7.4 Skill Practice

1. an isosceles right triangle

2. The sum of the interior angles of a triangle is 180°; if one angle is 90°, then the other 2 angles must total 90°. Since the triangle is isosceles, these angles must be congruent. Therefore each angle must be half of 90° or 45°.

3. $7\sqrt{2}$ 4. 10

5. 3   6. C

7. 2; 4 in.

8. $x = 9\sqrt{3}, y = 18$

9. $x = 3, y = 6$

10. $x = 18, y = 6\sqrt{3}$

11.

a	7	11	$5\sqrt{2}$	6	$\sqrt{5}$
b	7	11	$5\sqrt{2}$	6	$\sqrt{5}$
c	$7\sqrt{2}$	$11\sqrt{2}$	10	$6\sqrt{2}$	$\sqrt{10}$

12.

d	5	7	8	$9\sqrt{3}$	$4\sqrt{3}$
e	$5\sqrt{3}$	$7\sqrt{3}$	$8\sqrt{3}$	27	12
f	10	14	16	$18\sqrt{3}$	$8\sqrt{3}$

13. $x = \dfrac{15}{2}\sqrt{3}, y = \dfrac{15}{2}$

14. $m = \sqrt{3}, n = \sqrt{3}$

15. $p = 12, q = 12\sqrt{3}$

16. $r = 18, s = 9\sqrt{3}$

17. $t = 4\sqrt{2}, u = 7$

18. $e = 9, f = 18, g = 9\sqrt{2}$

19. C

20. The hypotenuse of a 30°-60°-90° triangle should be $2x$ not $x\sqrt{3}$; if $x = 7$, then the hypotenuse is 14.

21. The hypotenuse of a 45°-45°-90° triangle should be $x\sqrt{2}$; if $x = \sqrt{5}$, then the hypotenuse is $\sqrt{10}$.

22. Yes. *Sample answer:* After she multiplies by $\sqrt{3}$ she would have to divide by 3 to solve for x and find $x = 3\sqrt{3}$.

23. $f = \dfrac{20\sqrt{3}}{3}, g = \dfrac{10\sqrt{3}}{3}$

24. $x = 2\sqrt{2}, y = 2\sqrt{6}$

25. $x = 4, y = \dfrac{4\sqrt{3}}{3}$

26. about (1.5, 1.60)

31. $10\sqrt{3}$ in

7.4 Problem Solving

27. 5.5 ft

28. 142 ft, $142\sqrt{2}$ ft, $142\sqrt{3}$ ft

29. *Sample answer:* Method 1. Use the Angle-Angle Similarity Postulate, because by definition of an isosceles triangle, the base angles must be the same and in a right isosceles triangle, the angles are 45°. Method 2. Use the Side-Angle-Side Similarity Theorem, because a right angle is always congruent to another right angle and the ratio of the lengths of the corresponding sides of two isosceles right triangles will always be the same.

30. It is given that $\angle D \cong \angle E$, and $\angle F$ is a right angle, so by the Converse of the Base Angles Theorem, $\overline{DF} \cong \overline{EF}$. Then by the Pythagorean Theorem, $DF^2 + EF^2 = DE^2$. By substitution, the equation becomes $DF^2 + DF^2 = DE^2$. By addition, we get $2DF^2 = DE^2$ and a property of square roots allows us to state that $DE = DF \cdot \sqrt{2}$ or by substitution, $DE = EF \cdot \sqrt{2}$.

31. $10\sqrt{3}$ in.

32. It is given that $\triangle JKL$ is a 30°-60°-90° triangle with x as the side opposite the 30° angle and $\triangle JKL \cong \triangle JML$. Since $m\angle KJL$ is 30° and $m\angle MJL$ is also 30°, angle addition shows that $\angle KJM$ measures 60°. In addition, the definition of an equiangular triangle shows that $\triangle JKM$ is equiangular and since $\triangle JKM$ is equiangular, it is also equilateral. This allows us to state that since $KM = 2x$, then $JK = 2x$. Therefore, JK which is the hypotenuse of $\triangle JKL$ is twice as long as the shorter leg of this triangle. Using $\triangle JKL$, the Pythagorean Theorem states that $JL^2 + LK^2 = JK^2$. The Substitution Property of Equality allows us to rewrite this equation as $JL^2 + x^2 = (2x)^2$. A property of exponents simplifies the equation to $JL^2 + x^2 = 4x^2$, and subtraction simplifies the equation to $JL^2 = 3x^2$. Finally, a property of square roots simplifies the equation to $JL = x\sqrt{3}$.

33. a. 45°-45°-90° for all triangles

   b. $\dfrac{3\sqrt{2}}{2}$ in. $\times \dfrac{3\sqrt{2}}{2}$ in.

   c. 1.5 in. $\times$ 1.5 in.

34. a. $r = \sqrt{2}$, $s = \sqrt{3}$, $t = 2$, $u = \sqrt{5}$, $v = \sqrt{6}$, $w = \sqrt{7}$; r is the hypotenuse of an isosceles right triangle, so it must be $\sqrt{2}$, this then becomes a leg of another right triangle. With the Pythagorean Theorem and the given fact that the other leg is 1, determine the value of the hypotenuse, and continue the procedure.

b. The left most triangle with sides of 1; the triangle must be a 45°-45°-90° triangle because it is an isosceles right triangle.

c. The triangle with t as the hypotenuse; the side lengths fit those given in Theorem 7.9.

35. a.
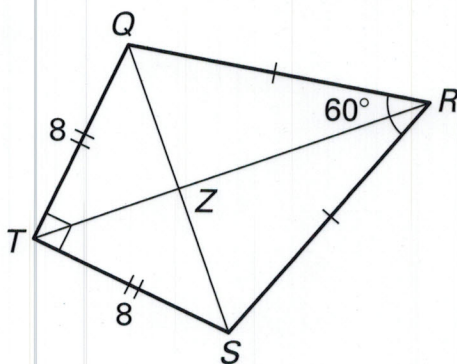
b. Side-Side-Side Congruence Postulate

c. RT; $QS = 8\sqrt{2}$ and $RT = 4\sqrt{6} + 4\sqrt{2}$.

7.4 Mixed Review

36. $AB = BC$, $AD = CD$

37. 5   **38.** 20

39. yes   **40.** no

41. yes   **42.** right triangle

43. right triangle

44. not a right triangle

7.1–7.4 Mixed Review of Problem Solving

1. 51 paces;

2. a.   Jefferson
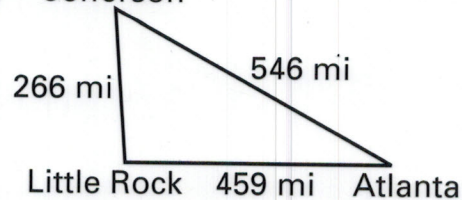
b. no; obtuse triangle

3. About 9.6 mi; determine that they had been running 1.5 hours and use this to find the number of miles run. These values form a right triangle and then use the Pythagorean Theorem to find their distance apart.

4. a. 10; if $m\angle 1 = 90°$, the Pythagorean Theorem gives 10.

   b. $10 < x < 14$; according to Theorem 7.4 the hypotenuse squared must be greater than the sum of the squares of the legs and the Triangle Inequality Theorem indicates that the side cannot exceed 14.

   c. $2 < x < 10$; according to Theorem 7.3 the hypotenuse squared must be less than the sum of the squares of the legs and the Triangle Inequality Theorem indicates that the side must not be less than 2.

   d. 6 or 8; an isosceles triangle must have two sides of the same measure.

   e. $x < 2$ or $x > 14$; the Triangle Inequality Theorem states that the sum of the lengths of any two sides of a triangle must be greater than the third.

5. a. equilateral triangle

   b. $16\sqrt{3}$ cm^2

   c. 61 marble holes; the purple triangle is $\frac{1}{6}$ of the center hexagon.

   d. $96\sqrt{3}$ cm^2; since the purple triangle is $\frac{1}{6}$ of the center hexagon and the purple triangle has an area of $16\sqrt{3}$ square centimeters, the area of the hexagon is $6 \cdot 16\sqrt{3} = 96\sqrt{3}$ square centimeters.

6. a. $\sqrt{13}$ ft

   b. $\dfrac{6\sqrt{13}}{13}$ ft

   c. $\dfrac{4\sqrt{13}}{13}$ feet from the bottom of the plywood along the hypotenuse; since the brace forms a right triangle with the front and base, the Pythagorean Theorem allows you to determine the distance from the ground.