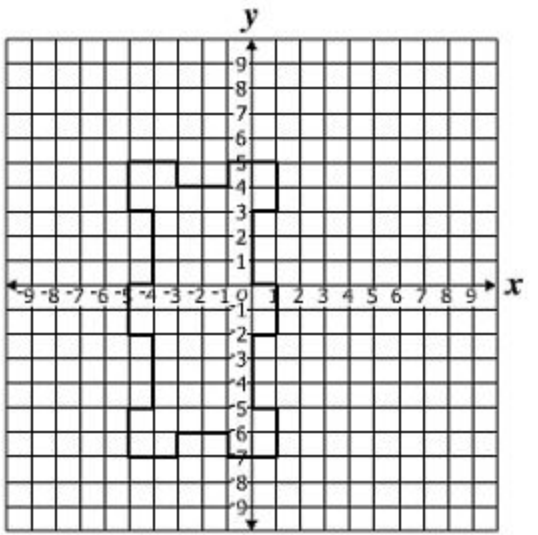
C



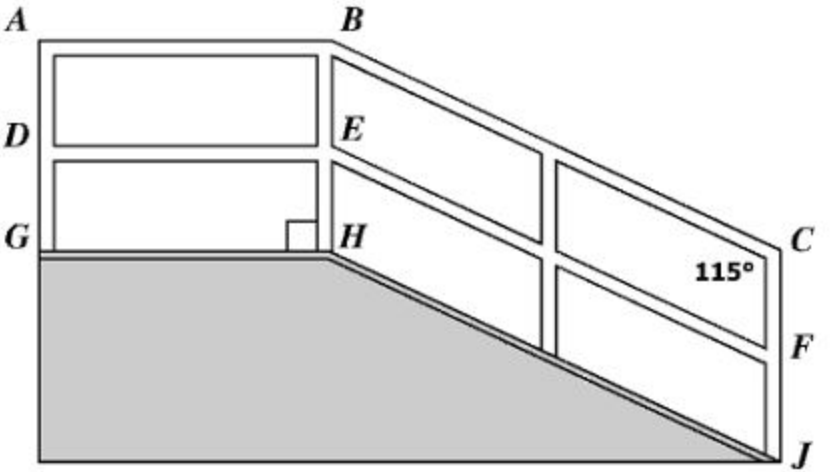
B



D



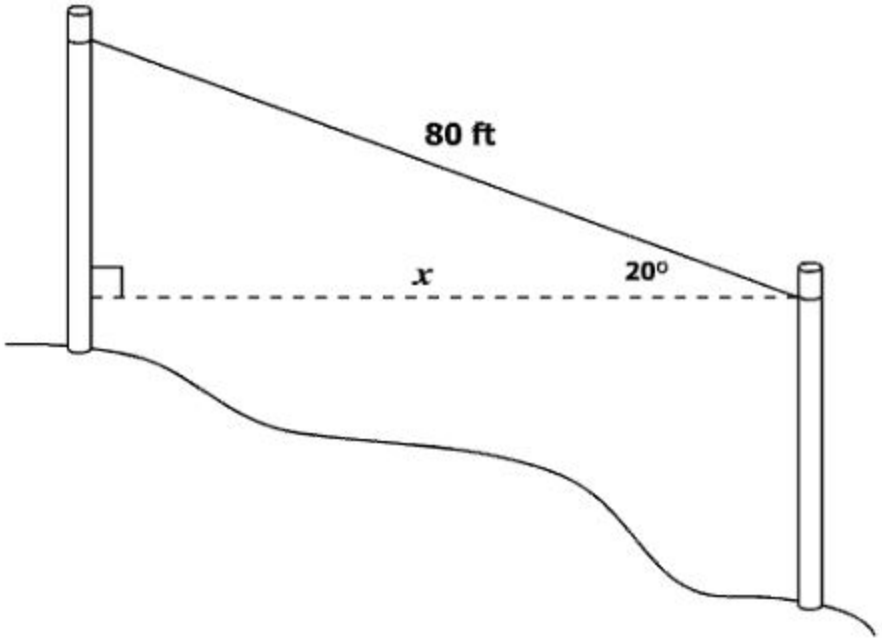
The figure represents a ramp with handrails. Segments AB and DE are parallel to $\overline{GH}$. Segments BC and EF are parallel to $\overline{HJ}$. Segments AG and BH are parallel to $\overline{CJ}$.



If $m\angle JCB = 115°$, what is $m\angle CBA$?

- A 65°
- B 90°
- C 115°
- D 155°

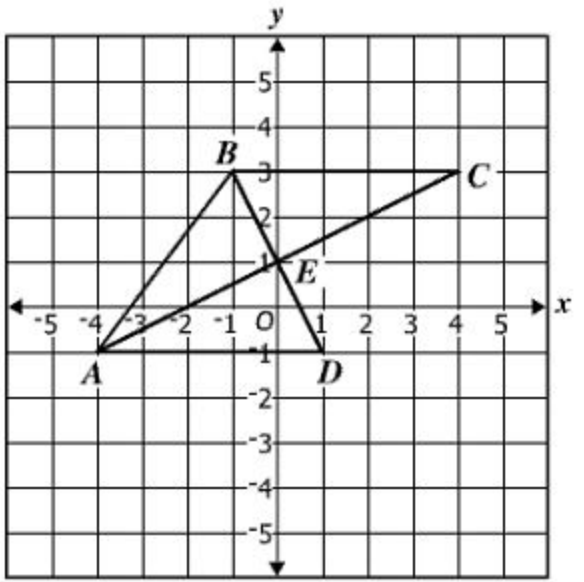
Reuben attached a wire between two poles on a hill as shown.



Which is closest to x, the distance between the two poles?

- **A** 27 ft
- **B** 29 ft
- **C** 60 ft
- **D** 75 ft

Triangles ABE, ADE, and CBE are shown on the coordinate grid, and all the vertices have coordinates that are integers.



Which statement is true?

- **A** No two triangles are congruent.
- **B** Only $\triangle ABE$ and $\triangle CBE$ are congruent.
- **C** Only $\triangle ABE$ and $\triangle ADE$ are congruent.
- **D** Triangle ABE, $\triangle ADE$, and $\triangle CBE$ are all congruent.

Directions: Click and drag each selected number to the correct box.

The lengths of two sides of a triangle are 24 inches and 43 inches. What is the range of possible lengths, in inches, for the third side, x, of this triangle?

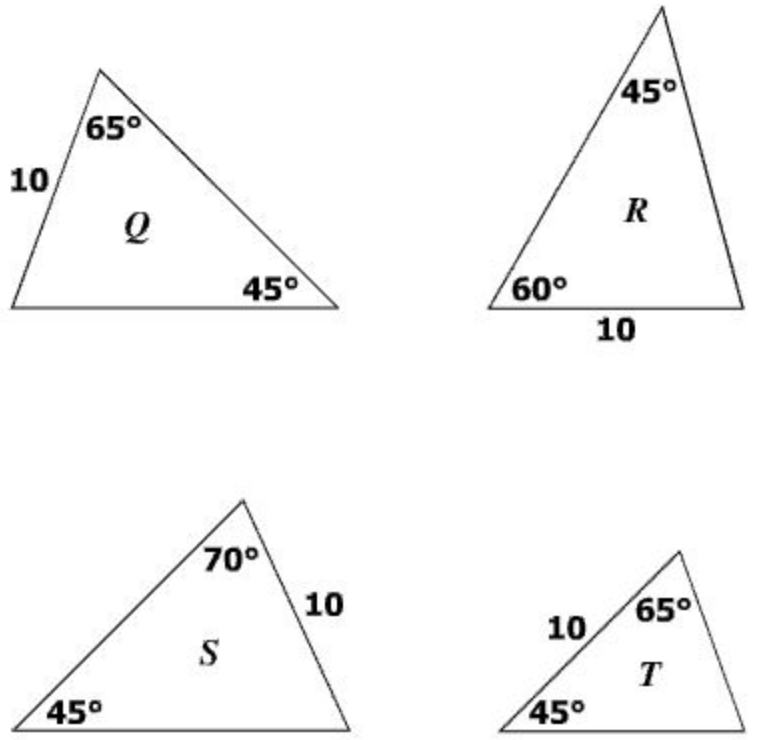
$\square < x < \square$

9	19	20	24	30	33.5	67	101.5

Which of the following sets of lengths can represent the measures of the sides of a right triangle?

- **A** 4, 5, 6
- **B** 5, 12, 15
- **C** 8, 10, 17
- **D** 20, 21, 29

Given the measures shown in the diagram, which two triangles are congruent?



- **A** Q and S
- **B** R and T
- **C** R and S
- **D** Q and T

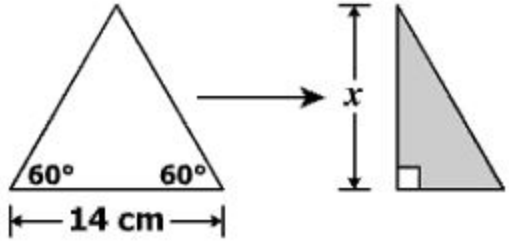
Part of a marching band formed a triangle made with trumpet players on one side, clarinet players on one side, and flute players on the third side.

- **The angle formed by the trumpet and flute players measured 45°.**
- **The angle formed by the flute and clarinet players measured 68°.**

Which orders the sides of this triangle from least to greatest using the instrument names?

- **A** Clarinet, trumpet, flute
- **B** Clarinet, flute, trumpet
- **C** Trumpet, flute, clarinet
- **D** Flute, trumpet, clarinet

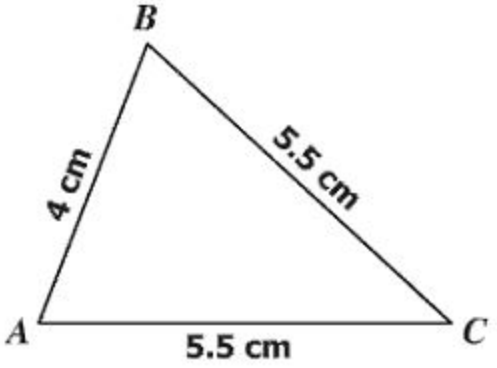
An equilateral triangle is folded in half.



What is x, the height of the equilateral triangle?

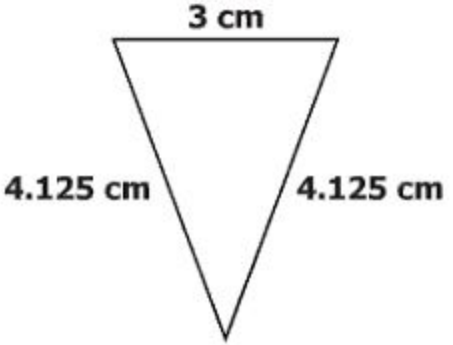
- **A** $14\sqrt{3}$ cm
- **B** 14 cm
- **C** $7\sqrt{3}$ cm
- **D** 7 cm

Look at this triangle.

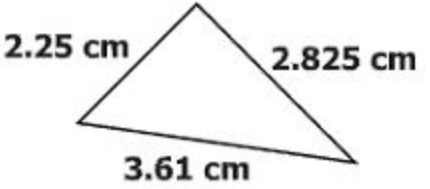


Which triangle is similar to the given triangle?

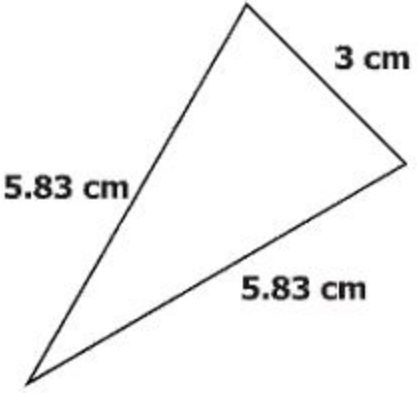
A



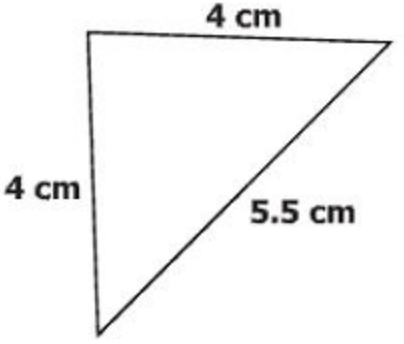
C



B

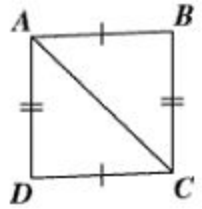


D



Directions: Click and drag each selected reason to the correct box.

Given: Figure $ABCD$ with diagonal $\overline{AC}$
$\overline{AB} \cong \overline{DC}; \overline{BC} \cong \overline{AD}$

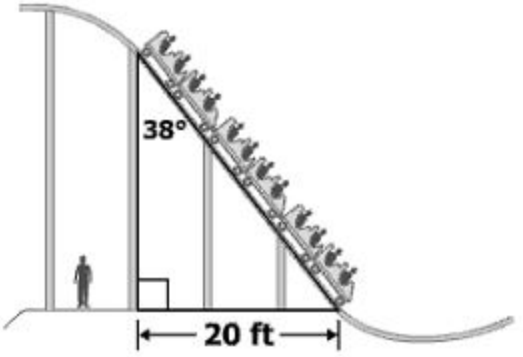


Complete the proof of $\triangle ABC \cong \triangle CDA$ by selecting the reasons for the last two statements.

Statements	Reasons
$\overline{AB} \cong \overline{DC}; \overline{BC} \cong \overline{AD}$	Given
$\overline{AC} \cong \overline{AC}$	
$\triangle ABC \cong \triangle CDA$	

- Definition of congruent triangles
- Reflexive property
- Side-Angle-Side (SAS) Theorem
- Side-Side-Side (SSS) Theorem
- Hypotenuse-Leg (HL) Theorem
- Given

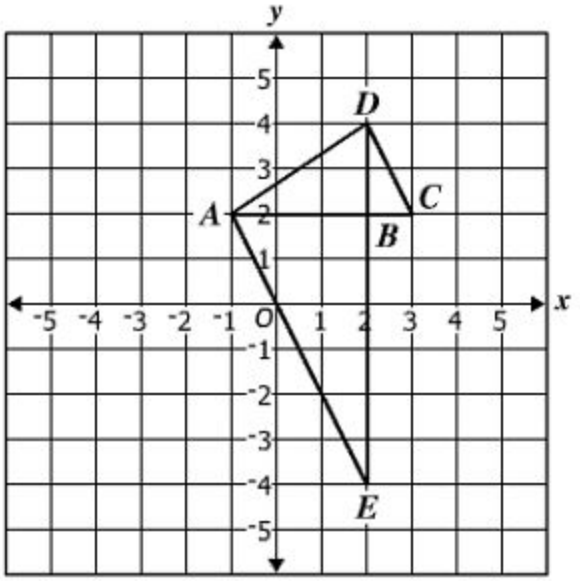
A spectator is viewing the six cars of a roller coaster as it travels down a hill at an amusement park.



Which is closest to the total length of the six cars?

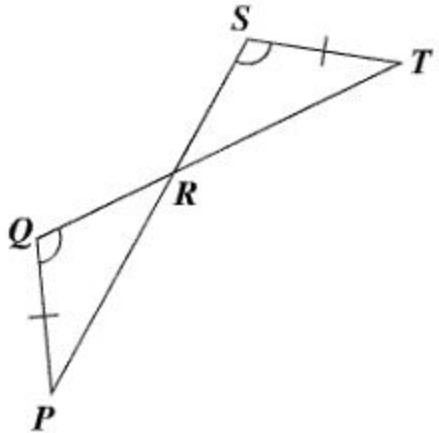
- **A** 12.3 ft
- **B** 15.8 ft
- **C** 25.6 ft
- **D** 32.5 ft

Three triangles that do not overlap are shown on the coordinate grid. The coordinates of all vertices are integers.



Which statement is true?

- **A** $\triangle ABD \sim \triangle EBA$
- **B** $\triangle ABD \sim \triangle DBC$
- **C** $\triangle CBD \sim \triangle ABE$
- **D** $\triangle CBD \sim \triangle EBA$



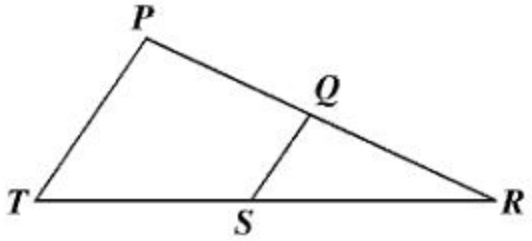
Using the information given, which congruence postulate or theorem can be used to prove that $\triangle PQR \cong \triangle TSR$?

- **A** Side-Side-Side Postulate
- **B** Side-Angle-Side Postulate
- **C** Hypotenuse-Leg Theorem
- **D** Angle-Angle-Side Theorem

Which could be the lengths of three sides of a triangle?

- **A** 6 cm, 14 cm, 8 cm
- **B** 9 cm, 11 cm, 21 cm
- **C** 8.5 cm, 17 cm, 10.6 cm
- **D** 14 cm, 4.7 cm, 4.7 cm

Given: Q lies on $\overline{PR}$ and S lies on $\overline{RT}$

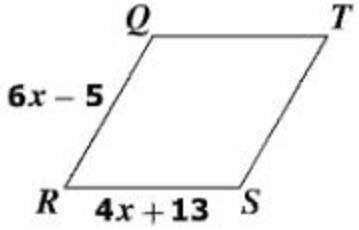


Which condition proves $\triangle PRT \sim \triangle QRS$?

- **A** $\angle PQS \cong \angle TSQ$
- **B** $\angle PTR \cong \angle TPR$
- **C** $\frac{QS}{PT} = \frac{QR}{SR}$
- **D** $\frac{QR}{PR} = \frac{SR}{TR}$

Directions: Type your answer in the box.

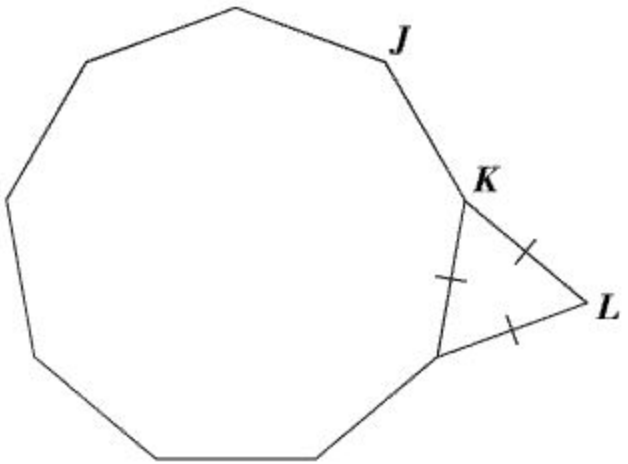
Given: Parallelogram $QRST$ where $QR = 6x - 5$ and $RS = 4x + 13$



What value of x proves this parallelogram is a rhombus?

$x =$

The floor plan for a modern home is modeled by the composite of the regular nonagon and triangle shown.



What is the measure of $\angle JKL$?

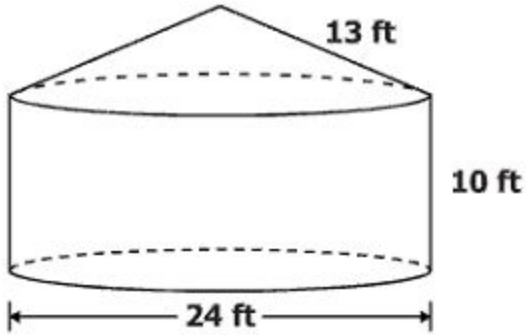
- **A** 150°
- **B** 160°
- **C** 165°
- **D** 175°

Given: Circle P with center at $(-4, 1)$

Which equation could represent circle P ?

- **A** $(x-4)^2+(y-1)^2=41$
- **B** $(x-4)^2+(y+1)^2=41$
- **C** $(x+4)^2+(y-1)^2=41$
- **D** $(x+4)^2+(y+1)^2=41$

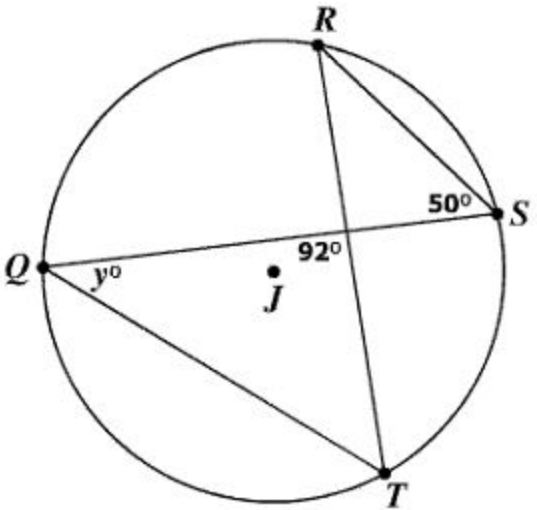
This container is composed of a right circular cylinder and a right circular cone.



Which is closest to the surface area of the container?

- **A** 490 ft^2
- **B** 754 ft^2
- **C** 1,243 ft^2
- **D** 1,696 ft^2

Given: Circle J

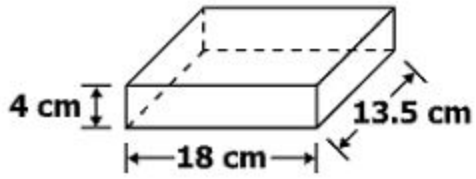


What is the value of y ?

- **A** 38
- **B** 50
- **C** 88
- **D** 92

A cell phone box in the shape of a rectangular prism is shown. The height of the box is 4 cm.

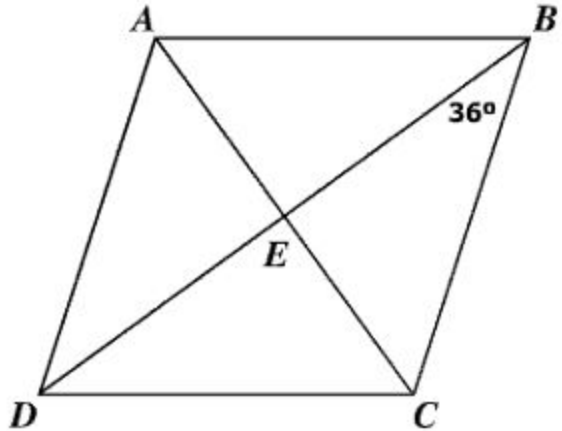
Original Box



The height of the original box will be increased by 3.5 centimeters so a new instruction manual and an extra battery can be included. Which is closest to the total surface area of the new box?

- **A** 479 cm^2
- **B** 707 cm^2
- **C** 738 cm^2
- **D** 959 cm^2

Parallelogram $ABCD$ is a rhombus with $m\angle EBC = 36°$.



What is the $m\angle DAE$?

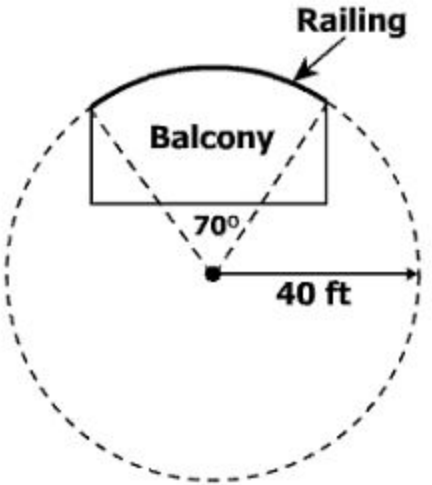
- **A** 36°
- **B** 54°
- **C** 108°
- **D** 144°

Circle O has a center at $(-2, -2)$ and a diameter of 10 units.

Which point lies on circle O ?

- **A** $(-6, -5)$
- **B** $(-2, -2)$
- **C** $(6, 4)$
- **D** $(8, 8)$

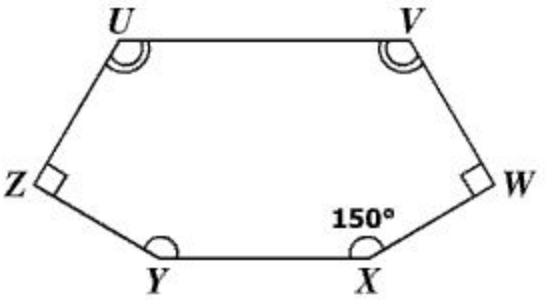
An architect used this diagram to design a curved balcony. She drew a circle with a radius of 40 feet and a central angle of 70° to determine the length of railing needed for the balcony.



Which is closest to the length of railing needed for the curved section of the balcony?

- **A** 24 ft
- **B** 49 ft
- **C** 251 ft
- **D** 977 ft

A polygon is shown.



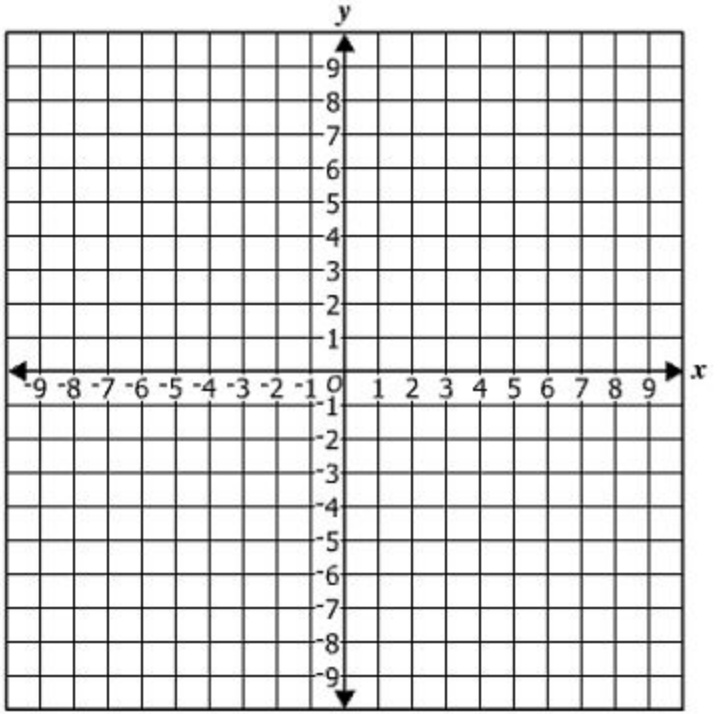
What is the measure of $\angle U$?

- **A** 60°
- **B** 90°
- **C** 120°
- **D** 240°

The volume of a cube is 64 cubic centimeters. What is the surface area of the cube?

- **A** $16\,cm^2$
- **B** $96\,cm^2$
- **C** $256\,cm^2$
- **D** $384\,cm^2$

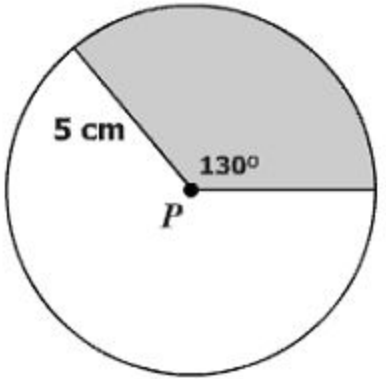
The diagonals of rectangle $KLMN$ intersect at the point (2, 1). One of the vertices of rectangle $KLMN$ is located at (−4, 5).



Which of the following could be the location of another vertex of this rectangle?

- **A** (8, −3)
- **B** (3, −1)
- **C** (−2, 3)
- **D** (−10, 9)

Given: Circle P

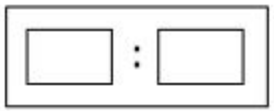


Which is closest to the area of the shaded sector of circle P ?

- **A** 11 cm^2
- **B** 28 cm^2
- **C** 50 cm^2
- **D** 78 cm^2

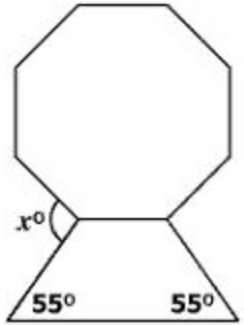
Directions: Click and drag each selected number to the correct box.

The ratio of the lengths of the radii of two spheres is 3:5. What is the ratio of the volumes of these two spheres?



1	3	5	9	15	25	27	125

This figure is composed of an isosceles trapezoid and a regular octagon.

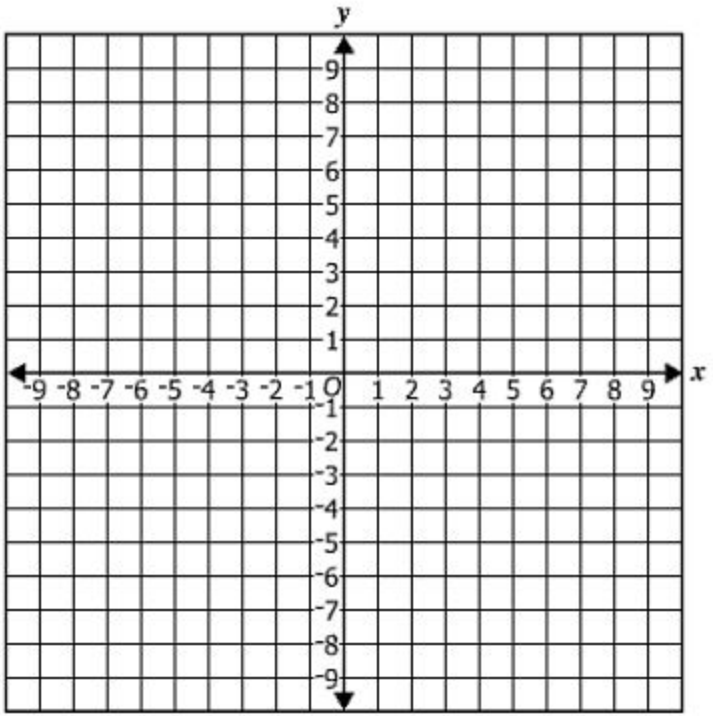


What is the value of x ?

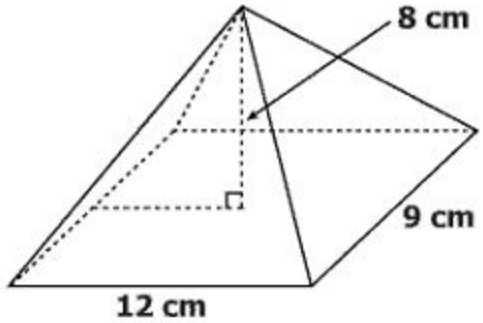
- **A** 100
- **B** 125
- **C** 135
- **D** 190

Directions: Click on the grid to plot the point you want to select.

Plot the center of the circle defined by the equation $(x+4)^2+(y-5)^2=3^2$.



A rectangular pyramid is shown.



What is the volume of the pyramid?

- **A** 864 cm^3
- **B** 432 cm^3
- **C** 288 cm^3
- **D** 108 cm^3

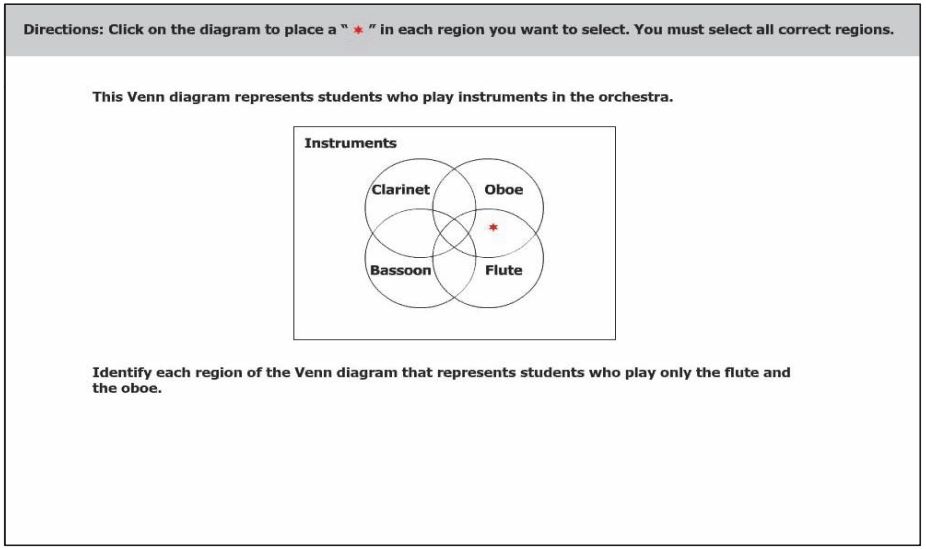
A company is creating a new cylindrical container to replace its original cylindrical container.

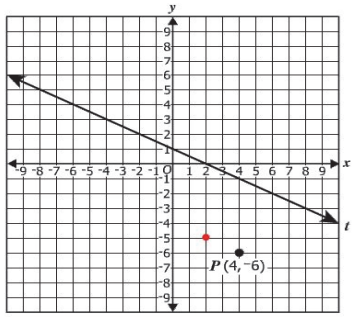
- **The new container will have 4 times the volume of the original container.**
- **The height of the new container will remain the same as the height of the original container.**

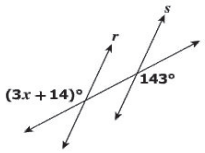
The length of the radius of the new container will be —

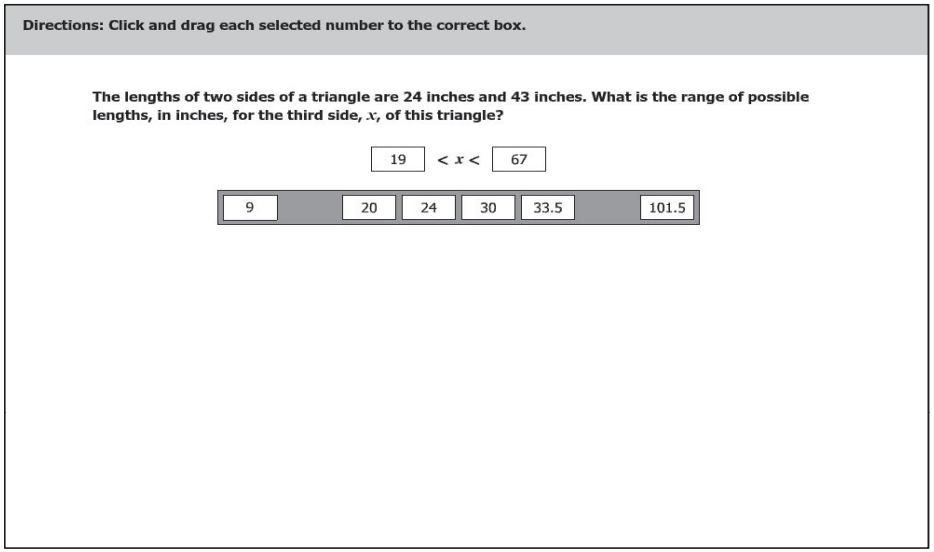
- **A** 2 times the length of the radius of the original container
- **B** 4 times the length of the radius of the original container
- **C** 8 times the length of the radius of the original container
- **D** 16 times the length of the radius of the original container

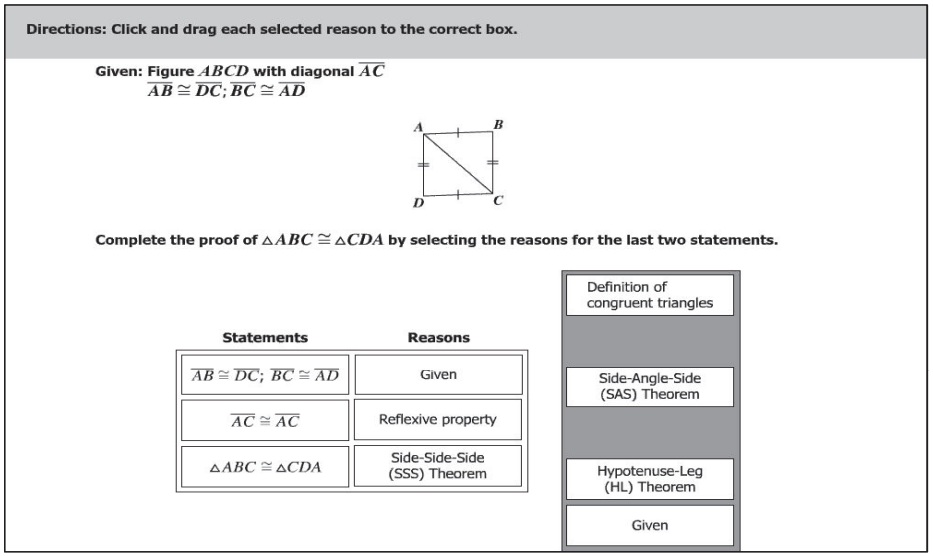
Geometry
Released Test Spring 2014
Answer Key

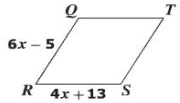
Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
1	MC	A	001	Reasoning, Lines, and Transformations
2	MC	B	001	Reasoning, Lines, and Transformations
3	MC	C	001	Reasoning, Lines, and Transformations
4	MC	A	001	Reasoning, Lines, and Transformations
5	TEI	The region that is common to both the Oboe circle and the Flute circle, but no other circle, as shown in the image below. This region, and only this region, must contain a star. 	001	Reasoning, Lines, and Transformations
6	MC	A	001	Reasoning, Lines, and Transformations
7	MC	B	001	Reasoning, Lines, and Transformations

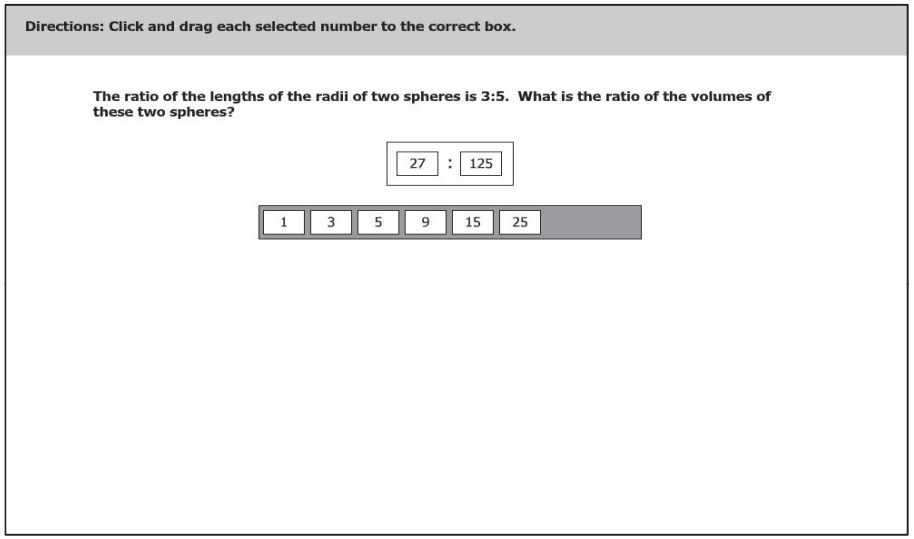
Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
8	MC	C	001	Reasoning, Lines, and Transformations
9	MC	C	001	Reasoning, Lines, and Transformations
10	MC	D	001	Reasoning, Lines, and Transformations
11	TEI	Any ONE of these points must be plotted on the coordinate plane: (10,−9), (8,−8), (6,−7), (2,−5), (0,−4), (−2,−3), (−4,−2), (−6,−1), (−8,0) or (−10,1) One of these points,(2,−5), is shown on the coordinate plane below. **Directions: Click on the grid to plot the point you want to select. You must plot a point other than point *P*.** **Line *t* contains the points (−8, 5) and (8, −3). Plot a point other than point *P* with integral coordinates that is on a line parallel to *t* and passes through point *P*.** 	001	Reasoning, Lines, and Transformations
12	MC	D	001	Reasoning, Lines, and Transformations
13	MC	A	001	Reasoning, Lines, and Transformations
14	MC	D	001	Reasoning, Lines, and Transformations

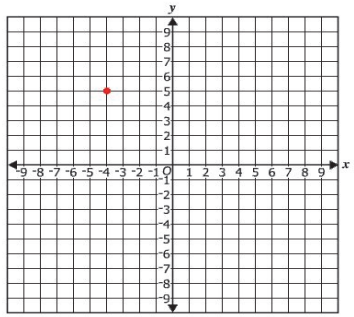
Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
15	TEI	Typed Response: 43 (and all equivalent answers) **Directions: Type your answer in the box.** **Lines r and s are cut by a transversal.**  **What value of x proves that $r \parallel s$?** $x =$ 43	001	Reasoning, Lines, and Transformations
16	MC	C	001	Reasoning, Lines, and Transformations
17	MC	C	001	Reasoning, Lines, and Transformations
18	MC	D	001	Reasoning, Lines, and Transformations
19	MC	D	002	Triangles
20	MC	D	002	Triangles

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
21	TEI	The number 19 must be placed in the box on the left, and the number 67 must be placed in the box on the right. 	002	Triangles
22	MC	D	002	Triangles
23	MC	A	002	Triangles
24	MC	B	002	Triangles
25	MC	C	002	Triangles
26	MC	A	002	Triangles

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
27	TEI	"Reflexive Property" must be placed in the second row, second column of the table; "Side-Side-Side (SSS) Theorem" must be placed in the third row, second column of the table. 	002	Triangles
28	MC	D	002	Triangles
29	MC	C	002	Triangles
30	MC	D	002	Triangles
31	MC	C	002	Triangles
32	MC	D	002	Triangles

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
33	TEI	Typed response: 9 (and all equivalent answers) **Directions: Type your answer in the box.** **Given: Parallelogram $QRST$ where $QR = 6x - 5$ and $RS = 4x + 13$**  **What value of x proves this parallelogram is a rhombus?** $x =$ 9	003	Polygons, Circles, and Three-Dimensional Figures
34	MC	B	003	Polygons, Circles, and Three-Dimensional Figures
35	MC	C	003	Polygons, Circles, and Three-Dimensional Figures
36	MC	D	003	Polygons, Circles, and Three-Dimensional Figures
37	MC	A	003	Polygons, Circles, and Three-Dimensional Figures
38	MC	D	003	Polygons, Circles, and Three-Dimensional Figures
39	MC	B	003	Polygons, Circles, and Three-Dimensional Figures
40	MC	A	003	Polygons, Circles, and Three-Dimensional Figures
41	MC	B	003	Polygons, Circles, and Three-Dimensional Figures
42	MC	C	003	Polygons, Circles, and Three-Dimensional Figures
43	MC	B	003	Polygons, Circles, and Three-Dimensional Figures
44	MC	A	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
45	MC	B	003	Polygons, Circles, and Three-Dimensional Figures
46	TEI	The numbers 27 and 125 should be placed in the boxes. The order of the numbers in the boxes does not matter, since this question did not specifically state the order in which the volumes of the two spheres should be compared. 	003	Polygons, Circles, and Three-Dimensional Figures
47	MC	A	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
48	TEI	The point (–4,5) must be plotted on the coordinate plane. **Directions: Click on the grid to plot the point you want to select.** **Plot the center of the circle defined by the equation $(x+4)^2+(y-5)^2=3^2$.** 	003	Polygons, Circles, and Three-Dimensional Figures
49	MC	C	003	Polygons, Circles, and Three-Dimensional Figures
50	MC	A	003	Polygons, Circles, and Three-Dimensional Figures