Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Geometry End Of The Year Final Exam Review

Calculate the distance between each given pair of points. Reduce the radical.

1. (3, 1) and (6, 5)

2. (2, 8) and (4, 3)

3. $(-6, 4)$ and $(5, -1)$

4. $(9, -2)$ and $(2, -9)$

5. $(-5, -8)$ and $(-2, -9)$

Determine the midpoint of a line segment with each set of given endpoints.

6. (8, 0) and (4, 6)

7. $(6, -3)$ and $(-4, 5)$

8. $(-10, -1)$ and (0, 4)

Vocabulary - Define the term in your own words.

9. angle bisector

Determine whether each pair of lines are parallel, perpendicular, or neither. Explain your reasoning.

10. line n: $y = -2x - 4$

line m: $y = -2x + 8$

11. line p: $y = 3x + 5$

line q: $y = \frac{1}{3}x + 5$

12. line r: $y = -5x + 12$

line s: $y = \frac{1}{5}x - 6$

13. line n: $y = 6x + 2$

line m: $y = -6x - 2$

14. line p: $y - x = 4$

line q: $2x + y = 8$

15. line r: $2y + x = 6$

line s: $3x + 6y = 12$

Determine an equation for the parallel line described. Write your answer in both point-slope form and slope-intercept form.

16. What is the equation of a line parallel to $y = 7x - 8$ that passes through $(5, -2)$?

Determine an equation for the perpendicular line described. Write your answer in both point-slope form and slope-intercept form.

17. What is the equation of a line perpendicular to $y = -3x + 4$ that passes through $(-1, 6)$?

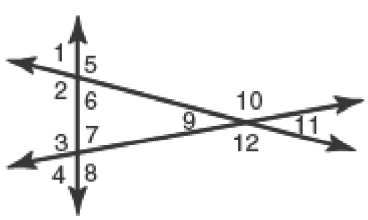
Use the given information to determine the measures of the angles in each pair.

18. The measure of the complement of an angle is three times the measure of the angle. What is the measure of each angle?

19. The measure of the supplement of an angle is one fourth the measure of the angle. What is the measure of each angle?

Name each pair of vertical angles.

20.



Identify the property demonstrated in each example.

21. $GH = MN$ and $MN = OP$, so $GH = OP$

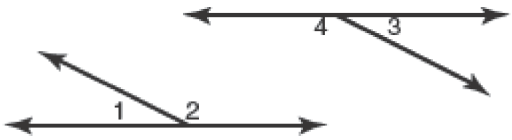
22. $m\angle 1 = 134°$ and $m\angle 2 = 134°$, so $m\angle 1 = m\angle 2$

Write the given proof as the indicated proof.

23. Write the two-column proof of the Congruent Supplement Theorem as a paragraph proof.

Given: $\angle 1$ is supplementary to $\angle 2$, $\angle 3$ is supplementary to $\angle 4$, and $\angle 2 \cong \angle 4$

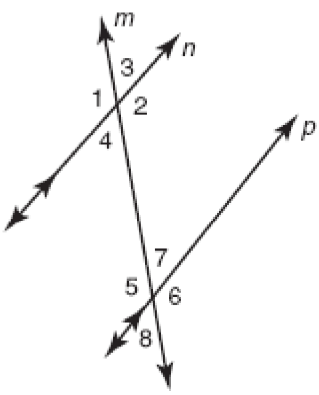
Prove: $\angle 1 \cong \angle 3$



Statements	Reasons
1. $\angle 1$ is supplementary to $\angle 2$	**1.** Given
2. $\angle 3$ is supplementary to $\angle 4$	**2.** Given
3. $\angle 2 \cong \angle 4$	**3.** Given
4. $m\angle 2 = m\angle 4$	**4.** Definition of congruent angles
5. $m\angle 1 + m\angle 2 = 180°$	**5.**
6. $m\angle 3 + m\angle 4 = 180°$	**6.** Definition of supplementary angles
7. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 4$	**7.** Substitution Property
8. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$	**8.**
9. $m\angle 1 = m\angle 3$	**9.** Subtraction Property of Equality
10. $\angle 1 \cong \angle 3$	**10.** Definition of congruent angles

Write congruence statements for the pairs of corresponding angles in each figure.

24.



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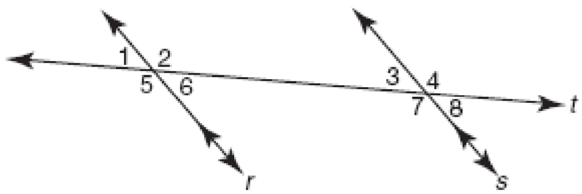
Prove each statement using the indicated type of proof.

25. Use a two-column proof to prove the Alternate Exterior Angles Theorem. In your proof, use the following information and refer to the diagram.

Given: $r \parallel s$, t is a transversal

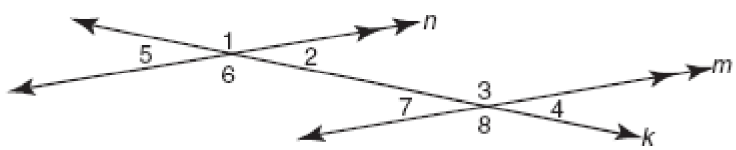
Prove: $\angle 4 \cong \angle 5$



26. Use a two-column proof to prove the Alternate Interior Angles Converse Theorem. In your proof, use the following information and refer to the diagram.

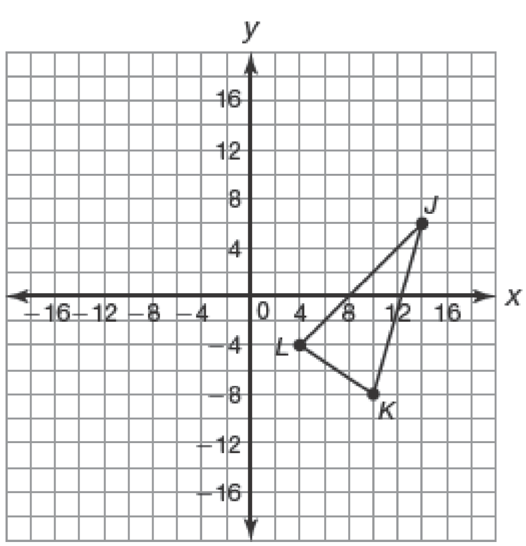
Given: $\angle 2 \cong \angle 7$, k is a transversal

Prove: $m \parallel n$



Translate the given triangle such that one vertex of the image is located at the origin and label the vertices of the translated image. Then, determine its perimeter. Round your answer to the nearest hundredth, if necessary.

27. triangle *JKL*



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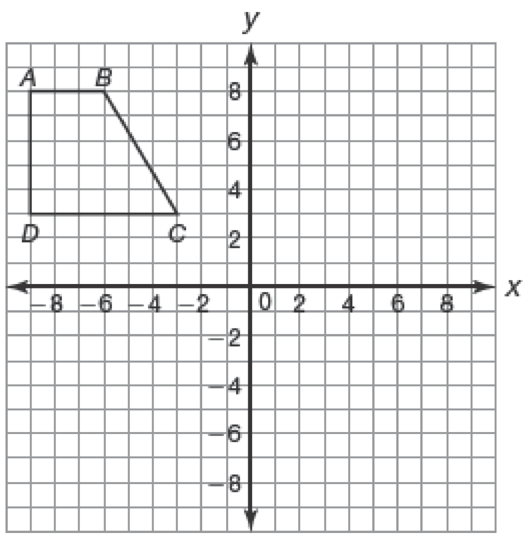
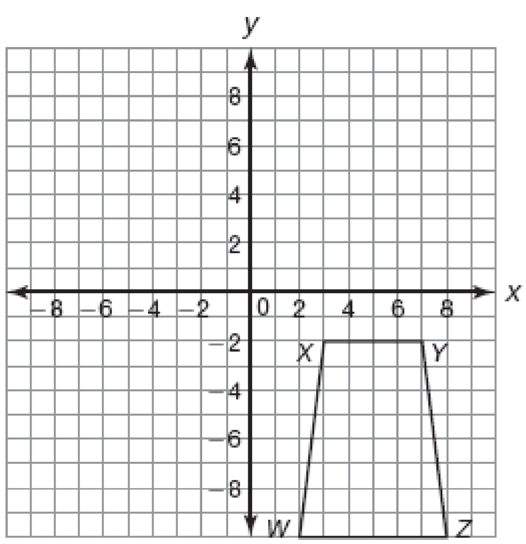
Translate the given trapezoid such that one vertex of the image is located at the origin and label the vertices of the translated image. Then, determine the perimeter or area. Round your answer to the nearest hundredth, if necessary.

28. perimeter of trapezoid *ABCD*



29. area of trapezoid *WXYZ*



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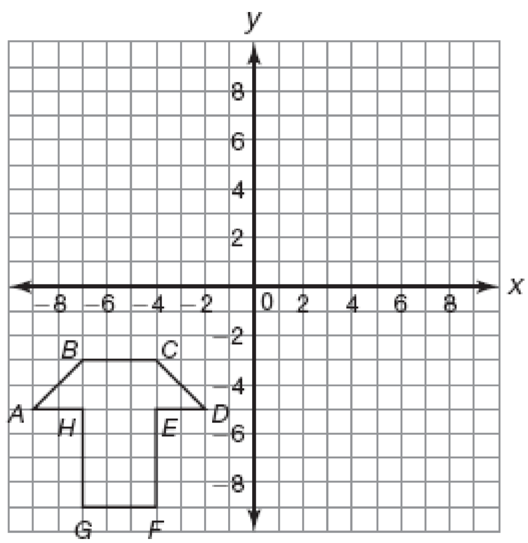
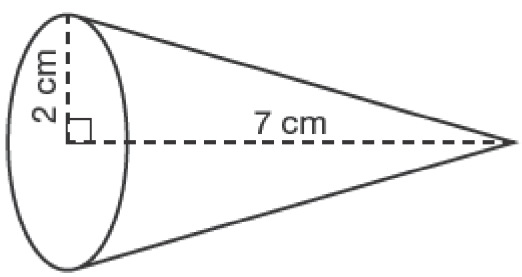
Translate the given composite figure such that one vertex of the image is located at the origin and label the vertices of the translated image. Then, determine the perimeter or area. Round your answer to the nearest hundredth, if necessary.

30. area of figure *ABCDEFGH*



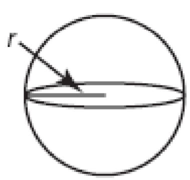
Calculate the volume of each cone. Use 3.14 for π.

31.

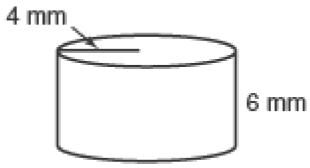


Calculate the volume of each sphere. Use π. Round decimals to the nearest tenth, if necessary.

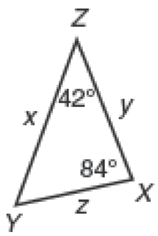
32. r = 6 inches

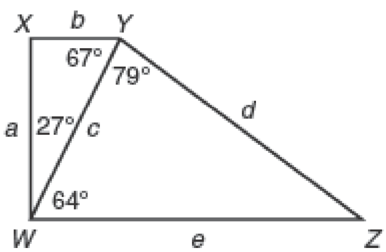


Calculate the volume of each cylinder. Use π.

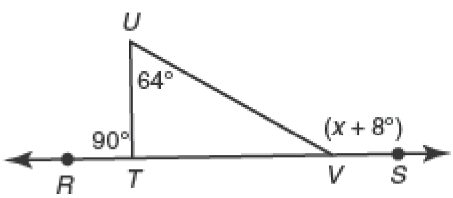
33. 

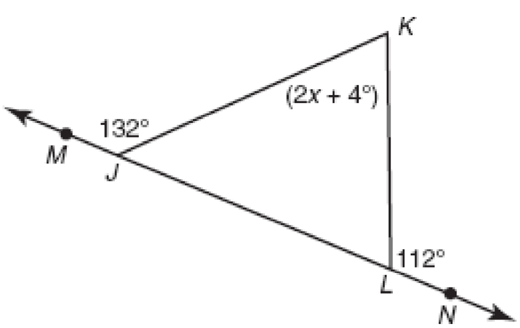
List the side lengths from <u>shortest to longest</u> for each diagram.

34. 

35. 

Solve for *x* in each diagram.

36. 

37. 

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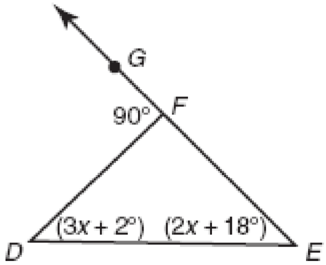
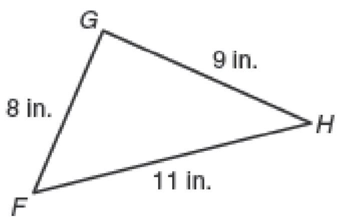
38.



Without measuring the angles, list the angles of each triangle in order from least to greatest measure.

39.



Determine whether it is possible to form a triangle using each set of segments with the given measurements. Explain your reasoning.

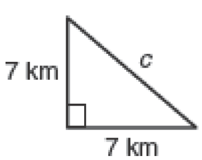
40. 3 inches, 2.9 inches, 5 inches

41. 4 meters, 5.1 meters, 12.5 meters

42. 13.8 kilometers, 6.3 kilometers, 7.5 kilometers

Determine the length of the hypotenuse of each $45° – 45° – 90°$ **triangle.**
Write your answer as a radical in simplest form.

43.



Use the given information to answer each question.

44. Soren is flying a kite on the beach. The string forms a 45° angle with the ground. If he has let out 16 meters of line, how high above the ground is the kite?

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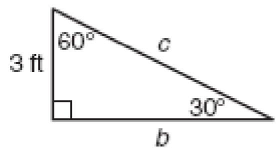
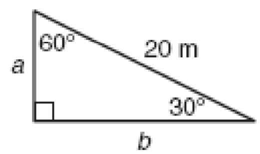
Given the length of the short leg of a $30° - 60° - 90°$ triangle, determine the lengths of the long leg and the hypotenuse. Write your answers as radicals in simplest form.

45.



Given the length of the hypotenuse of a $30° - 60° - 90°$ triangle, determine the lengths of the two legs. Write your answers as radicals in simplest form.

46.

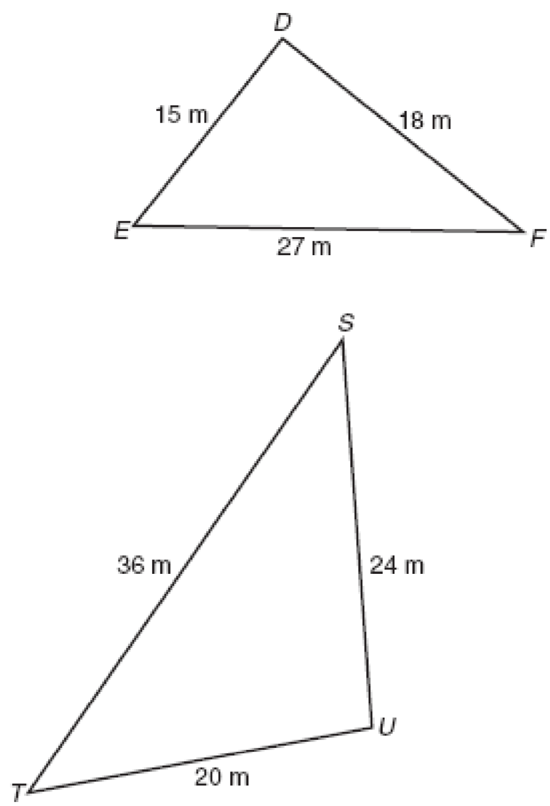


Vocabulary - Define the term in your own words.

47. similar triangles

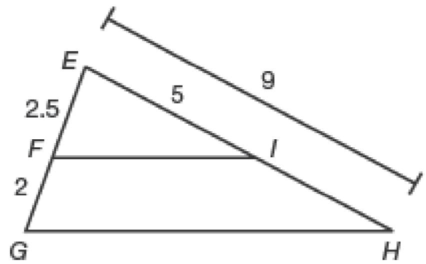
Determine whether each pair of triangles is similar. Explain your reasoning.

48.



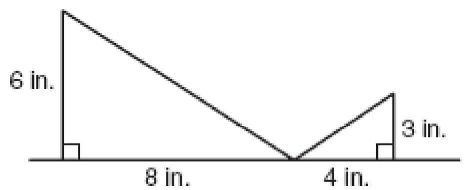
Use the diagram and given information to write a statement that can be justified using the Proportional Segments Theorem, Triangle Proportionality Theorem, or its Converse. State the theorem used.

49.



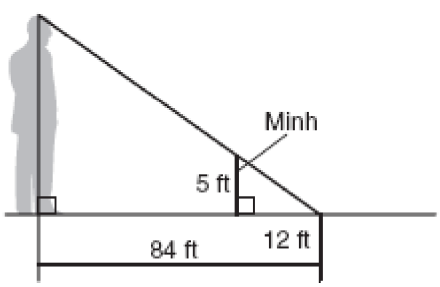
Explain how you know that each pair of triangles are similar.

50.



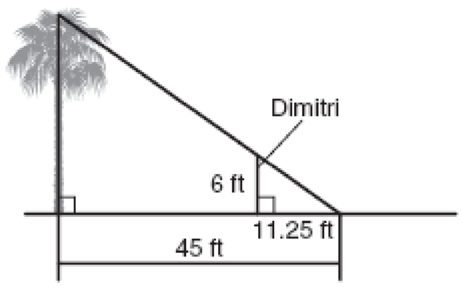
Use indirect measurement to calculate the missing distance.

51. Minh wanted to measure the height of a statue. She lined herself up with the statue's shadow so that the tip of her shadow met the tip of the statue's shadow. She marked the spot where she was standing. Then, she measured the distance from where she was standing to the tip of the shadow, and from the statue to the tip of the shadow.



What is the height of the statue?

52. Dimitri wants to measure the height of a palm tree. He lines himself up with the palm tree's shadow so that the tip of his shadow meets the tip of the palm tree's shadow. Then, he asks a friend to measure the distance from where he was standing to the tip of his shadow and the distance from the palm tree to the tip of its shadow.



What is the height of the palm tree?

Determine the coordinates of each translated image without graphing.

53. The vertices of triangle RST are R (0, 3), S (2, 7), and T (3, – 1). Translate the triangle 5 units to the left and 3 units up to form triangle $R'S'T'$.

54. The vertices of quadrilateral $WXYZ$ are W (–10, 8), X(–2, – 1), Y (0, 0), and Z (3, 7). Translate the quadrilateral 5 units to the right and 8 units down to form quadrilateral $W'X'Y'Z'$.

Determine the coordinates of each rotated image without graphing.

55. The vertices of triangle ABC are A (5, 3), B (2, 8), and C (–4, 5). Rotate the triangle about the origin 90° counterclockwise to form triangle $A'B'C'$.

56. The vertices of parallelogram $HJKL$ are H(2, – 6), J (3, – 1), K (7, – 1), and L(6, – 6). Rotate the parallelogram about the origin 90° counterclockwise to form parallelogram $H'J'K'L'$.

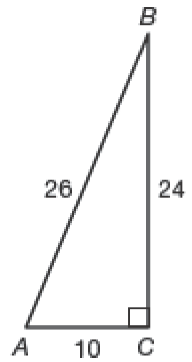
Determine the coordinates of each reflected image without graphing.

57. The vertices of rectangle $DEFG$ are D (–7, 1), E (–7, 8), F (1, 8), and G (1, 1). Reflect the rectangle over the y-axis to form rectangle $D'E'F'G'$.

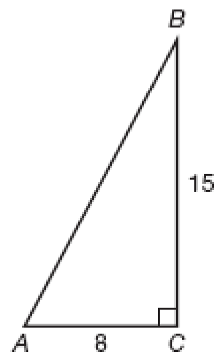
58. The vertices of parallelogram $HJKL$ are H (2, – 6), J (3, – 1), K (7, – 1), and L (6, – 6). Reflect the parallelogram over the x-axis to form parallelogram $H'J'K'L'$.

Determine the ratio $\frac{\text{opposite}}{\text{hypotenuse}}$ using $\angle A$ as the reference angle in each triangle. Write your answers as fractions in simplest form.

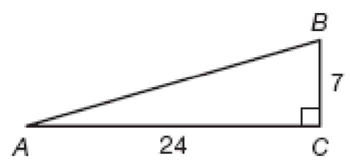
59.



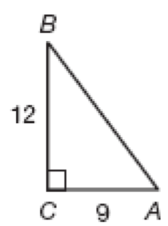
60.



61.

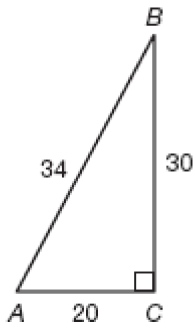


62.

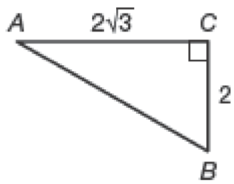


Determine the ratio $\frac{\text{adjacent}}{\text{hypotenuse}}$ using $\angle A$ as the reference angle in each triangle. Write your answers as fractions in simplest form.

63.

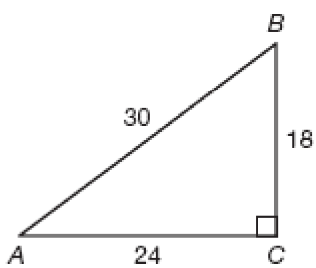


64.



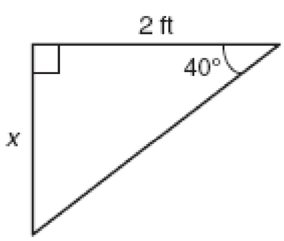
Determine the ratios $\frac{\text{opposite}}{\text{hypotenuse}}$, $\frac{\text{adjacent}}{\text{hypotenuse}}$, and $\frac{\text{opposite}}{\text{adjacent}}$ using $\angle A$ as the reference angle in each triangle. Write your answers as fractions in simplest form.

65.



Use a tangent ratio or a cotangent ratio to calculate the missing length of each triangle.

66.



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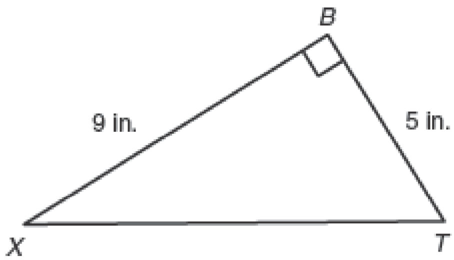
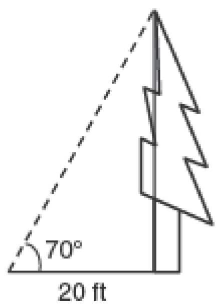
Calculate the measure of angle *X* for each triangle.

67.

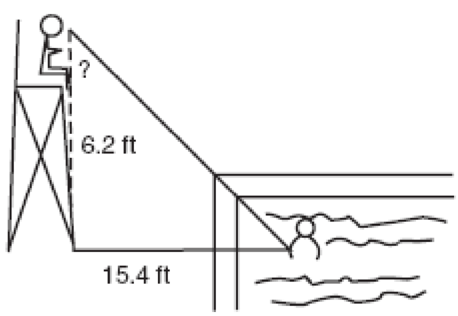


Solve each problem.

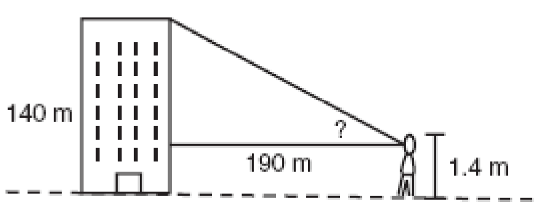
68. To calculate the height of a tree, a botanist makes the following diagram. What is the height of the tree?



69. A lifeguard is sitting on an observation chair at a pool. The lifeguard's eye level is 6.2 feet from the ground. The chair is 15.4 feet from a swimmer. Calculate the measure of the angle formed when the lifeguard looks down at the swimmer.



70. A surveyor is looking up at the top of a building that is 140 meters tall. His eye level is 1.4 meters above the ground, and he is standing 190 meters from the building. Calculate the measure of the angle from his eyes to the top of the building.



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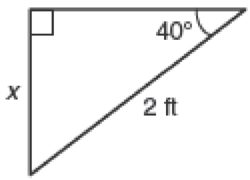
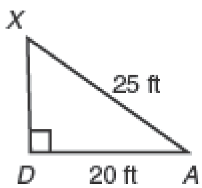
Use a sine ratio or a cosecant ratio to calculate the missing length of each triangle.

71.



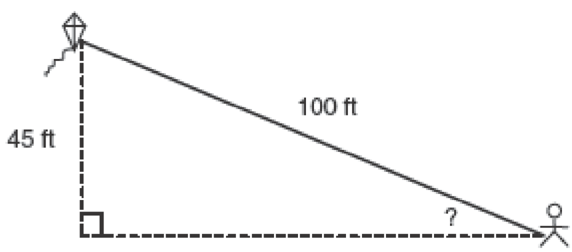
Calculate the measure of angle *X* for each triangle.

72.



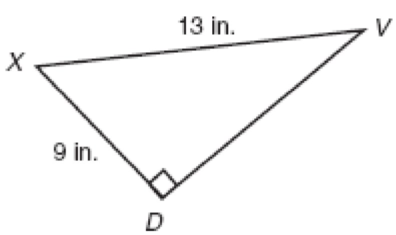
Solve the problem.

73. Jerome is flying a kite on the beach. The kite is attached to a 100-foot string and is flying 45 feet above the ground, as shown in the diagram. Calculate the measure of the angle formed by the string and the ground.



Calculate the measure of angle *X* for each triangle.

74.



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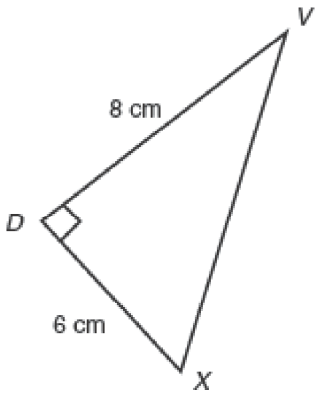
75.



Calculate the sum of the interior angle measures of each polygon.

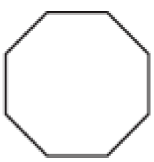
76. A polygon has 13 sides.

77. A polygon has 20 sides.

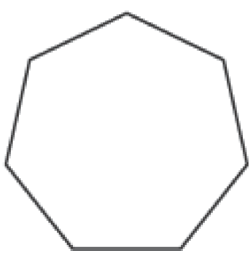
78. A polygon has 25 sides.

For each regular polygon, calculate the measure of each of its interior angles.

79.



80.



Calculate the number of sides for the polygon.

81. The measure of each angle of a regular polygon is 108°.

Given the regular polygon, calculate the measure of each of its exterior angles.

82. What is the measure of each exterior angle of a regular pentagon?

83. What is the measure of each exterior angle of a regular 12-gon?

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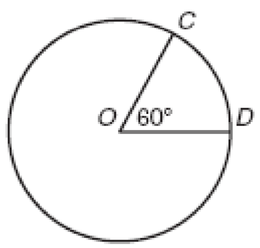
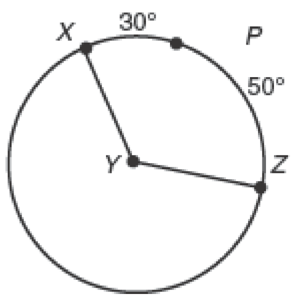
Determine the measure of the minor arc.

84. $\overset{\frown}{CD}$

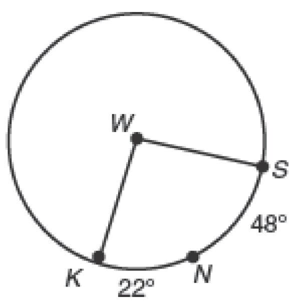


Determine the measure of each central angle.

85. $m\angle XYZ$

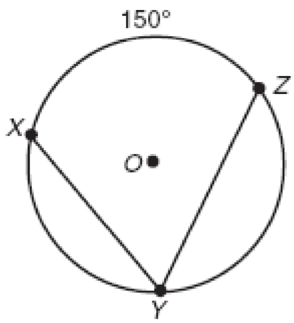


86. $m\angle KWS$

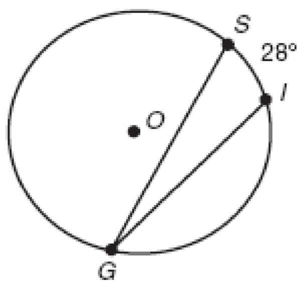


Determine the measure of each inscribed angle.

87. $m\angle XYZ$

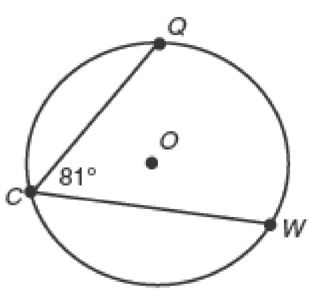


88. $m\angle SGI$



Determine the measure of each intercepted arc.

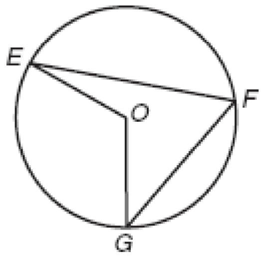
89. $m\overset{\frown}{QW}$



Name: ________________________ **ID: A**

Calculate the measure of the angle.

90. The measure of $\angle EOG$ is 128°. What is the measure of $\angle EFG$?

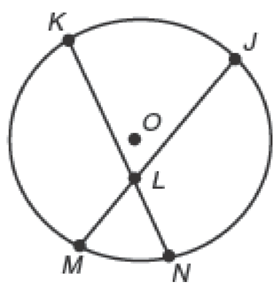


Use the diagram shown to determine the measure of each angle or arc.

91. Determine $m\angle KLJ$.

$m\overset{\frown}{KM} = 120°$

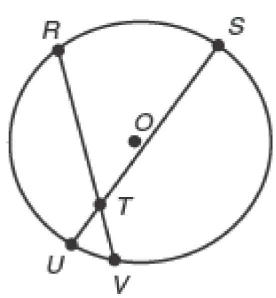
$m\overset{\frown}{JN} = 100°$



92. Determine $m\overset{\frown}{RS}$.

$m\overset{\frown}{UV} = 30°$

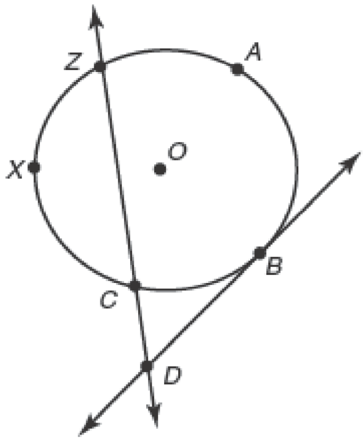
$m\angle RTS = 80°$



93. Determine $m\angle D$.

$m\overset{\frown}{ZXC} = 150°$

$m\overset{\frown}{CB} = 30°$

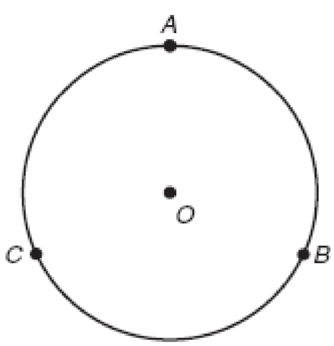


Vocabulary - Answer each question.

94. How are inscribed polygons and circumscribed polygons different?

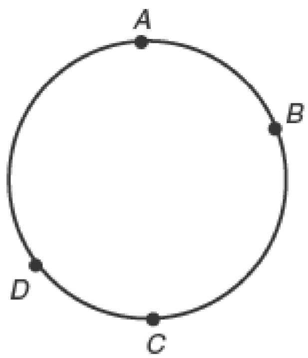
Draw a triangle inscribed in the circle through the three points. Then determine if the triangle is a right triangle.

95.



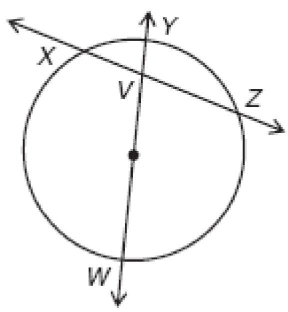
Draw a quadrilateral inscribed in the circle through the given four points. Then determine the measure of the indicated angle.

96. In quadrilateral *ABCD*, $m\angle B = 81°$. Determine $m\angle D$.



Use the given arc measures to determine the measures of the indicated angles.

97.



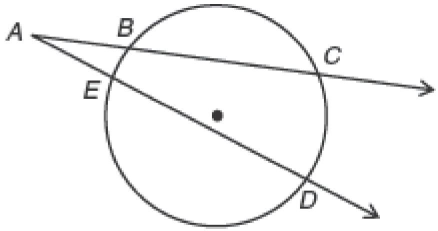
$m\overset{\frown}{XY} = 20°$

$m\overset{\frown}{YZ} = 50°$

$m\angle XVY =$ ________

$m\angle YVZ =$ ________

98.

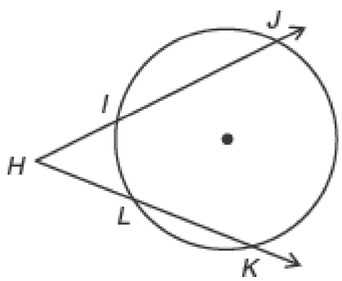


$m\overset{\frown}{BE} = 20°$

$m\overset{\frown}{CD} = 70°$

$m\angle A =$ ________

99.

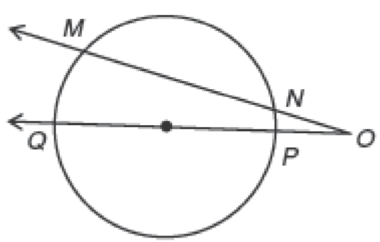


$m\overset{\frown}{JK} = 164°$

$m\overset{\frown}{IL} = 42°$

$m\angle H =$ ________

100.



$m\overset{\frown}{MQ} = 50°$

$m\overset{\frown}{NP} = 12°$

$m\angle O =$ ________

Geometry End Of The Year Final Exam Review
Answer Section

1. ANS:
$x_1 = 3, y_1 = 1, x_2 = 6, y_2 = 5$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$d = \sqrt{(6-3)^2 + (5-1)^2}$$
$$d = \sqrt{3^2 + 4^2}$$
$$d = \sqrt{9+16}$$
$$d = \sqrt{25}$$
$$d = 5$$

REF: 1.2

2. ANS:
$x_1 = 2,\ y_1 = 8, x_2 = 4, y_2 = 3$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$d = \sqrt{(4-2)^2 + (3-8)^2}$$
$$d = \sqrt{2^2 + (-5)^2}$$
$$d = \sqrt{4+25}$$
$$d = \sqrt{29}$$
$$d \approx 5.4$$

REF: 1.2

3. ANS:

$x_1 = -6, y_1 = 4, x_2 = 5, y_2 = -1$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$d = \sqrt{[5 - (-6)]^2 + [(-1) - 4]^2}$

$d = \sqrt{11^2 + (-5)^2}$

$d = \sqrt{121 + 25}$

$d = \sqrt{146}$

$d \approx 12.1$

REF: 1.2

4. ANS:

$x_1 = 9, y_1 = -2, x_2 = 2, y_2 = -9$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$d = \sqrt{(2 - 9)^2 + [(-9) - (-2)]^2}$

$d = \sqrt{(-7)^2 + (-7)^2}$

$d = \sqrt{49 + 49}$

$d = \sqrt{98}$

$d \approx 7\sqrt{2}$

REF: 1.2

5. ANS:

$x_1 = -5, y_1 = -8, x_2 = -2, y_2 = -9$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$d = \sqrt{[(-2) - (-5)]^2 + [(-9) - (-8)]^2}$

$d = \sqrt{3^2 + (-1)^2}$

$d = \sqrt{9 + 1}$

$d = \sqrt{10}$

$d \approx 3.2$

REF: 1.2

6. ANS:
$x_1 = 8, y_1 = 0$

$x_2 = 4, y_2 = 6$

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{8+4}{2}, \frac{0+6}{2}\right)$$

$$= \left(\frac{12}{2}, \frac{6}{2}\right)$$

$$= (6, 3)$$

REF: 1.3

7. ANS:
$x_1 = 6, y_1 = -3$

$x_2 = -4, y_2 = 5$

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{6+(-4)}{2}, \frac{-3+5}{2}\right)$$

$$= \left(\frac{2}{2}, \frac{2}{2}\right)$$

$$= (1, 1)$$

REF: 1.3

8. ANS:
$x_1 = -10, y_1 = -1$

$x_2 = 0, y_2 = 4$

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{-10+0}{2}, \frac{-1+4}{2}\right)$$

$$= \left(\frac{-10}{2}, \frac{3}{2}\right)$$

$$= (-5, 1.5)$$

REF: 1.3

9. ANS:
An angle bisector is a ray drawn through the vertex of an angle that divides the angle into two congruent angles.

REF: 1.4

10. ANS:
Parallel. The slope of line *n* is –2, which is equal to the slope of line *m*, so the lines are parallel.

REF: 1.5

11. ANS:

Neither. The slope of line p is 3 and the slope of line q is $\frac{1}{3}$. The slopes of the lines are not equal, so the lines are not parallel. The product of the slopes is $3 \times \frac{1}{3} = 1 \neq -1$, so the lines are not perpendicular.

REF: 1.5

12. ANS:

Perpendicular. The slope of line r is -5 and the slope of line s is $\frac{1}{5}$. The product of the slopes is $-5 \times \frac{1}{5} = -1$, so the slopes are negative reciprocals and the lines are perpendicular.

REF: 1.5

13. ANS:

Neither. The slope of line n is 6 and the slope of line m is -6. The slopes of the lines are not equal, so the lines are not parallel. The product of the slopes is $6 \times -6 = -36 \neq -1$, so the lines are not perpendicular.

REF: 1.5

14. ANS:

Neither. The equation for line p can be rewritten as $y = x + 4$, and the equation for line q can be rewritten as $y = -2x + 8$. The slope of line p is 1 and the slope of line q is -2. The slopes of the lines are not equal, so the lines are not parallel. The product of the slopes is $1 \times (-2) = -2 \neq -1$, so the lines are not perpendicular.

REF: 1.5

15. ANS:

Parallel. The equation for line r can be rewritten as $y = -\frac{1}{2}x + 3$, and the equation for line s can be rewritten as $y = -\frac{1}{2}x + 2$. The slope of line r is $-\frac{1}{2}$, which is equal to the slope of line s, so the lines are parallel.

REF: 1.5

16. ANS:

Point-slope form: $(y + 2) = 7(x - 5)$

Slope-intercept form:

$$y + 2 = 7x - 35$$
$$y = 7x - 35 - 2$$
$$y = 7x - 37$$

REF: 1.5

17. ANS:

The slope of the new line must be $\frac{1}{3}$.

Point-slope form: $(y-6)=\frac{1}{3}(x+1)$

Slope-intercept form:

$$y-6=\frac{1}{3}x+\frac{1}{3}$$

$$y=\frac{1}{3}x+\frac{1}{3}+6$$

$$y=\frac{1}{3}x+\frac{19}{3}$$

REF: 1.5

18. ANS:

$$x+3x=90$$

$$4x=90$$

$$x=22.5$$

The measure of the angle is 22.5° and the measure of the complement is 67.5°.

REF: 2.2

19. ANS:

$$x+0.25x=180$$

$$1.25x=180$$

$$x=144$$

The measure of the angle is 144° and the measure of the supplement is 36°.

REF: 2.2

20. ANS:

$\angle 1$ and $\angle 6$, $\angle 2$ and $\angle 5$, $\angle 3$ and $\angle 8$, $\angle 4$ and $\angle 7$, $\angle 9$ and $\angle 11$, $\angle 10$ and $\angle 12$

REF: 2.2

21. ANS:

Transitive Property

REF: 2.3

22. ANS:

Substitution Property

REF: 2.3

23. ANS:
If angles 1 and 2 are supplementary, then $m\angle 1 + m\angle 2 = 180°$ by the definition of supplementary angles. Likewise, if angles 3 and 4 are supplementary, then $m\angle 3 + m\angle 4 = 180°$ by the definition of supplementary angles. You can use the Substitution Property to write $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 4$. You are given that $\angle 2 \cong \angle 4$, so $m\angle 2 = m\angle 4$ by the definition of congruent angles. Then, you can use the Substitution Property to substitute $\angle 2$ for $\angle 4$ into the equation $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 4$ to get $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$. By the Subtraction Property of Equality $m\angle 1 = m\angle 3$. So, $\angle 1 \cong \angle 3$ by the definition of congruent angles.

REF: 2.3

24. ANS:
$\angle 1 \cong \angle 5,\ \angle 3 \cong \angle 7,\ \angle 4 \cong \angle 8,\ \angle 2 \cong \angle 6$

REF: 2.4

25. ANS:

Statements	Reasons
1. $r \parallel s$, t is a transversal	1. Given
2. $\angle 4 \cong /2$	2. Corresponding Angles Postulate
3. $\angle 2 \cong /5$	3. Vertical Angles Congruence Theorem
4. $\angle 4 \cong /5$	4. Transitive Property

REF: 2.4

26. ANS:

Statements	Reasons
1. $\angle 2 \cong \angle 7$ and line k is a transversal	1. Given
2. Angles 5 and 2 are vertical angles	2. Definition of vertical angles
3. $\angle 5 \cong \angle 2$	3. Vertical Angles Congruence Theorem
4. $\angle 5 \cong \angle 7$	4. Transitive Property
5. Angles 5 and 7 are corresponding angles	5. Definition of corresponding angles
6. $m \parallel n$	6. Corresponding Angles Converse Postulate

REF: 2.5

27. ANS:
The perimeter is approximately 35.9 units.

$$\begin{aligned} JK &= \sqrt{(10-14)^2 + (-8-6)^2} \\ &= \sqrt{16+196} \\ &= \sqrt{212} \end{aligned}$$

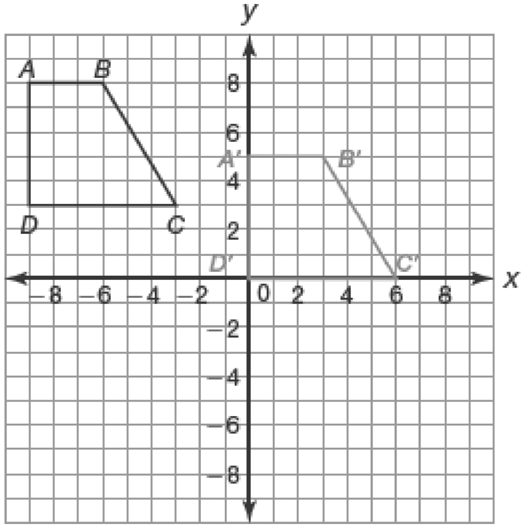
$$\begin{aligned} KL &= \sqrt{(4-10)^2 + (-4-(-8))^2} \\ &= \sqrt{36+16} \\ &= \sqrt{52} \end{aligned}$$

$$\begin{aligned} JL &= \sqrt{(4-14)^2 + (-4-6)^2} \\ &= \sqrt{100+100} \\ &= \sqrt{200} \end{aligned}$$

$$\begin{aligned} \text{Perimeter} &= JK + KL + JL \\ &= \sqrt{212} + \sqrt{52} + \sqrt{200} \\ &\approx 35.9 \end{aligned}$$

REF: 3.2

28. ANS:



The perimeter is approximately 19.83 units.

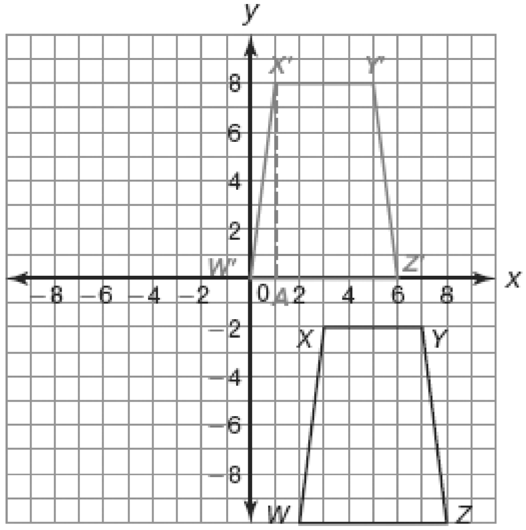
$A'B' = 3, A'D' = 5, C'D' = 6$

$$\begin{aligned} B'C' &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(6-3)^2 + (0-5)^2} \\ &= \sqrt{(3)^2 + (-5)^2} \\ &= \sqrt{9+25} \\ &= \sqrt{34} \end{aligned}$$

$$\begin{aligned} \text{Perimeter} &= A'B' + B'C' + C'D' + A'D' \\ &= 3 + \sqrt{34} + 6 + 5 \\ &\approx 19.83 \end{aligned}$$

REF: 3.4

29. ANS:



The area is 40 square units.

$AX' = 8, W'Z' = 6, X'Y' = 4$

$$Area = \frac{1}{2}(b_1 + b_2)h$$

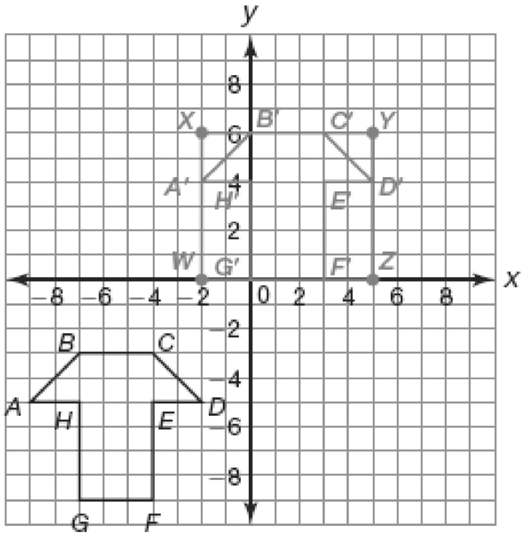
$$= \frac{1}{2}(6+4)(8)$$

$$= \frac{1}{2}(10)(8)$$

$$= 40$$

REF: 3.4

30. ANS:



The area of figure *ABCDEFGH* is 22 square units. I used the rectangle method to determine the area of the figure.

First, I sketched rectangle *WXYZ* that contains the figure and calculated that the area of rectangle *WXYZ* is 42 square units.

Area of Rectangle:

$$\begin{aligned} area &= bh \\ &= (7)(6) \\ &= 42 \end{aligned}$$

Area of Triangles:

Next, I calculated that the total area of the 2 corner rectangles is 16 square units.

Area of Corner Rectangles:

$$\text{area of rectangle } WA'H'G' = bh = (2)(4) = 8$$

$$\text{area of rectangle } F'E'D'Z = bh = (2)(4) = 8$$

Then, I calculated that the total area of the 2 corner triangles is 4 square units.

Area of Triangles:

$$\text{area of } \triangle A'XB' = \frac{1}{2}bh = \frac{1}{2}(2)(2) = 2$$

$$\text{area of } \triangle C'YD' = \frac{1}{2}bh = \frac{1}{2}(2)(2) = 2$$

Lastly, I subtracted the area of the 4 corner figures from the area of the rectangle to determine that the area of the figure is 22 square units.

Area of Figure:

$$\begin{aligned}\text{area of figure} &= \text{area of rectangle} - \text{area of 4 corner figures}\\ &= 42 - (16 + 4)\\ &= 42 - 20\\ &= 22\end{aligned}$$

REF: 3.5

31. ANS:

$$\begin{aligned}\text{volume} &= \frac{1}{3}Bh\\ &= \frac{1}{3}\pi r^2 h\\ &= \frac{1}{3}\pi(2)^2(7)\\ &\approx \frac{28}{3}\pi \text{ cubic centimeters}\end{aligned}$$

REF: 4.4

32. ANS:

$$\begin{aligned}\text{Volume} &= \frac{4}{3}\pi r^3\\ &= \frac{4}{3}\pi(6)^3\\ &= 288\pi\\ &\approx 904.3 \text{ cubic inches}\end{aligned}$$

REF: 4.5

33. ANS:

$$V = \pi r^2 h$$
$$= \pi(4)^2(6)$$
$$= 96\pi$$
$$\approx 301.4 \text{ cubic millimeters}$$

REF: 4.6

34. ANS:

$$m\angle Y = 180° - (84° + 42°) = 54°$$

The shortest side of a triangle is opposite the smallest angle. So, the side lengths from shortest to longest are *z*, *y*, *x*.

REF: 5.2

35. ANS:

$$m\angle X = 180° - (67° + 27°) = 86°$$
$$m\angle Z = 180° - (64° + 79°) = 37°$$

The shortest side of a triangle is opposite the smallest angle. Side *c* is the longest side of $\triangle WXY$, and the shortest side of $\triangle WYZ$. So, the side lengths from shortest to longest are *b*, *a*, *c*, *d*, *e*.

REF: 5.2

36. ANS:

$$m\angle UTV = 180° - 90° = 90°$$
$$m\angle SVU = m\angle UTV + m\angle TUV$$
$$x + 8° = 90° + 64°$$
$$x + 8° = 154°$$
$$x = 146°$$

REF: 5.2

37. ANS:

$$m\angle KJL = 180° - 132° = 48°$$
$$m\angle KLN = m\angle KJL + m\angle JKL$$
$$112° = 48° + (2x + 4°)$$
$$112° = 52° + 2x$$
$$60° = 2x$$
$$30° = x$$

REF: 5.2

38. ANS:
$m\angle DFE = 180° - 90° = 90°$

$m\angle DFG = m\angle DEF + m\angle EDF$

$90° = (2x + 18°) + (3x + 2°)$

$90° = 5x + 20°$

$70° = 5x$

$14° = x$

REF: 5.2

39. ANS:
The smallest angle of a triangle is opposite the shortest side. So, the angles from least to greatest are $\angle H$, $\angle F$, $\angle G$.

REF: 5.3

40. ANS:
Yes. A triangle can be formed because the sum of the two shortest sides is greater than the longest side.
Sum of the Two Shortest Sides: $3 + 2.9 = 5.9$
Longest Side: 5

REF: 5.3

41. ANS:
No. A triangle cannot be formed because the sum of the two shortest sides is less than the longest side.
Sum of the Two Shortest Sides: $4 + 5.1 = 9.1$
Longest Side: 12.5

REF: 5.3

42. ANS:
No. A triangle cannot be formed because the sum of the two shortest sides is equal to the longest side.
Sum of the Two Shortest Sides: $6.3 + 7.5 = 13.8$
Longest Side: 13.8

REF: 5.3

43. ANS:
$c = 7\sqrt{2}$

The length of the hypotenuse is $7\sqrt{2}$ kilometers.

REF: 5.4

44. ANS:

$a\sqrt{2} = 16$

$$a = \frac{16}{\sqrt{2}}$$

$$a = \frac{16\sqrt{2}}{\sqrt{2}\sqrt{2}}$$

$$a = \frac{16\sqrt{2}}{2} = 8\sqrt{2} \approx 11.3$$

The kite is approximately 11.3 meters above the ground.

REF: 5.4

45. ANS:

$a = 3$ feet

$b = 3\sqrt{3}$ feet

$c = 2(3) = 6$ feet

REF: 5.5

46. ANS:

$c = 20$ meters

$a = \frac{20}{2} = 10$ meters

$b = 10\sqrt{3}$ meters

REF: 5.5

47. ANS:

Triangles in which all corresponding angles are congruent and all corresponding sides are proportional.

REF: 6.1

48. ANS:
The triangles are similar by the Side-Side-Side Similarity Theorem because all of the corresponding sides are proportional.

$$\frac{DE}{TU} = \frac{15}{20} = \frac{3}{4}$$

$$\frac{DF}{SU} = \frac{18}{24} = \frac{3}{4}$$

$$\frac{EF}{ST} = \frac{27}{36} = \frac{3}{4}$$

REF: 6.2

49. ANS:
$\overline{GH} \parallel \overline{FI}$, Converse of Triangle Proportionality Theorem

REF: 6.3

50. ANS:
The known corresponding sides of the triangles are proportional: $\frac{6}{3} = \frac{2}{1}$ and $\frac{8}{4} = \frac{2}{1}$.

The angle between the known sides is a right angle for both triangles, so those angles are congruent. Therefore, by the Side-Angle-Side Similarity Postulate, the triangles are similar.

REF: 6.6

51. ANS:
The height of the statue is 35 feet.

$$\frac{x}{5} = \frac{84}{12}$$

$$x = 35$$

REF: 6.6

52. ANS:
The palm tree is 24 feet tall.

$$\frac{x}{6} = \frac{45}{11.25}$$

$$x = 24$$

REF: 6.6

53. ANS:
The vertices of triangle $R'S'T'$ are R' (–5, 6), S' (–3, 10), and T' (–2, 2).

REF: 7.1

54. ANS:
The vertices of quadrilateral $W'X'Y'Z'$ are $W'(-5, 0)$, $X'(3, -9)$, $Y'(5, -8)$, and $Z'(8, -1)$.

REF: 7.1

55. ANS:
The vertices of triangle $A'B'C'$ are $A'(-3,5)$, $B'(-8,2)$, and $C'(-5, -4)$.

REF: 7.1

56. ANS:
The vertices of parallelogram $H'J'K'L'$ are $H'(6,2)$, $J'(1,3)$, $K'(1,7)$ and $L'(6,6)$.

REF: 7.1

57. ANS:
The vertices of rectangle $D'E'F'G'$ are D' (7, 1), E' (7, 8), F' (–1, 8), and G' (–1, 1).

REF: 7.1

58. ANS:
The vertices of parallelogram $H'J'K'L'$ are H' (2, 6), J' (3, 1), K' (7, 1), and L' (6,6).

REF: 7.1

59. ANS:

$$\frac{\text{opposite}}{\text{hypotenuse}} = \frac{24}{26} = \frac{12}{13}$$

REF: 9.1

60. ANS:

$$c^2 = a^2 + b^2$$

$$c^2 = 15^2 + 8^2$$

$$c^2 = 225 + 64 = 289$$

$$c = \sqrt{289} = 17$$

$$\frac{\text{opposite}}{\text{hypotenuse}} = \frac{15}{17}$$

REF: 9.1

61. ANS:

$$c^2 = a^2 + b^2$$

$$c^2 = 7^2 + 24^2$$

$$c^2 = 49 + 576 = 625$$

$$c = \sqrt{625} = 25$$

$$\frac{\text{opposite}}{\text{hypotenuse}} = \frac{7}{25}$$

REF: 9.1

62. ANS:

$$c^2 = a^2 + b^2$$

$$c^2 = 12^2 + 9^2$$

$$c^2 = 144 + 81 = 225$$

$$c = \sqrt{225} = 15$$

$$\frac{\text{opposite}}{\text{hypotenuse}} = \frac{12}{15} = \frac{4}{5}$$

REF: 9.1

63. ANS:

$$\frac{\text{adjacent}}{\text{hypotenuse}} = \frac{16}{34} = \frac{8}{17}$$

REF: 9.1

64. ANS:

$$c^2 = a^2 + b^2$$

$$c^2 = 2^2 + (2\sqrt{3})^2$$

$$c^2 = 4 + 12 = 16$$

$$c = \sqrt{16} = 4$$

$$\frac{\text{adjacent}}{\text{hypotenuse}} = \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2}$$

REF: 9.1

65. ANS:

$$\frac{\text{opposite}}{\text{hypotenuse}} = \frac{18}{30} = \frac{3}{5}$$

$$\frac{\text{adjacent}}{\text{hypotenuse}} = \frac{24}{30} = \frac{4}{5}$$

$$\frac{\text{opposite}}{\text{adjacent}} = \frac{18}{24} = \frac{3}{4}$$

REF: 9.1

66. ANS:

$$\tan 40^\circ = \frac{x}{2}$$

$$2 \tan 40^\circ = x$$

$$x \approx 1.68 \text{ ft}$$

REF: 9.2

67. ANS:

$$\tan X = \frac{5}{9}$$

$$m\angle X = \tan^{-1}\left(\frac{5}{9}\right) \approx 29.05^\circ$$

REF: 9.2

68. ANS:

$$\tan 70^\circ = \frac{h}{20}$$

$$20 \tan 70^\circ = h$$

$$h \approx 54.95 \text{ ft}$$

REF: 9.2

69. ANS:

$$\tan x = \frac{15.4}{6.2}$$

$$x = \tan^{-1}\left(\frac{15.4}{6.2}\right) \approx 68.07^\circ$$

The lifeguard is looking down at an angle of approximately 68.07°.

REF: 9.2

70. ANS:

$$\tan x = \frac{140 - 1.4}{190}$$

$$x = \tan^{-1}\left(\frac{138.6}{190}\right) \approx 36.11°$$

The surveyor is looking up at an angle of approximately 36.11°.

REF: 9.2

71. ANS:

$$\sin 40° = \frac{x}{2}$$

$$2\sin 40° = x$$

$$x \approx 1.29\,\text{ft}$$

REF: 9.3

72. ANS:

$$\sin X = \frac{20}{25}$$

$$m\angle X = \sin^{-1}\left(\frac{20}{25}\right) \approx 53.13°$$

REF: 9.3

73. ANS:

$$\sin x = \frac{45}{100}$$

$$x = \sin^{-1}\left(\frac{45}{100}\right) \approx 26.74°$$

The angle formed by the string and the ground is approximately 26.74°.

REF: 9.3

74. ANS:

$$\cos X = \frac{9}{13}$$

$$m\angle X = \cos^{-1}\left(\frac{9}{13}\right) \approx 46.19°$$

REF: 9.4

75. ANS:

$$XV^2 = 6^2 + 8^2$$

$$XV^2 = 36 + 64$$

$$XV^2 = 100$$

$$XV = 10$$

$$\cos X = \frac{6}{10}$$

$$m\angle X = \cos^{-1}\left(\frac{6}{10}\right) \approx 53.13°$$

REF: 9.4

76. ANS:
The sum is equal to $(n-2)\cdot 180°$:

$(13-2)\cdot 180° = 11\cdot 180° = 1980°$

The sum of the interior angles of the polygon is 1980°.

REF: 10.4

77. ANS:
The sum is equal to $(n-2)\cdot 180°$.

$(20-2)\cdot 180° = 18\cdot 180 = 3240°$

The sum of the interior angles of the polygon is 3240°.

REF: 10.4

78. ANS:
The sum is equal to $(n-2)\cdot 180°$.

$(25-2)\cdot 180° = 23\cdot 180 = 4140°$

The sum of the interior angles of the polygon is 4140°.

REF: 10.4

79. ANS:

$$\frac{(n-2)180^\circ}{n} = \frac{(8-2)180^\circ}{8}$$
$$= \frac{(6)180^\circ}{8}$$
$$= \frac{1080^\circ}{8}$$
$$= 135^\circ$$

The measure of each interior angle is 135°.

REF: 10.4

80. ANS:

$$\frac{(n-2)180^\circ}{n} = \frac{(7-2)180^\circ}{7}$$
$$= \frac{(5)180^\circ}{7}$$
$$= \frac{900^\circ}{7}$$
$$\approx 128.6^\circ$$

The measure of each interior angle is approximately 128.6°.

REF: 10.4

81. ANS:

$$108^\circ = \frac{(n-2)180^\circ}{n}$$
$$108^\circ n = (n-2)(180^\circ)$$
$$108^\circ n = 108^\circ n - 360^\circ$$
$$72^\circ n = 360^\circ$$
$$n = 5$$

The regular polygon has 5 sides.

REF: 10.4

82. ANS:

$$\frac{360}{5} = 72^\circ$$

REF: 10.5

83. ANS:
$\dfrac{360}{12} = 30°$

REF: 10.5

84. ANS:
The measure of $\overset{\frown}{CD}$ is 60°.

REF: 11.2

85. ANS:
$m\angle XYZ = 80°$

REF: 11.2

86. ANS:
$m\angle KWS = 70°$

REF: 11.2

87. ANS:
$m\angle XYZ = 75°$

REF: 11.2

88. ANS:
$m\angle SGI = 14°$

REF: 11.2

89. ANS:
$m\overset{\frown}{QW} = 162°$

REF: 11.2

90. ANS:
$m\angle EFG = \dfrac{1}{2}(m\angle EOG) = \dfrac{128°}{2} = 64°$

REF: 11.2

91. ANS:
The measure of angle *KLJ* is 70 degrees.

First, I determined that the sum of the measures of arcs *KJ* and *MN* is 140 degrees

$$m\overset{\frown}{KM} + m\overset{\frown}{JN} + m\overset{\frown}{KJ} + m\overset{\frown}{MN} = 360$$

$$120 + 100 + m\overset{\frown}{KJ} + m\overset{\frown}{MN} = 360$$

$$220 + m\overset{\frown}{KJ} + m\overset{\frown}{MN} = 360$$

$$m\overset{\frown}{KJ} + m\overset{\frown}{MN} = 140$$

Then, I calculated the measure of angle *KLJ*.

$$m\angle KLJ = \frac{1}{2}(m\overset{\frown}{KJ} + m\overset{\frown}{MN})$$

$$= \frac{1}{2}(140)$$

$$= 70$$

REF: 11.3

92. ANS:
The measure of arc *RS* is 130 degrees.

$$m\angle RTS = \frac{1}{2}(m\overset{\frown}{RS} - m\overset{\frown}{UV})$$

$$80 = \frac{1}{2}(m\overset{\frown}{RS} + 30)$$

$$160 = m\overset{\frown}{RS} + 30$$

$$m\overset{\frown}{RS} = 130$$

REF: 11.3

93. ANS:
The measure of angle *D* is 75 degrees.

To solve the problem, I calculated the measure of arc *ZAB* first. Then, I calculated the measure of angle *D*.

$$m\overparen{ZXC} + m\overparen{CB} + m\overparen{ZAB} = 360$$
$$150 + 30 + m\overparen{ZAB} = 360$$
$$180 + m\overparen{ZAB} = 360$$
$$m\overparen{ZAB} = 180$$

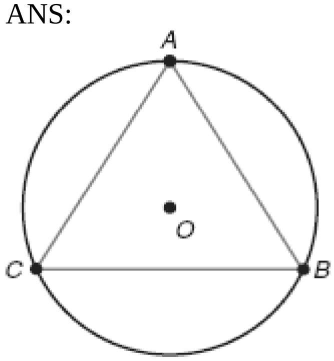
$$m\angle D = \frac{1}{2}(m\overparen{ZAB} - m\overparen{CB})$$
$$= \frac{1}{2}(180 - 30)$$
$$= \frac{1}{2}(150)$$
$$= 75$$

REF: 11.3

94. ANS:
Inscribed polygons are drawn inside of a circle with all vertices touching the circle. Circumscribed polygons are drawn outside of a circle with all sides tangent to the circle.

REF: 12.1

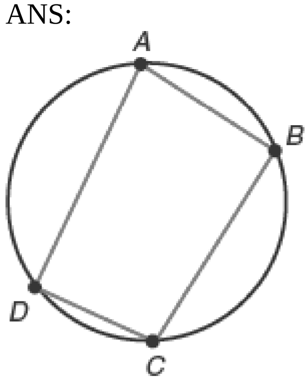
95. ANS:



No. The triangle is not a right triangle. None of the sides of the triangle is a diameter of the circle.

REF: 12.1

96. ANS:



$m\angle D = 180° - 81° = 99°$

REF: 12.1

97. ANS:

$m\angle XVY = \mathbf{75°}$

$m\angle YVZ = \mathbf{105°}$

Because arc *YZW* is a semicircle, its measure is 180°.

$$m\overset{\frown}{YZW} = m\angle\overset{\frown}{YZ} + m\angle\overset{\frown}{ZW}$$

$$180° = 50° + m\overset{\frown}{ZW}$$

$$m\overset{\frown}{ZW} = 130°$$

$$m\angle XVY = \frac{1}{2}(m\overset{\frown}{XY} + m\overset{\frown}{ZW})$$

$$m\angle XVY = \frac{1}{2}(20° + 130°)$$

$$m\angle XVY = \frac{1}{2}(150°)$$

$$m\angle XVY = 75°$$

$$m\angle YVZ = 180° - 75°$$

$$= 105°$$

REF: 12.4

98. ANS:
$m\angle A = \mathbf{25°}$

$$m\angle A = \frac{1}{2}(m\overparen{CD} - m\overparen{BE})$$

$$m\angle A = \frac{1}{2}(70° - 20°)$$

$$m\angle A = \frac{1}{2}(50°)$$

$$m\angle A = 25°$$

REF: 12.4

99. ANS:
$m\angle H = \mathbf{61°}$

$$m\angle H = \frac{1}{2}(m\overparen{JK} - m\overparen{IL})$$

$$m\angle H = \frac{1}{2}(164° - 42°)$$

$$m\angle H = \frac{1}{2}(122°)$$

$$m\angle H = 61°$$

REF: 12.4

100. ANS:
$m\angle O = \mathbf{19°}$

$$m\angle O = \frac{1}{2}(m\overparen{MQ} - m\overparen{NP})$$

$$m\angle O = \frac{1}{2}(50° - 12°)$$

$$m\angle O = \frac{1}{2}(38°)$$

$$m\angle O = 19°$$

REF: 12.4