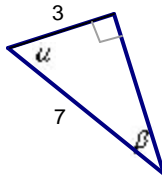


Chapter 10 Trigonometry of Right Triangles Trigonometric Ratios – Applications

1. A giant redwood tree casts a shadow 532 ft long. Find the height of the tree if the angle of elevation of the sun is 25.7° (A: 256 ft)

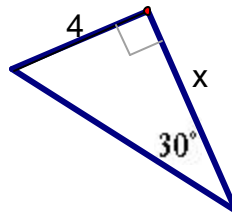
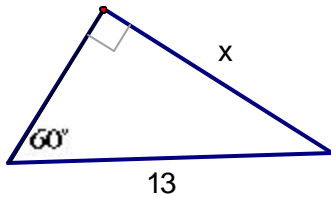
2. From a point on the ground 500 feet from the base of a building, it is observed that the angle of elevation to the top of the building is 24° and the angle of elevation to the top of a flagpole atop the building is 27° . Find the height of the building and the length of the flagpole. (A: 32 ft)

3. Find $\sin a$, $\cos b$, $\tan a$, $\cot b$ if



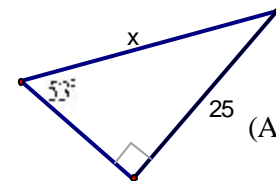
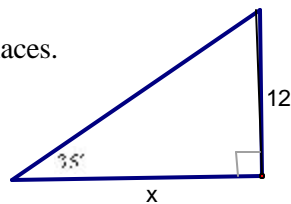
A: $\left(\frac{2\sqrt{10}}{7}, \frac{2\sqrt{10}}{7}, \frac{2\sqrt{10}}{3}, \frac{2\sqrt{10}}{3}\right)$

4. Find the side labeled x .



(A: $\frac{13\sqrt{3}}{2}, 4\sqrt{3}$)

5. Find x correct to five decimal places.



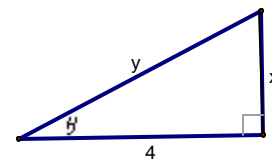
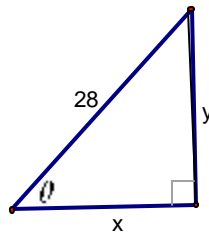
(A: a) 16.51658)

6. Sketch a right triangle that has one acute angle q , and find the other five trigonometric ratios of q .

a) $\sin q = \frac{3}{5}$

b) $\tan q = \sqrt{3}$

7. Express x and y in terms of trigonometric ratios of q .



($x = 28\cos q, y = 28\sin q$)

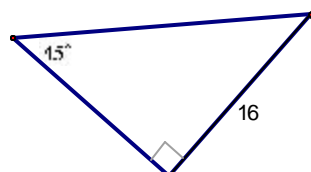
8. Evaluate the expressions:

a) $\sin 30^\circ + \cos 30^\circ$

c) $(\sin 60^\circ)^2 + (\cos 60^\circ)^2$

b) $\sin 30^\circ \csc 30^\circ$

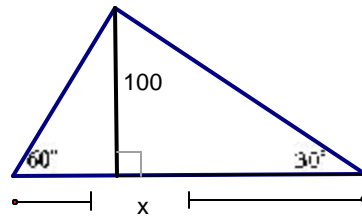
9. Solve the right triangle.



(A: leg=16, hyp= $16\sqrt{2}$)

10. Using a protractor, sketch a right triangle that has the acute angle 40° . Measure the sides carefully and use your results to estimate the six trigonometric ratios of 40° .
11. From the top of a 200-ft lighthouse, the angle of depression to a ship in the ocean is 23° . How far is the ship from the base of the lighthouse? (A: approx. 471 ft)
12. A 20-ft ladder leans against a building so that the angle between the ground and the ladder is 72° . How high does the ladder reach on the building?
13. A man is lying on the beach, flying a kite. He holds the end of the kite string at ground level, and estimates the angle of elevation of the kite to be 50° . If the string is 450 ft long, how high is the kite above the ground?
14. A water tower is located 325 ft from a building. From a window in the building, it is observed that the angle of elevation to the top of the tower is 39° and the angle of depression to the bottom of the tower is 25° . How tall is the tower? How high is the window? (A: 414 ft)
15. An airplane flying at the rate of 350 feet per second begins to climb at an angle of 10° . What is the increase in altitude over the next 15 seconds if the speed remains the same? (A: 912 ft)
16. At an altitude of 12,000 ft, a pilot sees two towns through angles of depression of 37° and 48° . To the nearest ten feet, how far apart are the towns? (A: 5121 ft)
17. To estimate the height of a mountain above a level plain, the angle of elevation to the top of the mountain is measured to be 32° . One thousand feet closer to the mountain along the plain, it is found that the angle of elevation is 35° . Estimate the height of the mountain. (A: 4200 ft)

18. Find x correct to one decimal place.



(A: 230.9)

Simplifying Trigonometric Expressions Proving Trigonometric Identities

Simplify the following expressions:

1. $(1 + \sin x)(\sec x - \tan x)$

4. $\frac{\cos q \sec q}{\cot q}$

7. $\frac{1 + \sin a}{\cos a} + \frac{\cos a}{1 + \sin a}$

2. $\frac{\sin a}{\cos a} + \frac{\cos a}{1 + \sin a}$

5. $\frac{\sec^2 x - 1}{\sec^2 x}$

8. $\frac{2 + \tan^2 x}{\sec^2 x} - 1$

3. $\cos^3 y + \sin^2 y \cos y$

6. $\frac{\sin t}{\csc t} + \frac{\cos t}{\sec t}$

9. $\frac{1 + \cot A}{\csc A}$

Answers:

1) $\cos x$; 2) $\sec a$; 3) $\cos y$; 4) $\tan q$; 5) $\sin^2 x$; 6) 1; 7) $\frac{2}{\cos a} = 2\sec a$; 8) $\cos^2 x$; 9) $\sin A + \cos A$

Prove the following identities:

1. $\cos a(\sec a - \cos a) = \sin^2 a$

2. $2 \tan x \sec x = \frac{1}{1 - \sin x} - \frac{1}{1 + \sin x}$

3. $\frac{1}{1 - \sin t} = \sec^2 t + \tan t \sec t$

4. $\frac{1 + \cos q}{\cos q} = \frac{\tan^2 q}{\sec q - 1}$

5. $\sin x \cot x = \cos x$

6. $\frac{\tan a}{\sec a} = \sin a$

7. $\frac{\cos t}{\sec t} + \frac{\sin t}{\csc t} = 1$

8. $(\sin q + \cos q)^2 = 1 + 2 \sin q \cos q$

9. $\frac{1 - \sin x}{1 + \sin x} = (\sec x - \tan x)^2$

10. $\sin a + \cos a \cot a = \csc a$