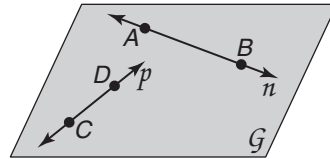## 1-1 Skills Practice

### *Points, Lines, and Planes*

Refer to the figure.

1. Name a line that contains point D.

2. Name a point contained in line n.

3. What is another name for line p?

4. Name the plane containing lines n and p.

Draw and label a figure for each relationship.

5. Point K lies on $\overleftrightarrow{RT}$.

6. Plane $\mathcal{J}$ contains line s.

7. $\overrightarrow{YP}$ lies in plane $\mathcal{B}$ and contains point C, but does not contain point H.

8. Lines q and f intersect at point Z in plane $\mathcal{U}$.
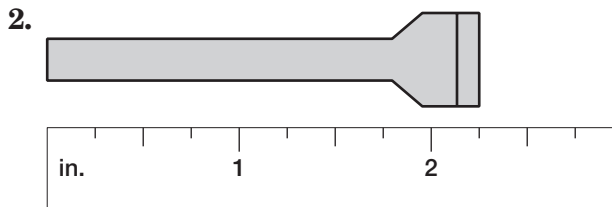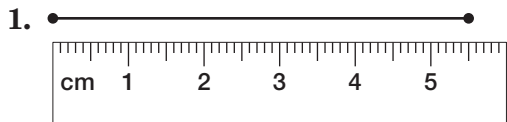
Refer to the figure.
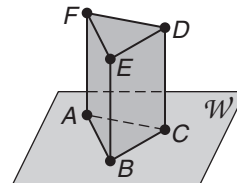
9. How many planes are shown in the figure?

10. How many of the planes contain points F and E?

11. Name four points that are coplanar.

12. Are points A, B, and C coplanar? Explain.

1-2 Skills Practice

Linear Measure and Precision

Find the length of each line segment or object.

1.

2.

Find the precision for each measurement.

3. 40 feet

4. 12 centimeters

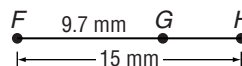**5.** $9\frac{1}{2}$ inches

Find the measurement of each segment.

6. $\overline{NQ}$

1 in. $1\frac{1}{4}$ in.

Q   P   N

7. $\overline{AC}$

4.9 cm   5.2 cm

A   B   C

8. $\overline{GH}$

F   9.7 mm   G   H

15 mm
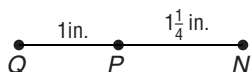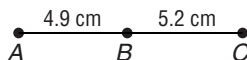
Find the value of the variable and YZ if Y is between X and Z.

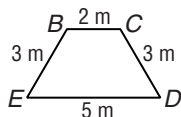**9.** $XY = 5p$, $YZ = p$, and $XY = 25$

10. $XY = 12$, $YZ = 2g$, and $XZ = 28$

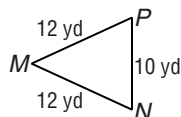**11.** $XY = 4m$, $YZ = 3m$, and $XZ = 42$

12. $XY = 2c + 1$, $YZ = 6c$, and $XZ = 81$

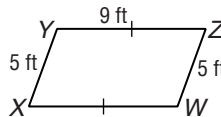**Use the figures to determine whether each pair of segments is congruent.**

13. $\overline{BE}$, $\overline{CD}$

B   2 m   C
3 m   3 m
E   5 m   D

14. $\overline{MP}$, $\overline{NP}$

12 yd   P
M   10 yd
12 yd   N

15. $\overline{WX}$, $\overline{WZ}$

Y   9 ft   Z
5 ft   5 ft
X   W

1-3 Skills Practice

Distance and Midpoints

Use the number line to find each measure.

1. LN

2. JL

3. KN

4. MN
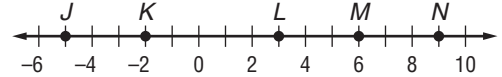
Use the Pythagorean Theorem to find the distance between each pair of points.
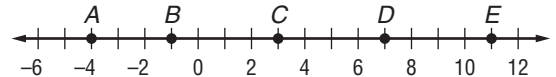
5.

6.
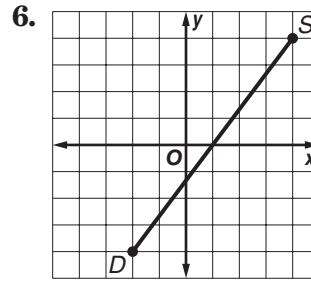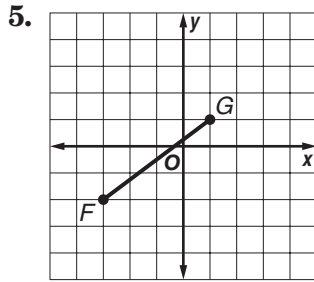
7. $K(2, 3), F(4, 4)$

8. $C(-3, -1), Q(-2, 3)$

Use the Distance Formula to find the distance between each pair of points.

9. $Y(2, 0), P(2, 6)$

10. $W(-2, 2), R(5, 2)$

11. $A(-7, -3), B(5, 2)$

12. $C(-3, 1), Q(2, 6)$

Use the number line to find the coordinate of the midpoint of each segment.

13. $\overline{DE}$

14. $\overline{BC}$

15. $\overline{BD}$

16. $\overline{AD}$

Find the coordinates of the midpoint of a segment having the given endpoints.

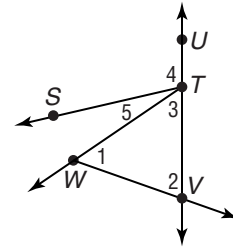**17.** $T(3, 1), U(5, 3)$

18. $J(-4, 2), F(5, -2)$

Find the coordinates of the missing endpoint given that P is the midpoint of $\overline{NQ}$.

19. $N(2, 0), P(5, 2)$

20. $N(5, 4), P(6, 3)$

21. $Q(3, 9), P(-1, 5)$

Lesson 1-3

1-4 **Skills Practice**

Angle Measure

For Exercises 1–12, use the figure at the right.

Name the vertex of each angle.

1. ∠4

2. ∠1

3. ∠2

4. ∠5

Name the sides of each angle.

5. ∠4

6. ∠5

7. ∠STV

8. ∠1

Write another name for each angle.

9. ∠3

10. ∠4

11. ∠WTS

12. ∠2

Measure each angle and classify it as *right*, *acute*, or *obtuse*.

13. ∠NMP

14. ∠OMN

15. ∠QMN

16. ∠QMO
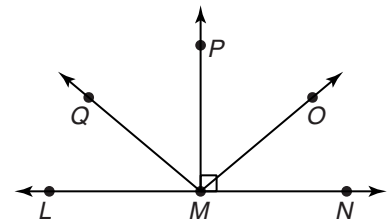
ALGEBRA In the figure, $\overrightarrow{BA}$ and $\overrightarrow{BC}$ are opposite rays, $\overrightarrow{BD}$ bisects ∠EBC, and $\overrightarrow{BF}$ bisects ∠ABE.
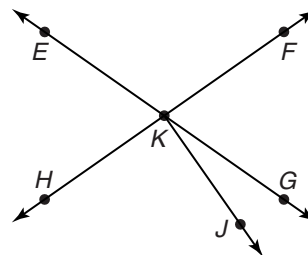
17. If $m\angle EBD = 4x + 16$ and $m\angle DBC = 6x + 4$, find $m\angle EBD$.

18. If $m\angle ABF = 7x - 8$ and $m\angle EBF = 5x + 10$, find $m\angle EBF$.

Lesson 1-4
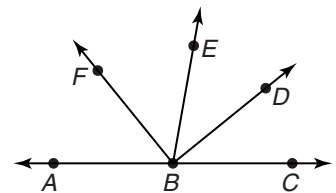
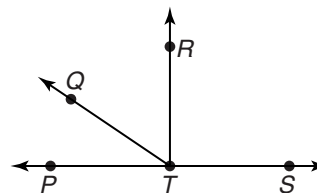## 1-5 Skills Practice

Angle Relationships

For Exercises 1–6, use the figure at the right and a protractor.

1. Name two acute vertical angles.

2. Name two obtuse vertical angles.

3. Name a linear pair.

4. Name two acute adjacent angles.

5. Name an angle complementary to ∠EKH.

6. Name an angle supplementary to ∠FKG.

7. Find the measures of an angle and its complement if one angle measures 18 degrees more than the other.

8. The measure of the supplement of an angle is 36 less than the measure of the angle. Find the measures of the angles.
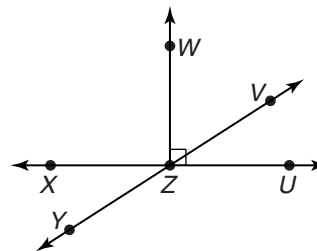
ALGEBRA For Exercises 9–10, use the figure at the right.

9. If $m\angle RTS = 8x + 18$, find x so that $\overrightarrow{TR} \perp \overrightarrow{TS}$.

10. If $m\angle PTQ = 3y - 10$ and $m\angle QTR = y$, find y so that $\angle PTR$ is a right angle.

Determine whether each statement can be assumed from the figure. Explain.

11. ∠WZU is a right angle.

12. ∠YZU and ∠UZV are supplementary.

13. ∠VZU is adjacent to ∠YZX.

1-6 Skills Practice

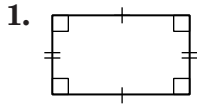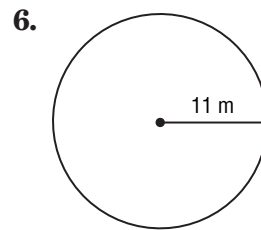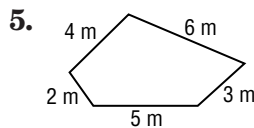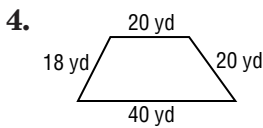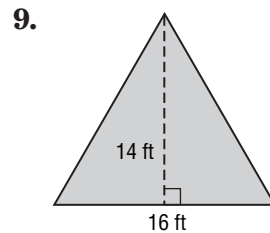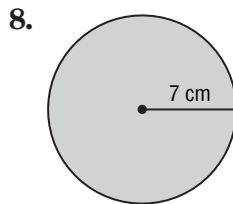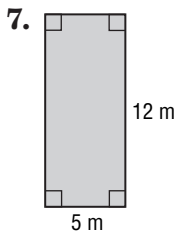### *Two-Dimensional Figures*

Name each polygon by its number of sides and then classify it as *convex* or *concave* and *regular* or *irregular*.

1.

2.

3.
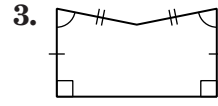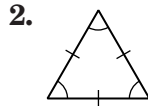
Find the perimeter or circumference of each figure.

4. 20 yd / 18 yd / 20 yd / 40 yd

5. 4 m / 6 m / 2 m / 3 m / 5 m

6. 11 m

Find the area of each figure.

7. 12 m / 5 m

8. 7 cm

9. 14 ft / 16 ft

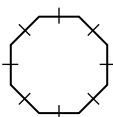**COORDINATE GEOMETRY Find the perimeter or circumference of each polygon.**

10. triangle ABC with vertices $A(3, 5)$, $B(3, 1)$, and $C(0, 1)$

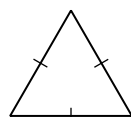**11.** quadrilateral $QRST$ with vertices $Q(-3, 2)$, $R(1, 2)$, $S(1, -4)$, and $T(-3, -4)$

12. circle O with center $(2, 3)$ and a radius of 4 units

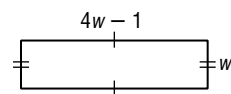**ALGEBRA Find the length of each side of the polygon for the given perimeter.**

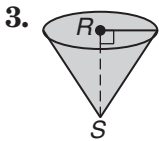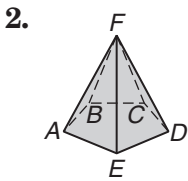**13.** $P = 104$ millimeters

14. $P = 84$ kilometers

15. $P = 88$ feet

$4w - 1$ / w
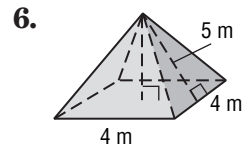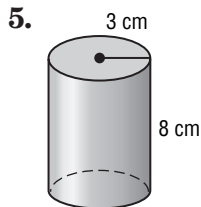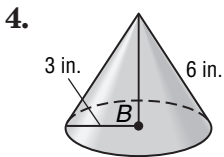
1-7 Skills Practice

Three-Dimensional Figures

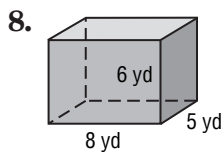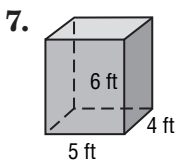**Identify each solid. Name the bases, faces, edges, and vertices.**

1.

2.

3.

Find the surface area of each solid.

4.

3 in.   6 in.

B

5.

3 cm

8 cm

6.

5 m

4 m

4 m

Find the volume of each solid.

7.

6 ft

4 ft

5 ft

8.

6 yd

5 yd

8 yd

9.

2 cm

10 cm
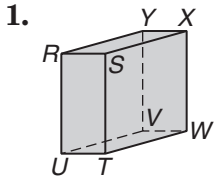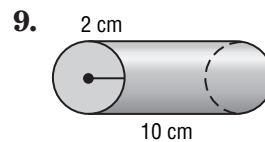
2-1 Skills Practice

Inductive Reasoning and Conjecture

Make a conjecture about the next item in each sequence.

1.
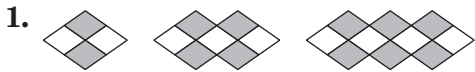
2. $-4, -1, 2, 5, 8$

3. $6, \dfrac{11}{2}, 5, \dfrac{9}{2}, 4$

4. $-2, 4, -8, 16, -32$

Make a conjecture based on the given information. Draw a figure to illustrate your conjecture.

5. Points A, B, and C are collinear, and D is between B and C.

6. Point P is the midpoint of $\overline{NQ}$.

7. $\angle 1$, $\angle 2$, $\angle 3$, and $\angle 4$ form four linear pairs.

8. $\angle 3 \cong \angle 4$

Determine whether each conjecture is *true* or *false*. Give a counterexample for any false conjecture.

9. Given: $\angle ABC$ and $\angle CBD$ form a linear pair.
   Conjecture: $\angle ABC \cong \angle CBD$

10. Given: $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$ are congruent.
   Conjecture: A, B, and C are collinear.

11. Given: $AB + BC = AC$
   Conjecture: $AB = BC$

12. Given: $\angle 1$ is complementary to $\angle 2$, and $\angle 1$ is complementary to $\angle 3$.
   Conjecture: $\angle 2 \cong \angle 3$

2-2 Skills Practice

Logic

Use the following statements to write a compound statement for each conjunction and disjunction. Then find its truth value.

p: $-3 - 2 = -5$
q: Vertical angles are congruent.
r: $2 + 8 > 10$
s: The sum of the measures of complementary angles is 90°.

1. p and q

2. $p \wedge r$

3. p or s

4. $r \vee s$

5. $p \wedge \sim q$

6. $q \vee \sim r$

Copy and complete each truth table.

7.

p	q	$\sim p$	$\sim p \wedge q$	$\sim(\sim p \wedge q)$
T	T			
T	F			
F	T			
F	F			

8.

p	q	$\sim q$	$p \vee \sim q$
T	T	F	
T	F	T	
F	T	F	
F	F	T	

Construct a truth table for each compound statement.

9. $\sim q \wedge r$

10. $\sim p \vee \sim r$

16

2-3 Skills Practice

Conditional Statements

Identify the hypothesis and conclusion of each statement.

1. If you purchase a computer and do not like it, then you can return it within 30 days.

2. If $x + 8 = 4$, then $x = -4$.

3. If the drama class raises $2000, then they will go on tour.

Write each statement in if-then form.

4. A polygon with four sides is a quadrilateral.

5. "Those who stand for nothing fall for anything." (*Alexander Hamilton*)

6. An acute angle has a measure less than 90.

Determine the truth value of the following statement for each set of conditions.
If you finish your homework by 5 P.M., then you go out to dinner.

7. You finish your homework by 5 P.M. and you go out to dinner.

8. You finish your homework by 4 P.M. and you go out to dinner.

9. You finish your homework by 5 P.M. and you do not go out to dinner.

10. Write the converse, inverse, and contrapositive of the conditional statement. Determine whether each statement is true or false. If a statement is false, find a counterexample.
If 89 is divisible by 2, then 89 is an even number.

2-4 Skills Practice

Deductive Reasoning

Determine whether the stated conclusion is valid based on the given information. If not, write *invalid*. Explain your reasoning.
If the sum of the measures of two angles is 180, then the angles are supplementary.

1. Given: $m\angle A + m\angle B$ is 180.
   Conclusion: $\angle A$ and $\angle B$ are supplementary.

2. Given: $m\angle ABC$ is 95 and $m\angle DEF$ is 90.
   Conclusion: $\angle ABC$ and $\angle DEF$ are supplementary.

3. Given: $\angle 1$ and $\angle 2$ are a linear pair.
   Conclusion: $\angle 1$ and $\angle 2$ are supplementary.

Use the Law of Syllogism to determine whether a valid conclusion can be reached from each set of statements. If a valid conclusion is possible, write it.

4. If two angles are complementary, then the sum of their measures is 90.
   If the sum of the measures of two angles is 90, then both of the angles are acute.

5. If the heat wave continues, then air conditioning will be used more frequently.
   If air conditioning is used more frequently, then energy costs will be higher.

Determine whether statement (3) follows from statements (1) and (2) by the Law of Detachment or the Law of Syllogism. If it does, state which law was used. If it does not, write *invalid*.

6. (1) If it is Tuesday, then Marla tutors chemistry.
   (2) If Marla tutors chemistry, then she arrives home at 4 P.M.
   (3) If Marla arrives at home at 4 P.M., then it is Tuesday.

7. (1) If a marine animal is a starfish, then it lives in the intertidal zone of the ocean.
   (2) The intertidal zone is the least stable of the ocean zones.
   (3) If a marine animal is a starfish, then it lives in the least stable of the ocean zones.

Lesson 2-4

2-5 Skills Practice

Postulates and Paragraph Proofs

Determine the number of line segments that can be drawn connecting each pair of points.

1.
•   •
  •
  •

2.
  •   •
•   •
  • •

Determine whether the following statements are *always*, *sometimes*, or *never* true. Explain.
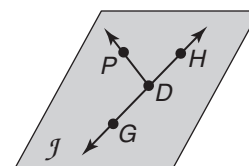
3. Three collinear points determine a plane.

4. Two points A and B determine a line.
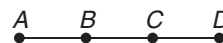
5. A plane contains at least three lines.

In the figure, $\overleftrightarrow{DG}$ and $\overrightarrow{DP}$ lie in plane $\mathcal{J}$ and H lies on $\overleftrightarrow{DG}$. State the postulate that can be used to show each statement is true.

6. G and P are collinear.

7. Points D, H, and P are coplanar.

8. PROOF In the figure at the right, point B is the midpoint of $\overline{AC}$ and point C is the midpoint of $\overline{BD}$. Write a paragraph proof to prove that $AB = CD$.

A   B   C   D

2-6 Skills Practice

Algebraic Proof

State the property that justifies each statement.

1. If $80 = m\angle A$, then $m\angle A = 80$.

2. If $RS = TU$ and $TU = YP$, then $RS = YP$.

3. If $7x = 28$, then $x = 4$.

4. If $VR + TY = EN + TY$, then $VR = EN$.

5. If $m\angle 1 = 30$ and $m\angle 1 = m\angle 2$, then $m\angle 2 = 30$.

Complete the following proof.

6. Given: $8x - 5 = 2x + 1$
   Prove: $x = 1$
   Proof:

Statements	Reasons
a. $8x - 5 = 2x + 1$	**a.** _____
b. $8x - 5 - 2x = 2x + 1 - 2x$	**b.** _____
c. _____	**c.** Substitution Property
d. _____	**d.** Addition Property
e. $6x = 6$	**e.** _____
f. $\dfrac{6x}{6} = \dfrac{6}{6}$	**f.** _____
g. _____	**g.** _____

Write a two-column proof for the following.

7. If $\overline{PQ} \cong \overline{QS}$ and $\overline{QS} \cong \overline{ST}$, then $PQ = ST$.
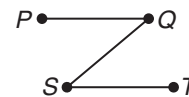
2-7 Skills Practice

Proving Segment Relationships

Justify each statement with a property of equality, a property of congruence, or a postulate.

1. $QA = QA$

2. If $\overline{AB} \cong \overline{BC}$ and $\overline{BC} \cong \overline{CE}$, then $\overline{AB} \cong \overline{CE}$.

3. If Q is between P and R, then $PR = PQ + QR$.

4. If $AB + BC = EF + FG$ and $AB + BC = AC$, then $EF + FG = AC$.

Complete each proof.
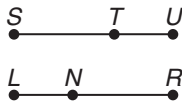
5. Given: $\overline{SU} \cong \overline{LR}$
    $\overline{TU} \cong \overline{LN}$
Prove: $\overline{ST} \cong \overline{NR}$

Proof:

Statements	Reasons
a. $\overline{SU} \cong \overline{LR}, \overline{TU} \cong \overline{LN}$	**a.** _____
b. _____	**b.** Definition of $\cong$ segments
c. $SU = ST + TU$	**c.** _____
$LR = LN + NR$	
d. $ST + TU = LN + NR$	**d.** _____
e. $ST + LN = LN + NR$	**e.** _____
f. $ST + LN - LN = LN + NR - LN$	**f.** _____
g. _____	**g.** Substitution Property
h. $\overline{ST} \cong \overline{NR}$	**h.** _____

6. Given: $\overline{AB} \cong \overline{CD}$
Prove: $\overline{CD} \cong \overline{AB}$
Proof:

Statements	Reasons
a. _____	**a.** Given
b. $AB = CD$	**b.** _____
c. $CD = AB$	**c.** _____
d. _____	**d.** Definition of $\cong$ segments

2-8 Skills Practice

Proving Angle Relationships

Find the measure of each numbered angle.

1. $m\angle 2 = 57$
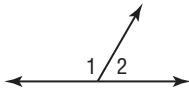
2. $m\angle 5 = 22$
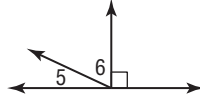
3. $m\angle 1 = 38$
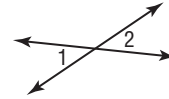
4. $m\angle 13 = 4x + 11$, $m\angle 14 = 3x + 1$
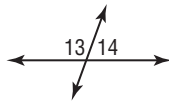
5. $\angle 9$ and $\angle 10$ are complementary. $\angle 7 \cong \angle 9$, $m\angle 8 = 41$
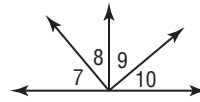
6. $m\angle 2 = 4x - 26$, $m\angle 3 = 3x + 4$
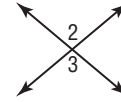
Determine whether the following statements are *always*, *sometimes*, or *never* true.

7. Two angles that are supplementary form a linear pair.

8. Two angles that are vertical are adjacent.

9. Copy and complete the following proof.

Given: $\angle QPS \cong \angle TPR$

Prove: $\angle QPR \cong \angle TPS$

Proof:
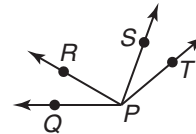
Statements	Reasons
a. _____	**a.** _____
b. $m\angle QPS = m\angle TPR$	**b.** _____
c. $m\angle QPS = m\angle QPR + m\angle RPS$ $m\angle TPR = m\angle TPS + m\angle RPS$	**c.** _____
d. _____	**d.** Substitution
e. _____	**e.** _____
f. _____	**f.** _____

Lesson 2-8

3-1 Skills Practice

Parallel Lines and Transversals

For Exercises 1–4, refer to the figure at the right.
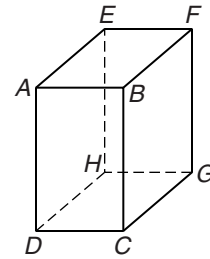
  1. Name all planes that are parallel to plane *DEH*.

  2. Name all segments that are parallel to $\overline{AB}$.

  3. Name all segments that intersect $\overline{GH}$.

  4. Name all segments that are skew to $\overline{CD}$.

Identify the sets of lines to which each given line is a transversal.
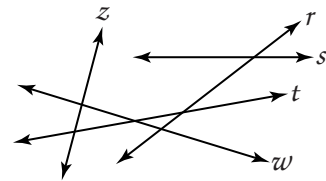
  5. *r*

  6. *s*

  7. *w*

Identify each pair of angles as *alternate interior, alternate exterior, corresponding,* or *consecutive interior* angles.
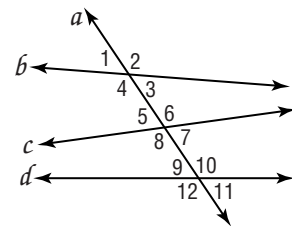
  8. ∠2 and ∠8   **9.** ∠3 and ∠6

  10. ∠1 and ∠9   **11.** ∠3 and ∠9

  12. ∠6 and ∠12   **13.** ∠7 and ∠11

Name the transversal that forms each pair of angles. Then identify the special name for the angle pair.
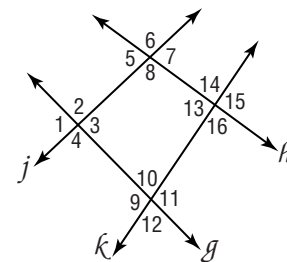
  14. ∠4 and ∠10   **15.** ∠2 and ∠12

  16. ∠7 and ∠3   **17.** ∠13 and ∠10

  18. ∠8 and ∠14   **19.** ∠6 and ∠14

3-2 **Skills Practice**

Angles and Parallel Lines

In the figure, $m\angle 2 = 70$. Find the measure of each angle.

1. $\angle 3$ 2. $\angle 5$

3. $\angle 8$ 4. $\angle 1$

5. $\angle 4$ 6. $\angle 6$
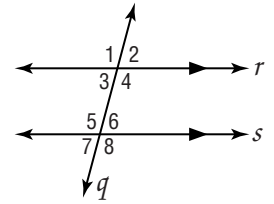
In the figure, $m\angle 7 = 100$. Find the measure of each angle.

7. $\angle 9$ 8. $\angle 6$

9. $\angle 8$ 10. $\angle 2$

11. $\angle 5$ 12. $\angle 11$
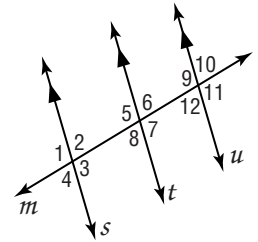
In the figure, $m\angle 3 = 75$ and $m\angle 10 = 115$. Find the measure of each angle.

13. $\angle 2$ 14. $\angle 5$

15. $\angle 7$ 16. $\angle 15$

17. $\angle 14$ 18. $\angle 9$
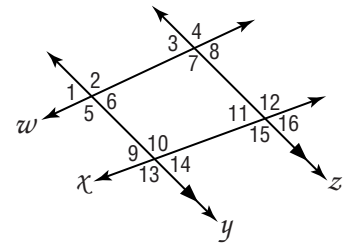
Find x and y in each figure.

19.   20.
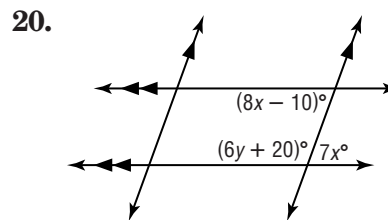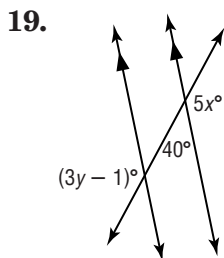
Find $m\angle 1$ in each figure.

21.   22.

Lesson 3-2
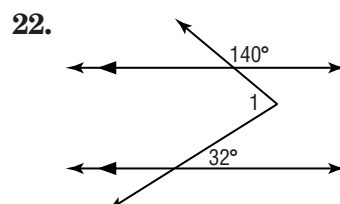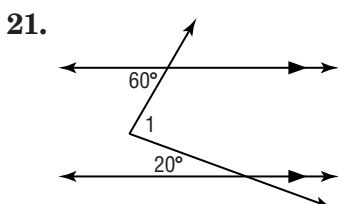
3-3 Skills Practice

Slopes of Lines

Determine the slope of the line that contains the given points.

1. $S(-1, 2)$, $W(0, 4)$

2. $G(-2, 5)$, $H(1, -7)$

3. $C(0, 1)$, $D(3, 3)$

4. $J(-5, -2)$, $K(5, -4)$

Find the slope of each line.

5. $\overleftrightarrow{NP}$

6. $\overleftrightarrow{TW}$

7. a line parallel to $\overleftrightarrow{TW}$

8. a line perpendicular to $\overleftrightarrow{NP}$
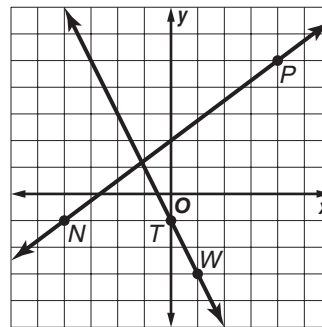
Determine whether $\overleftrightarrow{AB}$ and $\overleftrightarrow{MN}$ are *parallel*, *perpendicular*, or *neither*.

9. $A(0, 3)$, $B(5, -7)$, $M(-6, 7)$, $N(-2, -1)$

10. $A(-1, 4)$, $B(2, -5)$, $M(-3, 2)$, $N(3, 0)$

11. $A(-2, -7)$, $B(4, 2)$, $M(-2, 0)$, $N(2, 6)$

12. $A(-4, -8)$, $B(4, -6)$, $M(-3, 5)$, $N(-1, -3)$

Graph the line that satisfies each condition.

13. slope $= 3$, contains $A(0, 1)$
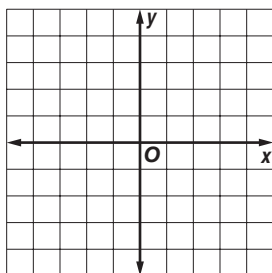
14. slope $= -\dfrac{3}{2}$, contains $R(-4, 5)$
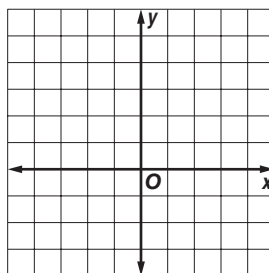
15. contains $Y(3, 0)$, parallel to $\overleftrightarrow{DJ}$ with $D(-3, 1)$ and $J(3, 3)$
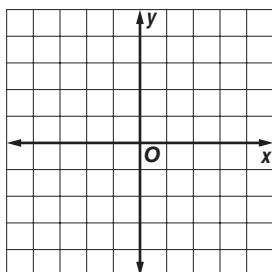
16. contains $T(0, -2)$, perpendicular to $\overleftrightarrow{CX}$ with $C(0, 3)$ and $X(2, -1)$
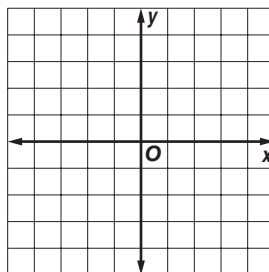
3-4 Skills Practice

Equations of Lines

Write an equation in slope-intercept form of the line having the given slope and
y-intercept.

1. m: -4, y-intercept: 3

2. m: 3, y-intercept: -8

3. m: $\frac{3}{7}$, $(0, 1)$

4. m: $-\frac{2}{5}$, $(0, -6)$

Write equations in point-slope form and slope-intercept form of the line having
the given slope and containing the given point.

5. m: 2, $(5, 2)$

6. m: -3, $(2, -4)$

7. m: $-\frac{1}{2}$, $(-2, 5)$

8. m: $\frac{1}{3}$, $(-3, -8)$

Write an equation in slope-intercept form for each line.

9. r

10. s

11. t

12. u

13. the line parallel to line r that contains $(1, -1)$

14. the line perpendicular to line s that contains $(0, 0)$
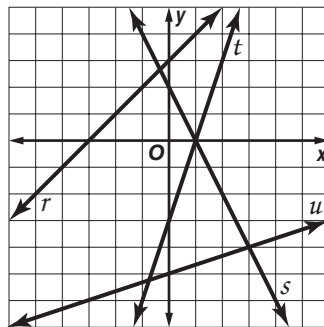
Write an equation in slope-intercept form for the line that satisfies the given
conditions.

15. $m = 6$, y-intercept $= -2$

16. $m = -\frac{5}{3}$, y-intercept $= 0$

17. $m = -1$, contains $(0, -6)$

18. $m = 4$, contains $(2, 5)$

19. contains $(2, 0)$ and $(0, 10)$

20. x-intercept is -2, y-intercept is -1

3-5 Skills Practice

Proving Lines Parallel

Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.
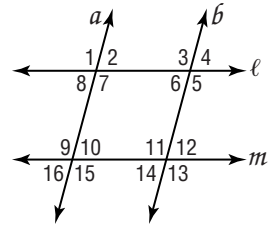
1. $\angle 3 \cong \angle 7$

2. $\angle 9 \cong \angle 11$

3. $\angle 2 \cong \angle 16$

4. $m\angle 5 + m\angle 12 = 180$

Find x so that $\ell \parallel m$.

5.

$(2x + 6)°$

$130°$

6.

$(4x - 10)°$

$(3x + 10)°$

7.

$(6x + 4)°$

$(8x - 8)°$
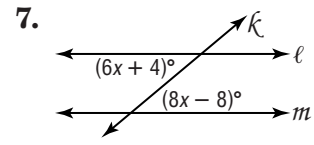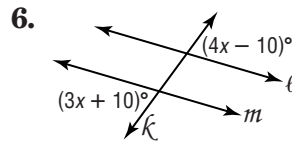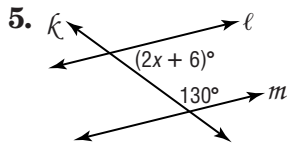
8. **PROOF** Provide a reason for each statement in the proof of Theorem 3.7.

Given: $\angle 1$ and $\angle 2$ are complementary.
$\overline{BC} \perp \overline{CD}$

Prove: $\overline{BA} \parallel \overline{CD}$

Proof:
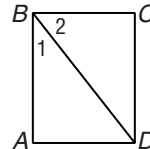
Statements	Reasons
1. $\overline{BC} \perp \overline{CD}$	1.
2. $m\angle ABC = m\angle 1 + m\angle 2$	2.
3. $\angle 1$ and $\angle 2$ are complementary.	3.
4. $m\angle 1 + m\angle 2 = 90$	4.
5. $m\angle ABC = 90$	5.
6. $\overline{BA} \perp \overline{BC}$	6.
7. $\overline{BA} \parallel \overline{CD}$	7.

Determine whether each pair of lines is parallel. Explain why or why not.

9.

$A(1, 3)$
$F(2, 1)$
$B(-2, -3)$
$E(0, -3)$

10.

$U(4, 2)$
$T(-4, 0)$
$S(5, -3)$
$R(0, -4)$

Lesson 3-5
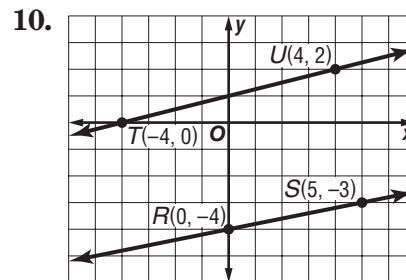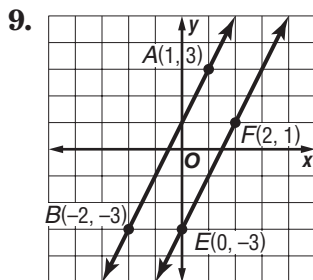
3-6 Skills Practice

Perpendiculars and Distance

Draw the segment that represents the distance indicated.

1. B to $\overleftrightarrow{AC}$
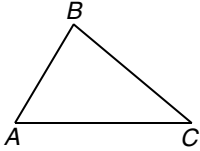
2. G to $\overleftrightarrow{EF}$
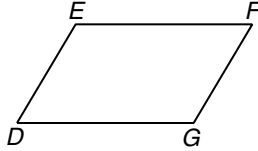
3. Q to $\overrightarrow{SR}$
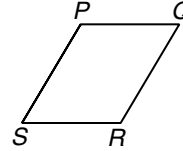
Construct a line perpendicular to ℓ through K. Then find the distance from K to ℓ.

4.

5.
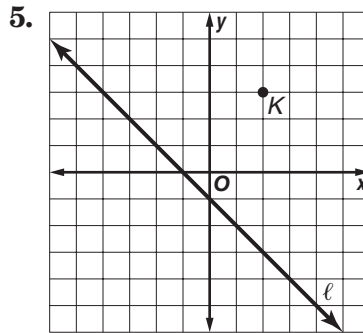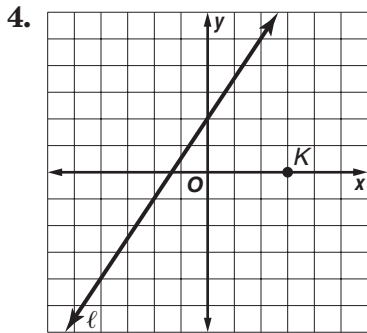
Find the distance between each pair of parallel lines.

6. $y = 7$
  $y = -1$

7. $x = -6$
  $x = 5$

8. $y = 3x$
  $y = 3x + 10$

9. $y = -5x$
  $y = -5x + 26$

10. $y = x + 9$
  $y = x + 3$

11. $y = -2x + 5$
  $y = -2x - 5$

4-1 **Skills Practice**

Classifying Triangles

Use a protractor to classify each triangle as *acute, equiangular, obtuse,* or *right*.

1.
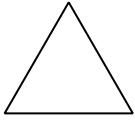
2.
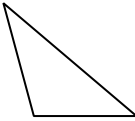
3.
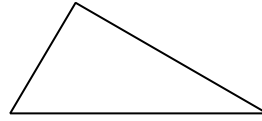
4.
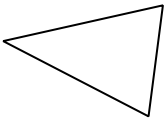
5.
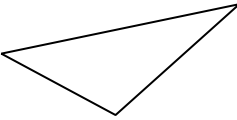
6.

Identify the indicated type of triangles.

7. right

8. isosceles

9. scalene

10. obtuse
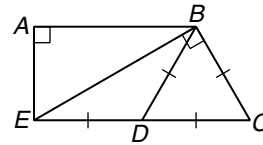
ALGEBRA Find x and the measure of each side of the triangle.

11. $\triangle ABC$ is equilateral with $AB = 3x - 2$, $BC = 2x + 4$, and $CA = x + 10$.

12. $\triangle DEF$ is isosceles, $\angle D$ is the vertex angle, $DE = x + 7$, $DF = 3x - 1$, and $EF = 2x + 5$.

Find the measures of the sides of $\triangle RST$ and classify each triangle by its sides.

13. $R(0, 2)$, $S(2, 5)$, $T(4, 2)$

14. $R(1, 3)$, $S(4, 7)$, $T(5, 4)$

4-2 Skills Practice

Angles of Triangles

Find the missing angle measures.

1.

TIGERS

80°

73°

2.

146°
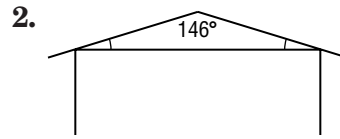
Find the measure of each angle.

3. $m\angle 1$

4. $m\angle 2$

5. $m\angle 3$

85°   55°

1   2

40°   3
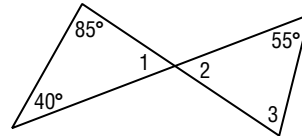
Find the measure of each angle.

6. $m\angle 1$

7. $m\angle 2$

8. $m\angle 3$

3

1   2

55°   150°

70°
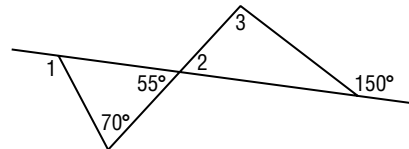
Find the measure of each angle.

9. $m\angle 1$

10. $m\angle 2$

11. $m\angle 3$

12. $m\angle 4$

13. $m\angle 5$

80°   40°

60°   1   4   5

2   105°

3
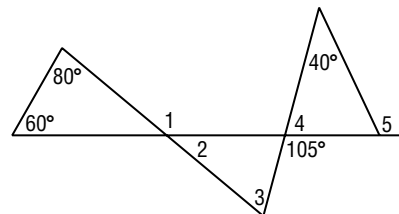
Find the measure of each angle.

14. $m\angle 1$

15. $m\angle 2$

B

1

A   2   63°   C

D

Lesson 4-2
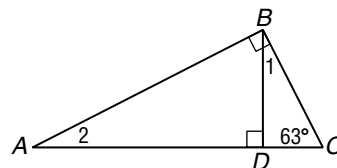
4-3 **Skills Practice**

Congruent Triangles

Identify the congruent triangles in each figure.

1.

2.

3.

4.
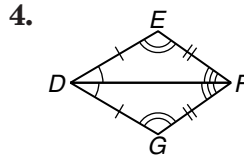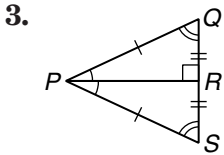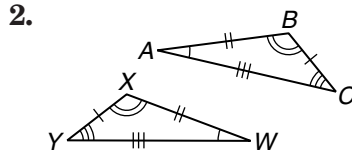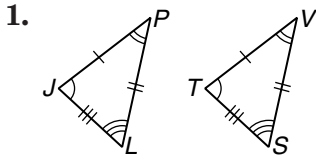
Name the congruent angles and sides for each pair of congruent triangles.

5. $\triangle ABC \cong \triangle FGH$

6. $\triangle PQR \cong \triangle STU$

Verify that each of the following transformations preserves congruence, and name the congruence transformation.

7. $\triangle ABC \cong \triangle A'B'C'$
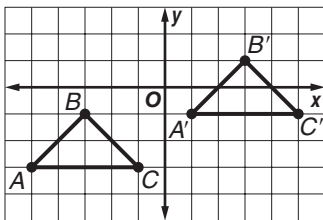
8. $\triangle DEF \cong \triangle D'E'F'$
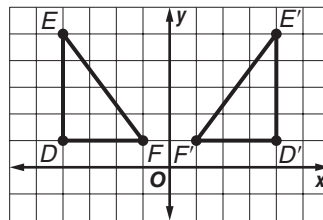
4-4 Skills Practice

Proving Congruence—SSS, SAS

Determine whether △ABC ≅ △KLM given the coordinates of the vertices. Explain.

1. $A(-3, 3), B(-1, 3), C(-3, 1), K(1, 4), L(3, 4), M(1, 6)$

2. $A(-4, -2), B(-4, 1), C(-1, -1), K(0, -2), L(0, 1), M(4, 1)$

3. Write a flow proof.

Given: $\overline{PR} \cong \overline{DE}, \overline{PT} \cong \overline{DF}$
         $\angle R \cong \angle E, \angle T \cong \angle F$

Prove: $\triangle PRT \cong \triangle DEF$
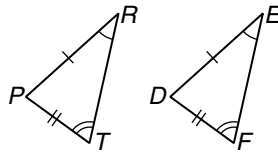
Determine which postulate can be used to prove that the triangles are congruent. If it is not possible to prove that they are congruent, write *not possible*.

4.

5.

6.
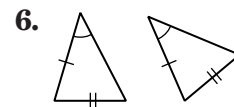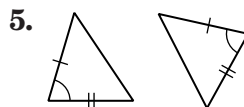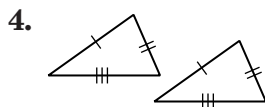
Lesson 4-4

4-5 Skills Practice

Proving Congruence—ASA, AAS

Write a flow proof.

1. **Given:** $\angle N \cong \angle L$
   $\overline{JK} \cong \overline{MK}$
   Prove: $\triangle JKN \cong \triangle MKL$
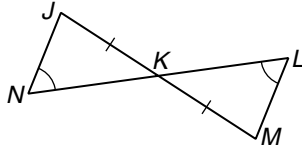
2. **Given:** $\overline{AB} \cong \overline{CB}$
   $\angle A \cong \angle C$
   $\overline{DB}$ bisects $\angle ABC$.
   Prove: $\overline{AD} \cong \overline{CD}$
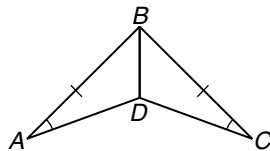
3. Write a paragraph proof.
   Given: $\overline{DE} \parallel \overline{FG}$
   $\angle E \cong \angle G$
   Prove: $\triangle DFG \cong \triangle FDE$
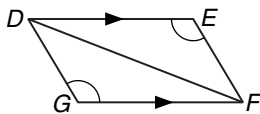
4-6 Skills Practice

Isosceles Triangles

Refer to the figure.
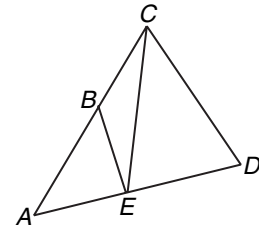
1. If $\overline{AC} \cong \overline{AD}$, name two congruent angles.

2. If $\overline{BE} \cong \overline{BC}$, name two congruent angles.

3. If $\angle EBA \cong \angle EAB$, name two congruent segments.

4. If $\angle CED \cong \angle CDE$, name two congruent segments.

$\triangle ABF$ is isosceles, $\triangle CDF$ is equilateral, and $m\angle AFD = 150$. Find each measure.
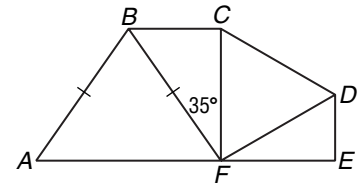
5. $m\angle CFD$ **6.** $m\angle AFB$

7. $m\angle ABF$ **8.** $m\angle A$

In the figure, $\overline{PL} \cong \overline{RL}$ and $\overline{LR} \cong \overline{BR}$.
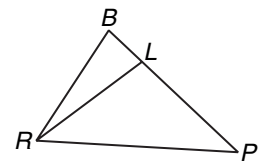
9. If $m\angle RLP = 100$, find $m\angle BRL$.

10. If $m\angle LPR = 34$, find $m\angle B$.

11. Write a two-column proof.

    Given: $\overline{CD} \cong \overline{CG}$

               $\overline{DE} \cong \overline{GF}$

    Prove: $\overline{CE} \cong \overline{CF}$
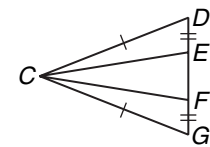
4-7 Skills Practice

Triangles and Coordinate Proof

Position and label each triangle on the coordinate plane.

1. right $\triangle FGH$ with legs a units and b units
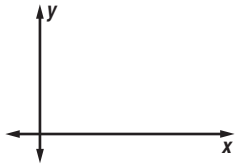
2. isosceles $\triangle KLP$ with base $\overline{KP}$ $6b$ units long
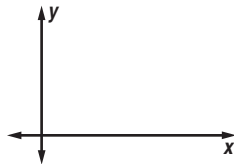
3. isosceles $\triangle AND$ with base $\overline{AD}$ $5a$ long
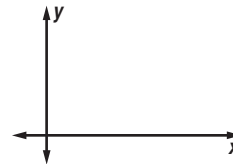
Find the missing coordinates of each triangle.

4.

$A(0, ?)$
$C(0, 0)$ $B(2a, 0)$

5.

$Z(?, ?)$
$X(0, 0)$ $Y(2b, 0)$

6.

$M(?, ?)$
$O(0, 0)$ $N(3b, 0)$

7.

$R(2a, b)$
$P(0, 0)$ $Q(?, ?)$

8.

$R(?, ?)$
$N(0, 0)$ $P(7b, 0)$

9.

$T(?, ?)$
$S(-a, 0)$ $U(a, 0)$
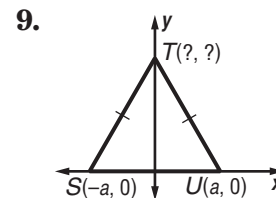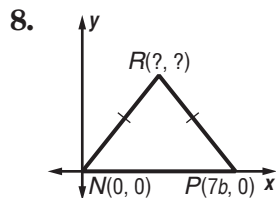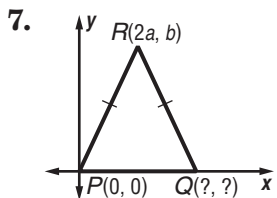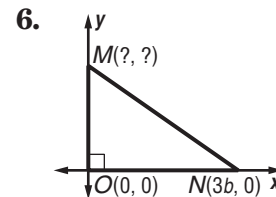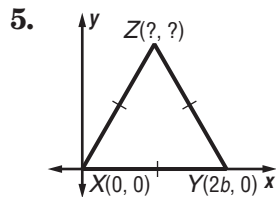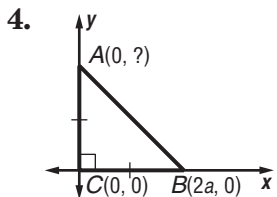
10. Write a coordinate proof to prove that in an isosceles right triangle, the segment from the vertex of the right angle to the midpoint of the hypotenuse is perpendicular to the hypotenuse.

Given: isosceles right $\triangle ABC$ with $\angle ABC$ the right angle and M the midpoint of $\overline{AC}$
Prove: $\overline{BM} \perp \overline{AC}$

5-1 Skills Practice

Bisectors, Medians, and Altitudes

ALGEBRA For Exercises 1–4, use the given information to find each value.

1. Find x if $\overline{EG}$ is a median of $\triangle DEF$.

F
5x − 17
E
G
3x + 1
D
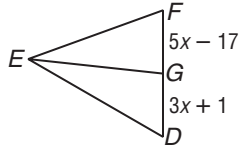
2. Find x and RT if $\overline{SU}$ is a median of $\triangle RST$.

T
2x + 24
S
U
5x − 30
R
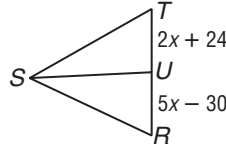
3. Find x and EF if $\overline{BD}$ is an angle bisector.

C
G
2x + 6
B
F
D
4x − 1
E
A
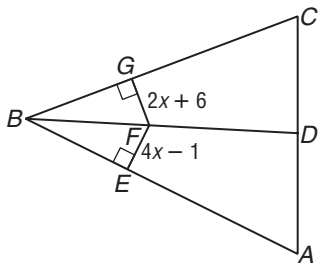
4. Find x and IJ if $\overline{HK}$ is an altitude of $\triangle HIJ$.

I
x + 8
(3x + 3)° K
x − 9
H
J
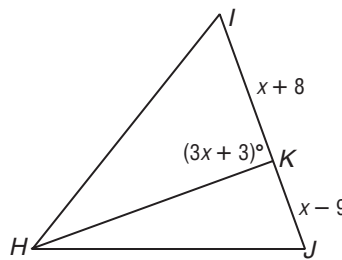
ALGEBRA For Exercises 5–7, use the following information.

In $\triangle LMN$, P, Q, and R are the midpoints of $\overline{LM}$, $\overline{MN}$, and $\overline{LN}$, respectively.
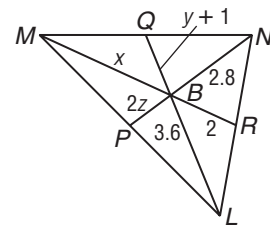
5. Find x.

6. Find y.

7. Find z.

M
Q
y + 1
N
x
2.8
B
2z
R
P
3.6
2
L

ALGEBRA Lines a, b, and c are perpendicular bisectors of $\triangle PQR$ and meet at A.

8. Find x.

9. Find y.

10. Find z.

P
18
5y − 6
7z + 4
R
8x + 16
A
24
Q
b
a
c
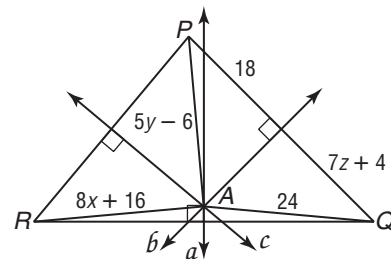
COORDINATE GEOMETRY The vertices of $\triangle HIJ$ are $J(1, 0)$, $H(6, 0)$, and $I(3, 6)$. Find the coordinates of the points of concurrency of $\triangle HIJ$.

11. orthocenter

12. centroid

13. circumcenter

5-2 Skills Practice

Inequalities and Triangles

Determine which angle has the greatest measure.

1. $\angle 1, \angle 3, \angle 4$

2. $\angle 4, \angle 5, \angle 7$

3. $\angle 2, \angle 3, \angle 6$

4. $\angle 5, \angle 6, \angle 8$
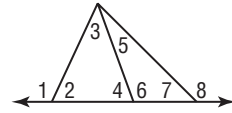
Use the Exterior Angle Inequality Theorem to list all angles that satisfy the stated condition.

5. all angles whose measures are less than $m\angle 1$

6. all angles whose measures are less than $m\angle 9$

7. all angles whose measures are greater than $m\angle 5$

8. all angles whose measures are greater than $m\angle 8$
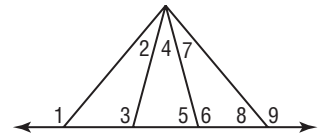
Determine the relationship between the measures of the given angles.

9. $m\angle ABD, m\angle BAD$

10. $m\angle ADB, m\angle BAD$

11. $m\angle BCD, m\angle CDB$

12. $m\angle CBD, m\angle CDB$
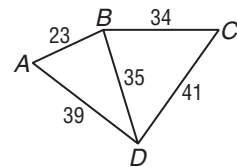
Determine the relationship between the lengths of the given sides.

13. $\overline{LM}, \overline{LP}$

14. $\overline{MP}, \overline{MN}$

15. $\overline{MN}, \overline{NP}$

16. $\overline{MP}, \overline{LP}$

Lesson 5-2
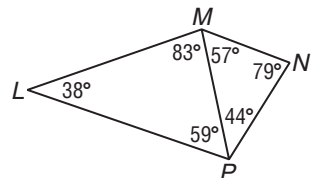
5-3 **Skills Practice**

Indirect Proof

Write the assumption you would make to start an indirect proof of each statement.

1. $m\angle ABC < m\angle CBA$

2. $\triangle DEF \cong \triangle RST$

3. Line a is perpendicular to line b.

4. $\angle 5$ is supplementary to $\angle 6$.

PROOF Write an indirect proof.

5. Given: $x^2 + 8 \leq 12$
  Prove: $x \leq 2$

6. Given: $\angle D \not\equiv \angle F$.
  Prove: $DE \neq EF$
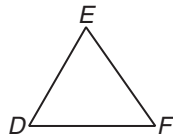
5-4 Skills Practice

The Triangle Inequality

Determine whether the given measures can be the lengths of the sides of a triangle. Write *yes* or *no*.

1. 2, 3, 4

2. 5, 7, 9

3. 4, 8, 11

4. 13, 13, 26

5. 9, 10, 20

6. 15, 17, 19

7. 14, 17, 31

8. 6, 7, 12

Find the range for the measure of the third side of a triangle given the measures of two sides.

9. 5 and 9

10. 7 and 14

11. 8 and 13

12. 10 and 12

13. 12 and 15

14. 15 and 27

15. 17 and 28

16. 18 and 22

ALGEBRA Determine whether the given coordinates are the vertices of a triangle. Explain.

17. $A(3, 5)$, $B(4, 7)$, $C(7, 6)$

18. $S(6, 5)$, $T(8, 3)$, $U(12, -1)$

19. $H(-8, 4)$, $I(-4, 2)$, $J(4, -2)$

20. $D(1, -5)$, $E(-3, 0)$, $F(-1, 0)$

Lesson 5-4

5-5 Skills Practice

Inequalities Involving Two Triangles

Write an inequality relating the given pair of angles or segment measures.

1. $m\angle BXA, m\angle DXA$

2. BC, DC
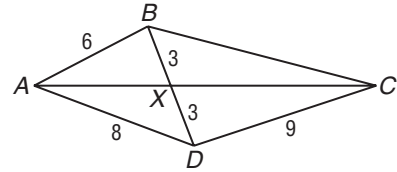
Write an inequality relating the given pair of angles or segment measures.

3. $m\angle STR, m\angle TRU$

4. PQ, RQ
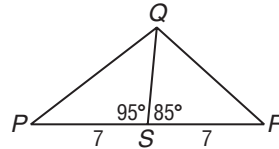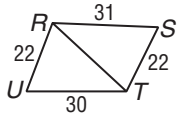
5. In the figure, $\overline{BA}, \overline{BD}, \overline{BC}$, and $\overline{BE}$ are congruent and $AC < DE$. How does $m\angle 1$ compare with $m\angle 3$? Explain your thinking.
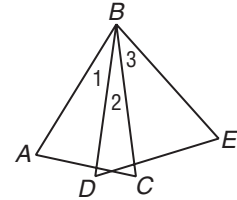
6. Write a two-column proof.
   Given: $\overline{BA} \cong \overline{DA}$
   $BC > DC$
   Prove: $m\angle 1 > m\angle 2$
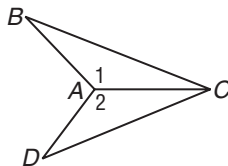
6-1 Skills Practice

Angles of Polygons

Find the sum of the measures of the interior angles of each convex polygon.

1. nonagon

2. heptagon

3. decagon

The measure of an interior angle of a regular polygon is given. Find the number of sides in each polygon.

4. 108

5. 120

6. 150

Find the measure of each interior angle using the given information.

7.

8.
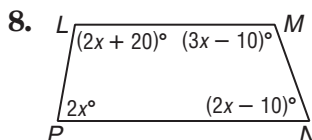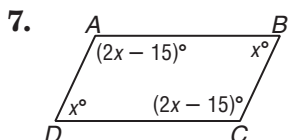
9. quadrilateral *STUW* with ∠*S* ≅ ∠*T*, ∠*U* ≅ ∠*W*, $m\angle S = 2x + 16$, $m\angle U = x + 14$
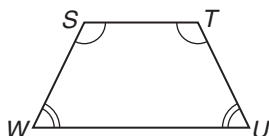
10. hexagon *DEFGHI* with ∠*D* ≅ ∠*E* ≅ ∠*G* ≅ ∠*H*, ∠*F* ≅ ∠*I*, $m\angle D = 7x$, $m\angle F = 4x$
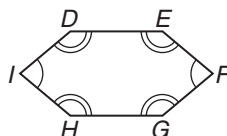
Find the measures of an interior angle and an exterior angle for each regular polygon.

11. quadrilateral

12. pentagon

13. dodecagon

Find the measures of an interior angle and an exterior angle given the number of sides of each regular polygon. Round to the nearest tenth if necessary.

14. 8

15. 9

16. 13

6-2 Skills Practice

Parallelograms

Complete each statement about $\square DEFG$. Justify your answer.
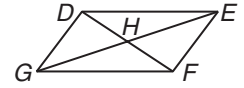
1. $\overline{DG} \parallel$ ___?___

2. $\overline{DE} \cong$ ___?___

3. $\overline{GH} \cong$ ___?___

4. $\angle DEF \cong$ ___?___

5. $\angle EFG$ is supplementary to ___?___.

6. $\triangle DGE \cong$ ___?___

ALGEBRA Use $\square WXYZ$ to find each measure or value.
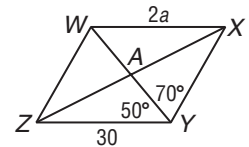
7. $m\angle XYZ =$ _____

8. $m\angle WZY =$ _____

9. $m\angle WXY =$ _____

10. $a =$ _____

COORDINATE GEOMETRY Find the coordinates of the intersection of the diagonals of parallelogram *HJKL* given each set of vertices.

11. $H(1, 1), J(2, 3), K(6, 3), L(5, 1)$

12. $H(-1, 4), J(3, 3), K(3, -2), L(-1, -1)$

13. PROOF Write a paragraph proof of the theorem *Consecutive angles in a parallelogram are supplementary*.

Lesson 6-2

6-3   Skills Practice

Tests for Parallelograms

Determine whether each quadrilateral is a parallelogram. Justify your answer.

1.

2.

3.

4.
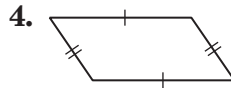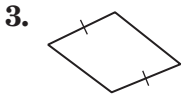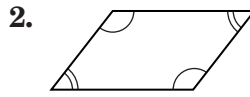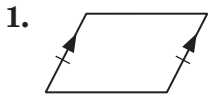
COORDINATE GEOMETRY Determine whether a figure with the given vertices is a parallelogram. Use the method indicated.

5. $P(0, 0)$, $Q(3, 4)$, $S(7, 4)$, $Y(4, 0)$; Slope Formula

6. $S(-2, 1)$, $R(1, 3)$, $T(2, 0)$, $Z(-1, -2)$; Distance and Slope Formula

7. $W(2, 5)$, $R(3, 3)$, $Y(-2, -3)$, $N(-3, 1)$; Midpoint Formula

ALGEBRA Find x and y so that each quadrilateral is a parallelogram.

8.

$2x - 8$
$2y$
$y + 19$
$x + 16$

9.

$3x$
$2y - 11$
$y + 3$
$4x - 3$

10.

$(4x - 35)°$ $(y + 15)°$
$(2y - 5)°$ $(3x + 10)°$

11.

$x + 20$
$3y + 2$
$y + 20$
$3x - 14$
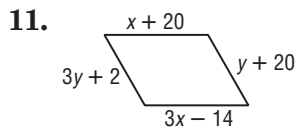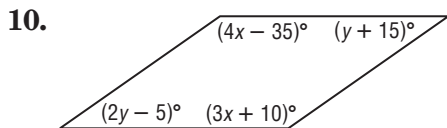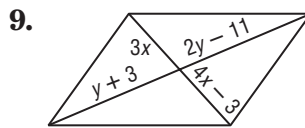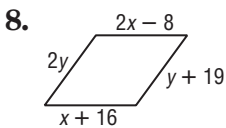
6-4 Skills Practice

Rectangles

ALGEBRA *ABCD* is a rectangle.
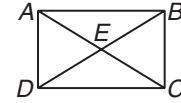
1. If $AC = 2x + 13$ and $DB = 4x - 1$, find x.

2. If $AC = x + 3$ and $DB = 3x - 19$, find AC.

3. If $AE = 3x + 3$ and $EC = 5x - 15$, find AC.

4. If $DE = 6x - 7$ and $AE = 4x + 9$, find DB.

5. If $m\angle DAC = 2x + 4$ and $m\angle BAC = 3x + 1$, find x.

6. If $m\angle BDC = 7x + 1$ and $m\angle ADB = 9x - 7$, find $m\angle BDC$.

7. If $m\angle ABD = x^2 - 7$ and $m\angle CDB = 4x + 5$, find x.

8. If $m\angle BAC = x^2 + 3$ and $m\angle CAD = x + 15$, find $m\angle BAC$.

PRST is a rectangle. Find each measure if $m\angle 1 = 50$.
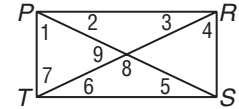
9. $m\angle 2$ **10.** $m\angle 3$

11. $m\angle 4$ **12.** $m\angle 5$

13. $m\angle 6$ **14.** $m\angle 7$

15. $m\angle 8$ **16.** $m\angle 9$

COORDINATE GEOMETRY Determine whether *TUXY* is a rectangle given each set of vertices. Justify your answer.

17. $T(-3, -2)$, $U(-4, 2)$, $X(2, 4)$, $Y(3, 0)$

18. $T(-6, 3)$, $U(0, 6)$, $X(2, 2)$, $Y(-4, -1)$

19. $T(4, 1)$, $U(3, -1)$, $X(-3, 2)$, $Y(-2, 4)$

Lesson 6-4

6-5 Skills Practice

Rhombi and Squares

Use rhombus *DKLM* with *AM* = 4*x*, *AK* = 5*x* − 3, and *DL* = 10.

1. Find *x*. **2.** Find *AL*.
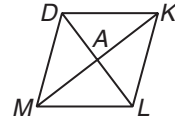
3. Find *m*∠*KAL*. **4.** Find *DM*.

Use rhombus *RSTV* with *RS* = 5*y* + 2, *ST* = 3*y* + 6, and *NV* = 6.

5. Find *y*. **6.** Find *TV*.
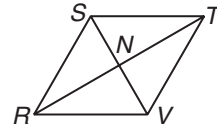
7. Find *m*∠*NTV*. **8.** Find *m*∠*SVT*.

9. Find *m*∠*RST*. **10.** Find *m*∠*SRV*.

COORDINATE GEOMETRY Given each set of vertices, determine whether ▱*QRST* is a *rhombus*, a *rectangle*, or a *square*. List all that apply. Explain your reasoning.

11. $Q(3, 5)$, $R(3, 1)$, $S(-1, 1)$, $T(-1, 5)$

12. $Q(-5, 12)$, $R(5, 12)$, $S(-1, 4)$, $T(-11, 4)$

13. $Q(-6, -1)$, $R(4, -6)$, $S(2, 5)$, $T(-8, 10)$

14. $Q(2, -4)$, $R(-6, -8)$, $S(-10, 2)$, $T(-2, 6)$

6-6 Skills Practice

Trapezoids

COORDINATE GEOMETRY *ABCD* **is a quadrilateral with vertices** *A*(−4, −3), *B*(3, −3), *C*(6, 4), *D*(−7, 4).

1. Verify that *ABCD* is a trapezoid.

2. Determine whether *ABCD* is an isosceles trapezoid. Explain.

COORDINATE GEOMETRY *EFGH* **is a quadrilateral with vertices** *E*(1, 3), *F*(5, 0), *G*(8, −5), *H*(−4, 4).

3. Verify that *EFGH* is a trapezoid.

4. Determine whether *EFGH* is an isosceles trapezoid. Explain.

COORDINATE GEOMETRY *LMNP* **is a quadrilateral with vertices** *L*(−1, 3), *M*(−4, 1), *N*(−6, 3), *P*(0, 7).

5. Verify that *LMNP* is a trapezoid.

6. Determine whether *LMNP* is an isosceles trapezoid. Explain.

ALGEBRA Find the missing measure(s) for the given trapezoid.

7. For trapezoid *HJKL*, *S* and *T* are midpoints of the legs. Find *HJ*.
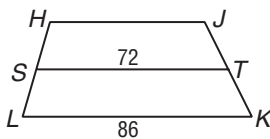
8. For trapezoid *WXYZ*, *P* and *Q* are midpoints of the legs. Find *WX*.
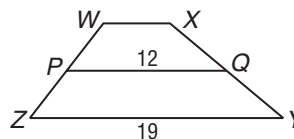
9. For trapezoid *DEFG*, *T* and *U* are midpoints of the legs. Find *TU*, *m∠E*, and *m∠G*.
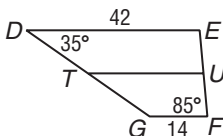
10. For isosceles trapezoid *QRST*, find the length of the median, *m∠Q*, and *m∠S*.
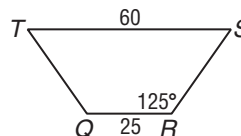
6-7 Skills Practice

Coordinate Proof and Quadrilaterals

Position and label each quadrilateral on the coordinate plane.

1. rectangle with length $2a$ units and height a units

2. isosceles trapezoid with height a units, bases $c - b$ units and $b + c$ units

Name the missing coordinates for each quadrilateral.

3. rectangle

D(0, a)   C(?, ?)

O A(0, 0)   U(c, 0)   x

4. rectangle

G(?, ?)   F(5b, 2b)

O D(0, 0)   E(5b, 0)   x

5. parallelogram

P(b, c)   R(?, ?)

O T(0, 0)   S(a, ?)   x
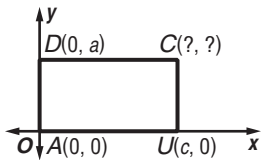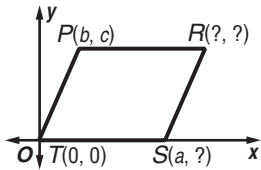
6. isosceles trapezoid

Y(?, ?)   W(?, c)

O S(a, 0)   T(b, 0)   x
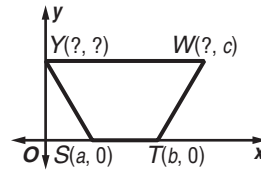
Position and label the figure on the coordinate plane. Then write a coordinate proof for the following.

7. The segments joining the midpoints of the sides of a rhombus form a rectangle.

7-1 Skills Practice

Proportions

1. **FOOTBALL** A tight end scored 6 touchdowns in 14 games. Find the ratio of touchdowns per game.

2. **EDUCATION** In a schedule of 6 classes, Marta has 2 elective classes. What is the ratio of elective to non-elective classes in Marta's schedule?

3. **BIOLOGY** Out of 274 listed species of birds in the United States, 78 species made the endangered list. Find the ratio of endangered species of birds to listed species in the United States.

4. **ART** An artist in Portland, Oregon, makes bronze sculptures of dogs. The ratio of the height of a sculpture to the actual height of the dog is 2:3. If the height of the sculpture is 14 inches, find the height of the dog.

5. **SCHOOL** The ratio of male students to female students in the drama club at Campbell High School is 3:4. If the number of male students in the club is 18, what is the number of female students?

Solve each proportion.

6. $\dfrac{2}{5} = \dfrac{x}{40}$

7. $\dfrac{7}{10} = \dfrac{21}{x}$

8. $\dfrac{20}{5} = \dfrac{4x}{6}$

9. $\dfrac{5x}{4} = \dfrac{35}{8}$

10. $\dfrac{x+1}{3} = \dfrac{7}{2}$

11. $\dfrac{15}{3} = \dfrac{x-3}{5}$

Find the measures of the sides of each triangle.

12. The ratio of the measures of the sides of a triangle is 3:5:7, and its perimeter is 450 centimeters.

13. The ratio of the measures of the sides of a triangle is 5:6:9, and its perimeter is 220 meters.

14. The ratio of the measures of the sides of a triangle is 4:6:8, and its perimeter is 126 feet.

15. The ratio of the measures of the sides of a triangle is 5:7:8, and its perimeter is 40 inches.

7-2 Skills Practice

Similar Polygons

Determine whether each pair of figures is similar. Justify your answer.

1.
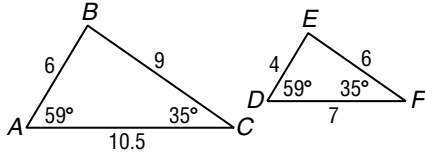
2.
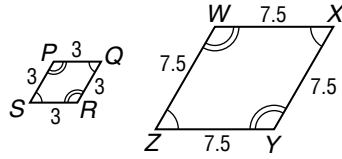
Each pair of polygons is similar. Write a similarity statement, and find x, the measure(s) of the indicated side(s), and the scale factor.

3. $\overline{GH}$
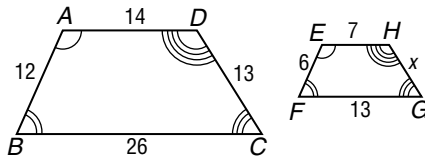
4. $\overline{ST}$ and $\overline{SU}$
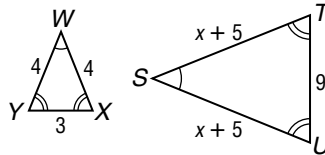
5. $\overline{WT}$
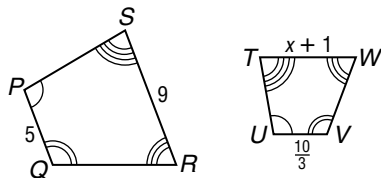
6. $\overline{TS}$ and $\overline{SP}$
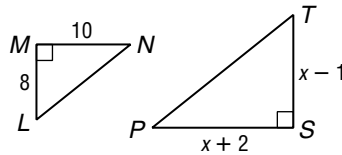
7-3   **Skills Practice**

Similar Triangles

Determine whether each pair of triangles is similar. Justify your answer.

1.
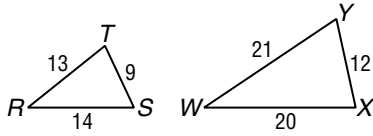
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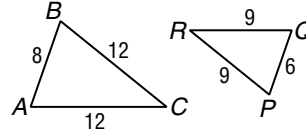
3.
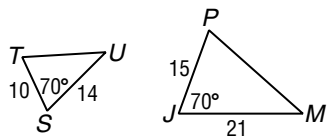
4.
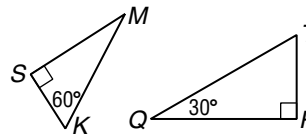
ALGEBRA   **Identify the similar triangles, and find x and the measures of the indicated sides.**

5. $\overline{AC}$ and $\overline{ED}$
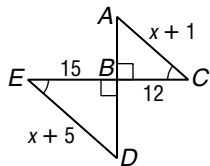
6. $\overline{JL}$ and $\overline{LM}$
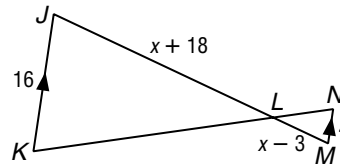
7. $\overline{EH}$ and $\overline{EF}$

8. $\overline{VT}$ and $\overline{ST}$

Lesson 7-3
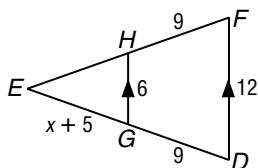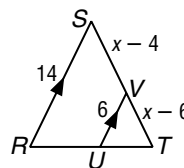
7-4   Skills Practice

Parallel Lines and Proportional Parts

1. If $JK = 7$, $KH = 21$, and $JL = 6$, find LI.
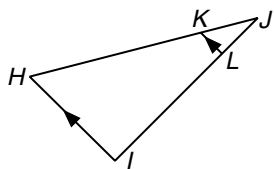
2. Find x and TV if $RU = 8$, $US = 14$, $TV = x - 1$ and $VS = 17.5$.
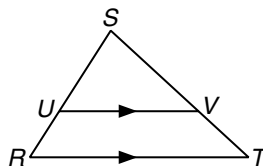
Determine whether $\overline{BC} \parallel \overline{DE}$.

3. $AD = 15$, $DB = 12$, $AE = 10$, and $EC = 8$
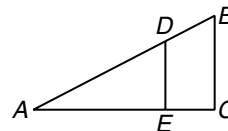
4. $BD = 9$, $BA = 27$, and CE is one third of EA

5. $AE = 30$, $AC = 45$, and AD is twice DB

COORDINATE GEOMETRY For Exercises 6–8, use the following information.

Triangle ABC has vertices $A(-5, 2)$, $B(1, 8)$, and $C(4, 2)$. Point D is the midpoint of $\overline{AB}$ and E is the midpoint of $\overline{AC}$.
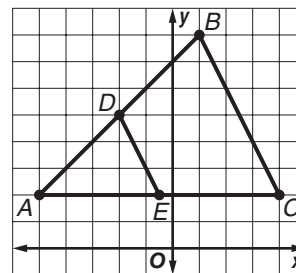
6. Identify the coordinates of D and E.

7. Show that $\overline{BC}$ is parallel to $\overline{DE}$.

8. Show that $DE = \dfrac{1}{2}BC$.

9. Find x and y.
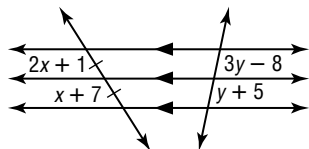
10. Find x and y.
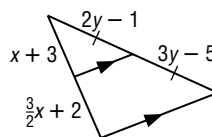
7-5 Skills Practice

Parts of Similar Triangles

Find the perimeter of the given triangle.

1. $\triangle JKL$, if $\triangle JKL \sim \triangle RST$, $RS = 14$, $ST = 12$, $TR = 10$, and $LJ = 14$
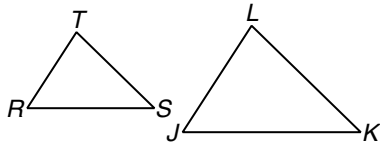
2. $\triangle DEF$, if $\triangle DEF \sim \triangle ABC$, $AB = 27$, $BC = 16$, $CA = 25$, and $FD = 15$
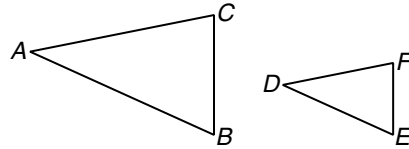
3. $\triangle PQR$, if $\triangle PQR \sim \triangle LMN$, $LM = 16$, $MN = 14$, $NL = 27$, and $RP = 18$
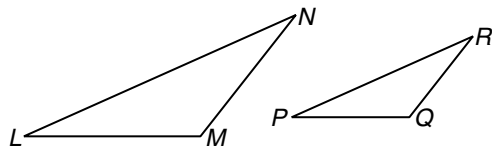
4. $\triangle KLM$, if $\triangle KLM \sim \triangle FGH$, $FG = 30$, $GH = 38$, $HF = 38$, and $KL = 24$
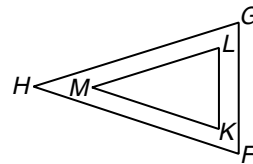
Use the given information to find each measure.

5. Find FG if $\triangle RST \sim \triangle EFG$, $\overline{SH}$ is an altitude of $\triangle RST$, $\overline{FJ}$ is an altitude of $\triangle EFG$, $ST = 6$, $SH = 5$, and $FJ = 7$.
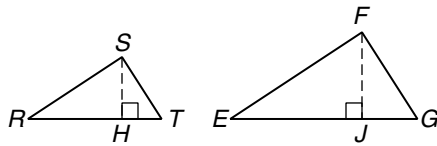
6. Find MN if $\triangle ABC \sim \triangle MNP$, $\overline{AD}$ is an altitude of $\triangle ABC$, $\overline{MQ}$ is an altitude of $\triangle MNP$, $AB = 24$, $AD = 14$, and $MQ = 10.5$.

Find x.

7. $\triangle HKL \sim \triangle XYZ$

8.

Lesson 7-5
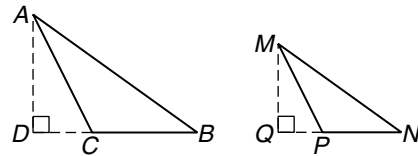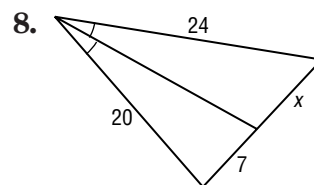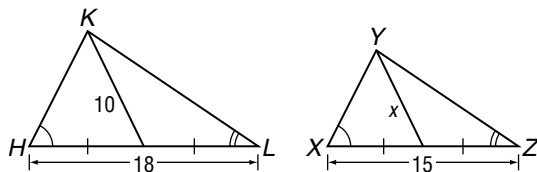
8-1 Skills Practice

Geometric Mean

Find the geometric mean between each pair of numbers. State exact answers and answers to the nearest tenth.

1. 2 and 8

2. 9 and 36

3. 4 and 7

4. 5 and 10

5. $2\sqrt{2}$ and $5\sqrt{2}$

6. $3\sqrt{5}$ and $5\sqrt{5}$

Find the measure of the altitude drawn to the hypotenuse. State exact answers and answers to the nearest tenth.

7.

8.

9.

10.

Find x and y.

11.

12.

13.

14.
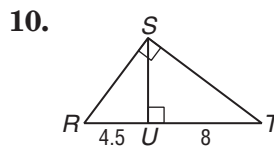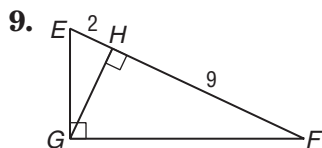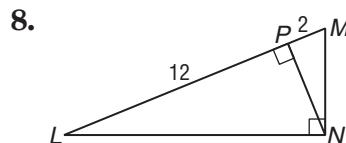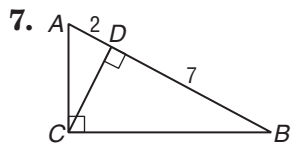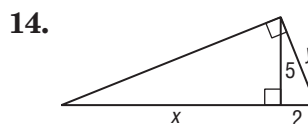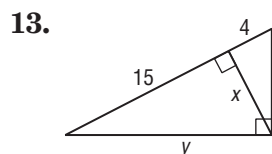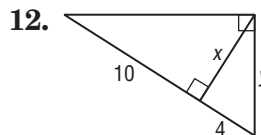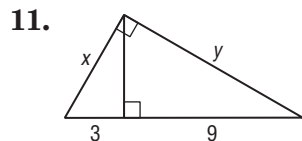
8-2 Skills Practice

The Pythagorean Theorem and Its Converse

Find x.

1.
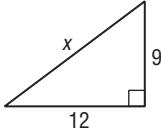
2.
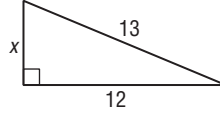
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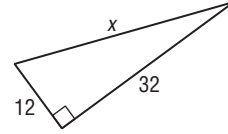
4.
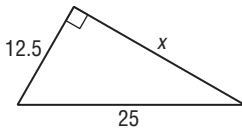
5.

6.
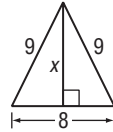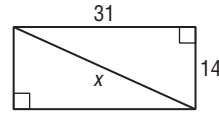
Determine whether $\triangle STU$ is a right triangle for the given vertices. Explain.

7. $S(5, 5)$, $T(7, 3)$, $U(3, 2)$

8. $S(3, 3)$, $T(5, 5)$, $U(6, 0)$

9. $S(4, 6)$, $T(9, 1)$, $U(1, 3)$

10. $S(0, 3)$, $T(-2, 5)$, $U(4, 7)$

11. $S(-3, 2)$, $T(2, 7)$, $U(-1, 1)$

12. $S(2, -1)$, $T(5, 4)$, $U(6, -3)$

Determine whether each set of measures can be the measures of the sides of a right triangle. Then state whether they form a Pythagorean triple.

13. 12, 16, 20

14. 16, 30, 32

15. 14, 48, 50

16. $\frac{2}{5}, \frac{4}{5}, \frac{6}{5}$

17. $2\sqrt{6}, 5, 7$

18. $2\sqrt{2}, 2\sqrt{7}, 6$

Lesson 8-2

8-3 Skills Practice

Special Right Triangles

Find the exact values of x and y.

1.

2.

3.

4.

5.

6.
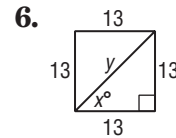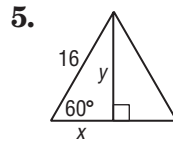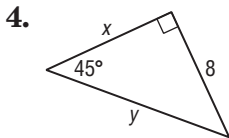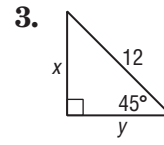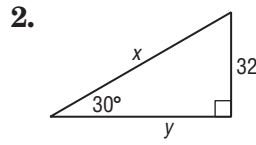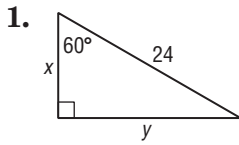
For Exercises 7–9, use the figure at the right.

7. If $a = 11$, find b and c.

8. If $b = 15$, find a and c.

9. If $c = 9$, find a and b.
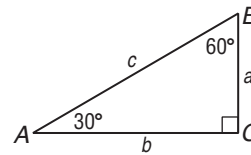
For Exercises 10 and 11, use the figure at the right.

10. The perimeter of the square is 30 inches. Find the length of $\overline{BC}$.

11. Find the length of the diagonal $\overline{BD}$.
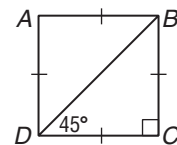
12. The perimeter of the equilateral triangle is 60 meters. Find the length of an altitude.
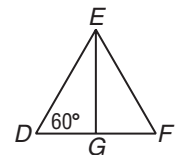
13. $\triangle GEC$ is a 30°-60°-90° triangle with right angle at E, and $\overline{EC}$ is the longer leg. Find the coordinates of G in Quadrant I for $E(1, 1)$ and $C(4, 1)$.

Lesson 8-3

8-4 Skills Practice

Trigonometry

Use △*RST* to find sin *R*, cos *R*, tan *R*, sin *S*, cos *S*, and tan *S*.
Express each ratio as a fraction and as a decimal to the
nearest hundredth.
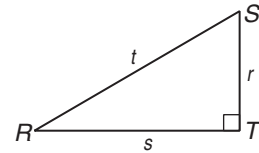
1. $r = 16, s = 30, t = 34$ **2.** $r = 10, s = 24, t = 26$

Use a calculator to find each value. Round to the nearest ten-thousandth.

3. sin 5 **4.** tan 23 **5.** cos 61

6. sin 75.8 **7.** tan 17.3 **8.** cos 52.9

**Use the figure to find each trigonometric ratio. Express
answers as a fraction and as a decimal rounded to the
nearest ten-thousandth.**

9. tan *C*   **10.** sin *A*   **11.** cos *C*
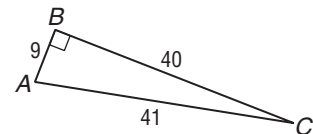
Find the measure of each acute angle to the nearest tenth of a degree.

12. sin *B* = 0.2985 **13.** tan *A* = 0.4168 **14.** cos *R* = 0.8443

15. tan *C* = 0.3894 **16.** cos *B* = 0.7329 **17.** sin *A* = 0.1176

Find *x*. Round to the nearest tenth.
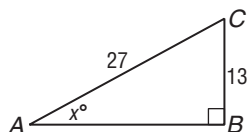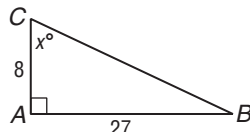
18. **19.** **20.**
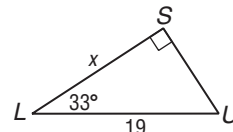
8-5 Skills Practice

Angles of Elevation and Depression

Name the angle of depression or angle of elevation in each figure.

1.

2.

3.

4.
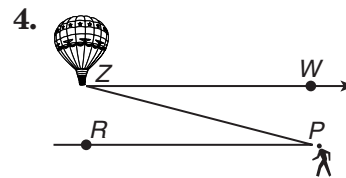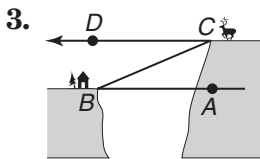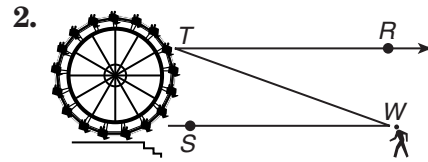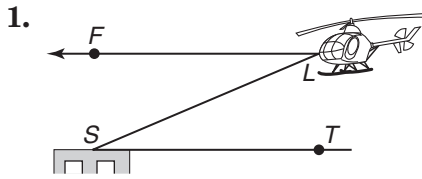
5. **MOUNTAIN BIKING** On a mountain bike trip along the Gemini Bridges Trail in Moab, Utah, Nabuko stopped on the canyon floor to get a good view of the twin sandstone bridges. Nabuko is standing about 60 meters from the base of the canyon cliff, and the natural arch bridges are about 100 meters up the canyon wall. If her line of sight is five feet above the ground, what is the angle of elevation to the top of the bridges? Round to the nearest tenth degree.

6. **SHADOWS** Suppose the sun casts a shadow off a 35-foot building. If the angle of elevation to the sun is 60°, how long is the shadow to the nearest tenth of a foot?
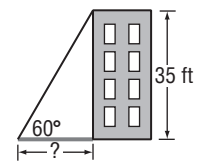
7. **BALLOONING** From her position in a hot-air balloon, Angie can see her car parked in a field. If the angle of depression is 8° and Angie is 38 meters above the ground, what is the straight-line distance from Angie to her car? Round to the nearest whole meter.

8. **INDIRECT MEASUREMENT** Kyle is at the end of a pier 30 feet above the ocean. His eye level is 3 feet above the pier. He is using binoculars to watch a whale surface. If the angle of depression of the whale is 20°, how far is the whale from Kyle's binoculars? Round to the nearest tenth foot.

Lesson 8-5
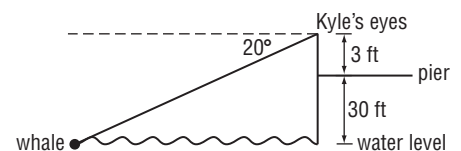
8-6 Skills Practice

The Law of Sines

Find each measure using the given measures from $\triangle ABC$. Round angle measures to the nearest tenth degree and side measures to the nearest tenth.

1. If $m\angle A = 35$, $m\angle B = 48$, and $b = 28$, find a.

2. If $m\angle B = 17$, $m\angle C = 46$, and $c = 18$, find b.

3. If $m\angle C = 86$, $m\angle A = 51$, and $a = 38$, find c.

4. If $a = 17$, $b = 8$, and $m\angle A = 73$, find $m\angle B$.

5. If $c = 38$, $b = 34$, and $m\angle B = 36$, find $m\angle C$.

6. If $a = 12$, $c = 20$, and $m\angle C = 83$, find $m\angle A$.

7. If $m\angle A = 22$, $a = 18$, and $m\angle B = 104$, find b.

Solve each $\triangle PQR$ described below. Round measures to the nearest tenth.

8. $p = 27$, $q = 40$, $m\angle P = 33$

9. $q = 12$, $r = 11$, $m\angle R = 16$

10. $p = 29$, $q = 34$, $m\angle Q = 111$

11. If $m\angle P = 89$, $p = 16$, $r = 12$

12. If $m\angle Q = 103$, $m\angle P = 63$, $p = 13$

13. If $m\angle P = 96$, $m\angle R = 82$, $r = 35$

14. If $m\angle R = 49$, $m\angle Q = 76$, $r = 26$

15. If $m\angle Q = 31$, $m\angle P = 52$, $p = 20$

16. If $q = 8$, $m\angle Q = 28$, $m\angle R = 72$

17. If $r = 15$, $p = 21$, $m\angle P = 128$

8-7 Skills Practice

The Law of Cosines

In △*RST*, given the following measures, find the measure of the missing side.

1. $r = 5, s = 8, m\angle T = 39$

2. $r = 6, t = 11, m\angle S = 87$

3. $r = 9, t = 15, m\angle S = 103$

4. $s = 12, t = 10, m\angle R = 58$

In △*HIJ*, given the lengths of the sides, find the measure of the stated angle to the nearest tenth.

5. $h = 12, i = 18, j = 7; m\angle H$

6. $h = 15, i = 16, j = 22; m\angle I$

7. $h = 23, i = 27, j = 29; m\angle J$

8. $h = 37, i = 21, j = 30; m\angle H$

Determine whether the Law of *Sines* or the Law of *Cosines* should be used first to solve each triangle. Then solve each triangle. Round angle measures to the nearest degree and side measures to the nearest tenth.

9.
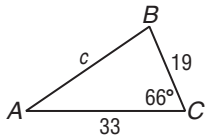
10.
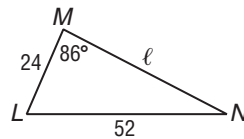
11. $a = 10, b = 14, c = 19$

12. $a = 12, b = 10, m\angle C = 27$

Solve each △*RST* described below. Round measures to the nearest tenth.

13. $r = 12, s = 32, t = 34$

14. $r = 30, s = 25, m\angle T = 42$

15. $r = 15, s = 11, m\angle R = 67$

16. $r = 21, s = 28, t = 30$

9-1 Skills Practice

Reflections

Draw the image of each figure under a reflection in line ℓ.

1.

2.
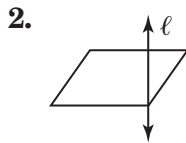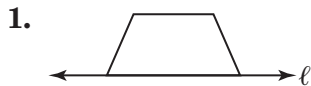
COORDINATE GEOMETRY Graph each figure and its image under the given reflection.

3. $\triangle ABC$ with vertices $A(-3, 2)$, $B(0, 1)$, and $C(-2, -3)$ in the origin
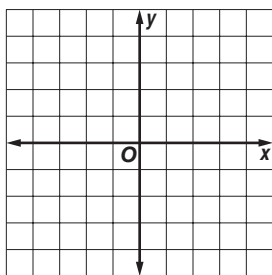
4. trapezoid $DEFG$ with vertices $D(0, -3)$, $E(1, 3)$, $F(3, 3)$, and $G(4, -3)$ in the y-axis
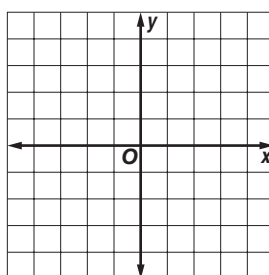
5. parallelogram $RSTU$ with vertices $R(-2, 3)$, $S(2, 4)$, $T(2, -3)$ and $U(-2, -4)$ in the line $y = x$
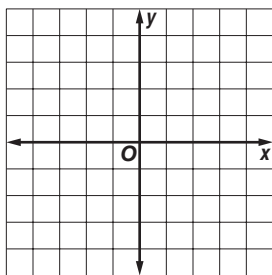
6. square $KLMN$ with vertices $K(-1, 0)$, $L(-2, 3)$, $M(1, 4)$, and $N(2, 1)$ in the x-axis
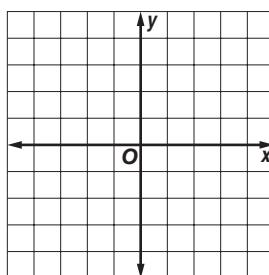
Determine how many lines of symmetry each figure has. Then determine whether the figure has point symmetry.

7.

8.

9. S

9-2 Skills Practice

Translations

In each figure, $a \parallel b$. Determine whether Figure 3 is a translation image of Figure 1. Write *yes* or *no*. Explain your answer.

1.

2.

3.

4.
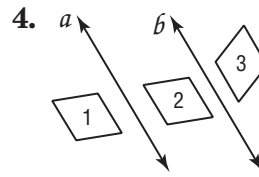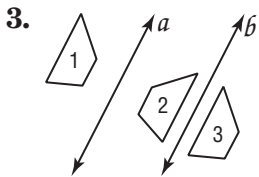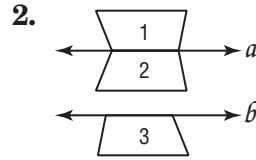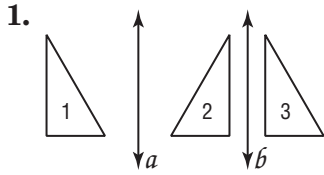
COORDINATE GEOMETRY Graph each figure and its image under the given translation.

5. $\triangle JKL$ with vertices $J(-4, -4)$, $K(-2, -1)$, and $L(2, -4)$ under the translation $(x, y) \rightarrow (x + 2, y + 5)$
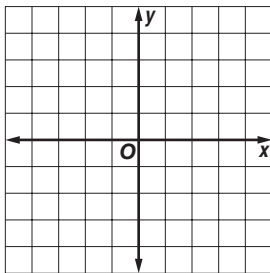
6. quadrilateral $LMNP$ with vertices $L(4, 2)$, $M(4, -1)$, $N(0, -1)$, and $P(1, 4)$ under the translation $(x, y) \rightarrow (x - 4, y - 3)$

Lesson 9-2
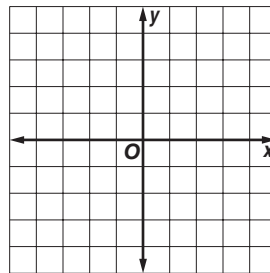
9-3 Skills Practice

Rotations

Rotate each figure about point *R* under the given angle of rotation and the given direction. Label the vertices of the rotation image.

1. 90° counterclockwise
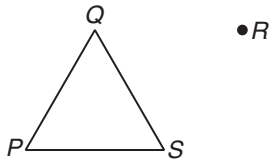
2. 90° clockwise
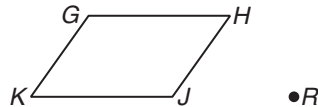
COORDINATE GEOMETRY Draw the rotation image of each figure 90° in the given direction about the origin and label the coordinates.

3. $\triangle STW$ with vertices $S(2, -1)$, $T(5, 1)$, and $W(3, 3)$ counterclockwise
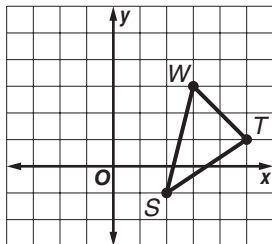
4. $\triangle DEF$ with vertices $D(-4, 3)$, $E(1, 2)$, and $F(-3, -3)$ clockwise
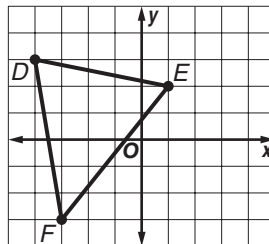
Use a composition of reflections to find the rotation image with respect to lines k and m. Then find the angle of rotation for each image.

5.

6.

24
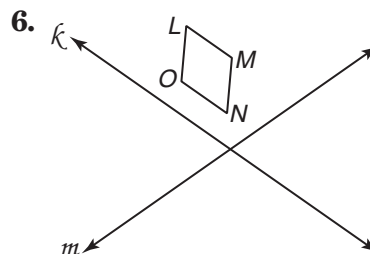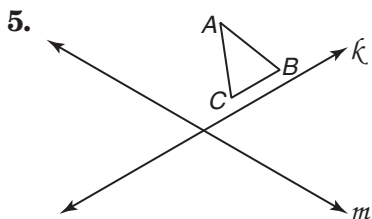
9-4 Skills Practice

Tessellations

Determine whether each regular polygon tessellates the plane. Explain.

1. 15-gon

2. 18-gon

3. square

4. 20-gon

Determine whether a semi-regular tessellation can be created from each set of figures. Assume each figure has a side length of 1 unit.

5. regular pentagons and equilateral triangles

6. regular dodecagons and equilateral triangles

7. regular octagons and equilateral triangles

Determine whether each polygon tessellates the plane. If so, describe the tessellation as *uniform*, *not uniform*, *regular*, or *semi-regular*.

8. rhombus
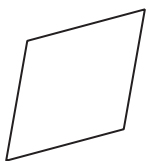
9. isosceles trapezoid and square
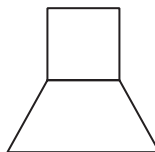
Determine whether each pattern is a tessellation. If so, describe it as *uniform*, *not uniform*, *regular*, or *semi-regular*.

10.

11.

Lesson 9-4
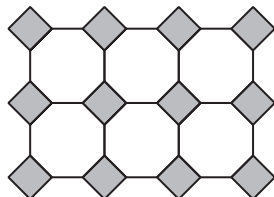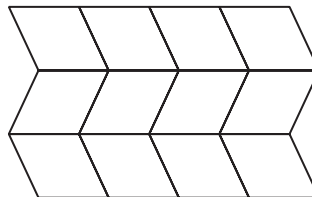
9-5 Skills Practice

Dilations

Draw the dilation image of each figure with center *C* and the given scale factor.

1. $r = 2$

C •

2. $r = \dfrac{1}{4}$

C •
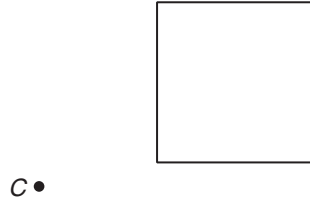
Find the measure of the dilation image $\overline{M'N'}$ or of the preimage $\overline{MN}$ using the given scale factor.

3. $MN = 3, r = 3$

4. $M'N' = 7, r = 21$

COORDINATE GEOMETRY Find the image of each polygon, given the vertices, after a dilation centered at the origin with a scale factor of 2. Then graph a dilation centered at the origin with a scale factor of $\dfrac{1}{2}$.

5. $J(2, 4), K(4, 4), P(3, 2)$
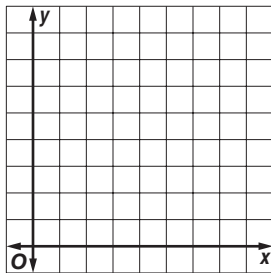
6. $D(-2, 0), G(0, 2), F(2, -2)$
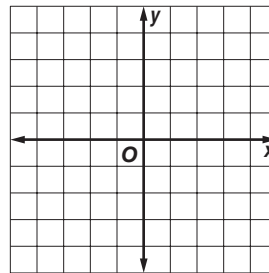
Determine the scale factor for each dilation with center *C*. Determine whether the dilation is an *enlargement*, *reduction*, or *congruence transformation*. The dashed figure is the dilation image.

7.

C

8.

C
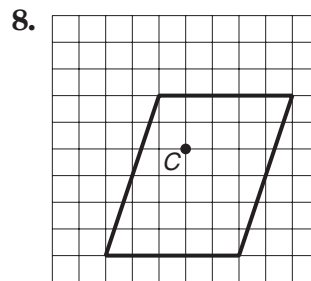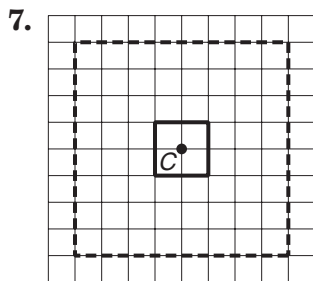
9-6 **Skills Practice**

Vectors

Write the component form of each vector.

1.

2.
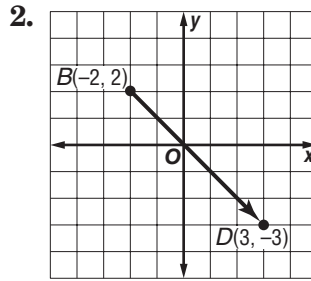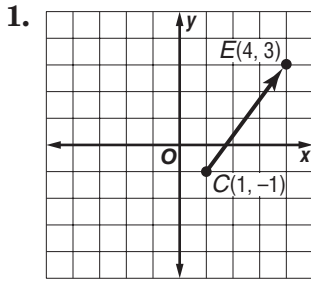
Find the magnitude and direction of $\overrightarrow{RS}$ for the given coordinates. Round to the nearest tenth.

3. $R(2, -3), S(4, 9)$

4. $R(0, 2), S(3, 12)$

5. $R(5, 4), S(-3, 1)$

6. $R(1, 5), S(-4, -6)$

Graph the image of each figure under a translation by the given vector(s).

7. $\triangle ABC$ with vertices $A(-4, 3), B(-1, 4),$ $C(-1, 1); \overrightarrow{t} = \langle 4, -3 \rangle$
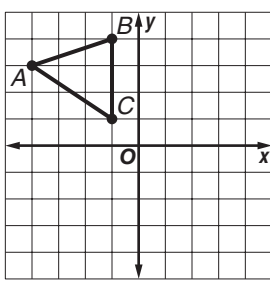
8. trapezoid with vertices $T(-4, -2),$ $R(-1, -2), S(-2, -3), Y(-3, -3); \overrightarrow{a} = \langle 3, 1 \rangle$ and $\overrightarrow{b} = \langle 2, 4 \rangle$
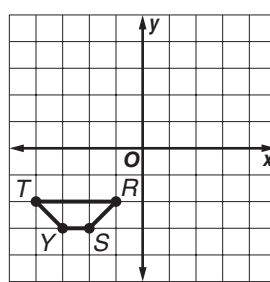
Find the magnitude and direction of each resultant for the given vectors.

9. $\overrightarrow{y} = \langle 7, 0 \rangle, \overrightarrow{z} = \langle 0, 6 \rangle$

10. $\overrightarrow{b} = \langle 3, 2 \rangle, \overrightarrow{c} = \langle -2, 3 \rangle$

10-1 Skills Practice

Circles and Circumference

For Exercises 1−5, refer to the circle at the right.
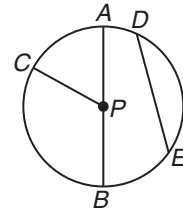
1. Name the circle.

2. Name a radius.

3. Name a chord.

4. Name a diameter.

5. Name a radius not drawn as part of a diameter.

6. Suppose the diameter of the circle is 16 centimeters. Find the radius.

7. If $PC = 11$ inches, find AB.

The diameters of $\odot F$ and $\odot G$ are 5 and 6 units, respectively. Find each measure.

8. BF
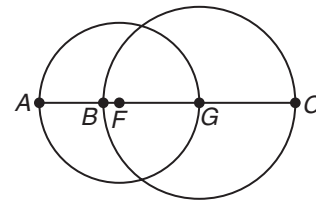
9. AB

The radius, diameter, or circumference of a circle is given. Find the missing measures to the nearest hundredth.

10. $r = 8$ cm

$d = $ _____, $C \approx$ _____

11. $r = 13$ ft

$d = $ _____, $C \approx$ _____

12. $d = 9$ m

$r = $ _____, $C \approx$ _____

13. $C = 35.7$ in.

$d \approx$ _____, $r \approx$ _____

Find the exact circumference of each circle.

14.

3 cm

15.

8 ft

15 ft
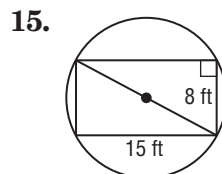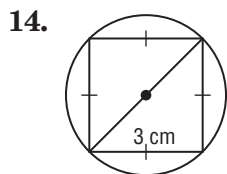
10-2 Skills Practice

Measuring Angles and Arcs

ALGEBRA In $\odot R$, $\overline{AC}$ and $\overline{EB}$ are diameters. Find each measure.
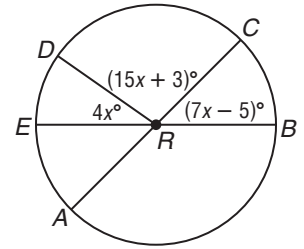
1. $m\angle ERD$

2. $m\angle CRD$

3. $m\angle BRC$

4. $m\angle ARB$

5. $m\angle ARE$

6. $m\angle BRD$

In $\odot A$, $m\angle PAU = 40$, $\angle PAU \cong \angle SAT$, and $\angle RAS \cong \angle TAU$. Find each measure.
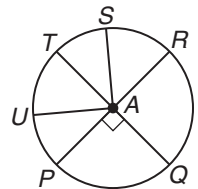
7. $m\overset{\frown}{PQ}$

8. $m\overset{\frown}{PQR}$

9. $m\overset{\frown}{ST}$

10. $m\overset{\frown}{RS}$

11. $m\overset{\frown}{RSU}$

12. $m\overset{\frown}{STP}$

13. $m\overset{\frown}{PQS}$

14. $m\overset{\frown}{PRU}$

The diameter of $\odot D$ is 18 units long. Find the length of each arc for the given angle measure.
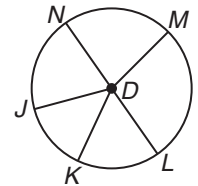
15. $\overset{\frown}{LM}$ if $m\angle LDM = 100$

16. $\overset{\frown}{MN}$ if $m\angle MDN = 80$

17. $\overset{\frown}{KL}$ if $m\angle KDL = 60$

18. $\overset{\frown}{NJK}$ if $m\angle NDK = 120$

19. $\overset{\frown}{KLM}$ if $m\angle KDM = 160$

20. $\overset{\frown}{JK}$ if $m\angle JDK = 50$

Lesson 10-2

10-3 Skills Practice

Arcs and Chords

In $\odot H$, $m\widehat{RS} = 82$, $m\widehat{TU} = 82$, $RS = 46$, and $\overline{TU} \cong \overline{RS}$.
Find each measure.
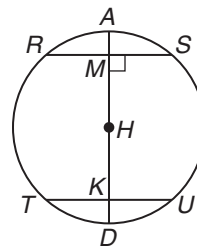
1. TU

2. TK

3. MS

4. $m\angle HKU$

5. $m\widehat{AS}$

6. $m\widehat{AR}$

7. $m\widehat{TD}$

8. $m\widehat{DU}$

The radius of $\odot Y$ is 34, $AB = 60$, and $m\widehat{AC} = 71$. Find each
measure.
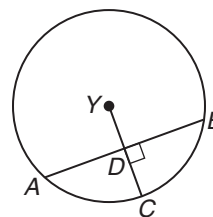
9. $m\widehat{BC}$

10. $m\widehat{AB}$

11. AD

12. BD

13. YD

14. DC

In $\odot X$, $LX = MX$, $XY = 58$, and $VW = 84$. Find each measure.
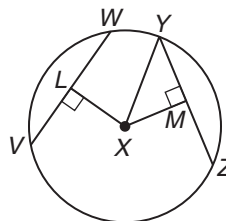
15. YZ

16. YM

17. MX

18. MZ

19. LV

20. LX

10-4 **Skills Practice**

Inscribed Angles

In $\odot S$, $m\widehat{KL} = 80$, $m\widehat{LM} = 100$, and $m\widehat{MN} = 60$. Find the measure of each angle.
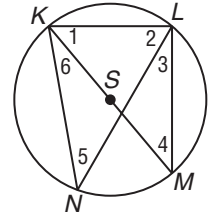
1. $m\angle 1$ **2.** $m\angle 2$

3. $m\angle 3$ **4.** $m\angle 4$

5. $m\angle 5$ **6.** $m\angle 6$

ALGEBRA Find the measure of each numbered angle for each figure.

7. $m\angle 1 = 5x - 2$, $m\angle 2 = 2x + 8$

8. $m\angle 1 = 5x$, $m\angle 3 = 3x + 10$, $m\angle 4 = y + 7$, $m\angle 6 = 3y + 11$
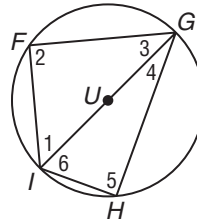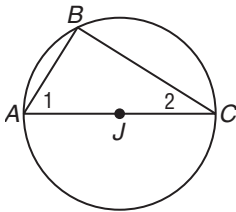
Quadrilateral $RSTU$ is inscribed in $\odot P$ such that $m\widehat{STU} = 220$ and $m\angle S = 95$. Find each measure.

9. $m\angle R$ **10.** $m\angle T$

11. $m\angle U$ **12.** $m\widehat{SRU}$

13. $m\widehat{RUT}$ **14.** $m\widehat{RST}$

Lesson 10-4
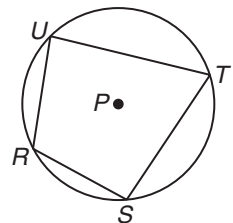
10-5 Skills Practice

Tangents

Determine whether each segment is tangent to the given circle.

1. $\overline{HI}$
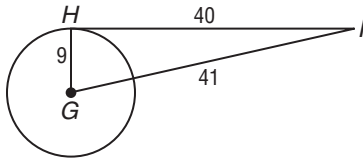
2. $\overline{AB}$
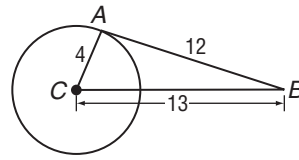
Find x. Assume that segments that appear to be tangent are tangent.

3.
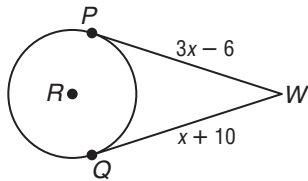
4.
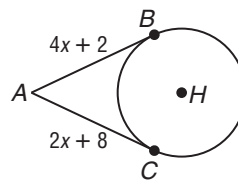
5.
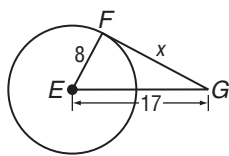
6.
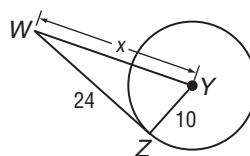
Find the perimeter of each polygon for the given information. Assume that segments that appear to be tangent are tangent.

7. $QT = 4, PT = 9, SR = 13$
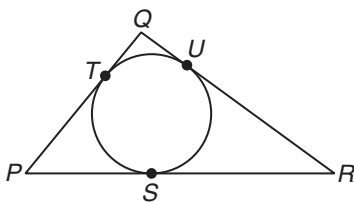
8. $HIJK$ is a rhombus, $SI = 5, HR = 13$
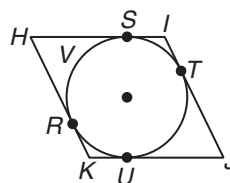
10-6 Skills Practice

Secants, Tangents, and Angle Measures

Find each measure.

1. $m\angle 1$

50°
1
56°

2. $m\angle 2$

48°
2
38°

3. $m\angle 3$

198°
3

4. $m\angle 4$

4
124°

5. $m\angle 5$

66°
5
50°

6. $m\angle 6$
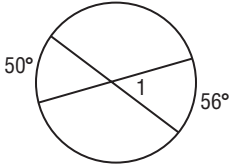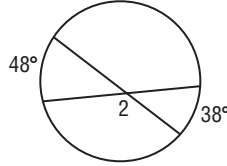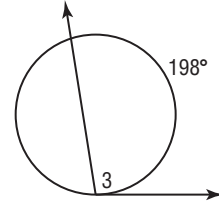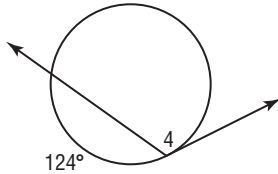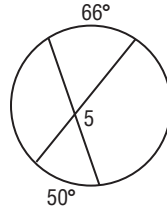
228°
6
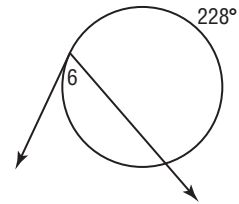
Find x. Assume that any segment that appears to be tangent is tangent.

7.

120°   40° $x°$

8.

100°
72°
$x°$
140°

9.

144°
$x°$ 60°

10.

$x°$
45°

11.

$x°$
84°

12.

34° $x°$
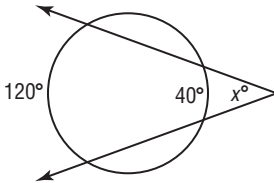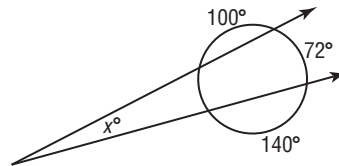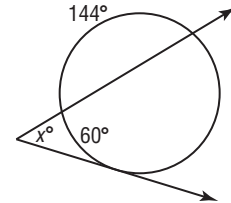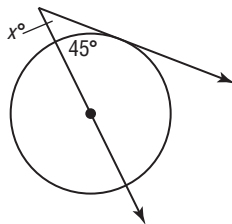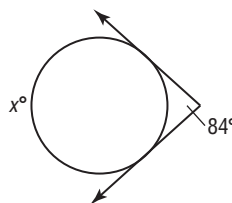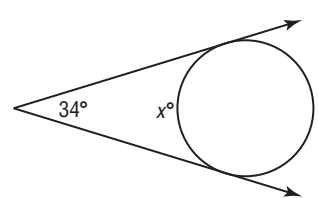
10-7 Skills Practice

Special Segments in a Circle

Find x to the nearest tenth if necessary. Assume that segments that appear to be tangent are tangent.

1.

2.

3.

4.

5.

6.

7.

8.

9.
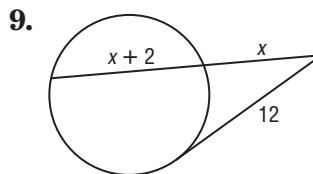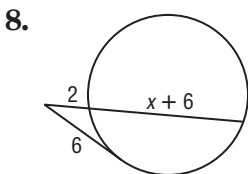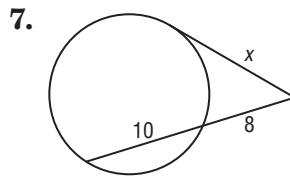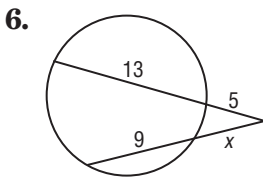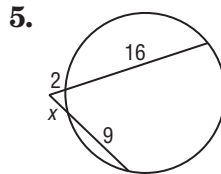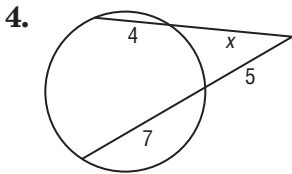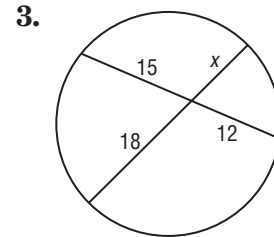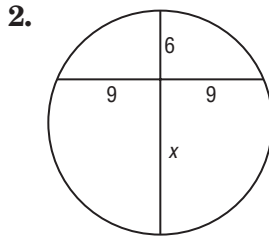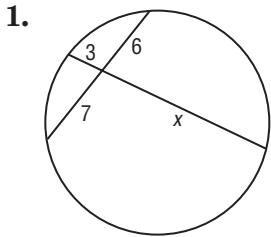
10-8 Skills Practice

Equations of Circles

Write an equation for each circle.

1. center at origin, $r = 6$

2. center at $(0, 0)$, $r = 2$

3. center at $(4, 3)$, $r = 9$

4. center at $(7, 1)$, $d = 24$

5. center at $(-5, 2)$, $r = 4$

6. center at $(6, -8)$, $d = 10$

7. a circle with center at $(8, 4)$ and a radius with endpoint $(0, 4)$

8. a circle with center at $(-2, -7)$ and a radius with endpoint $(0, 7)$

9. a circle with center at $(-3, 9)$ and a radius with endpoint $(1, 9)$

10. a circle whose diameter has endpoints $(-3, 0)$ and $(3, 0)$

Graph each equation.

11. $x^2 + y^2 = 16$

12. $(x - 1)^2 + (y - 4)^2 = 9$

Lesson 10-8
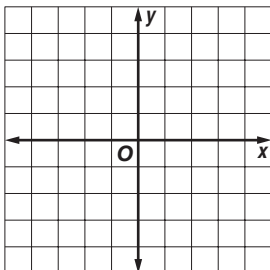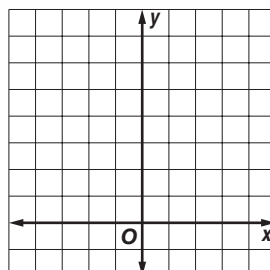
11-1 Skills Practice

Areas of Parallelograms

Find the perimeter and area of each parallelogram. Round to the nearest tenth if necessary.

1.

30 cm
60°
20 cm

2.

5.5 ft
4 ft
60°

3.

14 yd
7 yd
45°

4.

26 in.
22 in.
45°

5.

3.4 m

6.

18.5 km
9 km

Find the area of each figure.

7.

6
1   1
2   1   1   2
2   2
1   1
6

8.

8
2 3
6   2
2   3
2
2   2   4
2
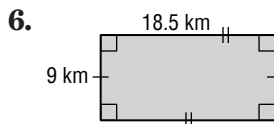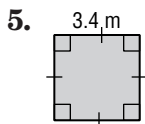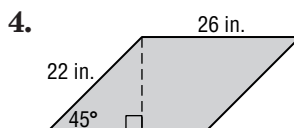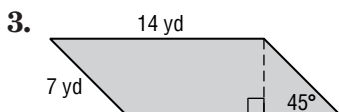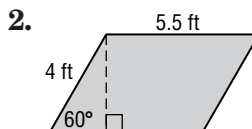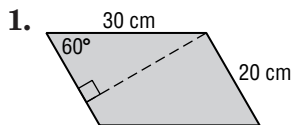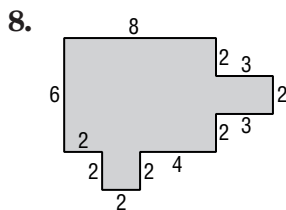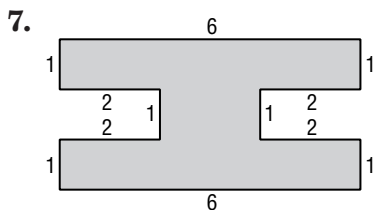
COORDINATE GEOMETRY Given the coordinates of the vertices of a quadrilateral, determine whether it is a *square*, a *rectangle*, or a *parallelogram*. Then find the area of the quadrilateral.

9. $A(-4, 2), B(-1, 2), C(-1, -1),$
$D(-4, -1)$

10. $P(-3, 3), Q(1, 3), R(1, -3),$
$S(-3, -3)$

11. $D(-5, 1), E(7, 1), F(4, -4),$
$G(-8, -4)$

12. $R(2, 3), S(4, 10), T(12, 10),$
$U(10, 3)$

11-2 Skills Practice

Areas of Triangles, Trapezoids, and Rhombi

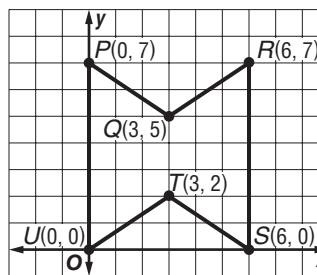**Find the area of each figure. Round to the nearest tenth if necessary.**

1.

4 ft
3.5 ft
6 ft

2.

22 in.
12 in.
25 in.

3.

28 cm
34 cm
21 cm
40 cm
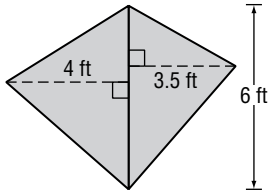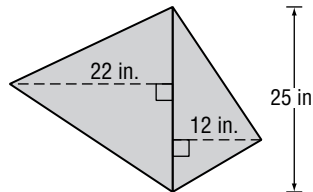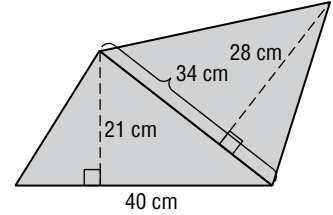
Find the area of each quadrilateral given the coordinates of the vertices.

4. trapezoid $WXYZ$
$W(-5, 3), X(3, 3), Y(6, -3), Z(-8, -3)$

5. rhombus $HIJK$
$H(4, -3), I(2, -7), J(0, -3), K(2, 1)$

Find the missing measure for each figure.

6. Trapezoid $RSTU$ has an area of 935 square centimeters. Find the height of $RSTU$.

S
30 cm
T
R
55 cm
U
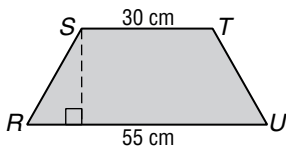
7. Trapezoid $JKLM$ has an area of 7.5 square inches. Find ML.

J
5 in.
K
2 in.
M
L
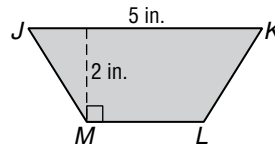
8. Triangle ABC has an area of 1050 square meters. Find the height of $\triangle ABC$.

B
A
60 m
C
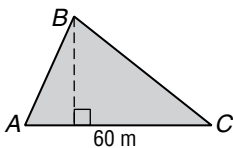
9. Rhombus $EFGH$ has an area of 750 square feet. If EG is 50 feet, find FH.

F
G
E
H

Lesson 11-2
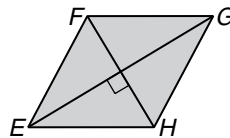
11-3 Skills Practice

Areas of Regular Polygons and Circles

Find the area of each regular polygon. Round to the nearest tenth.

1. a pentagon with a perimeter of 45 feet

2. a hexagon with a side length of 4 inches

3. a nonagon with a side length of 8 meters

4. a triangle with a perimeter of 54 centimeters

Find the area of each circle. Round to the nearest tenth.

5. a circle with a radius of 6 yards

6. a circle with a diameter of 18 millimeters

Find the area of each shaded region. Assume that all polygons are regular. Round to the nearest tenth.

7.

3 in.

8.

4 m

8 m

9.

4 ft

10.

5 cm
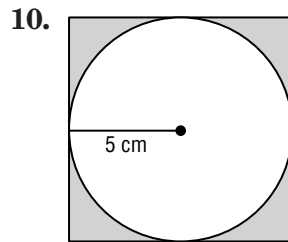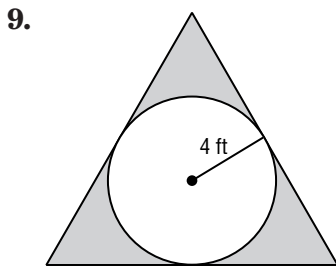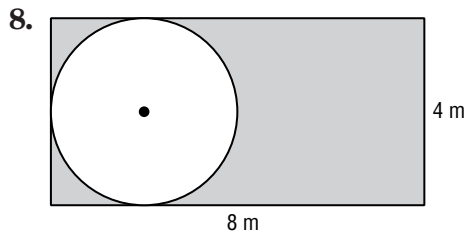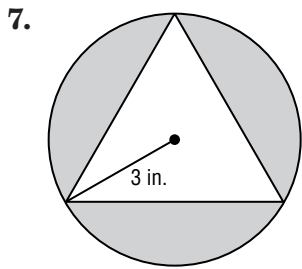
11-4 Skills Practice

Areas of Composite Figures

Find the area of each figure. Round to the nearest tenth if necessary.

1.

5

12

20

2.

3

7

3.

8

8

4.

15

30

5.

y

C(3, 8)

B(3, 5)

D(8, 5)

E(8, 0)

O *A*(0, 0)

x

6.

y

P(0, 7)

R(6, 7)

Q(3, 5)

T(3, 2)

U(0, 0)

S(6, 0)

O

x

7.

y

J(1, 4)

K(5, 4)

O

L(6, 0) *x*

M(1, –3)

8.

y

E(–2, 4)

F(2, 4)

G(4, 1)

O

x

D(–2, –2)

H(2, –2)

Lesson 11-4
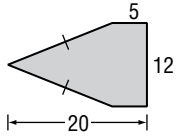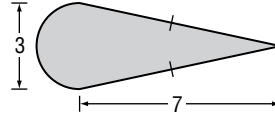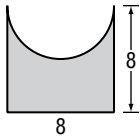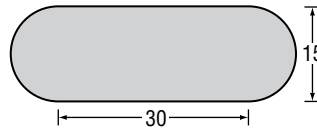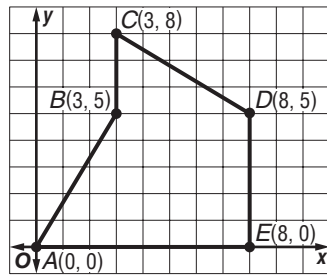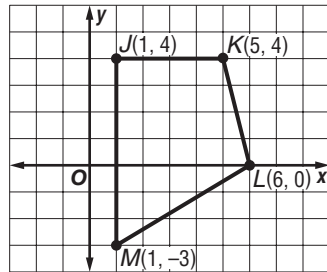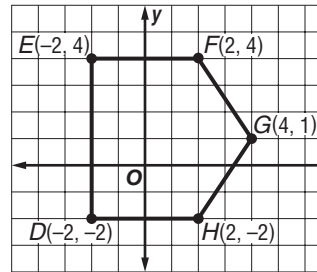
11-5 Skills Practice

Geometric Probability and Areas of Sectors

Find the probability that a point chosen at random lies in the shaded region.

1.

2.
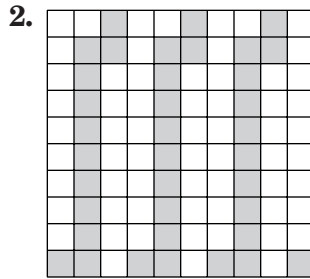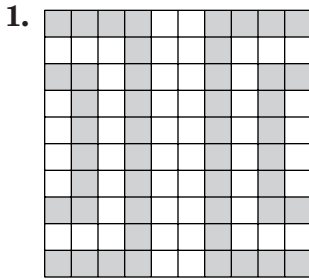
Find the area of the indicated sector. Then find the probability of spinning the color indicated if the diameter of each spinner is 6 inches.
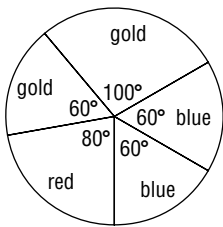
3. red

4. gold
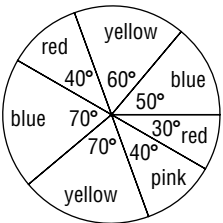
5. blue

6. yellow

Find the area of the shaded region. Then find the probability that a point chosen at random is in the shaded region. Assume that all inscribed polygons are regular.

7.

8.
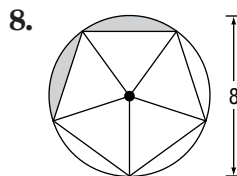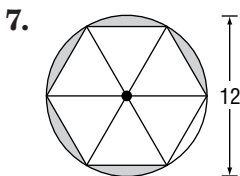
12-1 Skills Practice

Representations of Three-Dimensional Figures

Sketch each solid using isometric dot paper.

1. cube 2 units on each edge

2. rectangular prism 2 units high, 5 units long, and 2 units wide

Draw the back view and corner view of a figure given each orthogonal drawing.

3.

top view   left view   front view   right view

4.

top view   left view   front view   right view
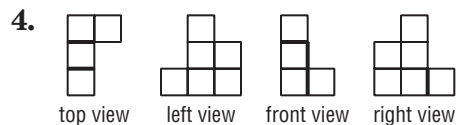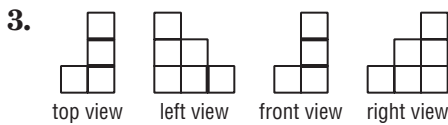
Determine the shape resulting from each cross section of the square prism.

5.

6.

7.

8.
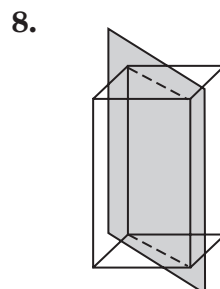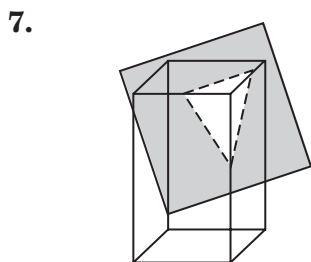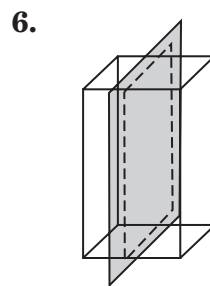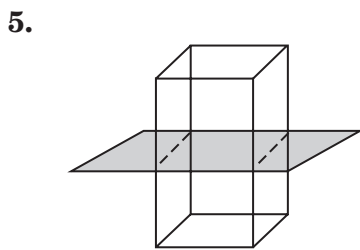
12-2 Skills Practice

Surface Areas of Prisms

Find the lateral area of each prism.

1.

12
10
12

2.

6
12
8

3.

6
8
5
10

4.

9
9
12
9
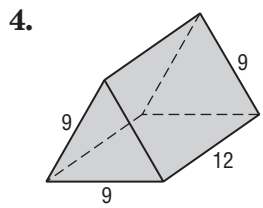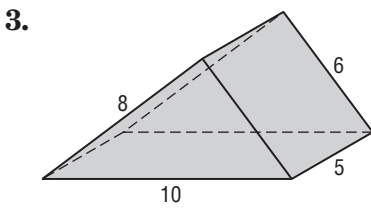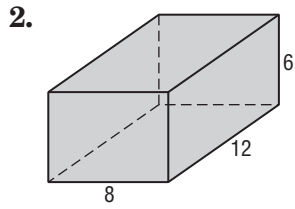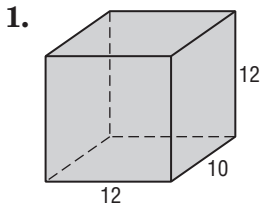
Find the surface area of each prism. Round to the nearest tenth if necessary.

5.

8
6
18

6.

7
13
15

7.

6
10
9

8.

4
7
3
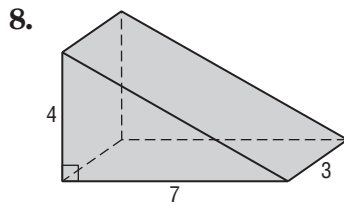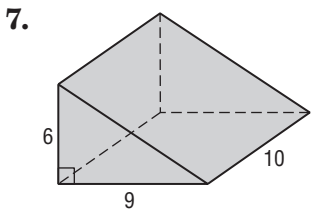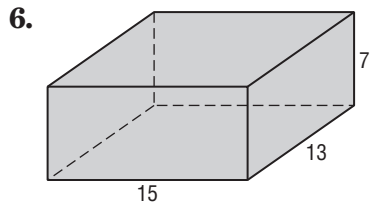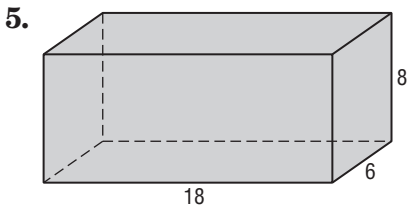
12-3 Skills Practice

Surface Areas of Cylinders

Find the surface area of a cylinder with the given dimensions. Round to the nearest tenth.

1. $r = 10$ in., $h = 12$ in.

2. $r = 8$ cm, $h = 15$ cm

3. $r = 5$ ft, $h = 20$ ft

4. $d = 20$ yd, $h = 5$ yd

5. $d = 8$ m, $h = 7$ m

6. $d = 24$ mm, $h = 20$ mm

Find the surface area of each cylinder. Round to the nearest tenth.

7.

5 ft

7 ft

8.

4 m

8.5 m
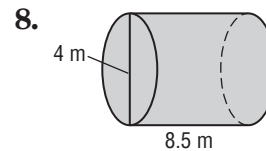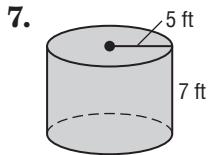
Find the radius of the base of each cylinder.

9. The surface area is 603.2 square meters, and the height is 10 meters.

10. The surface area is 100.5 square inches, and the height is 6 inches.

11. The surface area is 226.2 square centimeters, and the height is 5 centimeters.

12. The surface area is 1520.5 square yards, and the height is 14.2 yards.

Lesson 12-3

12-4   Skills Practice

Surface Areas of Pyramids

Find the surface area of each regular pyramid. Round to the nearest tenth if necessary.

1.
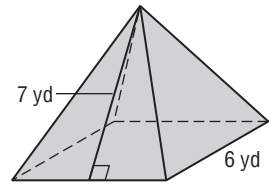
7 cm

4 cm

2.

20 in.

8 in.

3.

9 m

10 m

4.

12 ft

14 ft

5.

9 mm

6 mm

6.

7 yd

6 yd

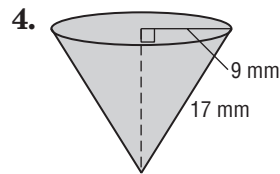**7.**

12 m

18 m

8.

20 in.

16 in.

Lesson 12-4
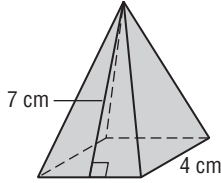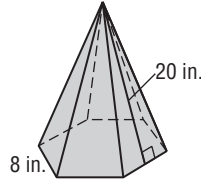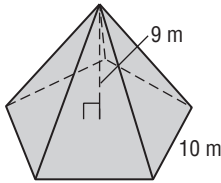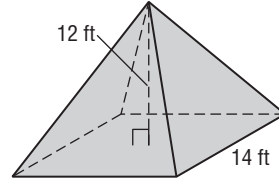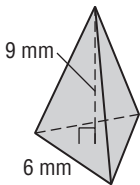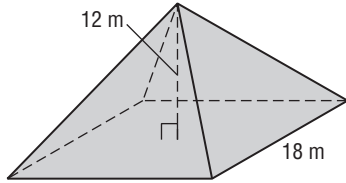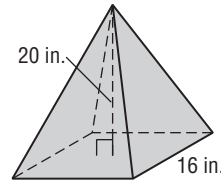
12-5 Skills Practice

Surface Areas of Cones

Find the surface area of each cone. Round to the nearest tenth if necessary.

1.

5 m
14 m

2.

10 ft
25 ft

3.

21 in.
8 in.

4.

9 mm
17 mm

5.

7 cm
22 cm

6.

6 yd
4 yd
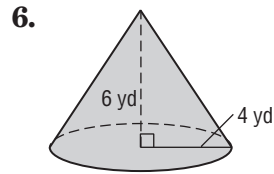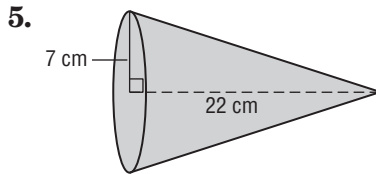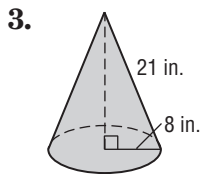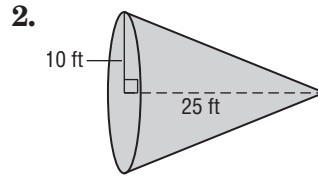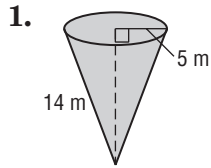
7. Find the surface area of a cone if the height is 12 inches and the slant height is 15 inches.

**8.** Find the surface area of a cone if the height is 9 centimeters and the slant height is 12 centimeters.

9. Find the surface area of a cone if the height is 10 meters and the slant height is 14 meters.

10. Find the surface area of a cone if the height is 5 feet and the slant height is 7 feet.

12-6 **Skills Practice**

Surface Areas of Spheres

In the figure, A is the center of the sphere, and plane $\mathcal{T}$ intersects the sphere in circle E. Round to the nearest tenth if necessary.
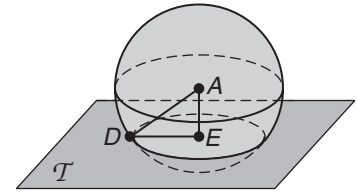
1. If $AE = 5$ and $DE = 12$, find AD.
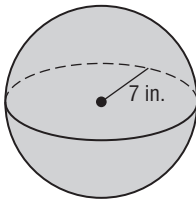
2. If $AE = 7$ and $DE = 15$, find AD.

3. If the radius of the sphere is 18 units and the radius of $\odot E$ is 17 units, find AE.

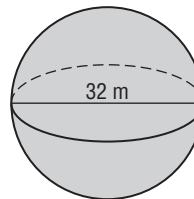**4.** If the radius of the sphere is 10 units and the radius of $\odot E$ is 9 units, find AE.

5. If M is a point on $\odot E$ and $AD = 23$, find AM.

Find the surface area of each sphere or hemisphere. Round to the nearest tenth.

6.

7 in.

7.

32 m

8. a hemisphere with a radius of the great circle 8 yards

9. a hemisphere with a radius of the great circle 2.5 millimeters

10. a sphere with the area of a great circle 28.6 inches
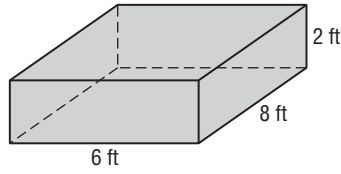
13-1 Skills Practice

Volumes of Prisms and Cylinders

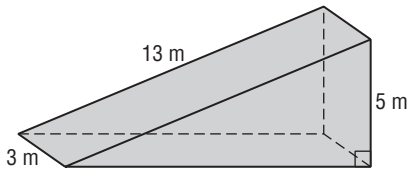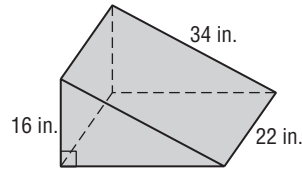**Find the volume of each prism or cylinder. Round to the nearest tenth if necessary.**

1.

8 cm
16 cm
18 cm

2.

2 ft
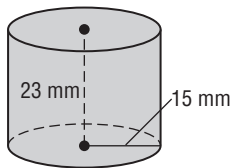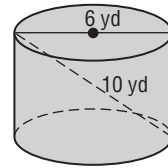8 ft
6 ft

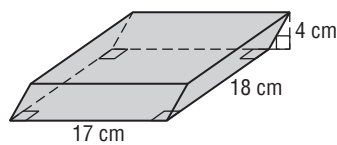3.

13 m
5 m
3 m

4.

34 in.
16 in.
22 in.

5.

23 mm
15 mm

6.

6 yd
10 yd
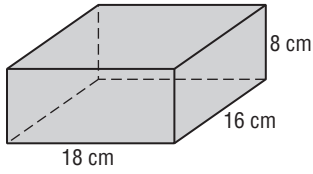
Find the volume of each oblique prism or cylinder. Round to the nearest tenth if necessary.

7.

4 cm
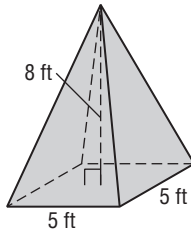18 cm
17 cm

8.

5 in.
3 in.
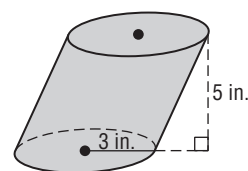
13-2 Skills Practice

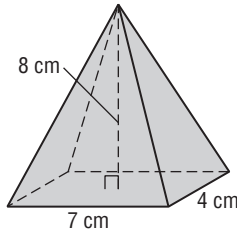### *Volumes of Pyramids and Cones*

Find the volume of each pyramid or cone. Round to the nearest tenth if necessary.
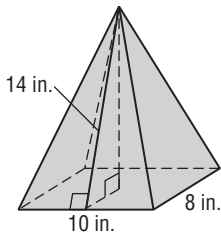
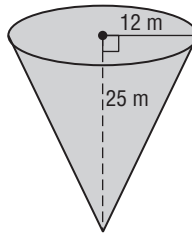**1.**

8 ft
5 ft
5 ft

2.

8 cm
7 cm
4 cm

3.

14 in.
10 in.
8 in.

4.

12 m
25 m

5.

14 yd
25 yd

6.

18 mm
66°

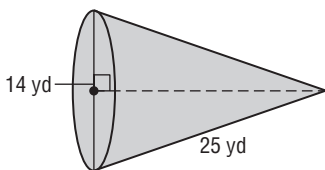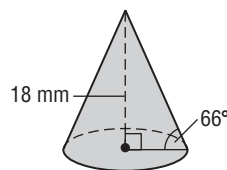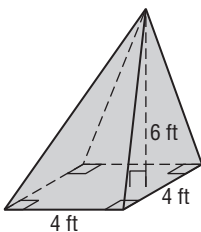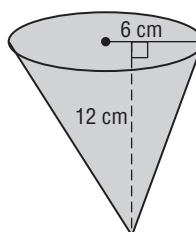**Find the volume of each oblique pyramid or cone. Round to the nearest tenth if necessary.**

7.

6 ft
4 ft
4 ft

8.

6 cm
12 cm

Lesson 13-2

13-3 Skills Practice

Volumes of Spheres

Find the volume of each sphere or hemisphere. Round to the nearest tenth.

1. The radius of the sphere is 9 centimeters.

2. The diameter of the sphere is 10 inches.

3. The circumference of the sphere is 26 meters.

4. The radius of the hemisphere is 7 feet.

5. The diameter of the hemisphere is 12 kilometers.

6. The circumference of the hemisphere is 48 yards.

7.

16.2 cm

8.

94.8 ft
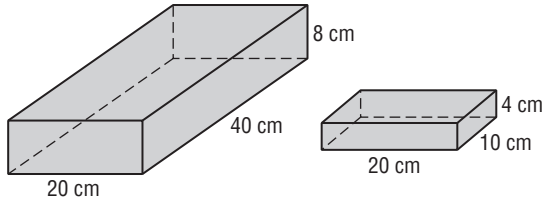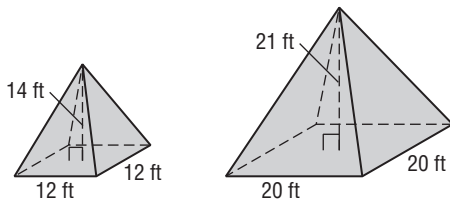
9.

4.5 in.

10.

14.4 m
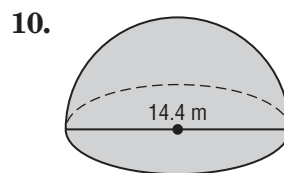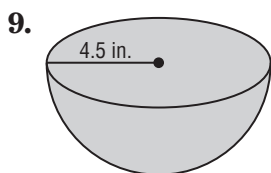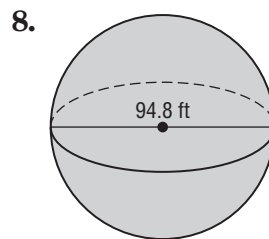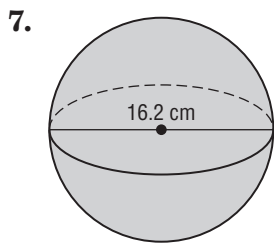
13-4 Skills Practice

Congruent and Similar Solids

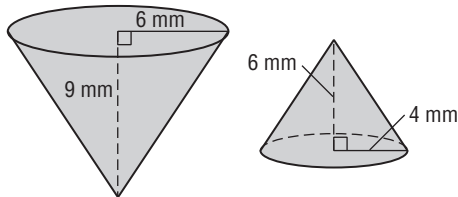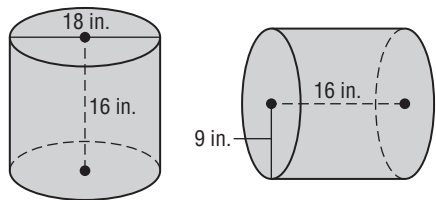**Determine whether each pair of solids are *similar*, *congruent*, or *neither*.**

1.

8 cm
40 cm
20 cm
4 cm
10 cm
20 cm

2.

21 ft
14 ft
12 ft
12 ft
20 ft
20 ft

3.

6 mm
9 mm
6 mm
4 mm

4.

18 in.
16 in.
16 in.
9 in.

For Exercises 5–8, refer to the two similar prisms.

9 cm
15 cm
12 cm
6 cm
10 cm
8 cm

5. Find the scale factor of the two prisms.

6. Find the ratio of the surface areas.

7. Find the ratio of the volumes.

8. Suppose the volume of the larger prism is 810 cubic centimeters. Find the volume of the smaller prism.
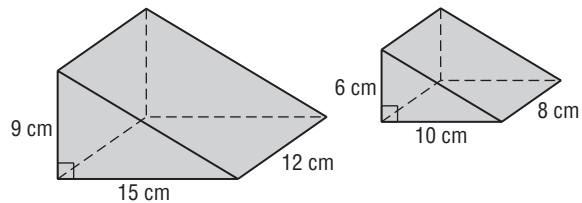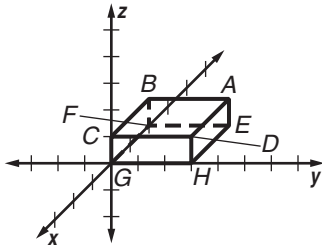
13-5 Skills Practice

Coordinates in Space

Graph the rectangular solid that contains the given point and the origin as vertices. Label the coordinates of each vertex.

1. $A(-5, 3, 2)$

2. $H(3, 2, 5)$

3. Dilate the prism by a scale factor of 2. Graph the image under the dilation.

Determine the distance between each pair of points. Then determine the coordinates of the midpoint M of the segment joining the pair of points.

4. $R(2, 1, 0)$ and $S(3, 3, 4)$

5. $Q(5, 0, -2)$ and $T(2, 3, 2)$

6. $A(-4, 1, 6)$ and $B(-1, 0, 4)$

7. $J(0, 5, 1)$ and $K(4, -3, 2)$

Lesson 13-5