Margin Exercise Answer

1. a. 26 in. **b.** 9 cm **2. a.** $d = 6$ **b.** $d = 10$ **3. a.** $d = 5$ **b.** $d = \sqrt{29} \approx 5.39$ **4.** $AB = \sqrt{58}$, $AC = 3\sqrt{5}$, and $BC = \sqrt{37}$. ΔABC is not equilateral, it is scalene. **5.** Triangle DEF is a right triangle since $\left(\sqrt{45}\right)^2 + \left(\sqrt{80}\right)^2 = \left(\sqrt{125}\right)^2$.

10.8 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. A right triangle is a triangle in which one angle measures ___ degrees.

2. The longest side of a right triangle is called the _____.

3. In a/an _____ triangle, no two sides have equal lengths.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

4. The Pythagorean Theorem is true for all triangles.

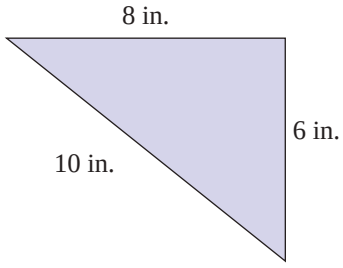
5. The distance d between two points may be negative.

6. An isosceles triangle has at least two sides that are equal in length.

Practice

Use the Pythagorean Theorem to determine whether each triangle is a right triangle.

1.



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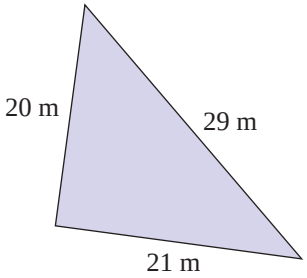

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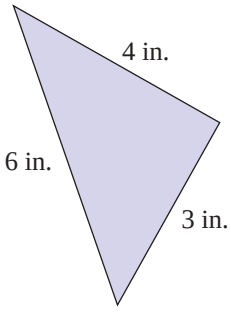

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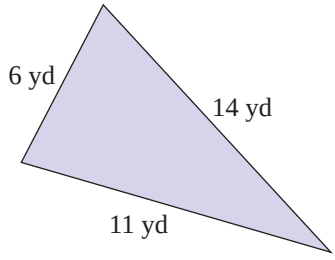

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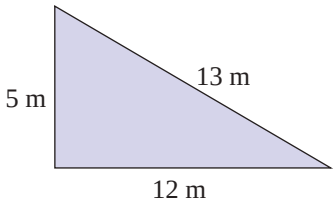

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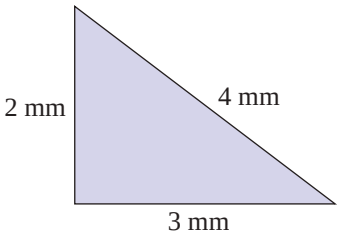
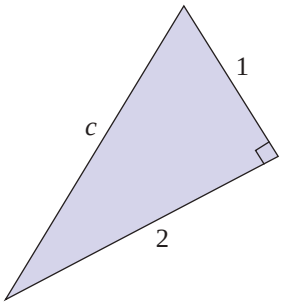


Find the hypotenuse for each right triangle accurate to the nearest hundredth. See Example 1.

7.



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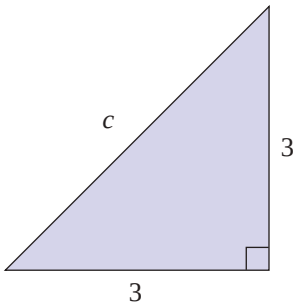

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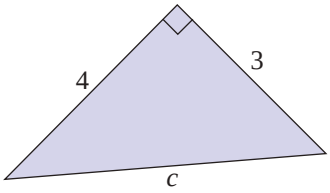

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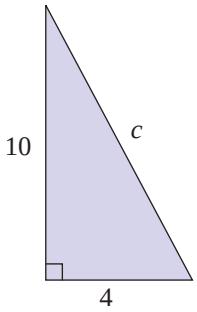

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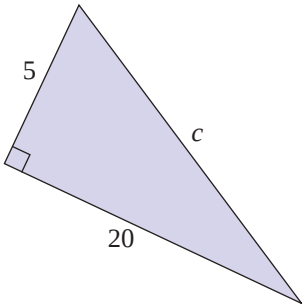

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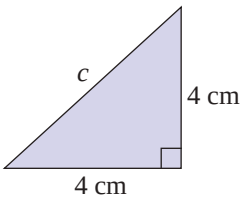

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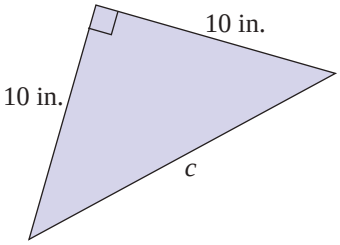

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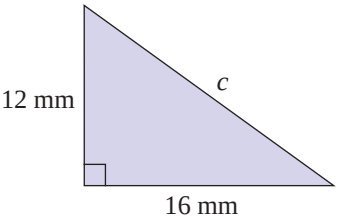


Find the distance between the two points given. See Examples 2 and 3.

15. (–3, 6), (–3, 2)

16. (5, 7), (–3, 7)

17. (4, –3), (7, –3)

18. (–1, 2), (5, 2)

19. $\left(3,1\right), \left(\frac{-1}{2}, 1\right)$

20. $\left(\frac{4}{3}, 1\right), \left(\frac{4}{3}, \frac{-2}{3}\right)$

21. (3, 1), (2, 0)

22. (4, 6), (5, –2)

23. (1, 5), (–1, 2)

24. (0, 0), (–3, 4)

25. (2, –7), (–3, 5)

26. (5, –3), (7, –3)

27. $\left(\frac{3}{7}, \frac{4}{7}\right), \left(0,0\right)$

28. (–5, 2), (1, 1)

29. (4, 1), (7, 5)

30. (10, 7), (1, 7)

31. (–10, 3), (2, –2)

32. $\left(\frac{7}{3}, 2\right), \left(\frac{-2}{3}, 1\right)$

33. (–3, 2), (3, –6)

34. $\left(\frac{3}{4}, 6\right), \left(\frac{3}{4}, -2\right)$

35. (4, 0), (0, –3)

36. (0, –2), (4, –3)

37. $\left(\frac{4}{5}, \frac{2}{7}\right), \left(\frac{-6}{5}, \frac{2}{7}\right)$

38. (6, 8), (2, 5)

39. Use the distance formula and the Pythagorean Theorem to determine whether the triangle with vertices at $A(1,-2)$, $B(7,1)$ and $C(5,5)$ is a right triangle.

40. Use the distance formula and the Pythagorean Theorem to determine whether the triangle with vertices at $A(-5,-1)$, $B(2,1)$, and $C(-1,6)$ is a right triangle.

41. Use the distance formula to determine whether the triangle with vertices $A(1,1)$, $B(5,9)$, and $C(9,5)$ is an isosceles triangle.

42. Use the distance formula to determine whether the triangle with vertices $A(1,-4)$, $B(3,2)$, and $C(9,4)$ is an isosceles triangle.

43. Use the distance formula to determine whether the triangle with vertices $A(1,0)$, $B\left(3,\sqrt{12}\right)$, and $C(5,0)$ is an equilateral triangle.

44. Use the distance formula to determine whether the triangle with vertices $A(0,5)$, $B(0,-3)$, and $C\left(\sqrt{48},1\right)$ is an equilateral triangle.

Use the distance formula to find the perimeter of the triangle with the given vertices.

45. A(–5, 0), B(3, 4), C(0, 0)

46. A(–6, –1), B(–3, 3), C(6, 4)

47. A(–2, 5), B(3, 1), C(2, –2)

48. $A(-1,3)$, $B(2,3)$, $C\left(-2,-\sqrt{11}+3\right)$

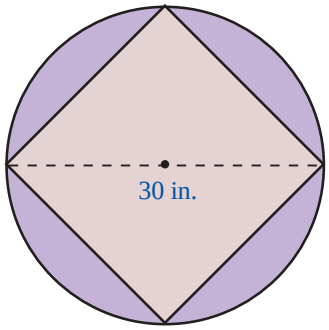
Applications

Solve.

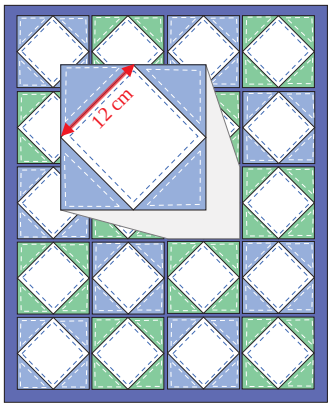
49. A square is said to be *inscribed* in a circle if each corner of the square lies on the circle. A furniture designer plans to create an end table with a 30-inch circular wooden tabletop inscribed with a marble square.

a. Find the circumference and area of the tabletop. Use $\pi = 3.14$.

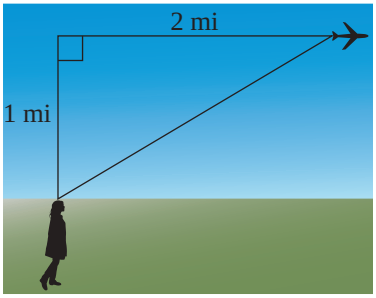
b. Find the perimeter and area of the marble square inscribed on the tabletop.



50. To create a square inside a square, a quilting pattern requires four triangular pieces like the one shaded in the figure shown here. If the square in the center measures 12 centimeters on a side, and the two legs of each triangle are of equal length, how long are the legs of each triangle, to the nearest tenth of a centimeter?



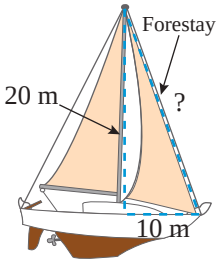
51. If an airplane passes directly over your head at an altitude of 1 mile, how far (to the nearest hundredth of a mile) is the airplane from your position after it has flown 2 miles farther at the same altitude?



52. The GE Building in New York is 850 feet tall (70 stories). At a certain time of day, the building casts a shadow 100 feet long. Find the distance from the top of the building to the tip of the shadow (to the nearest tenth of a foot).

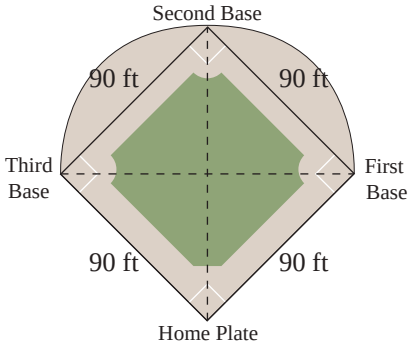
53. The base of a fire engine ladder is 30 feet from a building and reaches to a third floor window 50 feet above ground level. Find the length of the ladder to the nearest hundredth of a foot.

54. A forestay that helps support a ship's mast reaches from the top of the mast, which is 20 meters high, to a point on the deck 10 meters from the base of the mast. What is the length of the forestay (to the nearest tenth of a meter)?



55. The Xerox Center building in Chicago is 500 feet tall. At a certain time of day, it casts a shadow that is 150 feet long. At that time of day, what is the distance (to the nearest tenth of a foot) from the tip of the shadow to the top of the Xerox building?

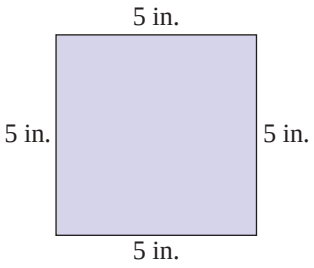
56. The shape of a baseball infield is a square with sides 90 feet long.



a. Find the distance (to the nearest tenth of a foot) from home plate to second base.

b. The diagonals of the square intersect halfway between home plate and second base. If the pitcher's mound is 60.5 feet from home plate, is the pitcher's mound closer to home plate or to second base?

57. A diagonal of a square is the line segment from one corner to an opposite corner of a square. A square has side length of 5 in.



a. Find the perimeter of the square.

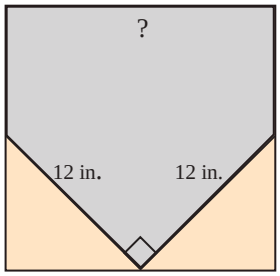
b. Find the area of the square.

c. Find the length of a diagonal of the square.

58. Before painting a picture on canvas, an artist must stretch the canvas on a rectangular wooden frame. To be sure that the corners of the canvas are true right angles, the artist can measure the diagonals of the stretched canvas. What should be the diagonal measure, to the nearest tenth of an inch, of a canvas whose sides are 24 inches and 30 inches in length?

59. While installing windows in a new home, a builder measures the diagonals of rectangular window casements to verify that their corners are true right angles. What should be the diagonal measure, to the nearest tenth of an inch, of a window casement with dimensions 36 inches and 54 inches.

60. The shape of home plate in the game of baseball can be created by cutting off two triangular pieces at the corners of a square, as shown in the figure. If each of the triangular pieces has a hypotenuse of 12 inches and legs of equal length, what is the length of one side of the original square, to the nearest tenth of an inch?



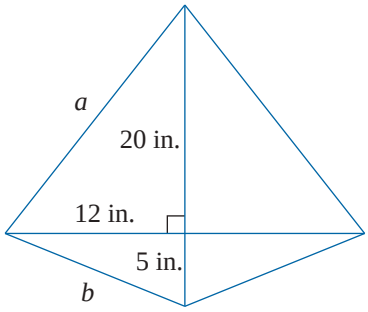
61. The city needs to replant an 18-foot tree. To ensure the tree does not fall over, three wires are to be attached to the tree 3 feet from the top. The wires will extend 8 feet from the base of the tree.

a. How long will each wire be? Round to the nearest hundredth.

b. What will be the total length of the three wires?

62. A hiker hikes 9 kilometers north and then turns left and hikes 11 kilometers west. If she takes the shortest path, how long will she have to walk to get back? Assume the terrain is flat with no obstructions. Round the answer to the closest tenth.

63. A simple diamond-shaped kite is created from wooden dowel rods and nylon cloth. A diagram for the kite is shown.



a. Determine the length of side a. Write your answer in simplified radical form.

b. Determine the length of side b. Write your answer in simplified radical form.

c. Calculate the perimeter of the kite. Write your answer in simplified radical form.

Writing & Thinking

64. If three whole numbers satisfy the Pythagorean Theorem, these three numbers are called a Pythagorean triple. For example, 3, 4, and 5 are a Pythagorean triple because $3^2 + 4^2 = 5^2$ (or $9 + 16 = 25$). Another Pythagorean triple is 5, 12, and 13 because $5^2 + 12^2 = 13^2$ (or $25 + 144 = 169$). Complete the following table by finding a, b, and c, and telling which sets of these three numbers (if any) constitute a Pythagorean triple. The first one is done for you.

m	n	$a = 2nm$	$b = m^2 - n^2$	$c = m^2 + n^2$	Pythagorean Triple?
5	1	10	24	26	yes: $10^2 + 24^2 = 26^2$
7	1				
3	2				
7	2				
5	3				
11	3				
13	7				

Extension: Choose some of your own numbers for m and n. Are your results Pythagorean triples? (**Note:** m must be larger than n so $m^2 - n^2$ will be positive.)