Chapter 4 Summary and Review

VOCABULARY

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- **equilateral triangle,** *p. 173*
- **isosceles triangle,** *p. 173*
- **scalene triangle,** *p. 173*
- **equiangular triangle,** *p. 174*
- **acute triangle,** *p. 174*
- **right triangle,** *p. 174*
- **obtuse triangle,** *p. 174*
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- **Pythagorean Theorem,** *p. 192*
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- **median of a triangle,** *p. 207*
- **centroid,** *p. 208*

VOCABULARY REVIEW

Fill in the blank.

1. A(n) __?__ is a figure formed by three segments joining three noncollinear points.

2. The side opposite the right angle is the __?__ of a right triangle.

3. A(n) __?__ to a theorem is a statement that can be proved easily using the theorem.

4. The congruent sides of an isosceles triangle are called __?__, and the third side is called the __?__.

5. A point that joins two sides of a triangle is called a(n) __?__.

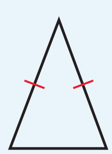
6. A segment from a vertex of a triangle to the midpoint of its opposite side is called a(n) __?__.

7. The point at which the medians of a triangle intersect is called the __?__ of a triangle.

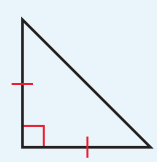
4.1 CLASSIFYING TRIANGLES

Examples on pp. 173–175

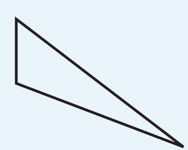
EXAMPLES **Classify the triangle by its angles and by its sides.**



Acute isosceles



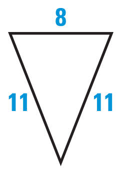
Right isosceles



Obtuse scalene

Classify the triangle by its sides.

8.



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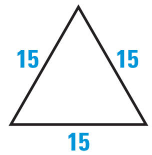

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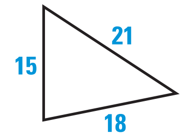


11. What kind of triangle has angle measures of 30°, 60°, and 90°?

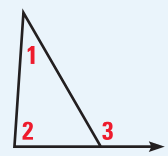
12. What kind of triangle has angle measures of 84°, 55°, and 41°?

13. What kind of triangle has side lengths of 4 feet, 8 feet, and 8 feet?

4.2 Angle Measures of Triangles

Examples on pp. 179–181

EXAMPLE **Given $m\angle 1 = 34°$ and $m\angle 2 = 86°$, find $m\angle 3$.**



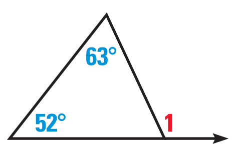
$m\angle 3 = m\angle 1 + m\angle 2$ — Exterior Angle Theorem

$= 34° + 86°$ — Substitute 34° for $m\angle 1$ and 86° for $m\angle 2$.

$= 120°$ — Simplify.

Find $m\angle 1$.

14.



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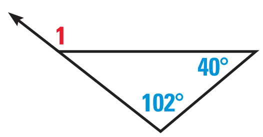

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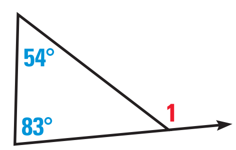


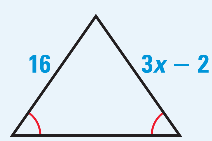
17. The measure of one interior angle of a triangle is 16°. The other interior angles are congruent. Find their measures.

18. The measure of one of the interior angles of a right triangle is 31°. Find the measures of the other interior angles.

4.3 Isosceles and Equilateral Triangles

Examples on pp. 185–187

EXAMPLE **Find the value of x in the diagram.**



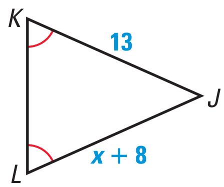
$3x - 2 = 16$ — Converse of the Base Angles Theorem

$3x = 18$ — Add 2 to each side.

$x = 6$ — Divide each side by 3.

Find the value of *x*.

19.



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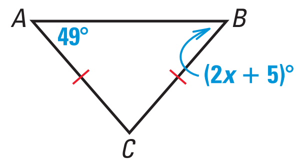

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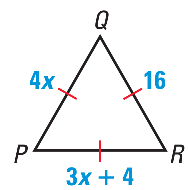

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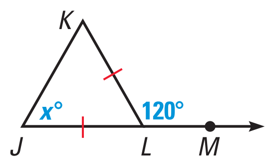

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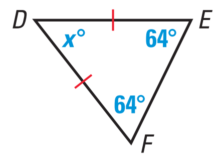

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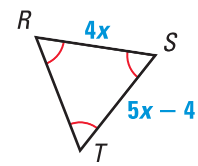


4.4 THE PYTHAGOREAN THEOREM AND THE DISTANCE FORMULA

Examples on pp. 192–194

EXAMPLE Find the distance between *G*(3, 5) and *H*(7, −2).

$GH = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ — Distance Formula

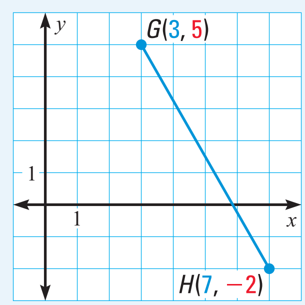
$= \sqrt{(7 - 3)^2 + (-2 - 5)^2}$ — Substitute 7 for x_2, 3 for x_1, −2 for y_2, and 5 for y_1.

$= \sqrt{4^2 + (-7)^2}$ — Simplify.

$= \sqrt{16 + 49}$ — Multiply.

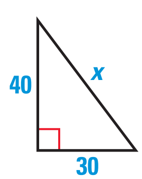
$= \sqrt{65}$ — Add.

≈ 8.1 — Approximate with a calculator.



Find the unknown side length. Use a calculator to round your answer to the nearest tenth, if necessary.

25.



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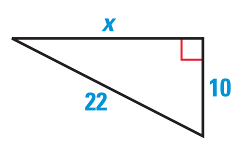

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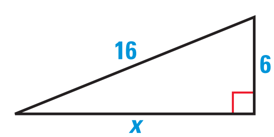


Find the distance between the two points. Use a calculator to round your answer to the nearest tenth, if necessary.

28. $A(0, 0)$, $B(-3, 4)$

29. $A(2, 5)$, $B(6, -4)$

30. $A(-8, 7)$, $B(3, 7)$

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

32. $A(-2, -1)$, $B(-6, -7)$

33. $A(8, -3)$, $B(-2, 4)$

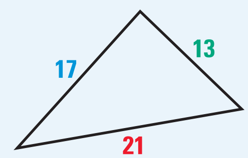
34. $A(9, 1)$, $B(-3, -6)$

35. $A(5, 4)$, $B(0, 6)$

4.5 THE CONVERSE OF THE PYTHAGOREAN THEOREM

Examples on pp. 200–202

EXAMPLE **Classify the triangle as *acute, right,* or *obtuse*.**



Compare the square of the length of the longest side with the sum of the squares of the lengths of the two shorter sides.

$c^2 \stackrel{?}{=} a^2 + b^2$	Compare c^2 with $a^2 + b^2$.
$21^2 \stackrel{?}{=} 17^2 + 13^2$	Substitute 21 for *c*, 17 for *a*, and 13 for *b*.
$441 \stackrel{?}{=} 289 + 169$	Multiply.
$441 < 458$	Simplify.

$c^2 < a^2 + b^2$, so the triangle is acute.

Use the side lengths to classify the triangle as *acute, right,* or *obtuse*.

36. 12, 9, 15 **37.** 7, 11, 16 **38.** 18, 19, 22

39. 18, 42, 44 **40.** 10, 3, 12 **41.** 15, 21, 31

4.6 MEDIANS OF A TRIANGLE

Examples on pp. 207–209

EXAMPLES **Find the segment lengths.**

a. *D* is the centroid of $\triangle ABC$ and $AE = 12$. Find *AD* and *ED*.

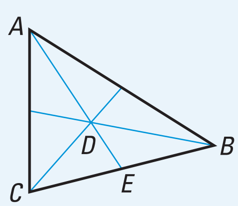
$AD = \frac{2}{3}AE$

$= \frac{2}{3}(12) = 8$

$AE = AD + ED$

$12 = 8 + ED$

$4 = ED$



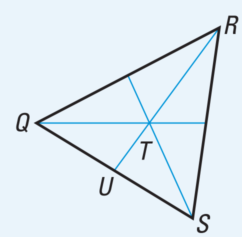
b. *T* is the centroid of $\triangle QRS$ and $RT = 18$. Find *RU*.

$RT = \frac{2}{3}RU$

$18 = \frac{2}{3}RU$

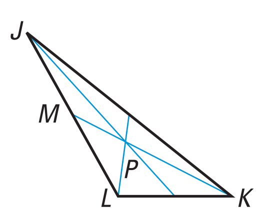
$\frac{3}{2}(18) = RU$

$27 = RU$

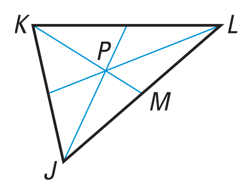


***P* is the centroid of $\triangle JKL$. Find *KP* and *PM*.**

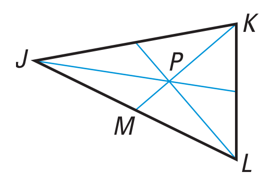
42. $KM = 18$



43. $KM = 42$

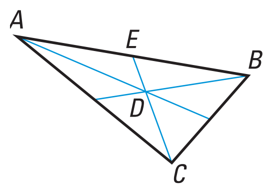


44. $KM = 120$

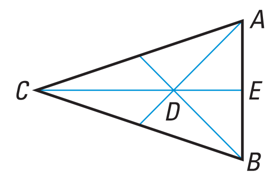


***D* is the centroid of △*ABC*. Find *CE* and *DE*.**

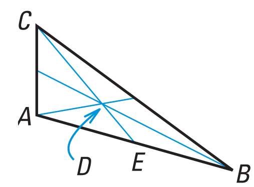
45. $CD = 8$



46. $CD = 16$



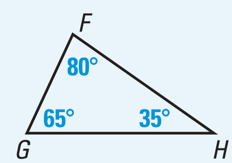
47. $CD = 28$



4.7 TRIANGLE INEQUALITIES

Examples on pp. 212–214

EXAMPLE **Name the sides of the triangle shown from longest to shortest.**

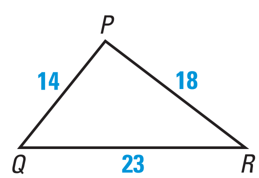


By Theorem 4.11, if one angle of a triangle is larger than another angle, then the side opposite the larger angle is longer than the side opposite the smaller angle.

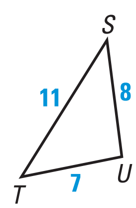
So, because $m\angle F > m\angle G > m\angle H$, $GH > FH > GF$. The sides from longest to shortest are $\overline{GH}$, $\overline{FH}$, and $\overline{GF}$.

Name the angles from largest to smallest.

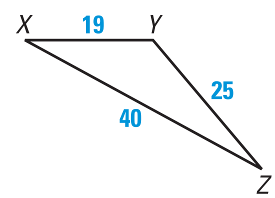
48.



49.

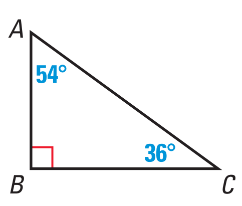


50.



Name the sides from longest to shortest.

51.



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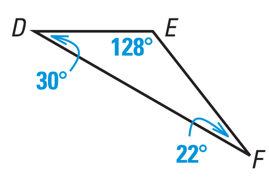

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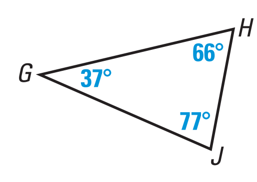

Determine whether it is possible to draw a triangle with the given side lengths. Explain your reasoning.

54. 10, 11, 20

55. 21, 23, 25

56. 3, 10, 15

57. 6, 6, 12

58. 13, 14, 15

59. 2, 3, 4

60. 4, 5, 9

61. 11, 11, 20

62. 14, 20, 38