CHAPTER 12

LESSON 12.1

EXERCISES

1. 0.6018

2. 0.8746

3. 0.1405

4. a. $\sin 36° = \cos 54°$; $\sin 36° = .5878$, $\cos 54° = .5878$. The angles are complementary. The sine of an angle is equal to the cosine of its complement.

b. $\cos 89° = \sin 1°$; $\cos 89° = .0175$, $\sin 1° = .0175$. The angles are complementary. The sine of an angle is equal to the cosine of its complement.

c. $\sin 48° = 2(\sin 24°)(\cos 24°)$; $\sin 48° = .7431$, $\sin 24° = .4067$, and $\cos 24° = .9135$. By substitution, $.7431 = 2(.4067)(.9135)$ when values are rounded.

5. 11.57. $\sin 40° = \frac{x}{18}$, so $x = 18\sin 40° \approx 11.57$.

6. 30.86. $\cos 52° = \frac{19}{x}$, so $x\cos 52° = 19$, and $x = \frac{19}{\cos 52°} \approx 30.86$.

7. 62.08. $\tan 29° = \frac{x}{112}$, so $x = 112\tan 29° \approx 62.08$.

8. $\sin A = \frac{s}{t}$; $\cos A = \frac{r}{t}$; $\tan A = \frac{s}{r}$. The length of the side opposite $\angle A$ is s, the length of the side adjacent to $\angle A$ is r, and the length of the hypotenuse is t.

9. $\sin\theta = \frac{4}{5}$; $\cos\theta = \frac{3}{5}$; $\tan\theta = \frac{4}{3}$. The right triangle has horizontal leg of length 6, vertical leg of length 8, and hypotenuse of length 10, so $\sin\theta = \frac{8}{10} = \frac{4}{5}$, $\cos\theta = \frac{6}{10} = \frac{3}{5}$, and $\tan\theta = \frac{8}{6} = \frac{4}{3}$.

10. $\sin A = \frac{7}{25}$; $\cos A = \frac{24}{25}$; $\tan A = \frac{7}{24}$; $\sin B = \frac{24}{25}$; $\cos B = \frac{7}{25}$; $\tan B = \frac{24}{7}$. To find that the length of the hypotenuse is 25, use the Pythagorean Theorem, or recall that 7-24-25 is a Pythagorean triple.

11. 30°. $A = \sin^{-1}(0.5) = 30°$.

12. 53°. $B = \cos^{-1}(0.6) \approx 53°$.

13. 30°. $C = \tan^{-1}(0.5773) \approx 30°$.

14. 24°. $x = \tan^{-1}\left(\frac{48}{106}\right) \approx 24°$.

15. $a \approx 35$ cm. $\tan 30° = \frac{20}{a}$, so $a\tan 30° = 20$, and $a = \frac{20}{\tan 30°} \approx 35$ cm.

16. $b \approx 15$ cm. $\sin 65° = \frac{b}{17}$, so $b = 17\sin 65° \approx 15$ cm.

17. $c \approx 105$ yd. $\cos 70° = \frac{36}{c}$, so $c\cos 70° = 36$, and $c = \frac{36}{\cos 70°} \approx 105$ yd.

18. $d \approx 40°$. $\tan d = \frac{107}{128}$, so $d = \tan^{-1}\left(\frac{107}{128}\right) \approx 40°$.

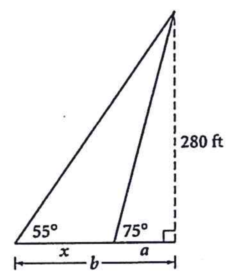
19. $e \approx 50$ cm. $\cos 15° = \frac{48}{e}$, so $e\cos 15° = 48$, and $e = \frac{48}{\cos 15°} \approx 50$ cm.

20. $f \approx 33°$. $\sin f = \frac{36}{66}$, so $f = \sin^{-1}\left(\frac{36}{66}\right) \approx 33°$.

21. $g \approx 18$ in. The radius of the circle is 21 in., so the diameter is 42 in. The angle opposite the diameter shown in the figure is a right angle because every angle inscribed in a semicircle is a right angle. Therefore, the triangle is a right triangle with hypotenuse of length 42 in. Then $\sin 25° = \frac{g}{42}$, so $g = 42\sin 25° \approx 18$ in.

22. Approximately 237 m. Let b represent the length of the base of the quadrilateral (which is a rectangle) and h represent the height. Find the length of the base and then the height: $\sin 35° = \frac{b}{85}$, so $b = 85(\sin 35°) \approx 48.75$ m, and $\cos 35° = \frac{h}{85}$, so $h = 85(\cos 35°) \approx 69.63$ cm. Then the perimeter of the rectangle is $2b + 2h \approx 2(48.75) + 2(69.63) \approx 237$ m.

23. $x \approx 121$ ft. x is not the length of a side of a right triangle, but you can find x by subtracting length a from length b in this figure.



From the large right triangle, $\tan 55° = \frac{280}{b}$, so $b(\tan 55°) = 280$, and $b = \frac{280}{\tan 55°} \approx 196$ ft. From the small right triangle, $\tan 75° = \frac{280}{a}$, so $a(\tan 75°) = 280$, and $a = \frac{280}{\tan 75°} \approx 75$ ft. Therefore, $x \approx 196 - 75 = 121$ ft.

24. $(6, 6\sqrt{3})$. Construct $\overline{BB'}$, then construct the perpendicular bisector of $\overline{BB'}$. By definition of reflection, the distance from point B to the intersection, point P, is the same as the distance from point B' to P. To find the coordinates of point B', use the 30°-60°-90° right triangle relationship to find $OP = 6$ and $BP = 6\sqrt{3}$. Construct $\overline{OB'}$, the hypotenuse of right triangle OPB'. By the 30°-60°-90° right triangle relationship, $OB' = 12$. Construct $\overline{B'D}$ perpendicular to the x-axis. $OD = 6$ and $OB' = 12$, so $B'D = 6\sqrt{3}$. The coordinates of B' are $(6, 6\sqrt{3})$.

©2015 Kendall Hunt Publishing