CHAPTER 8

Solutions Key

Geometric Figures

ARE YOU READY? PAGE 439

1. proportion

2. ordered pair

3. percent

4. integer

5. $0.77 = 77\%$

6. $0.06 = 6\%$

7. $0.9 = 90\%$

8. $1.04 = 104\%$

9. $42\% = 0.42$

10. $80\% = 0.8$

11. $1\% = 0.01$

12. $131\% = 1.31$

13. 10% of 40
$0.10 \cdot 40 = 4$

14. 12% of 100
$0.12 \cdot 100 = 12$

15. 99% of 60
$0.99 \cdot 60 = 59.4$

16. 100% of 81
$1.00 \cdot 81 = 81$

17. 45% of 360
$0.45 \cdot 360 = 162$

18. 55% of 1,024
$0.55 \cdot 1{,}024 = 563.2$

19. $45 + n = 97$
$97 - 45 = n$
$n = 52$

20. $n - 18 = 100$
$100 + 18 = n$
$n = 118$

21. $n - 72 = 91$
$91 + 72 = n$
$n = 163$

22. $n + 23 = 55$
$55 - 23 = n$
$n = 32$

23. $5 \times t = 105$
$105 \div 5 = t$
$t = 21$

24. $b \div 13 = 8$
$13 \cdot b \div 13 = 8 \cdot 13$
$b = 104$

25. $k \times 18 = 90$
$90 \div 18 = k$
$k = 5$

26. $\frac{d}{7} = 8$
$8 \times 7 = d$
$d = 56$

27. point $A = (4, 7)$

28. point $B = (3, 3)$

29. point $C = (7, 2)$

30. point $D = (5, 1)$

31. point $E = (2, 5)$

32. point $F = (6, 4)$

8-1, PAGES 443-445

Think and Discuss

1. Possible answer: You can name a line using any 2 points on the line and name a plane using any of its 3 points that are not on the same line. A line segment can be named using only its 2 endpoints.

2. Possible answer: Because a line has only 1 dimension, you need 3 points not on the same line to show the 2 dimensions of a plane.

Exercises

1. Possible answer: *Q*, *R*, *S*

2. Choose any two points on a line to name the line.
Possible answer: $\overleftrightarrow{QS}$, $\overleftrightarrow{RT}$

3. Choose any three points on a plane to name the plane. Possible answer: plane *QRS*

4. Name the endpoint of a ray first.
Possible answer: $\overrightarrow{UQ}$, $\overrightarrow{UT}$, $\overrightarrow{US}$

5. Use the endpoints in any order to name a segment.
Possible answer: $\overline{QU}$, $\overline{RU}$, $\overline{SU}$

6. $\overline{BA}$ and $\overline{BC}$ *One tick mark*
$\overline{AE}$ and $\overline{CE}$ *Two tick marks*
$\overline{AD}$ and $\overline{CD}$ *Three tick marks*

7. *D*, *E*, *F*

8. Possible answer: $\overleftrightarrow{DE}$, $\overleftrightarrow{EF}$

9. Possible answer: plane *DEF*

10. Possible answer $\overrightarrow{DE}$, $\overrightarrow{FD}$, $\overrightarrow{EF}$

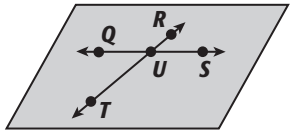
11. Possible answer: $\overline{DE}$, $\overline{EF}$, $\overline{DF}$

12. $\overline{AF}$ and $\overline{BC}$,
$\overline{AE}$ and $\overline{BD}$,
$\overline{AB}$ and $\overline{ED}$,
$\overline{FE}$ and $\overline{CD}$,

13. Plane *ABC* contains points *A*, *B*, and *C*; lines $\overleftrightarrow{AB}$, and $\overleftrightarrow{BC}$; line segments $\overline{AB}$, $\overline{AC}$, and $\overline{BC}$; and rays $\overrightarrow{AB}$, $\overrightarrow{BA}$, $\overrightarrow{BC}$, $\overrightarrow{CB}$, and $\overrightarrow{CA}$. Plane *ACD* contains points *A*, *C*, and *D*; line segments $\overline{AC}$, $\overline{AD}$, and $\overline{CD}$; and ray $\overrightarrow{CA}$.

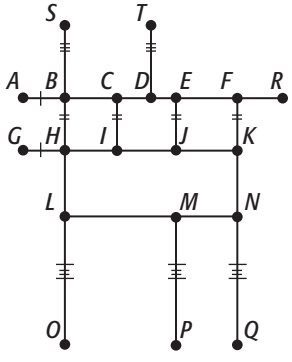
14. 6 line segments: $\overline{WX}$, $\overline{WY}$, $\overline{WZ}$, $\overline{XY}$, $\overline{XZ}$, and $\overline{YZ}$.

15.



Possible answer: plane *QRS*;
points *Q*, *R*, *S*, *T*, and *U*;
lines, $\overleftrightarrow{QS}$, $\overleftrightarrow{RT}$;
and rays $\overrightarrow{UQ}$, $\overrightarrow{UT}$, $\overrightarrow{US}$, $\overrightarrow{UR}$

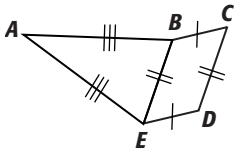
16. a-b.



$\overline{HK} \cong \overline{LN}$

b. Possible answer:
$\overline{AB} \cong \overline{GH}$, $\overline{CI} \cong \overline{EJ}$, $\overline{HK} \cong \overline{LN}$, $\overline{MP} \cong \overline{NQ}$

17. Possible answer:



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18. No; two endpoints cannot be shared by two different line segments. If two line segments share two endpoints, then the line segments are the same.

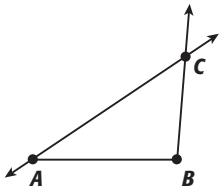


19. A line is a straight path that extends forever in two directions; a ray is a straight path that extends forever in one direction from an endpoint; and a segment is a straight path from one endpoint to another. It is possible to estimate the length of a segment, because it does not extend forever in any direction.

20. Yes; since a plane extends forever, it is possible that two faces could be on the same plane and still not touch.

21. C, II and IV; both sets of these segments are congruent.

22. Check students' work. Possible answer:



23. $-48 \div (-3) = 16$ **24.** $-2 \cdot (-6) = 12$

25. $-56 \div 8 = -7$ **26.** $5 \cdot (-13) = -65$

27. $\frac{\text{change in quantity}}{\text{original quantity}} \times 100\% = \text{percent of change}$

$$\frac{85 - 60}{85} \times 100\% = \frac{25}{85} \times 100\%$$
$$= 0.2941177 \times 100\%$$
$$= 29.4\%$$

28. $\frac{\text{change in quantity}}{\text{original quantity}} \times 100\% = \text{percent of change}$

$$\frac{120 - 35}{35} \times 100\% = \frac{85}{35} \times 100\%$$
$$= 2.4285714 \times 100\%$$
$$= 242.9\%$$

29. $\frac{\text{change in quantity}}{\text{original quantity}} \times 100\% = \text{percent of change}$

$$\frac{6 - 1}{6} \times 100\% = \frac{5}{6} \times 100\%$$
$$= 0.8333333 \times 100\%$$
$$= 83.3\%$$

HANDS-ON LAB 8-2, PAGES 446-447

Activity 1

Think and Discuss

1. Possible answer: Since $\angle AVC$ is a right angle, the sum of the measures of $\angle AVB$ and $\angle BVC$ is 90°. Therefore, the measure of $\angle BVC$ is 90° − m$\angle AVB$ or 90° − 50° = 40°.

Try This

1. 90° **2.** 25°

3. 90°

Activity 2

1–8. Check student's work.

Think and Discuss

1. Possible answer: For complementary angles A and B, m$\angle A$ = 90° − m$\angle B$. For supplementary angles A and B, m$\angle A$ = 180° − m$\angle B$.

Try This

1. complementary **2.** supplementary

3. neither **4.** supplementary

5. The pair of angles in Exercise 4 forms a straight line. The measure of a straight line is 180°, so the angle pairs are supplementary.

6. Complementary: $\angle 1, \angle 2$; $\angle 3, \angle 4$; $\angle 5, \angle 6$; $\angle 7, \angle 8$; $\angle 1, \angle 3$; $\angle 1, \angle 6$; $\angle 1, \angle 7$; $\angle 2, \angle 4$; $\angle 2, \angle 5$; $\angle 2, \angle 8$; $\angle 3, \angle 5$; $\angle 3, \angle 8$; $\angle 6, \angle 4$; $\angle 6, \angle 8$; $\angle 7, \angle 4$; $\angle 7, \angle 5$
Supplementary: $\angle 9, \angle 10$; $\angle 10, \angle 11$; $\angle 11, \angle 12$; $\angle 12, \angle 9$

8-2, PAGES 449-451

Think and Discuss

1. Possible answer: A right angle measures 90°. An acute angle is less than 90°. An obtuse angle is greater than 90°, and a straight angle measures 180°.

2. Possible answer: Since the sum of the measures of complementary angles is 90°, the missing measure can be found using the equation m$\angle P$ + 25° = 90°. Therefore, m$\angle P$ = 65°.

Exercises

1. right angle **2.** acute angle

3. straight angle

4. m$\angle AXB$ = 65° and m$\angle BXC$ = 20°
Since 65° + 20° = 85°, $\angle AXB$ and $\angle BXC$ are neither.

5. m$\angle BXC$ = 20° and m$\angle DXE$ = 70°
Since 20° + 70° = 90°, $\angle BXC$ and $\angle DXE$ are complementary.

6. m$\angle DXE$ = 70° and m$\angle AXD$ = 110°
Since 70° + 110° = 180°, $\angle DXE$ and $\angle AXD$ are supplementary.

7. m$\angle CXD$ = 25° and m$\angle AXB$ = 65°
Since 25° + 65° = 90°, $\angle CXD$ and $\angle AXB$ are complementary.

8. m$\angle L$ = 90 − 34 = 56°

9. m$\angle C$ = 180 − 119 = 61°

10. obtuse angle **11.** right angle

12. acute angle

13. m$\angle NZO$ = 45° and m$\angle MZN$ = 45°
Since 45° + 45° = 90°, $\angle NZO$ and $\angle MZN$ are complementary.

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14. $m\angle MZN = 45°$ and $m\angle OZP = 56°$
Since $45° + 56° = 101°$, $\angle MZN$ and $\angle OZP$ are neither.

15. $m\angle LZN = 79°$ and $m\angle NZP = 101°$
Since $79° + 101° = 180°$, $\angle LZN$ and $\angle NZP$ are supplementary.

16. $m\angle NZO = 45°$ and $m\angle LZM = 34°$
Since $45° + 34° = 79°$, $\angle NZO$ and $\angle LZM$ are neither.

17. $m\angle O = 180 - 85 = 95°$

18. $m\angle J = 90 - 22 = 68°$

19. supplementary
$x + 28° = 180°$
$x = 152°$

20. complementary
$x + 66° = 90°$
$x = 24°$

21. supplementary
$x + 134° = 180°$
$x = 46°$

22. The hands form a straight angle at 6:00.
The hands form a right angle at 3:00.
The hands form an obtuse angle at 5:00.

23. a. Lines of latitude and longitude cross to form right angles.
b. Washington, D.C., is about 39°N, 77°W.

24. A straight angle measures 180°, so the two angles must be supplementary. Two angles whose sum equals 180° are supplementary.

25. Two angles are supplementary when their sum equals 180°. Since obtuse angles measure greater than 90°, the sum of two obtuse angles is greater than 180°.

26. Find the $m\angle BAC$ in the figure.
$m\angle CAD + m\angle DAF = 180°$
$m\angle CAD + 160° = 180°$
$m\angle CAD = 20°$
$m\angle BAC + m\angle CAE = 180°$
$m\angle BAC + 115° = 180°$
$m\angle BAC = 65°$

27. C; $\angle FAE$ and $\angle EAD$ are complementary angles.
$m\angle FAE = 30°$, $m\angle EAD = 90°$
$30° + 90° = 120°$, so this pair of angles is not complementary.

28. G; 120°
$m\angle FAE = 30°$, $m\angle EAD = 90°$
So, $m\angle FAD = 30° + 90° = 120°$

29. Data set: 6, 3, 5, 6, 8
$6 + 3 + 5 + 6 + 8 = 28$
$28 \div 5 = 5.6$
The mean is 5.6.
Arrange the numbers in order: 3, 5, 6, 6, 8
The median is 6.
The number that appears the most is 6, so the mode is 6.
greatest value − least value $= 8 - 3 = 5$
The range is 5.

30. Data set: 14, 18, 10, 20, 23
$14 + 18 + 10 + 20 + 23 = 85$
$85 \div 5 = 17$
The mean is 17.
Arrange the numbers in order: 10, 14, 18, 20, 23
The median is 18.
There isn't a number that appears more than once, so there is no mode.
greatest value − least value $= 23 - 10 = 13$
The range is 13.

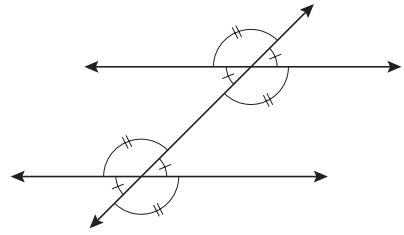
31. Data set: 41, 35, 29, 41, 58, 24
$41 + 35 + 29 + 41 + 58 + 24 = 228$
$228 \div 6 = 38$
The mean is 38.
Arrange the numbers in order: 24, 29, 35, 41, 41, 58
Determine the average of the two middle numbers.
$35 + 41 = 76$
$76 \div 2 = 38$
The median is 38.
The number that appears the most is 41, so the mode is 41.
greatest value − least value $= 58 - 24 = 34$
The range is 34.

32. The figure is a ray, named $\overrightarrow{JK}$.

8-3, PAGES 453-455

Think and Discuss

1. Possible answer:



2. Possible answer: parallel—railroad tracks, sides of a ladder; perpendicular—side and bottom edges of a desk drawer; skew—a telephone pole and the edge of the curb of sidewalk

Exercises

1. $\overleftrightarrow{JL}$ and $\overleftrightarrow{KM}$
The lines are in the same plane and do not intersect.
$\overleftrightarrow{JL} \parallel \overleftrightarrow{KM}$

2. $\overleftrightarrow{LM}$ and $\overleftrightarrow{KN}$
The lines are in different places and do not intersect.
$\overleftrightarrow{LM}$ and $\overleftrightarrow{KN}$ are skew.

3. $\overleftrightarrow{LM}$ and $\overleftrightarrow{KM}$
The lines appear to intersect to form right angles.
$\overleftrightarrow{LM} \perp \overleftrightarrow{KM}$

4. $\angle 5$ and the 115° angle are obtuse angles. Since all of the obtuse angles in the figure are congruent, $m\angle 5 = 115°$.

5. $\angle 2$ and the 115° angle are vertical angles. Since all of the vertical angles are congruent, $m\angle 2 = 115°$.

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6. $\angle 7$ is an acute angle.
In the figure, the acute and obtuse angles are supplementary.

$$\begin{aligned} m\angle 5 + m\angle 7 &= 180° \\ 115° + m\angle 7 &= 180° \\ -115 \qquad & \quad -115 \\ \hline m\angle 7 &= 65° \end{aligned}$$

7. $\overleftrightarrow{UX}$ and $\overleftrightarrow{YZ}$
The lines are in different places and do not intersect.
$\overleftrightarrow{UX}$ and $\overleftrightarrow{YZ}$ are skew.

8. $\overleftrightarrow{YZ}$ and $\overleftrightarrow{XY}$
The lines appear to intersect to form right angles.
$\overleftrightarrow{YZ} \perp \overleftrightarrow{XY}$

9. $\overleftrightarrow{UX}$ and $\overleftrightarrow{VW}$
The lines are in the same plane and do not intersect.
$\overleftrightarrow{UX} \parallel \overleftrightarrow{VW}$

10. $\angle 1$ and the 30° angle are acute angles. Since all of the acute angles in the figure are congruent, $m\angle 1 = 30°$.

11. $\angle 3$ is an obtuse angle.
In the figure, the acute and obtuse angles are supplementary.

$$\begin{aligned} m\angle 1 + m\angle 3 &= 180° \\ 30° + m\angle 3 &= 180° \\ -30 \qquad & \quad -30 \\ \hline m\angle 3 &= 150° \end{aligned}$$

12. $\angle 6$ is an obtuse angle.
In the figure, the acute and obtuse angles are supplementary.

$$\begin{aligned} 30° + m\angle 6 &= 180° \\ -30 \qquad & \quad -30 \\ \hline m\angle 6 &= 150° \end{aligned}$$

13. parallel

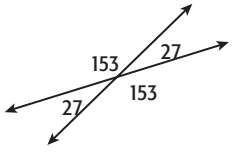
14. perpendicular

15. supplementary; adjacent

16. corresponding; congruent

17. The sum of the measures of two angles that are complementary is 90 degrees. If the angles are congruent, each one must measure 45 degrees.

18.



Since vertical angles are congruent, the angle opposite the given angle has the same measure as the given angle, 27°. The remaining angles are both adjacent to the angles that measure 27°. Since adjacent angles are supplementary, both remaining angles measure $180° - 27° = 153°$.

19. sometimes **20.** never

21. always **22.** never

23. **a.** $\overline{OR}$ and $\overline{RS}$ are perpendicular.
b. $\overline{PT}$ is a transversal.
c. $\angle 1$ and $\angle 2$ are corresponding angles.

24. If two intersecting lines form congruent, adjacent angles, the lines are perpendicular.

25. C; 10
Draw a Diagram or Make a Model

26. The nonadjacent sides of a pair of adjacent angles are formed by one of the two straight lines. A line is a straight angle, which, by definition, has a measure of 180°. Therefore, the measures of the adjacent angles must add up to the 180°; that is, they are supplementary.

27. Draw a transversal that intersects two or more lines in the parking lot, and measure a pair of angles that should be congruent, such as corresponding angles. If you can assume that your measurements are correct and the angles are congruent, then you can conclude that the lines in the parking lot are likely to be parallel.

28. D; 55°

$$\begin{aligned} 125° + m\angle 3 &= 180° \\ -125 \qquad & \quad -125 \\ \hline m\angle 3 &= 55° \end{aligned}$$

29. F; 125°
$\angle 2$ and the 125° are vertical angles, which makes them congruent. So, $m\angle 2 = 125°$. Since r and s are parallel, $\angle 2$ and $\angle 6$ become corresponding angles by the transversal line. Therefore, $\angle 2$ and $\angle 6$ are congruent, making $m\angle 6 = 125°$.

30. $3.583 - (-2.759) = 3.5.83 + 2.759 = 6.342$

31. $-9.43 + 7.68 = -1.75$

32. $-1.03 + (-0.081) = -1.111$

33. complementary

$$\begin{aligned} m\angle x + 59° &= 90° \\ m\angle x &= 31° \end{aligned}$$

34. supplementary

$$\begin{aligned} m\angle x + 148° &= 180° \\ m\angle x &= 32° \end{aligned}$$

35. complementary

$$\begin{aligned} m\angle x + 25° &= 90° \\ m\angle x &= 65° \end{aligned}$$

HANDS-ON LAB 8-3, PAGES 456-457

Activity

1. The lengths of $\overline{JK}$ and $\overline{KS}$ are the same, and they are both exactly half the length of $\overline{JS}$.

2. Angles *GHD* and *DHE* have the same measure, and they both have exactly half the measure of the angle *GHE*.

3. Angles *ABM* and *FCD* have the same measure.

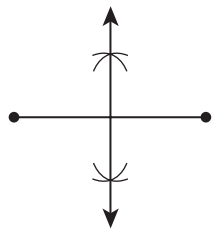
Think and Discuss

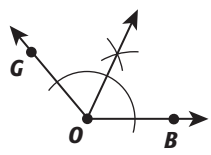
1. Bisect the angle and then bisect each of the angles formed. Therefore, 3 bisectors would divide an angle into four equal parts.

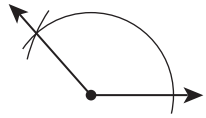
2. $88° \div 2 = 44°$
$44° \div 2 = 22°$
The measure of each of the smaller angles would be 22°.

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Try This

1. 

2. 

3. 

READY TO GO ON? PAGE 458

1. Possible answer: *A*, *B*, *C*
2. Choose any two points on a line to name the line. Possible answer: $\overleftrightarrow{AG}$, $\overleftrightarrow{CE}$, $\overleftrightarrow{BF}$
3. Choose any three points on a plane to name the plane. Possible answer: plane *BCD*
4. Use the endpoints in any order to name a segment. Possible answer: $\overline{BD}$, $\overline{BF}$, $\overline{DE}$
5. Name the endpoint of a ray first. Possible answer: $\overrightarrow{BD}$, $\overrightarrow{CE}$, $\overrightarrow{DE}$
6. $\overline{AB}$ and $\overline{ED}$, $\overline{BC}$ and $\overline{FE}$, $\overline{AF}$ and $\overline{CD}$, $\overline{BF}$ and $\overline{CE}$
7. right
8. obtuse
9. acute
10. straight
11. $\angle DXE$ and $\angle AXD$
    $m\angle DXE = 25°$ and $m\angle AXD = 155°$
    $25° + 155° = 180°$, so $\angle DXE$ and $\angle AXD$ are supplementary.
12. $\angle AXB$ and $\angle CXD$
    $m\angle AXB = 48°$ and $m\angle CXD = 42°$
    $48° + 42° = 90°$, so $\angle AXB$ and $\angle CXD$ are complementary.
13. $\angle DXE$ and $\angle AXB$
    $m\angle DXE = 25°$ and $m\angle AXB = 48°$
    $25° + 48° = 73°$, so $\angle DXE$ and $\angle$AXB are neither.
14. $\angle BXC$ and $\angle DXE$
    $m\angle BXC = 65°$ and $m\angle DXE = 25°$
    $65° + 25° = 90°$, so $\angle BXC$ and $\angle DXE$ are complementary.
15. $m\angle R + 17 = 90°$
    $m\angle R = 73°$
16. $m\angle F + 45 = 180°$
    $m\angle F = 135°$
17. The lines are in different planes and do not intersect. $\overleftrightarrow{KL}$ and $\overleftrightarrow{MN}$ are skew.
18. The lines are in the same plane and do not intersect. $\overleftrightarrow{JL}$ and $\overleftrightarrow{MN}$ are parallel.
19. The lines appear to intersect to form right angles. $\overleftrightarrow{KL}$ and $\overleftrightarrow{JL}$ are perpendicular.
20. The lines are in different planes and do not intersect. $\overleftrightarrow{IJ}$ and $\overleftrightarrow{MN}$ are skew.
21. $\angle 3$ and the 39° angle are vertical angles. Since vertical angles are congruent, $m\angle 3 = 39°$.
22. $\angle 4$ is an obtuse angle. In the figure, the acute and obtuse angles are supplementary.
    $m\angle 3 + m\angle 4 = 180°$
    $39° + m\angle 4 = 180°$
    $-39 \quad -39$
    $m\angle 4 = 141°$
23. $\angle 8$ and $\angle 4$ are obtuse angles. Since all of the obtuse angles in the figure are congruent, $m\angle 8 = 141°$.
24. $\angle 6$ and the 39° angle are acute angles. Since all of the acute angles in the figure are congruent, $m\angle 6 = 39°$.
25. $\angle 1$ and $\angle 4$ are vertical angles. Since vertical angles are congruent, $m\angle 1 = 141°$.
26. $\angle 5$ and $\angle 8$ are obtuse and vertical angles. Since all of the vertical, obtuse angles in the figure are congruent, $m\angle 5 = 141°$.

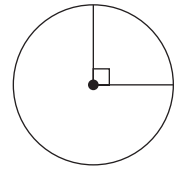
FOCUS ON PROBLEM SOLVING, PAGE 459

1. Possible answer: The angle of reflection + 40° + 90° = 180°. Therefore, the angle of reflection is 50°. The angle of incidence is also 50°, from the same equation. Therefore, the obtuse angle formed equals 100°.
2. Possible answer: Angles 2 and 4 are vertical and congruent. So, as the measure of angle 2 increases, so will the measure of angle 4. Since angles 1 and 3 are adjacent and supplementary to angles 2 and 4, their measures will decrease as angles 2 and 4 increase.
3. If the obtuse angles measure 134°, the acute angles are 180° − 134°, or 46°.
4. Possible answer: $m\angle 2 + 88° = 180°$ because they are supplementary angles.
    $m\angle 2 = 92°$
    Since angle 1 and angle 2 are corresponding angles, their angle measures are equal.
    $m\angle 2 = m\angle 1$
    $m\angle 1 = 92°$

8-4, PAGES 461-463

Think and Discuss

1. Possible answer: A diameter is a chord because both of its endpoints lie on the circle. A radius has only on endpoint on the circle.
2. Possible answer:



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Exercises

1. Radii
$\overline{OQ}$, $\overline{OR}$, $\overline{OS}$, $\overline{OT}$

2. Diameter
$\overline{RT}$

3. Chords
$\overline{RT}$, $\overline{RS}$, $\overline{ST}$, $\overline{TQ}$

4. 10% of 360°
$0.10 \cdot 360° = 36°$
The central angle of the sector measures 36°.

5. Radii
$\overline{CA}$, $\overline{CB}$, $\overline{CD}$, $\overline{CE}$, $\overline{CF}$

6. Diameters
$\overline{AE}$, $\overline{BF}$

7. Chords
$\overline{GB}$, $\overline{BF}$, $\overline{DE}$, $\overline{FE}$, $\overline{AE}$

8. 43.5% of 360°
$0.435 \cdot 360° = 156.6°$
The central angle of the sector measures 156.6°.

9. Add the radii of the circles.
$4 + 6 = 10$
The distance between the centers is 10 centimeters.

10. $360° \div 5 = 72°$
The measure of the central angle of each sector is 72°.

11. 37% of 360°
$0.37 \cdot 360° = 133.2°$
The central angle of the sector measures 133.2°.

12. 34% of 360°
$0.34 \cdot 360° = 122.4°$
The central angle of the sector measures 122.4°.

13. $\angle 1$ is 60°. All acute angles made by a transversal and two parallel lines are congruent.

14. Answers will vary.

15. Possible answer: A central angle is an angle formed by two radii. A sector is the region inside the circle formed by a central angle and an arc.

16. The clock is a circle divided into 12 equal parts.
$360° \div 12 = 30°$
Each five-minute section equals 30°. There are 4 five-minute sections between the hands.
$4 \cdot 30° = 120°$
The angle measure between the hands is 120°.

17. C; $\angle GIJ$ is a central angle of the circle. Points *I* and *J* are not connected by a line segment, so $\angle GIJ$ is not an angle.

18. If $\overline{HF}$ is perpendicular to diameter $\overline{GI}$, the angles formed by their intersection are 90°, making $\angle HFI$ 90°.

19. 28% of 150
Estimating: 30% of 150
$0.3 \cdot 150 = 45$

20. 21% of 90
Estimating: 20% of 90
$0.20 \cdot 90 = 18$

21. 2% of 55
Estimating: 2% of 50
$0.02 \cdot 50 = 1$

22. 53% of 72
Estimating: 50% of 70
$0.5 \cdot 70 = 35$

23. Letters *E*, *F*, *H*, *M*, *N*, and *Z* appear to have parallel lines.

24. Letters *E*, *F*, *H*, *L*, and *T* appear to have perpendicular lines.

HANDS-ON LAB 8-4, PAGES 464-465

Activity

Decimal column: 0.35, 0.25, 0.20, 0.15, 0.05

Fraction column: 7/20, 1/4, 1/5, 3/20, 1/20

Degrees column: 126°, 90°, 72°, 54°, 18°

Think and Discuss

1. 100%; 1; 1; 360°; All column totals are equivalent to one whole.

2. categories that represent all parts of a whole

3. The larger the sector, the larger the percent, decimal, and fraction.

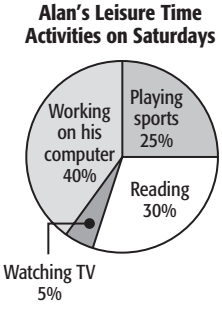
Try This

1. Reading: $30\% = 0.30 = \frac{30}{100} = \frac{3}{10}; \frac{3}{10} \cdot 360° = 108°$

Playing sports: $25\% = 0.25 = \frac{25}{100} = \frac{1}{4}; \frac{1}{4} \cdot 360° = 90°$

Working on computer: $40\% = 0.40 = \frac{40}{100} = \frac{2}{5}; \frac{2}{5} \cdot 360° = 144°$

Watching TV: $5\% = 0.05 = \frac{5}{100} = \frac{1}{20}; \frac{1}{20} \cdot 360° = 18°$



8-5, PAGES 467-469

Think and Discuss

1. Possible answer: Although a circle is a closed figure, it does not contain line segments, so it cannot be a polygon.

2. Possible answer: The figure is not closed; the figure has more than two dimensions; one of the line segments crosses another line segment.

Exercises

1. The figure is not a polygon. Not all of the sides of the figure are line segments.

2. The figure is a polygon. It is a closed figure with 7 sides.

3. The figure is not a polygon. It is not a closed figure.

4. 8 sides, 8 angles = octagon

5. 4 sides, 4 angles = quadrilateral

6. 9 sides, 9 angles = nonagon

7. The figure is a regular quadrilateral, or square.

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8. The figure is a quadrilateral (rectangle). It is not a regular polygon because all the sides are not congruent.

9. The figure is a triangle. It is not a regular polygon because all of the sides and all of the angles are not congruent.

10. The figure is not a polygon. There are line segments in the figure that cross.

11. The figure is not a polygon. Not all of the sides of the figure are line segments.

12. The figure is a polygon. It is a closed figure with 8 sides.

13. 5 sides, 5 angles = pentagon

14. 3 sides, 3 angles = triangle

15. 7 sides, 7 angles = heptagon

16. The figure is a regular octagon.

17. The figure is a pentagon. It is not a regular polygon because all of the sides and all of the angles are not congruent.

18. The figure is a hexagon. It is not a regular polygon because all of the sides are not congruent.

19. a. Possible answer: hexagons, pentagons, rhombuses, trapezoids, parallelograms
b. regular triangles and hexagons

20. The smaller shapes are quadrilaterals.

21. It has 16 sides and it is called a 16-gon.

22. Make sure that students draw and identify one of each type of polygon: triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, nonagon, and decagon.

23. A; It is a polygon.
The figure is a closed figure with 10 sides. Not all of its sides are equal.

24. Possible answer:



The figure is not a polygon because it is not formed by line segments.

25. 4, 7, 10, 13, …

n	Rule	*y*
1	$1 \cdot 3 + 1$	4
2	$2 \cdot 3 + 1$	7
3	$3 \cdot 3 + 1$	10
4	$4 \cdot 3 + 1$	13

The function $y = 3n + 1$ describes this sequence.

26. $-1, 1, 3, 5, \ldots$

n	Rule	*y*
1	$1 \cdot 2 - 3$	-1
2	$2 \cdot 2 - 3$	1
3	$3 \cdot 2 - 3$	3
4	$4 \cdot 2 - 3$	5

The function $y = 2n - 3$ describes this sequence.

27. 2.3, 3.3, 4.3, 5.3, …

n	Rule	*y*
1	$1 + 1.3$	2.3
2	$2 + 1.3$	3.3
3	$3 + 1.3$	4.3
4	$4 + 1.3$	5.3

The function $y = n + 1.3$ describes this sequence.

28. 8 is what percent of 15?

$\frac{n}{100} = \frac{8}{15}$
$15n = 800$
$n = 53.3$
8 is 53.3% of 15.

29. What is 35% of 58%?
$0.35 \cdot 58 = 20.3$
35% of 58 is 20.3.

30. 63 is 25% of what number?
$63 = 0.25 \cdot n$
$252 = n$
63 is 25% of 252.

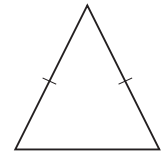
31. 22 is what percent of 85?

$\frac{n}{100} = \frac{22}{85}$
$85n = 2{,}200$
$n = 25.9$
22 is 25.9% of 85.

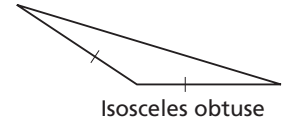
8-6, PAGES 471-473

Think and Discuss

1. Possible answer:

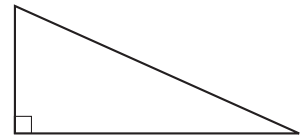


Isosceles acute



Isosceles obtuse

2. Possible answer:



Scalene right triangle

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3. Possible answer: Since at least two of the sides of an equilateral triangle are congruent, it is also isosceles. A triangle with exactly two congruent sides is an isosceles triangle, but it is not equilateral, because all of its sides are not congruent.

Exercises

1. two congruent sides, one right angle
This is an isosceles right triangle.

2. no congruent sides, one obtuse angle
This is a scalene obtuse triangle.

3. two congruent sides, three acute angles
This is an isosceles acute triangle.

4. The figure has 2 isosceles right, 1 isosceles acute, and 2 scalene obtuse triangles.

5. no congruent sides, one right angle
This is a scalene right triangle.

6. two congruent sides, one obtuse angle
This is an isosceles obtuse triangle.

7. three congruent sides, three acute angles
This is an equilateral acute triangle.

8. The figure has 1 isosceles right, 1 isosceles acute, and 2 scalene right triangles.

9. no congruent sides
This is a scalene triangle.

10. three congruent sides
This is an equilateral triangle.

11. two congruent sides
This is an isosceles triangle.

12. one obtuse angle
This is an obtuse triangle.

13. one right angle
This is a right triangle.

14. three acute angles
This is an acute triangle.

15. $25 - 9 - 8 = 8$
$\overline{AC}$ is 8 inches. The triangle is isosceles.

16. Each triangle has two congruent sides and one right angle. They are isosceles right triangles.

17. two congruent sides, three acute angles
This is an isosceles acute triangle.

18. no congruent sides, one obtuse angle
This is a scalene obtuse triangle.

19. no congruent sides, one right angle
This is a scalene right triangle.

20. Each face is a scalene triangle.

21. Each face of the pyramid is an isosceles triangle.

22. Eight triangles are created. Each triangle has two congruent sides and three acute angles, so the triangles are all isosceles acute triangles.

23. D; 13
Solve a Simpler Problem
Small triangles = 9
Medium triangles (made up of 4 small triangles) = 3
Large triangle (made up of all the small triangles) = 1
$9 + 3 + 1 = 13$

24. No; the angles in an equilateral triangle are all acute, and a triangle must have one obtuse angle to be classified as an obtuse triangle.

25. Using the fact that all the radii of a given circle are congruent, find the missing radii and thereby the missing side lengths.
$\triangle ABC$ is equilateral; $\triangle BCD$ is isosceles; $\triangle BDE$ is scalene.

26. B; 90°, 45°, 45°
The one 90° angle makes this a right triangle, not acute.

27. H; isosceles, obtuse triangle
Two congruent sides and one obtuse angle makes this an isosceles, obtuse triangle.

28. $\frac{3}{7}$, -0.4, 2.3, $1\frac{3}{10}$
Convert the measurements to decimals for easy comparison.

$\frac{3}{7} = 0.4285714$
$-0.4 = -0.4$
$2.3 = 2.3$
$1\frac{3}{10} = 1.3$

From least to greatest: -0.4, $\frac{3}{7}$, $1\frac{3}{10}$, 2.3

29. This figure is a heptagon. It is not regular because all the sides and all the angles are not congruent.

30. This figure is a quadrilateral. It is regular because all the sides and all the angles are congruent.

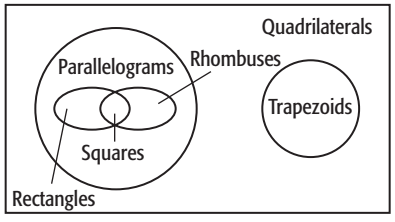
31. This figure is an octagon. It is not regular because all the sides and all the angles are not congruent.

8-7, PAGES 475-477

Think and Discuss

1. Possible answer: If the angles of a rhombus are right angles, then the rhombus is also a square. If the diagonals of a rhombus are congruent, then the rhombus is also a square.

2. Possible answer:



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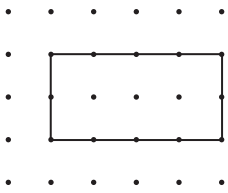
Exercises

1. The figure has two pairs of parallel sides, so it is a parallelogram. This figure is best described as a parallelogram.

2. The figure has two pairs of parallel sides, so it is a parallelogram. It has four right angles, so it is also a rectangle. This figure is best described as a rectangle.

3. The figure has two pairs of parallel sides, so it is a parallelogram. It has four congruent sides, so it is also a rhombus. This figure is best described as a rhombus.

4.



5. A parallelogram has two pairs of opposites that are parallel, but a trapezoid has exactly one pair of opposite sides that is parallel. It is not possible to draw the figure.

6. The figure has two pairs of parallel sides, so it is a parallelogram. It has four congruent sides, so it is also a rhombus. This figure is best described as a rhombus.

7. The figure has two pairs of parallel sides, so it is a parallelogram. This figure is best described as a parallelogram.

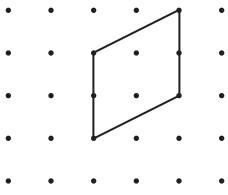
8. The figure has exactly one pair of parallel sides, so it is a trapezoid. This figure is best described as a trapezoid.

9. The figure has two pairs of parallel sides, so it is a parallelogram. It has four congruent sides, so it is also a rhombus. This figure is best described as a rhombus.

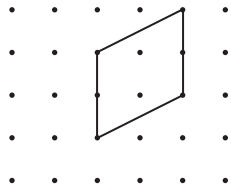
10. The figure has two pairs of parallel sides, so it is a parallelogram. It has four congruent sides, so it is also a rhombus. It has four right angles, so it is also a rectangle and a square. This figure is best described as a square.

11. The figure has two pairs of parallel sides, so it is a parallelogram. It has four right angles, so it is also a rectangle. This figure is best described as a rectangle.

12.



13.



14. A square and a rectangle both have four right angles.

15. A parallelogram, rectangle, rhombus, and square all have two pairs of opposite, parallel sides.

16. A rhombus and a square both have four congruent sides.

17. A parallelogram, rectangle, rhombus, and square all have opposite sides that are congruent.

18. Draw lines parallel to each side. Their intersection is the fourth vertex.

19. True; Squares have four congruent sides.

20. True; Opposite sides of a rectangle are parallel.

21. True; Squares have four right angles.

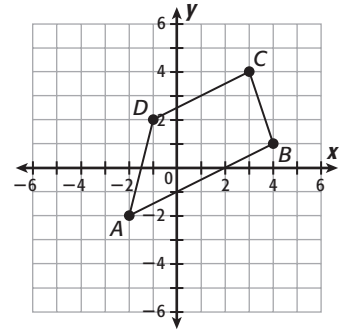
22. False; A rhombus may or may not have four right angles; if it does not, it is not a rectangle.

23. False; A square has two sets of parallel sides, but a trapezoid has only one set.

24. True; Rectangles with four congruent sides are squares.

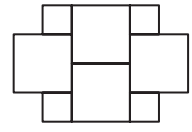
25. Black: 1 triangle; Yellow: 1 pentagon; Blue: 2 trapezoids

26. The quadrilateral is a trapezoid.



27. The following polygons could be made: parallelogram, rhombus, square, rectangle, trapezoid, right triangle.

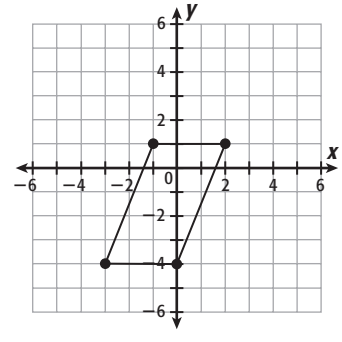
28. Answers will vary. Possible answer:



How many squares are in the design?

29. Some swimming pools are rectangles. A baseball diamond is a rhombus, but the angle at each base is 90°, so it is also a square.

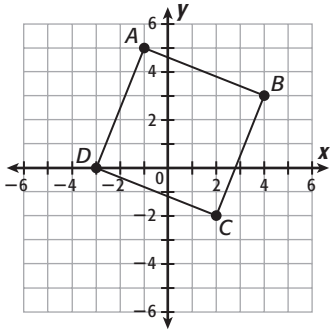
30. Possible answer:
The coordinates of the fourth vertex of the parallelogram are $(-3, -4)$.



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31. C; Some trapezoids are rectangles.
All rectangles have two pairs of congruent sides, while trapezoids only need one pair of congruent sides.

32. This figure is a parallelogram, rectangle, and square. It is best described as a square.



33.

Stems	Leaves
1	8
2	8
3	3, 4
4	0, 3, 4, 9
5	7, 7

34.

Snowfall in Colorado Spring		
Snowfall (in)	**Frequency**	**Comulative Frequency**
10-19	1	1
20-29	1	2
30-39	2	4
40-49	4	8
50-59	2	10

35. Two acute angles make this an acute triangle.

36. One right angle makes this a right triangle.

37. One obtuse angle makes this an obtuse triangle.

38. One obtuse angle makes this an obtuse triangle.

8-8, PAGES 479-481

Think and Discuss

1. Possible answer: Subtract the sum of the measures of the two angles from 180°.

2. Possible answer: The octagon has more triangles when the diagonals are drawn. Since there are more triangles, there are more degrees. The octagon has 1080°, while the pentagon has only 540°.

3. Possible answer: The size of each angle in a regular polygon increases as the number of the sides increase. For example, each angle of an equilateral triangle is 60°, and each angle of a square is 90°.

Exercises

1. $43° + 60° + x = 180°$
$103° + x = 180°$
$-103° \quad -103°$
$x = 77°$
The measure of the unknown angle is 77°.

2. $40° + 30° + x = 180°$
$70° + x = 180°$
$-70° \quad -70°$
$x = 110°$
The measure of the unknown angle is 110°.

3. $90° + 35° + x = 180°$
$125° + x = 180°$
$-125° \quad -125°$
$x = 55°$
The measure of the unknown angle is 55°.

4. $90° + 90° + 127° + x = 360°$
$307° + x = 360°$
$-307° \quad -307°$
$x = 53°$
The measure of the unknown angle is 53°.

5. $76° + 39° + 135° + x = 360°$
$250° + x = 360°$
$-250° \quad -250°$
$x = 110°$
The measure of the unknown angle is 110°.

6. $44° + 118° + 109° + x = 360°$
$271° + x = 360°$
$-271° \quad -271°$
$x = 89°$
The measure of the unknown angle is 89°.

7. There are 4 triangles.
$4 \cdot 180° = 720°$
The sum of the angle measures of a hexagon is 720°.

8. There are 3 triangles.
$3 \cdot 180° = 540°$
The sum of the angle measures of a pentagon is 540°.

9. There are 2 triangles.
$2 \cdot 180° = 360°$
The sum of the angle measures of a quadrilateral is 360°.

10. $60° + 60° + x = 180°$
$120° + x = 180°$
$-120° \quad -120°$
$x = 60°$
The measure of the unknown angle is 60°.

11. $78° + 65° + x = 180°$
$143° + x = 180°$
$-143° \quad -143°$
$x = 37°$
The measure of the unknown angle is 37°.

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12. $120° + 28° + x = 180°$
$148° + x = 180°$
$-148° \quad -148°$
$x = 32°$
The measure of the unknown angle is 32°.

13. $77° + 82° + 113° + x = 360°$
$272° + x = 360°$
$-272° \quad -272°$
$x = 88°$
The measure of the unknown angle is 88°.

14. $48° + 135° + 105° + x = 360°$
$288° + x = 360°$
$-288° \quad -288°$
$x = 72°$
The measure of the unknown angle is 72°.

15. $61° + 90° + 108° + x = 360°$
$259° + x = 360°$
$-259° \quad -259°$
$x = 101°$
The measure of the unknown angle is 101°.

16. There are 7 triangles.
$7 \cdot 180° = 1{,}260°$
The sum of the angle measures of a nonagon is 1,260°.

17. There are 6 triangles.
$6 \cdot 180° = 1{,}080°$
The sum of the angle measures of an octagon is 1,080°.

18. There are 2 triangles.
$2 \cdot 180° = 360°$
The sum of the angle measures of a quadrilateral is 360°.

19. $90° + 52° + x = 180°$
$142° + x = 180°$
$-142° \quad -142°$
$x = 38°$
The measure of the other acute angle is 38°.

20. $56° + 101° + x = 180°$
$157° + x = 180°$
$-157° \quad -157°$
$x = 23°$
The measure of the unknown angle is 23°. One obtuse angle makes this an obtuse triangle.

21. $18° + 63° + x = 180°$
$81° + x = 180°$
$-81° \quad -81°$
$x = 99°$
The measure of the unknown angle is 99°. One obtuse angle makes this an obtuse triangle.

22. $62° + 58° + x = 180°$
$120° + x = 180°$
$-120° \quad -120°$
$x = 60°$
The measure of the unknown angle is 60°. Three acute angles make this an acute triangle.

23. $41° + 49° + x = 180°$
$90° + x = 180°$
$-90° \quad -90°$
$x = 90°$
The measure of the unknown angle is 90°. One right angle makes this a right triangle.

24. There are 3 triangles.
$3 \cdot 180° = 540°$
The sum of the angle measures made by the pentagon's outer walls is 540°.

25. Since it is a right triangle, it has one 90° angle. Since it is isosceles, the two acute angles are congruent. They have a sum of 90°, so each measures 45°.

26. Possible answer: Six triangles can be drawn inside an octagon, not seven.

27. Divide the quadrilateral into two triangles, and then find the sum of the angles measures of each triangle.

28. $180° - 27° = 153°$
$x + 2x = 3x$
$3x = 153°$
$\frac{3x}{3} = \frac{153°}{3}$
$x = 51°$
$2x = 2(51°) = 102°$
The angles at the tugboat and cargo ship are 51° and 102°.

29. B; 60°
$180° \div 3 = 60°$

30. $58° + 42° + x = 180°$
$100° + x = 180°$
$-100° \quad -100°$
$x = 80°$
The measure of the unknown angle is 80°.

31. $\frac{x}{3} = \frac{30}{18}$
$18x = 90$
$x = 5$

32. $\frac{8}{p} = \frac{24}{27}$
$24p = 216$
$p = 9$

33. $\frac{4}{3} = \frac{t}{21}$
$3t = 84$
$t = 28$

34. $\frac{0.5}{1.8} = \frac{n}{9}$
$1.8n = 4.5$
$n = 2.5$

35. A parallelogram, rectangle, rhombus, and square all have two pairs of opposite, congruent sides.

36. A square and a rhombus both have four congruent sides.

READY TO GO ON? PAGE 482

1. Radii: $\overline{BC}$, $\overline{BD}$, $\overline{BA}$

2. Diameter: $\overline{CD}$

3. Chords: $\overline{CD}$, $\overline{EF}$

4. $360° \div 6 = 60°$
The measure of the central angle of each sector is 60°.

5. The figure is a regular polygon. It is a pentagon.

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6. The figure is an octagon. But it is not a regular octagon because all sides and all angles are not congruent.

7. The figure is a triangle. But it is not a regular triangle because all sides and all angles are not congruent.

8. The figure is a regular polygon. It is a hexagon.

9. two congruent sides, one right angle
This is an isosceles right triangle.

10. no congruent sides, one obtuse angle
This is a scalene obtuse triangle.

11. two congruent sides, one obtuse angle
This is an isosceles obtuse triangle.

12. no congruent sides, one right angle
This is a scalene right triangle.

13. The figure has exactly one pair of parallel sides, so it is a trapezoid. This figure is best described as a trapezoid.

14. The figure has two pairs of parallel sides, so it is a parallelogram. It has four congruent sides, so it is also a rhombus. It has four right angles, so it is also a rectangle and square. This figure is best described as a square.

15. The figure has two pairs of parallel sides, so it is a parallelogram. It has four congruent sides, so it is also a rhombus. This figure is best described as a rhombus.

16. The figure has two pairs of parallel sides, so it is a parallelogram. This figure is best described as a parallelogram.

17. $37° + 65° + x = 180°$
$102° + x = 180°$
$-102° \quad -102°$
$x = 78°$
The measure of the unknown angle is 78°.

18. $25° + 90° + x = 180°$
$115° + x = 180°$
$-115° \quad -115°$
$x = 65°$
The measure of the unknown angle is 65°.

19. $87° + 138° + 90° + x = 360°$
$315° + x = 360°$
$-315° \quad -315°$
$x = 45°$
The measure of the unknown angle is 45°.

20. $56° + 118° + 61° + x = 360°$
$235° + x = 360°$
$-235° \quad -235°$
$x = 125°$
The measure of the unknown angle is 125°.

FOCUS ON PROBLEM SOLVING, PAGE 483

1. Possible answer:
Mr. Papadimitriou: He, a man, Mr. P
calipers: scientific instrument
amphora: vase
$17.8 \div 2 = 8.9$
The radius is 8.9 centimeters at this point.

2. Possible answer:
gloxinia: tropical plant
hydrangeas: shrubs
$\frac{5}{4} = \frac{20}{w}$
$5w = 80$
$w = 16$
The width is 16 ft.

3. Possible answer:
Mr. Manityche: He, a man, Mr. M
catamaran: sailboat
Kaua'i to Ni'hau: K to N
nautical mile: 6,080 ft
knot: a speed of 1 nautical mile per hour
$12 \div 10 = 1.2$
The trip will take 1.2 hours.

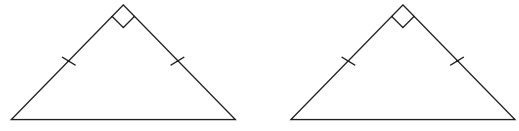
4. Possible answer:
lepidoptera: butterfly
The sum of the measures of the angles of each triangle is 180°.

5. Possible answer:
resistors: electric devices
Wheatstone: model
To be a square, the angles would have to be 90°.

8-9, PAGES 485-487

Think and Discuss

1. Possible answer: If the sides and angles of the isosceles triangle are congruent to the sides and angles of the right triangle, then, an isosceles triangle can be congruent to a right triangle.



2. Possible answer: The corresponding angle measures of congruent figures are always equal, which means the figures are similar.

Exercises

1. The triangles on the game board are congruent, and the holes on the game board are also congruent. The pairs of dragons and words "Chinese Checkers" may also be considered to be congruent.

2. The triangles in the kite's design are not congruent.

3. The bowling pins are congruent.

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4. $AC = 6$ mm $\quad DF = 6$ mm
$AB = 5$ mm $\quad DE = 5$ mm
$CB = 4$ mm $\quad FE = 4$ mm

By the Side-by-Side Rule, $\triangle ABC$ is congruent to $\triangle DEF$, or $\triangle ABC \cong \triangle DEF$. If you rotate it, it will fit exactly over the other.

5. The corresponding sides are not congruent; therefore, the triangles are not congruent.

6. The corresponding angles of congruent polygons are congruent. The missing angle measure is 90°.

7. The corresponding sides of congruent polygons are congruent. The missing side measure is 2.5.

8. The gears are not congruent.

9. The triangles in the kite's design are congruent.

10. The pink and blue triangles that make up the kite are congruent.

11. The corresponding sides are not congruent; therefore, the triangles are not congruent.

12. $JK = 5$ m $\quad AB = 5$ m
$KL = 13$ m $\quad BC = 13$ m
$JL = 12$ m $\quad AC = 12$ m

By the Side-by-Side Rule, $\triangle KJL$ is congruent to $\triangle BAC$, or $\triangle KJL \cong \triangle BAC$. If you rotate it, it will fit exactly over the other.

13. The corresponding angles of congruent polygons are congruent. The missing angle measure is 80°. The corresponding sides of congruent polygons are also congruent. The missing side measure is 8 cm.

14. The corresponding angles of congruent polygons are congruent. The missing angle measure is 90°. The corresponding sides of congruent polygons are also congruent. The missing side measure is 4 in.

15. the lengths of all of the sides

16. the length of one side in each square

17. the length of adjacent sides in each rectangle

18. the length of each side and the measure of each angle in each pentagon

19. The corresponding sides of congruent triangles are congruent. $\overline{AB} \cong \overline{DE}$ and $\overline{DE} = 40$ m. Therefore, $AB = 40$ m and the distance between the trees is 40 m.

20. The squares appear to be congruent and the triangles appear to be congruent.

21. C; They arrive at the same time.
Use Logical Reasoning
Anji's vertical distances, when combined, are equal to Art's vertical distance. Anji's horizontal distances, when combined, are equal to Art's horizontal distance. They are walking the same distance.

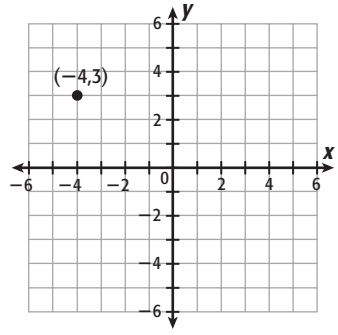
22. Compare the measures of the three sides. If the corresponding sides are congruent, the triangles are congruent.

23. No. The three angles in each triangle are congruent, but the sides in one triangle can be of different length than those in the other triangle.

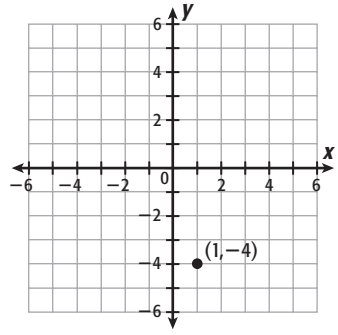
24. C; the lightning bolts
The lightning bolts are the same size and same shape.

25. G; 5 mm
The corresponding sides of congruent triangles are congruent. $\overline{AB} \cong \overline{DE}$ and $\overline{DE} = 5$ mm. Therefore, $AB = 5$ mm.

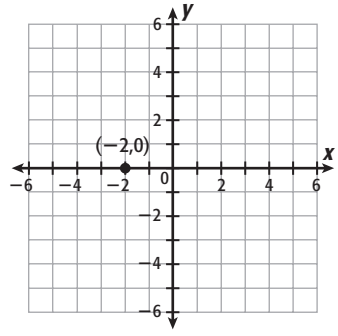
26.



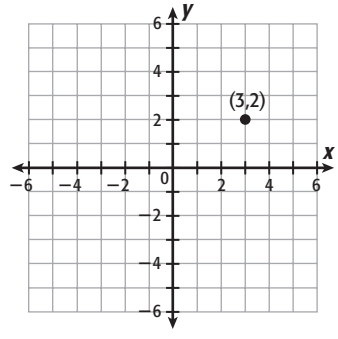
27.



28.



29.



30. $25° + 48° + x = 180°$
$73° + x = 180°$
$-73° \quad -73°$
$x = 107°$

The measure of the unknown angle is 107°. One obtuse angle makes this an obtuse triangle.

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31. $125° + 30° + x = 180°$
$155° + x = 180°$
$-155° \quad -155°$
$x = 25°$
The measure of the unknown angle is 25°. One obtuse angle makes this an obtuse triangle.

32. $60° + 60° + x = 180°$
$120° + x = 180°$
$-120° \quad -120°$
$x = 60°$
The measure of the unknown angle is 60°. Three acute angles make this an acute triangle.

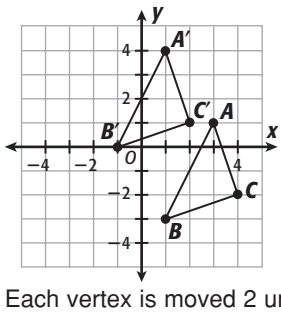
33. $72° + 18° + x = 180°$
$90° + x = 180°$
$-90° \quad -90°$
$x = 90°$
The measure of the unknown angle is 90°. One right angle makes this a right triangle.

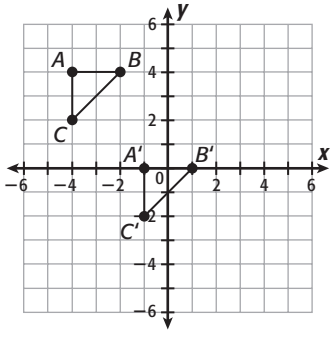
8-10, PAGES 489-492

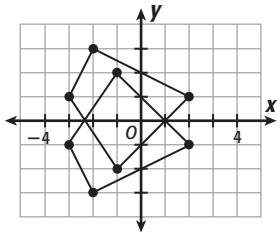
Think and Discuss

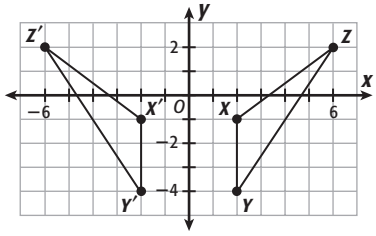
1. Possible answer: Sliding a desk without turning it from one row to another would be a translation.
2. Possible answer: If a skater outlines on the ice the shape of a lowercase *d*, he would be able to perform a translation and a rotation at the same time.

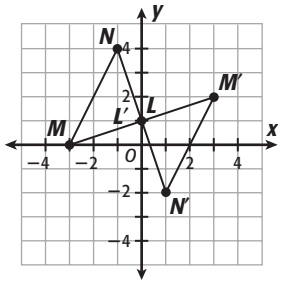
Exercises

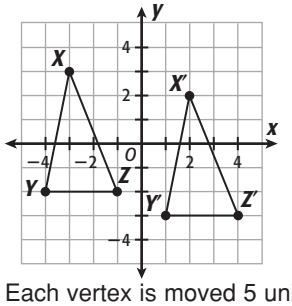
1. rotation
2. translation
3. 

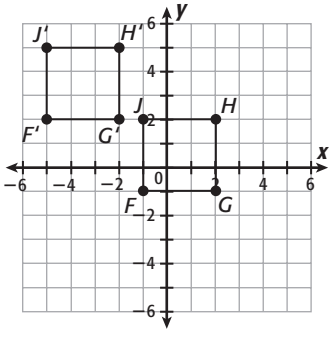
Each vertex is moved 2 units left and 3 units up.
4. 

Each vertex is moved 3 units to the right and 4 units down.
5. 

6. 

7. 

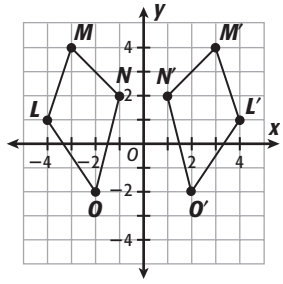
Notice that vertex *N* is 1 unit to the right and 4 units above vertex *M*, and vertex *N′* is 1 unit to the left and 4 units below vertex *M′*.
8. reflection
9. translation
10. 

Each vertex is moved 5 units to the right and 1 unit down.
11. 

Each vertex is moved 4 units left and 3 units up.

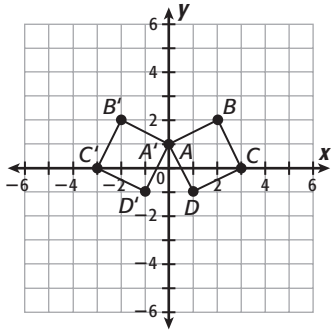
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12.



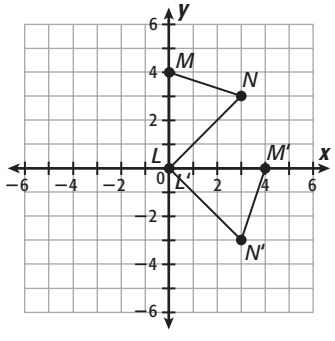
The *y*-coordinates of the corresponding vertices are the same, and the *x*-coordinates of the corresponding vertices are opposites.

13.



The *x*-coordinates of the corresponding vertices are the same, and the *y*-coordinates of the corresponding vertices are opposites.

14.

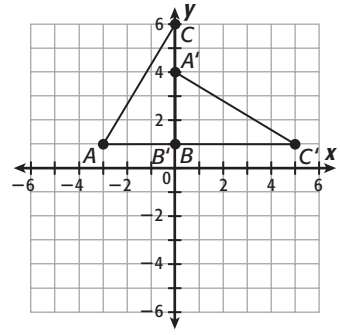


15. Possible answer: The two people are the same size and shape, but they are holding different objects, and their skirts are slightly different.

16. Possible answer: The stick figures are a reflection of each other, but they are also a 180° rotation of each other. One is also a translated image of the other.

17. A; (0, 1)
Point *X* is originally located at (−3, 3). Moving it 2 units down and 3 units to the right will put it at (0, 1).

18.



19. The median of the data is 38.

20. The range of the data is 49 − 33 = 16.

21. The corresponding sides of congruent triangles are congruent. $\overline{AC} \cong \overline{FD}$ and $AE = 3$ m. Therefore, $FD = 3$ m.

22. The corresponding sides of congruent triangles are congruent. $\overline{MO} \cong \overline{PR}$ and $MO = 7$ in. Therefore, $PR = 7$ in.

TECHNOLOGY LAB 8-10, PAGE 493

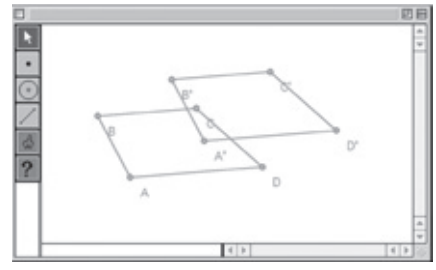
Think and Discuss

1. Possible answer: No; no matter which direction the triangle is translated, the vertices of the triangle will always have the same orientation.

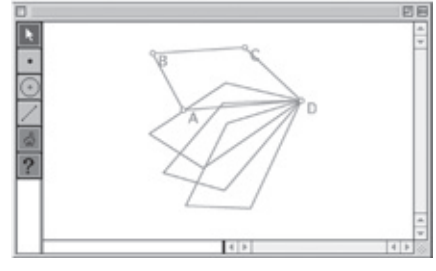
2. Possible answer: The figure will have the same orientation as the original figure after a 360° rotation.

Try This

1. a.



b.

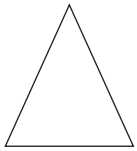


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8-11, PAGES 495-497

Think and Discuss

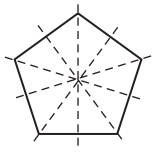
1. Possible answer:



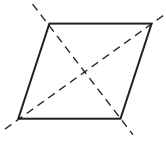
2. Possible answer: Yes, an equilateral triangle has rotational symmetry. It shows rotational symmetry three times within a 360° rotation.

Exercises

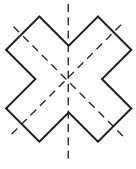
1.



2.



3.



4.



There is 1 line of symmetry.

5. There are no lines of symmetry.

6.



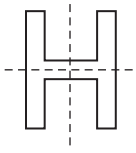
There is 1 line of symmetry.

7. Draw lines from the center of the figure out through identical places in the figure. Count the number of lines drawn. The hexagon will show rotational symmetry 6 times within a 360° rotation.

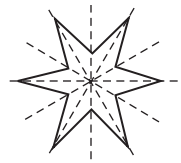
8. Draw lines from the center of the figure out through identical places in the figure. Count the number of lines drawn. The figure will show rotational symmetry 2 times within a 360° rotation.

9. Draw lines from the center of the figure out through identical places in the figure. Count the number of lines drawn. The hexagon will show rotational symmetry 3 times within a 360° rotation.

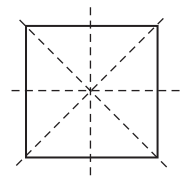
10.



11.



12.



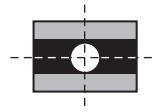
13. There are no lines of symmetry.

14.



There is 1 line of symmetry.

15.



There are 2 lines of symmetry.

16. Draw lines from the center of the figure out through identical places in the figure. Count the number of lines drawn. The figure will show rotational symmetry 3 times within a 360° rotation.

17. Draw lines from the center of the figure out through identical places in the figure. Count the number of lines drawn. The octagon will show rotational symmetry 8 times within a 360° rotation.

18. Draw lines from the center of the figure out through identical places in the figure. Count the number of lines drawn. The hexagon will show rotational symmetry 4 times within a 360° rotation.

19. A regular nonagon will show rotational symmetry 9 times within one full rotation because 9 lines from the center can be drawn to each vertex.

20. The image of the moth has 1 line of symmetry down the middle.

21. The design has vertical symmetry, because the design was cut along a vertical line. The design shows rotational symmetry, because the same design was cut into both halves.

22. It will show rotational symmetry 4 times because the design, ignoring color, looks the same on each side. It will show rotational symmetry because the little shapes come in more than one color and there is no color pattern.

23. Possible answer: What is the smallest angle of rotational symmetry for the square?

24. In order to have rotational symmetry, a figure must match itself at least once before rotating completely around; otherwise, all figures would have rotational symmetry.

25. Possible answers: *BED* and *MOM*

26. D; 4
The figure will show rotational symmetry 4 times within a 360° rotation.

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27. Draw lines from the center of the figure out through identical places in the figure. Count the number of lines drawn. The figure will show rotational symmetry 8 times within a 360° rotation.

28. $\frac{2 \text{ cm}}{30 \text{ m}} = \frac{22 \text{ cm}}{x}$

$2x = 660$

$x = 330$

The length of the actual bridge is 330 m.

29. When triangle *JKL* is translated 4 units to the right and 2 units down, the vertices become $J'(1, -3)$, $K'(3, -3)$, and $L'(3, -6)$.

30. When triangle *JKL* is reflected across the *y*-axis, the vertices become $J'(3, -1)$, $K'(1, -1)$, and $L'(1, -4)$.

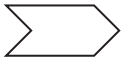
HANDS-ON LAB 8-11, PAGES 498-499

Think and Discuss

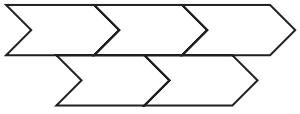
1. Possible answer: Translation tessellations use translated images to create a pattern, and rotation tessellations use rotated images to create a pattern.

Try This:

1. Possible answer:



2. Possible answer:



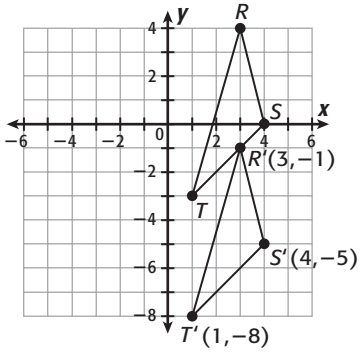
READY TO GO ON? PAGE 500

1. Each of the corresponding sides of these two triangles is congruent, so the triangles are congruent.

2. The corresponding sides of these two triangles are not congruent, so the triangles are not congruent.

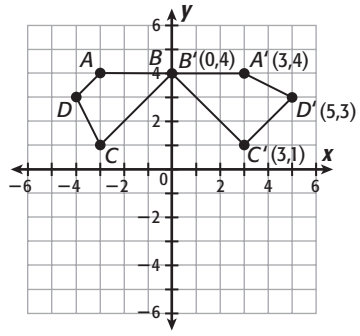
3. The corresponding sides of congruent triangles are congruent. $\overline{YZ} \cong \overline{CD}$ and $YZ = 20$ m. Therefore, $CD = 20$ m.

4.



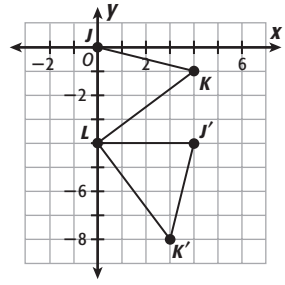
Translated 5 units down, the vertices become $R'(3, -1)$, $S'(4, -5)$, and $T'(1, -8)$.

5.



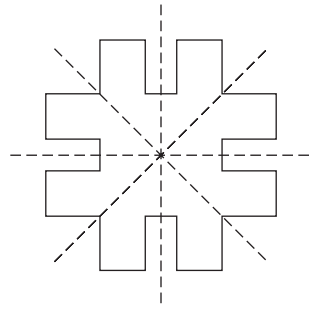
Reflected across the *x*-axis, the vertices become $A'(3, 4)$, $B'(0, 4)$, $C'(3, 1)$, and $D'(5, 3)$.

6.



Rotated 90° clockwise about vertex *K*, the vertices become $K'(4, -1)$, $J'(5, 3)$, and $L'(1, 3)$.

7.



This figure has 4 lines of symmetry.

8. The figure will show rotational symmetry 3 times within a 360° rotation.

MULTI-STEP TEST PREP, PAGE 501

1. A trapezoid has exactly one pair of parallel sides, so $\overline{AB}$ and $\overline{DC}$ are parallel.

2. The sum of the measures of the angles in triangle *ADF* is 180°. Add the measures of $\angle ADF$ and $\angle DFA$ and subtract from 180°.

$81° + 66° = 147°$

$180° - 147° = 33°$

The measure of $\angle CAD$ is 33°.

3. Since $\overline{DC} \cong \overline{BC}$ and $\overline{BC} = 20$ ft, $\overline{DC} = 20$ ft. Since triangle *DEC* is an equilateral triangle, all three sides will be of equal length. Therefore, $\overline{ED}$ is also 20 ft.

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4. Starting at A, the course is: A to B, B to C, C to A, A to D, D to C, C to E, E to D, D to B, end at B. Given that $\overline{AB} = 36$ ft, $\overline{AC}$ and $\overline{DB}$ are 33 ft, $\overline{BC} \cong \overline{AD} \cong \overline{DC} \cong \overline{CE} \cong \overline{ED}$ and all of those segments are 20 ft, add all of the lengths together to find the total length of the course.
$36 + 20 + 33 + 20 + 20 + 20 + 20 + 33 = 202$
The total length of the course is 202 ft.

5. $202 \text{ ft} \cdot \frac{1 \text{ s}}{10 \text{ ft}} = 20.2 \text{ s}$
It will take approximately 20 seconds to complete the course.

STUDY GUIDE: REVIEW, PAGES 506-508

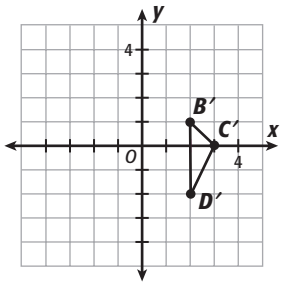
1. acute or isosceles
2. parallel lines
3. chord
4. D, E, F
5. $\overleftrightarrow{DF}$
6. plane DEF
7. $\overrightarrow{ED}$, $\overrightarrow{FD}$, $\overrightarrow{DF}$
8. $\overline{DE}$, $\overline{DF}$, $\overline{EF}$
9. acute
10. straight
11. skew
12. parallel
13. $\overline{HF}$, $\overline{FI}$, $\overline{FG}$
14. $\overline{GI}$
15. $\overline{HI}$, $\overline{GI}$, $\overline{GJ}$, $\overline{JI}$
16. Square; All sides are congruent and all angles are congruent.
17. No; All sides are not congruent.
18. equilateral acute triangle
19. scalene right triangle
20. parallelogram, rhombus
21. parallelogram, rectangle

22.
$$\begin{aligned} 93° + 34° + x &= 180° \\ 127° + x &= 180° \\ -127 \qquad & \quad -127 \\ x &= 53° \end{aligned}$$

23.
$$\begin{aligned} 90° + 103° + 66° + x &= 360° \\ 259° + x &= 360° \\ -259 \qquad & \quad -259 \\ x &= 101° \end{aligned}$$

24. The polygons are congruent, so their angles are congruent. The missing measurement is 133°.

25.



26. There is one vertical line of symmetry through the center of the flag.

CHAPTER TEST, PAGE 509

1. Possible answers: A, B, C, D, E
2. Possible answer: $\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, $\overleftrightarrow{CB}$
3. Possible answer: plane ABC
4. Possible answer: $\overline{AB}$, $\overline{CD}$, $\overline{EC}$, $\overline{EB}$, $\overline{CB}$
5. Possible answer: $\overrightarrow{AB}$, $\overrightarrow{BA}$, $\overrightarrow{BC}$, $\overrightarrow{CB}$, $\overrightarrow{CD}$, $\overrightarrow{DC}$
6. $\angle ABC$ and the 42° angle are acute angles. Since all of the acute angles in the figure are congruent, $m\angle ABC = 42°$.
7. $m\angle BCE = 180°$ because it is a straight angle.
8. $\angle DCE$ is an obtuse angle. In the figure, the acute and obtuse angles are supplementary.
$$\begin{aligned} 42° + m\angle DCE &= 180° \\ -42° \qquad & \quad -42° \\ m\angle DCE &= 138° \end{aligned}$$
9. The lines are in the same plane and do not intersect. $\overleftrightarrow{MN}$ and $\overleftrightarrow{PO}$ are parallel.
10. The lines are in different planes and do not intersect. $\overleftrightarrow{LM}$ and $\overleftrightarrow{PO}$ are skew.
11. The lines appear to intersect to form right angles. $\overleftrightarrow{NO}$ and $\overleftrightarrow{MN}$ are perpendicular.
12. Radii: $\overline{AE}$, $\overline{EC}$, $\overline{BE}$
13. Chords: $\overline{AD}$, $\overline{AC}$
14. Diameter: $\overline{AC}$
15. No; all the interior angles are not congruent.
16. No; one side is curved.
17. Yes. All sides are congruent and all angles are congruent.
18. Two congruent sides and three acute angles make this an isosceles acute triangle.
19. Three congruent sides and three acute angles make this an equilateral acute triangle.
20. No congruent sides and one right angle make this a scalene right triangle.
21. The figure has two pairs of parallel sides, so it is a parallelogram.
22. The figure has two pairs of parallel sides, so it is a parallelogram. It has four congruent sides, so it is also a rhombus. It has four right angles, so it is also a rectangle and square.
23. The figure has exactly one pair of parallel sides, so it is a trapezoid.

24.
$$\begin{aligned} 15° + 75° + x &= 180° \\ 90° + x &= 180° \\ -90° \qquad & \quad -90° \\ x &= 90° \end{aligned}$$
The measure of the unknown angle is 90°.

25.
$$\begin{aligned} 106° + 45° + x &= 180° \\ 151° + x &= 180° \\ -151° \qquad & \quad -151° \\ x &= 29° \end{aligned}$$
The measure of the unknown angle is 29°.

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26. $35° + 35° + x = 180°$

$70° + x = 180°$

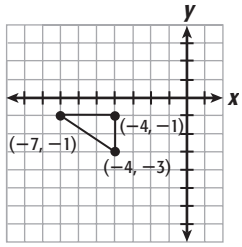
$-70° \quad -70°$

$x = 110°$

The measure of the unknown angle is 110°.

27. The corresponding sides of congruent polygons are congruent. The missing measure is 6 in.

28.



29. There is 1 vertical line through the center of the flag.

30. There are no lines of symmetry.

PROBLEM SOLVING ON LOCATION, PAGES 512-513

See Appendix.

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CHAPTER 8, PAGES 512-513

The Little League World Series

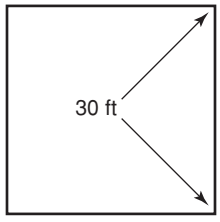
1. *Use logical reasoning* is a possible strategy to solve this problem.
   Find the possible number of matchups by using the fundamental counting principle.
   Number of U.S. teams · Number of other country teams = possible matchups
   $8 \cdot 8 = 64$
   There are 64 different possible matchups.

2. *Work backward* is a possible strategy to solve this problem.
   First, find how many wins are 5% of the championships from 1985 to 2004.
   5% of 20 is 1, so Mexico, Curacao, and South Korea won 5% of the championships from 1985 to 2004. Because Mexico won the championship in 1997, they are not the team that won in 1994. Curacao or South Korea is one of the teams that won in 1994. Since the team that won is NOT from Asia, Curacao has to be the team that won in 1994.

Longwood Gardens

1. *Use logical reasoning* is a possible strategy to solve this problem.
   Let s represent the number of large pools and 2s represent the number of small pools.
   $2s + s = 18$
   $3s = 18$
   $\frac{3s}{3} = \frac{18}{3}$
   $s = 6$
   There are 6 large pools and 12 small pools.

2. *Draw a diagram* is a possible strategy to solve this problem.
   Because the fountain is square, find how many tulip bulbs are on one 30-foot side. Multiplying that value by 4 will give the total amount of bulbs.
   $\frac{12 \text{ inches}}{1 \text{ foot}} \cdot 30 \text{ feet} = 360 \text{ inches}$



   $360 \div 6 = 60$
   There are 60 tulip bulbs on one side, so the gardener needs to plant 240 tulip bulbs.

3. *Make a table* is a possible strategy to solve this problem.

Type of Plant	varieties	divided by 7	cards needed
Topiary plants	50	7.14	8
Banana plants	20	2.85	3
Bonsai trees	40	5.71	6
Water lilies	100	14.28	15
Lilacs	70	10	10
totals	280		42

   42 cards will need to be printed.

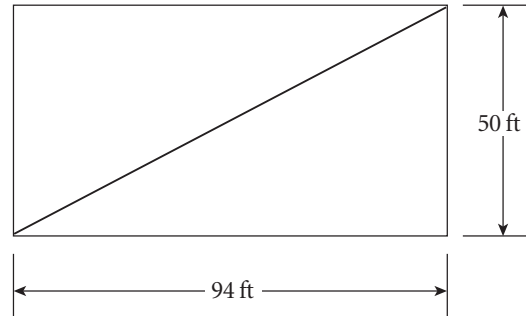
CHAPTER 10, PAGES 622-623

The Meadowlands Sports Complex

1. *Use logical reasoning* is a possible strategy to solve this problem.
   First, find the dimensions of the stadium video screen using an area formula.
   Let x represent the length of the stadium video screen and solve for x.
   Area of a rectangle = ℓw or bh or ℓh
   length · height = 1,392 ft^2
   $x \cdot 24 = 1{,}392$
   $\frac{24x}{24} = \frac{1{,}392}{24}$
   $x = 58$
   The length of the stadium video screen is 58 feet.
   Next, find the length of the arena video screen.
   Because the length of the arena's screen is 36 feet less than the length of the stadium's screen, subtract 36 from 58.
   $58 - 36 = 22$
   The length of the arena's screen is 22 feet.

2. *Act it out* is a possible strategy to solve this problem.
   The area of the football field is 360 · 160, or 57,600 ft^2.
   The area of the tarp is 60 · 40, or 2,400 ft^2.
   Dividing the area of the football field by the area of the tarp will result in the number of sheets needed to cover the field without overlap.
   $57{,}600 \div 2{,}400 = 24$
   24 sheets are needed to cover the football field without overlap.

3. *Make a model* is a possible strategy to solve this problem.



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