8. They are equal in size.
9. 12 m^2
10. 1,200 m^2
11. 2.5 m^2
12. 2
13. 57,000
14. 21,700
16. 50,000 cm^3
17. 236 mL
18. 1,500 cm^3
19. 42.5
20. 1,500
21. 6,750
22. 800
23. 10.2
24. 163.52
25. 50 g
26. 180 kg
27. 624 g
28. 8.9
29. 17,000
30. 70
31. 0.144
32. 196,000
33. 0.09
34. 28.5 °F
35. 20 °C
36. 71.1 °C
37. 210
38. 100
39. 35
40. 107
41. 81
42. 399

Chapter 10

Your Turn

10.1
1. $\overrightarrow{BD}$ is the ray that starts at point B and extends infinitely in the direction of point D.
2. $\overline{AB}$ represents the line segment that starts at point A and ends at point B.
3. $\overleftarrow{BA}$ represents the ray that starts at point A and extends infinitely in the direction of point B.
4. $\overleftrightarrow{AD}$ represents a line that contains the points A and D. Notice the arrowheads on both ends of the line above AD, which means that the line continues infinitely in both directions.

10.2
1. Answers will vary. One way $\overline{AE}$, $\overline{EI}$, $\overline{IE}$, $\overline{EB}$, $\overline{BC}$, $\overline{CD}$, $\overline{DG}$; Second way $\overline{AH}$, $\overline{HI}$, $\overline{IE}$, $\overline{EB}$, $\overline{BC}$, $\overline{CF}$, $\overline{FG}$.

10.3
1. $\overleftrightarrow{RS} \parallel \overleftrightarrow{UV}$
   $\overleftrightarrow{RS} \perp \overleftrightarrow{XY}$
   $\overleftrightarrow{UV} \perp \overleftrightarrow{XY}$

10.4
1. $\overline{AB} \cap \overline{BC} = B$
2. $\overrightarrow{BC} \cup \overleftrightarrow{CA} = \overleftrightarrow{AC}$

3. $\overline{BC} \cap \overline{AC} = \overline{BC}$

10.5

1. Point A is located at $(-5, -2)$; Point B is located at $(-3, 4)$; Point C is located at $(3, -6)$; Point D is located at $(5, -2)$; Point E is located at $(3, 2)$; Point F is located at $(5, 5)$.
2. Points A and B are on the straight line $\overleftrightarrow{AB}$.
3. The line that begins at point E in the direction of point F is a ray, $\overrightarrow{EF}$.
4. The line from point C to point D is a line segment $\overline{CD}$.
5. Yes, this represents a plane. One reason is that the figure contains four points that are not on the line $\overleftrightarrow{AB}$.

10.6

1. Plane $MNOP$ intersects with plane $OPQR$, and plane $OPQR$ intersects with plane $QRST$.

10.7

1.

Acute Angles	Obtuse Angles	Right Angles	Straight Angles
$\angle AOB$	$\angle AOE$	$\angle AOD$	$\angle AOF$
$\angle AOC$	$\angle BOF$	$\angle BOE$	
$\angle BOC$	$\angle COF$	$\angle DOF$	
$\angle BOD$			
$\angle COD$			
$\angle DOE$			
$\angle FOE$			

10.8

1.
$$5x = 125°$$
$$2x + 5 = 55°$$

10.9

1. $m\angle(6x) = 24°$, $m\angle(9x) = 36°$, $m\angle(7x + 2) = 30°$

10.10

1. $m\angle 4 = 67°$, $m\angle 1 = 113°$, $m\angle 3 = 113°$

10.11

1. $130°$

10.12

1. $m\angle 5 = 120°$, $m\angle 4 = 120°$, $m\angle 8 = 120°$

10.13

1. $m\angle 1 = 132°$, $m\angle 5 = 132°$

10.14

1. $m\angle 5 = 56°$

   $m\angle 6 = 62°$

   $m\angle 7 = 118°$

   $m\angle 8 = 62°$

   $m\angle 9 = 118°$

10.15

  1. $m\angle x = 66°$, $m\angle(x + 1) = 67°$, $m\angle(x - 19) = 47°$

10.16
  1. $m\angle 1 = 35°$; $m\angle 2 = 2 = 85°$; $m\angle 3 = 60°$

10.17
  1. Triangle ABC is congruent to triangle DEF.

10.18
  1. SAS

10.19
  1. ASA

10.20
  1. The triangles are similar.

10.21
  1. $x = 6$, $y = 24$

10.22
  1. The tree is 86 feet high.

10.23
  1. 60 ft

10.24
  1. rectangle
  2. pentagon
  3. heptagon
  4. parallelogram

10.25
  1. Shapes 1, 2, 4, and 6 are triangles; shape 3 is a pentagon; shape 5 is a parallelogram; and shape 7 is a rectangle.

10.26
  1. 120 in

10.27
  1. 22.4 in

10.28
  1. $a = 108°$
    The sum of the interior angles is $540°$.

10.29
  1. We have the sum of interior angles is $360°$. Then, $x = -9$. The other angles measure $54°$, $111°$, $44°$.

10.30
  1. $7(51.43) = 360°$

10.31
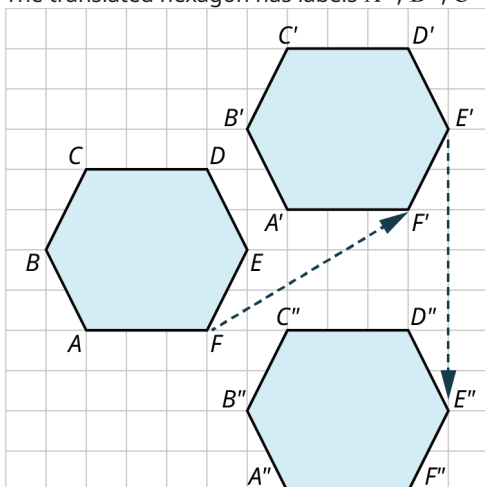 **1.** $C = 2(2.25)\pi = 14.14$ cm

10.32
  1. $r = 2.5$ cm

10.33

1. You need to buy 15.74 feet of trim.

10.34

1. The translated hexagon has labels A'', B'', C'', D'', E'', F''.

10.35

1. Rotate the triangle about the rotation point 90° to the right three times.

10.36

1. This tessellation could be produced with a reflection of the triangle vertically, then each triangle is rotated $180°$ and translated to the right.

10.37

1. From the first square on the left, rotate the square 30° to the right, or $A1 \rightarrow A2$. Then, reflect the square over the horizontal, or $A2 \rightarrow A3$. Next, reflect all three squares over the vertical line. The lavender triangles comprise another pattern that tessellates, fits in with the squares, and fills the gaps.

10.38

1. No

10.39

1. Not by themselves, but by adding an equilateral triangle, the two regular polygons do tessellate the plane without gaps.

10.40

1. We made a tessellation with a regular decagon (10 sides) and an irregular hexagon. We see that the regular decagon will not fill the plane by itself. The gap is filled, however, with an irregular hexagon. These two shapes together will fill the plane.
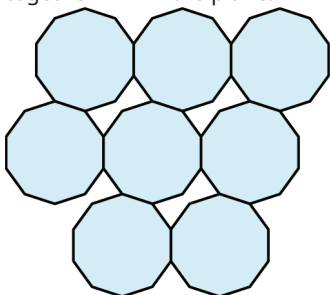
10.41

1. $8\,\text{cm}^2$

10.42
 1. 108 ft^2

10.43
 1. 45 boxes at a cost of $2,025.00

10.44
 1. 270 in^2

10.45
 1. 13,671 square feet; cost is $19,872.95.

10.46
 1. 132 in^2

10.47
 1. $d_2 = 10$

10.48
 1. 40 in

10.49
 1. $A = 96.25 \, \text{cm}^2$

10.50
 1. 30 yd^2

10.51
 1. 28.3 cm^2

10.52
 1. the 15-inch pizza

10.53
 1. $A = 21.875 + 4.8 = 26.7 \, \text{ft}^2$

10.54
 1. 21.46 cm^2

10.55
 1. $300

10.56
 1. $\begin{aligned} SA &= 432 \text{ cm}^2 \\ V &= 540 \text{ cm}^3 \end{aligned}$

10.57
 1. 100 cm^2

10.58
 1. $\begin{aligned} SA &= 336 \text{ cm}^2 \\ V &= 480 \text{ cm}^3 \end{aligned}$

10.59
 1. 1,192 ft^2

10.60

1.
$$\begin{aligned} SA &= 527.78 \text{ cm}^2 \\ V &= 769.69 \text{ cm}^3 \end{aligned}$$

10.61
  1. approximately 8 1/3 cans of soup

10.62
  1. 6.25 ft by 6.25 ft

10.63
  1. $1.26 \text{ ft wide} \times 1.26 \text{ ft long} \times 1.26 \text{ ft high}$, $95.26

10.64
  1. $a = 5$

10.65
  1. 1,140 ft

10.66
  1. The slanted distance will be 120.4 inches.

10.67
  1. The side lengths are $15, 15\sqrt{3}, 30$.

10.68
  1. The ladder reaches 12 feet up the wall and sits $12\sqrt{3}$ feet from the wall.

10.69
  1. Each side x equals $x = 4\sqrt{2} = 5.66$.

10.70
  1.
  $$\begin{aligned} r &= 6.53 \\ y &= 4.2 \end{aligned}$$

10.71
  1. $\alpha = 46.3°$, $\beta = 43.7°$, $x = 5.73$

10.72
  1. 2,241 ft

10.73
  1. $c = 8.06$, one angle is 60°, and the other angle is 30°.

10.74
  1. 11.9°

10.75
  1. 46 ft

Check Your Understanding

  1. The line containing point D and point A is a line segment from point D to point A, $\overline{DA}$, or from point A to point D, $\overline{AD}$.
  2. The line containing points C and B is a straight line that extends infinitely in both directions and contains points C and B.
  3. This is a ray that begins at point E, although it does not contain point E, and extends in the direction of point F.
  4. $\overline{AB} \cup \overline{BD} = \overline{AD}$. The union of line segment $\overline{AB}$ and the line segment $\overline{BD}$ contains all points in each line segment

combined.

5. $\overrightarrow{BD} \cap \overline{BC} = \overline{BC}$. The intersection of the ray $\overrightarrow{BD}$ and the line segment $\overline{BC}$ contains only the points common to each set, $\overline{BC}$.

6. $\overrightarrow{BA} \cup \overrightarrow{BD} = \overleftrightarrow{AD}$. The union of the ray starting at point B and extending infinitely in the direction of A and the ray starting at point B and extending infinitely in the direction of D is the straight line extending infinitely in both directions containing points A, B, C, and D.

7. Two lines are parallel if the distance between the lines is constant implying that the lines cannot intersect.

8. Perpendicular lines intersect forming a 90° angle between them.

9. Yes, because it contains a line and a point not on the line.

10. straight

11. obtuse

12. right

13. acute

14. $m\angle 1 = 149°$ by supplementary angles with $\angle 31°$.

15. $m\angle 3 = 31°$ by vertical angles with the angle measuring 31°.

16. $m\angle 5 = 149°$ by corresponding angles with $\angle 1$.

17. $x = 89°$

18. $x = 67°$

19. $x = 77°$ and $y = 26°$

20. These are similar triangles, so we can solve using proportions.

$$\begin{array}{rcl|rcl}
\frac{3}{2} & = & \frac{(3+4)}{x} & \frac{4}{2} & = & \frac{4+y}{\frac{14}{3}} \\
3x & = & 14 & & & \\
x & = & \frac{14}{3} & \frac{14}{3}(4) & = & 2(4+y) \\
& & & \frac{56}{3} & = & 8 + 2y \\
& & & 56 & = & 3(8+2y) \\
& & & 56 & = & 24 + 6y \\
& & & 32 & = & 6y \\
& & & \frac{16}{3} & = & y
\end{array}$$

Then, $x = \frac{14}{3}$ and $y = \frac{16}{3}$.

21. Set up the proportions.
$$\begin{array}{rcl}
\frac{6}{a} & = & \frac{12}{14} \\
6(14) & = & 12a \\
84 & = & 12a \\
7 & = & a
\end{array}$$
Thus, $t = 20$ and $a = 7$.

22. pentagon

23. octagon

24. heptagon

25. $6(5) = 30$ cm

26. $S = (6-2)\,180° = 720°$

27. 120°
$$\begin{array}{rcl}
360 & = & 152 + 9x + (5x + 1) + (x + 12) \\
& = & 15x + 165
\end{array}$$

28. $$\begin{array}{rcl}
195 & = & 15x \\
13 & = & x
\end{array}$$
$x + 12 = 25°$, $9x = 117°$, $5x + 1 = 66°$

29. $C = 2\pi(3) = 6\pi = 18.85$ cm

30. The patterns are repeated shapes that can be transformed in such a way as to fill the plane with no gaps or overlaps.

31. Starting with the triangle with the point labeled A, the triangle is translated point by point 3 units to the right and 3

units up to point A'. Then, the triangle labeled A' is translated 3 units to the right and 3 units up to point A''.

32. The triangle is rotated about the rotation point 180° to vertex B'.

33. The dark triangle is reflected about the vertical line showing the light back, and then reflected about the horizontal line. The pattern is repeated leaving a white diamond between the shapes.

34. 3.3.3.3.3.3

35. 7.5 cm^2

36. 25 ft

37. 168 cm^2

38. 64.5 cm^2

39. 201.1 in^2

40. 116.38 in^2

41. 706.86 in^2

42. 386.6 cm^2

43. 416 in^2

44. 640 in^3

45. 942.48 cm^2

46. $1,570$ cm^3

47. 511.35 in^2

48. $a = 2.5$
$b = 2.5\sqrt{3}$

49. $b = 10$
$c = 10\sqrt{2}$

50. $b = 6$

51. 24.2 ft

52. $c = 11.7$ cm

53. $x = 14.3$ m

Chapter 11

Your Turn

11.1
1. Yes, Joe Biden won the majority.

11.2
1. Tony Cambell won a plurality of votes in the Republican primary.

11.3
1. Hearn and Lim tied. Yes, there must be a third election.
2. Kelly must be removed in the runoff.

11.4
1. Option B.

11.5
1. $4 + 6 + 4 + 7 = 21$
2. None
3. 4

11.6
1. Using ranked-choice voting, Yoda is determined to be the winner.

11.7
1. Blue received 78 points.

11.8
1. Candidate B would be considered the winner using the ranked-choice voting method.
2. Candidate C would be considered the winner using the Borda count method.