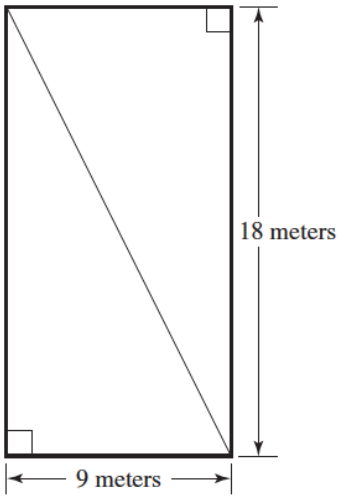
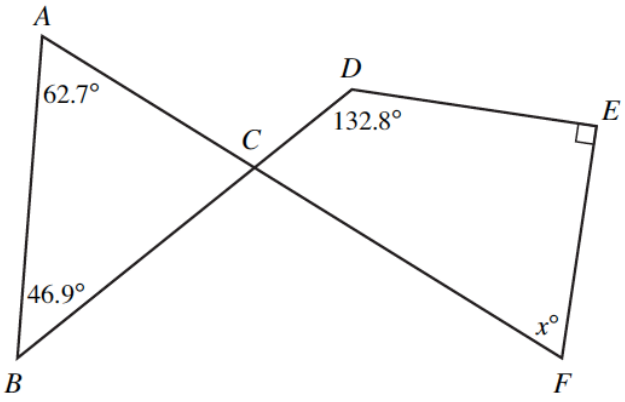
1. The dimensions and shape of a rectangular volleyball court are shown in this picture.



What is the approximate distance of a serve that is hit diagonally from one corner of the court to the other?

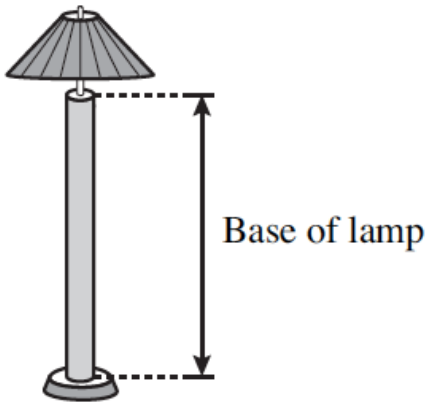
2. In the figure below, $\overline{BD}$ and $\overline{AF}$ intersect at point C.



What is the value of x?

3. Tobias is restoring an antique lamp like the one pictured below. The base of the lamp is cylindrical with a height of $19\frac{1}{2}$ inches and a diameter of $1\frac{1}{4}$ inches. He will use gold leaf to cover the lateral surface area of the base of the lamp.

TOBIAS'S LAMP

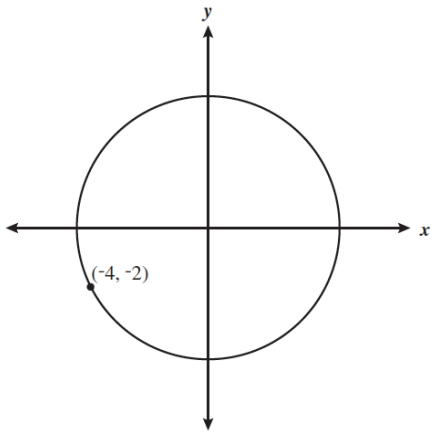


The gold-leaf material Tobias will use comes in square pieces that measure $3\frac{3}{8}$ inches by $3\frac{3}{8}$ inches. What is **the least number** of these pieces of gold-leaf material Tobias will need to completely cover the lateral area of the lamp's base?

4. What is the converse of the following statement?

"If today is Sunday, then tomorrow is Monday."

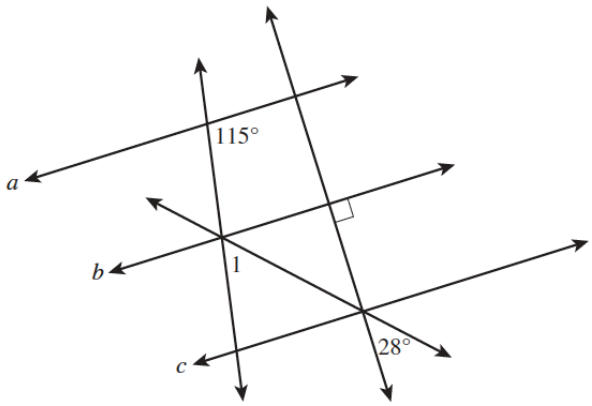
5. The circle shown below is centered at the origin and contains the point (-4, -2).



What is the length of the diameter of the circle?

6. On a coordinate grid, $\overline{AB}$ has endpoint B at (24, 16). The midpoint of $\overline{AB}$ is P(4, -3). What is the y-coordinate of Point A?

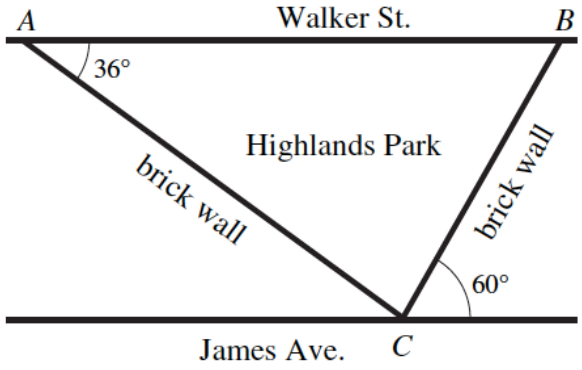
7. In the figure shown below, $a \| b \| c$



not to scale

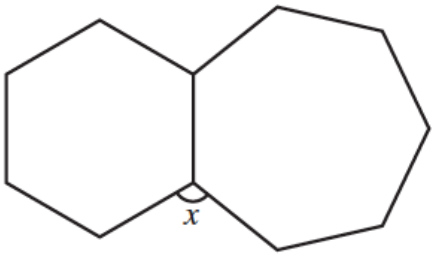
What is the measure of $\angle 1$?

8. Highland Park is located between two parallel streets, Walker street and James Avenue. The park faces Walker Street and is bordered by two brick walls that intersect James Avenue at point C, as shown below.



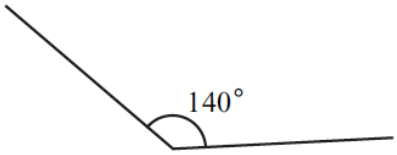
What is the measure, in degrees, of $\angle ACB$, the angle formed by the park's two brick walls?

9. A regular hexagon and a regular heptagon share on side, as shown in the diagram below.



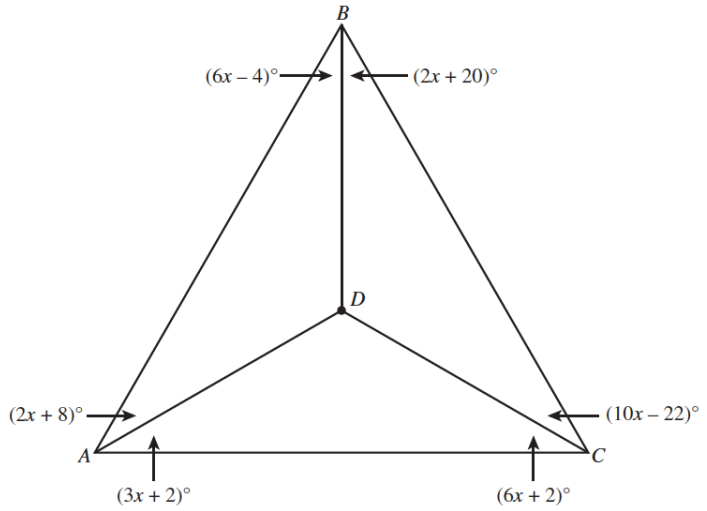
What is the measure of angle x, the angle formed by one side of the hexagon and one side of the heptagon?

10. Claire is drawing a regular polygon. She has drawn two of the sides with an interior angle of $140°$, as shown below.



When Claire completes the regular polygon, what would be **the sum**, in degrees, of the measures of the interior angles?

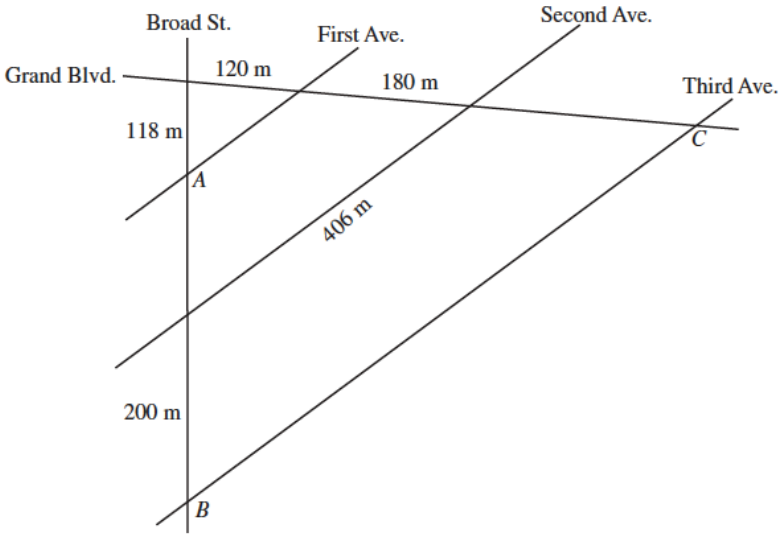
11. Point D is in the interior of ΔABC with some angle measures given in terms of x. This triangle is shown below.



Using the given information, which term best describes point D?

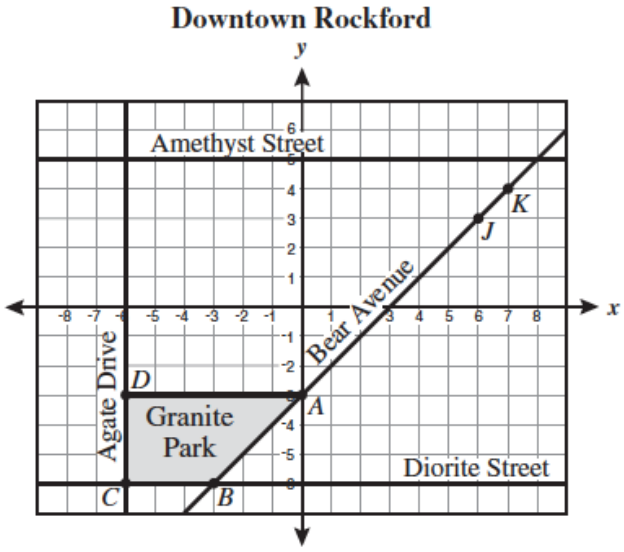
A. centroid
B. circumcenter
C. incenter
D. orthocenter

12. The diagram below shows the intersections of several roads. Each of the roads is straight. The roads First Avenue (Ave.), Second Ave., and Third Ave. are parallel.



Marisa drives from point A to point B along Broad St. and then from point B to point C along Third Ave. What distance, to the nearest meter, did she drive?

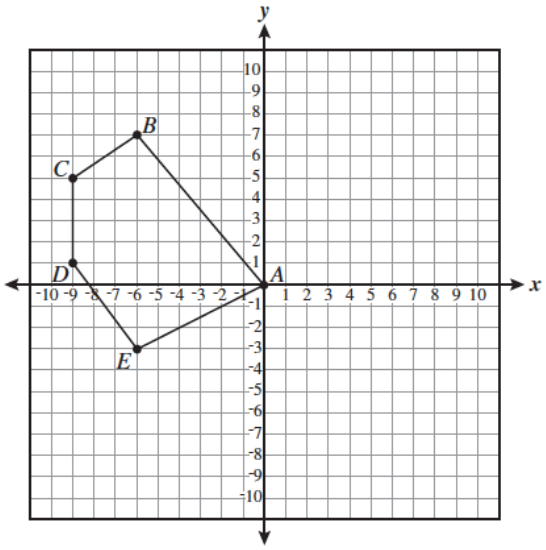
13. A top view of downtown Rockford is shown on the grid below, with Granite Park represented by quadrilateral ABCD. The shape of a new park, Mica Park, will be similar to the shape of Granite Park. Vertices L and M will be plotted on the grid to form quadrilateral JKLM, representing Mica Park.



Which of the following coordinates for L and M could be the vertices of JKLM so that the shape of Mica Park is similar to the shape of Granite Park?

A. L(4, 4), M(4, 3)
B. L(7, 1), M(6, 1)
C. L(7, 6), M(6, 6)
D. L(8, 4), M(8, 3)

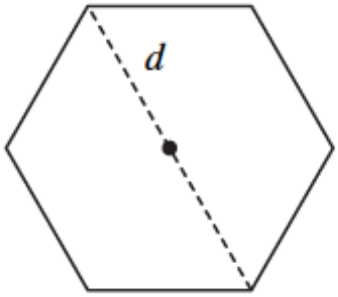
14. Pentagon ABCDE is shown below on a coordinate grid. The coordinates of A, B, C, D, and E all have integer values.



If pentagon ABCDE is rotated 90° clockwise about point A to create pentagon A'B'C'D'E', what will be the x-coordinate of E'?

15. Marisol is creating a custom window frame that is in the shape of a regular hexagon. She wants to find the area of the hexagon to determine the amount of glass needed. She measured diagonal d and determined it was 40 inches. A diagram of the window frame is shown below.

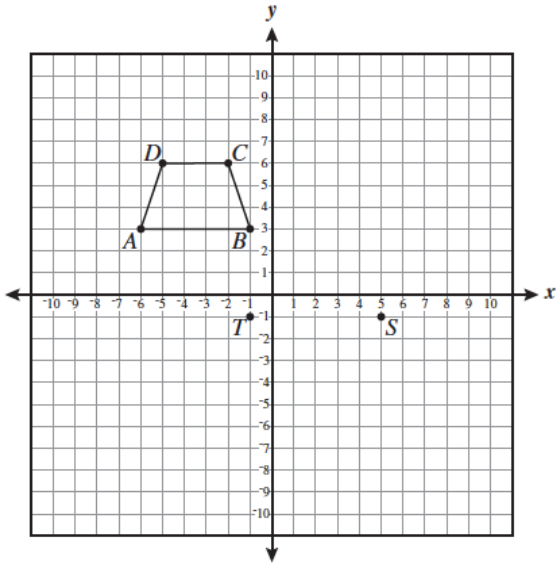
Custom Window Frame



What is the area, in square inches, of the hexagon?

16. A square with an area of 144 square centimeters was increased in length, but not in width, until the resulting rectangle had a perimeter that was 4 times the perimeter of the original square. By how many square centimeters did the area of the figure increase?

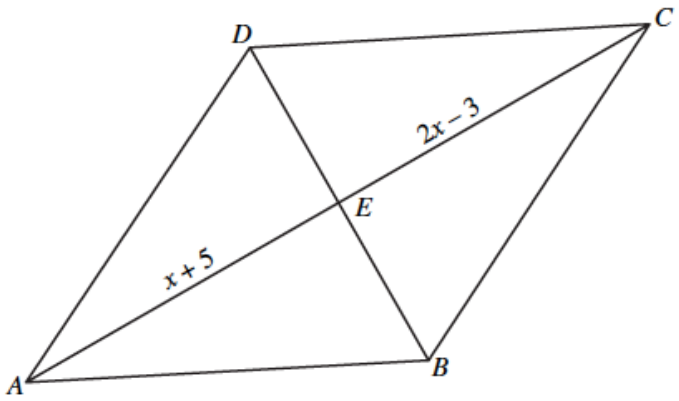
17. On the coordinate grid below, quadrilateral ABCD has vertices with integer coordinates.



Quadrilateral QRST is similar to quadrilateral ABCD with point S located at (5, -1) and point T located at (-1, -1). Which of the following could be possible coordinates for point Q?

A. (6, -4)
B. (7, -7)
C. (-3, -7)
D. (-2, -4)

18. Figure ABCD is a rhombus. The length of $\overline{AE}$ is (x + 5) units, and the length of $\overline{EC}$ is (2x – 3) units.



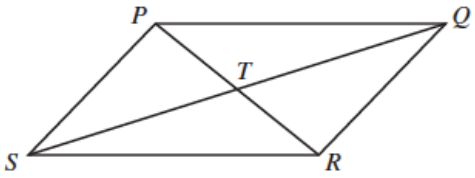
Which statement best explains why the equation x + 5 = 2x – 3 can be used to solve for x?

A. Opposite sides of a rhombus are parallel.
B. Diagonals of a rhombus bisect each other.
C. Diagonals of a rhombus are perpendicular.
D. All four sides of a rhombus are congruent.

19. Mr. Vancol gave his students the following proof to complete.

Given: $\overline{ST} \cong \overline{TQ}$
$\overline{PS} \cong \overline{QR}$
$\angle TSR \cong \angle TQP$

Prove: $PQRS$ is a parallelogram

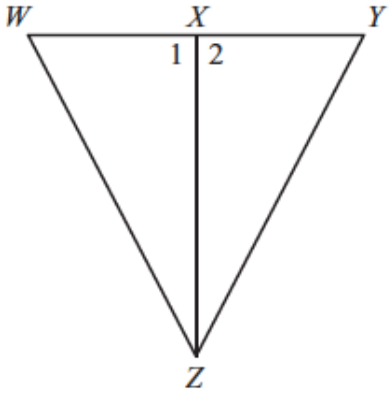


Statement	Reason
1. $\overline{PS} \cong \overline{QR}$	1. Given
2. $\overline{ST} \cong \overline{TQ}$	2. Given
3. $\angle TSR \cong \angle TQP$	3. Given
4. $\angle QTP \cong \angle RTS$	4.
5. $\Delta QTP \cong \Delta STR$	5.
6.	6. Corresponding parts of congruent triangles are congruent.
7. $PQRS$ is a parallelogram.	7. If both pairs of opposite sides of a quadrilateral are congruent then the quadrilateral is a parallelogram.

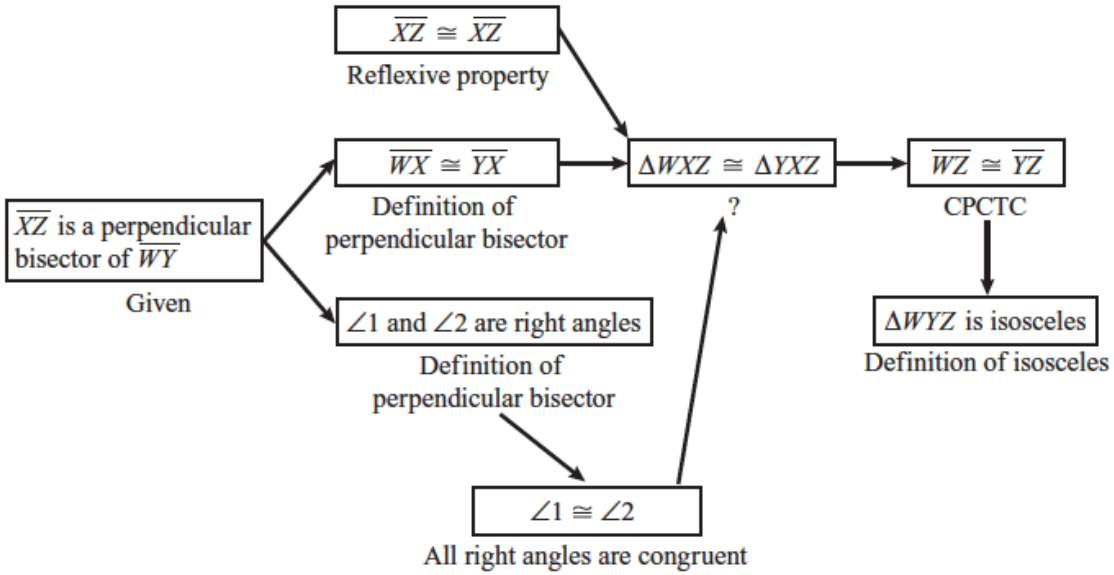
Which is the correct statement 6 for this proof?

A. $\overline{PQ} \cong \overline{SR}$
B. $\overline{ST} \cong \overline{TR}$
C. $\overline{PT} \cong \overline{TR}$
D. $\overline{PR} \cong \overline{QS}$

20. Nancy wrote a proof about the figure shown below.

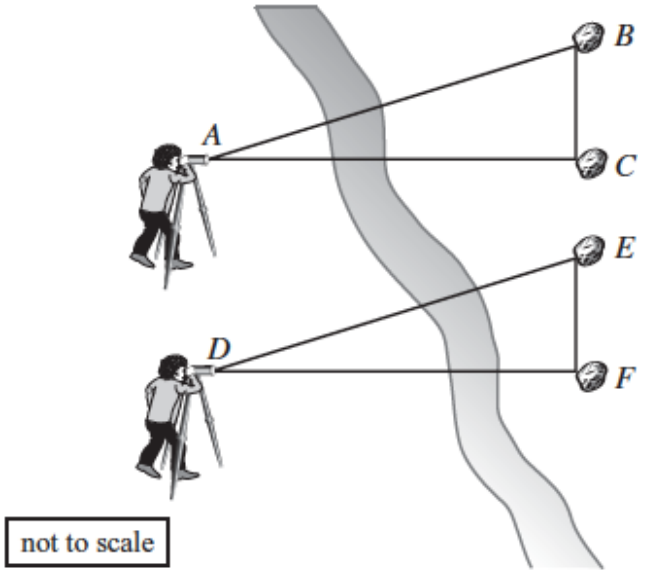


In the proof below, Nancy started with the fact that $\overline{XZ}$ is a perpendicular bisector of $\overline{WY}$ and proved that ΔWYZ is isosceles.



Which triangle congruence shortcut replaces the question mark in Nancy's proof?

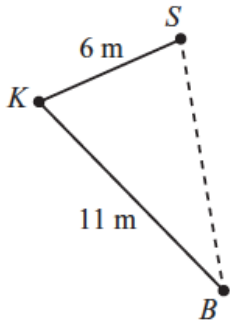
21. A surveyor took some measurements across a river, as shown below. In the diagram, AC = DF and AB = DE.



The surveyor determined that $m\angle BAC = 29°$ and $m\angle EDF = 32°$. Which of the following can he conclude?

A. $BC > EF$
B. $BC < EF$
C. $AC > DE$
D. $AC < DF$

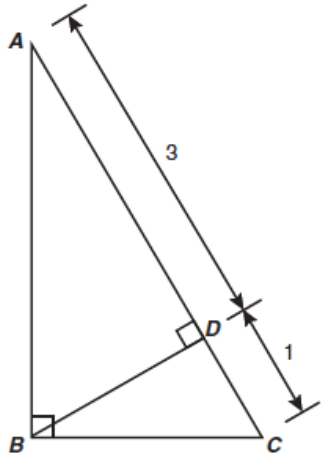
22. Kristin has two dogs, Buddy and Socks. She stands at point K in the diagram and throws two disks. Buddy catches one at point B, which is 11 meters (m) away from Kristin. Socks catches the other at point S, which is 6 m from Kristin.



If KSB forms a triangle, which could be the length, in meters, of segment SB?

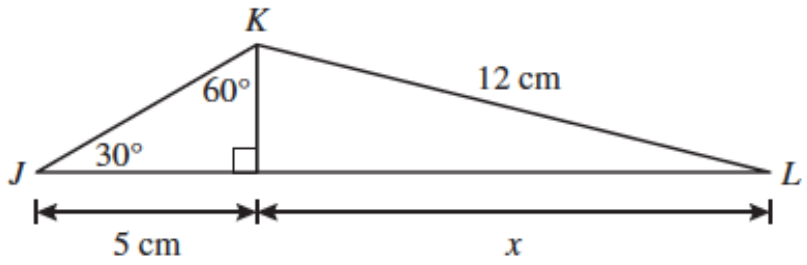
A. 5
B. 8
C. 17
D. 22

23. In ΔABC, $\overline{BD}$ is an altitude.



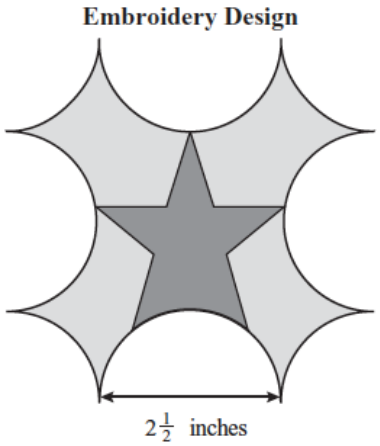
What is the length, in units, of $\overline{BD}$?

24. Nara created two right triangles. She started with ΔJKL and drew an altitude from point K to side $\overline{JL}$. The diagram below shows ΔJKL and some of its measurements, in centimeters (cm).



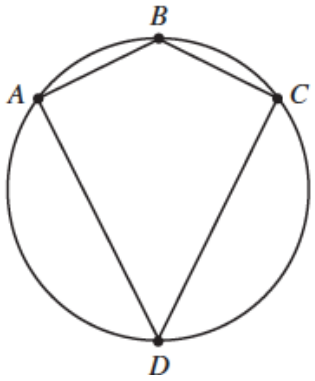
Based on the information in the diagram, what is the measure of x to the nearest tenth of a centimeter?

25. Allison created an embroidery design of a stylized star emblem. The perimeter of the design is made by alternating semicircle and quarter-circle arcs. Each arc is formed from a circle with a $2\frac{1}{2}$ inch diameter. There are 4 semicircle and 4 quarter-circle arcs, as shown in the diagram below.



To the nearest whole inch, what is the **perimeter** of Allison's design?

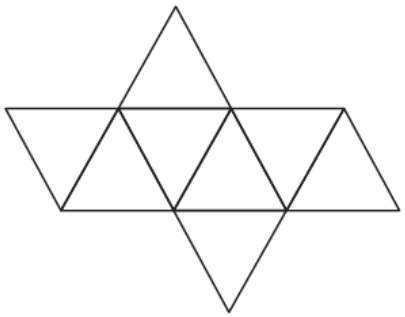
26. Kayla inscribed quadrilateral ABCD in a circle, as shown below.



If major arc ADC measures $255°$ in Kayla's design, what is the measure, in degrees of $\angle ADC$?

27. Circle Q has a radius of 5 units with center (3.7, -2). What is the equation that defines circle Q?

28. Below is a net of a polyhedron.

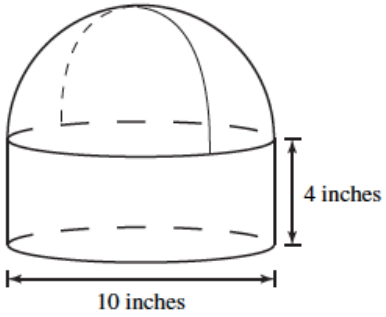


How many edges does the polyhedron have?

29. How many faces does a dodecahedron have?

30. Abraham works at the Delicious Cake Factory. He packages cakes in cardboard containers shaped like right circular cylinders with hemispheres on top, as shown in the diagram below.

CAKE CONTAINER



Abraham wants to wrap one cake container completely in colored plastic wrap and needs to know how much wrap he will need. What is the total exterior surface area of the container? Leave your answer in terms of π.

31. The two rectangular prisms shown below are similar to each other. Side AB corresponds to side WX, and side CD corresponds to side YZ.

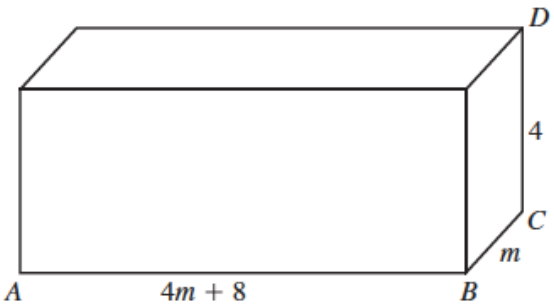


Figure 1

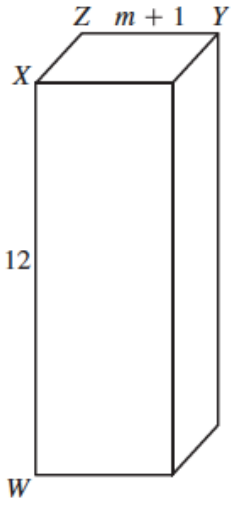


Figure 2

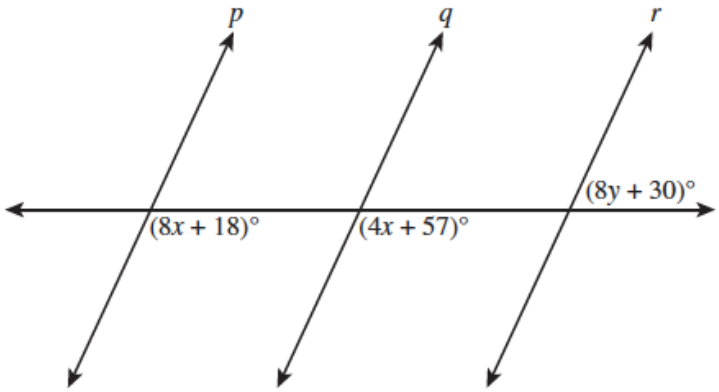
What is the surface area of Figure 1, in square units?

32. Kendra has a compost box that has the shape of a cube. She wants to increase the size of the box by extending every edge of the box by half of its original length. After the box is increased in size, which of the following statements is true?

A. The volume of the new compost box is exactly 112.5% of the volume of the original box.
B. The volume of the new compost box is exactly 150% of the volume of the original box.
C. The volume of the new compost box is exactly 337.5% of the volume of the original box.
D. The volume of the new compost box is exactly 450% of the volume of the original box.

33. A city is planning to replace one of its water storage tanks with a larger one. The city's old tank is a right circular cylinder with a radius of 12 feet and a volume of 10,000 cubic feet. The new tank is a right circular cylinder with a radius of 15 feet and the same height as the old tank. What is the maximum number of cubic feet of water the new storage tank will hold?

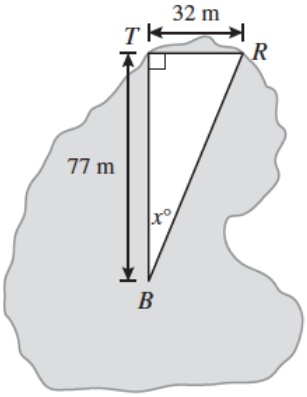
34. In the figure below, line p is parallel to line q.



Janet makes the conjecture that line p is also parallel to line r. What must the value of y be for her conjecture to be correct?

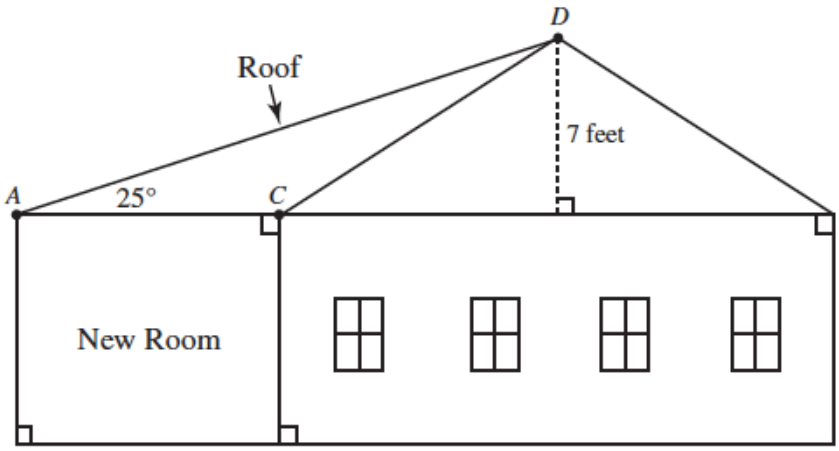
A. 6.75
B. 7.25
C. 8.25
D. 8.75

35. A tackle shop and restaurant are located on the shore of a lake and are 32 meters (m) apart. A boat on the lake heading toward the tackle shop is a distance of 77 meters from the tackle shop. This situation is shown in the diagram below, where point T represents the location of the tackle shop, point T represents the location of the restaurant, and point B represents the location of the boat.



The driver of the boat wants to change direction to sail toward the restaurant. What is the measure of the angle labeled x?

36. Mr. Rose is remodeling his house by adding a room to one side, as shown in the diagram below. In order to determine the length of the boards he needs for the roof of the room, he must calculate the distance from point A to point D.



What is the length, to the nearest tenth of a foot, of $\overline{AD}$?