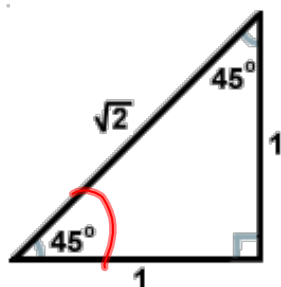
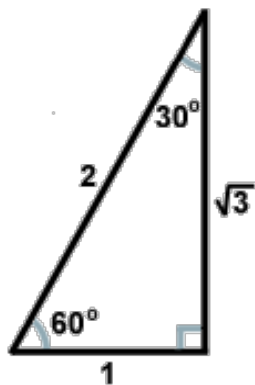


Review:

An acute angle is an \angle strictly betw. 0° & 90°



The function value of an angle is equal to the cofunction value of the complement of that angle.

SohCahToa

$$\sin 45^\circ = \frac{1}{\sqrt{2}}$$

$$\sec 60^\circ = 2$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\csc 45^\circ = \sqrt{2}$$

$$\tan 45^\circ = 1$$

$$\cot 30^\circ = \sqrt{3}$$

Homework questions?

Reciprocal Identities

$$\csc x = \frac{1}{\sin x}, \quad \sin x = \frac{1}{\csc x}, \quad \sec x = \frac{1}{\cos x}, \quad \cos x = \frac{1}{\sec x}, \quad \cot x = \frac{1}{\tan x}, \quad \tan x = \frac{1}{\cot x}$$

Cofunction Identities:

$$\sin(90^\circ - \theta) = \cos \theta, \quad \cos(90^\circ - \theta) = \sin \theta$$

$$\tan(90^\circ - \theta) = \cot \theta, \quad \cot(90^\circ - \theta) = \tan \theta$$

$$\csc(90^\circ - \theta) = \sec \theta, \quad \sec(90^\circ - \theta) = \csc \theta$$

Ratio Identities:

$$\frac{\sin \theta}{\cos \theta} = \frac{\frac{\text{opp}}{\text{hyp}}}{\frac{\text{adj}}{\text{hyp}}} = \frac{\text{opp}}{\cancel{\text{hyp}}} \cdot \frac{\cancel{\text{hyp}}}{\text{adj}} = \frac{\text{opp}}{\text{adj}} = \tan \theta$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}; \quad \cot \theta = \frac{\cos \theta}{\sin \theta}$$

Example Problem 5.5 #98

Given that

$$\sin 8^\circ \approx 0.1392$$

$$\csc 8^\circ \approx 7.1853$$

$$\cos 8^\circ \approx 0.9903$$

$$\sec 8^\circ \approx 1.0098$$

$$\tan 8^\circ \approx 0.1405$$

$$\cot 8^\circ \approx 7.1154$$

find the six function values of 82° .

82° is the complement of 8° .

$$\sin 82^\circ = \cos 8^\circ = 0.9903$$

$$\cot 82^\circ = \tan 8^\circ = 0.1405$$

$$\sec 82^\circ = \csc 8^\circ = 7.1853$$

2 \angle 's are
complementary
if their sum is
 90° .

Write in terms of $\sin 40^\circ$ and/or $\cos 40^\circ$.

$$\csc 40^\circ = \frac{1}{\sin 40^\circ}$$

$$\csc 50^\circ = \sec 40^\circ = \frac{1}{\cos 40^\circ}$$

$$\cot 40^\circ = \frac{\cos 40^\circ}{\sin 40^\circ}$$

$$\tan 50^\circ = \cot 40^\circ = \frac{\cos 40^\circ}{\sin 40^\circ}$$

$$\cos 50^\circ = \sin 40^\circ$$

$$\sec 50^\circ = \frac{1}{\cos 50^\circ} = \frac{1}{\sin 40^\circ}$$

How many different ways can you rewrite the expression using ratio, reciprocal, and/or cofunction identities?

$$\sin 32^\circ = \cos 58^\circ = \frac{1}{\csc 32^\circ} = \frac{1}{\sec 58^\circ}$$

$$\begin{aligned} \tan 13^\circ &= \cot 77^\circ = \frac{1}{\tan 77^\circ} = \frac{1}{\cot 13^\circ} = \\ &= \frac{\sin 13^\circ}{\cos 13^\circ} = \frac{\cos 77^\circ}{\sin 77^\circ} = \frac{\sin 13^\circ}{\sin 77^\circ} \\ &= \frac{\frac{1}{\csc 13^\circ}}{\frac{1}{\sec 13^\circ}} = \frac{\sec 13^\circ}{\csc 13^\circ} = \frac{\csc 77^\circ}{\sec 77^\circ} \end{aligned}$$

Degree° Minute' Second'' Notation

(used widely in navigation; will not be used widely in this class)

$1' = 60'' \quad 1^\circ = 60' = 3600''$

$1' = \frac{1}{60}^\circ \quad 1'' = \frac{1}{60}' = \frac{1}{3600}^\circ$

Convert 20.14° to $D^\circ M'S''$.

$20^\circ + 0.14 \cdot \frac{60'}{1} = 20^\circ + 8.4'$

$$\begin{array}{r} 0.14 \\ \times 60 \\ \hline 8.40 \end{array}$$
 $= 20^\circ + 8' + 0.4 \cdot \frac{60''}{1} = \boxed{20^\circ 8' 2.4''}$

Convert $12^\circ 6' 12''$ to decimal degrees.

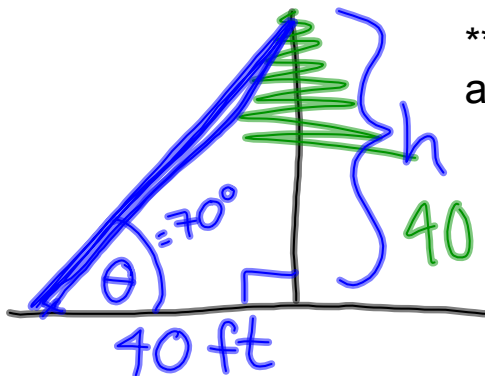
$12^\circ + \frac{6}{60}^\circ + \frac{12}{3600}^\circ = 12.1^\circ + 0.00\bar{3}^\circ$

$$= \boxed{12.10\bar{3}^\circ}$$

$$\frac{1}{300} = \frac{1}{3} \cdot \frac{1}{100} = 0.00\bar{3}$$

5.2 Applications of Right Triangles

20. ...40 ft. from the base of a tree and estimates the angle of elevation to the tree's peak to be 70 degrees. How tall is the tree?



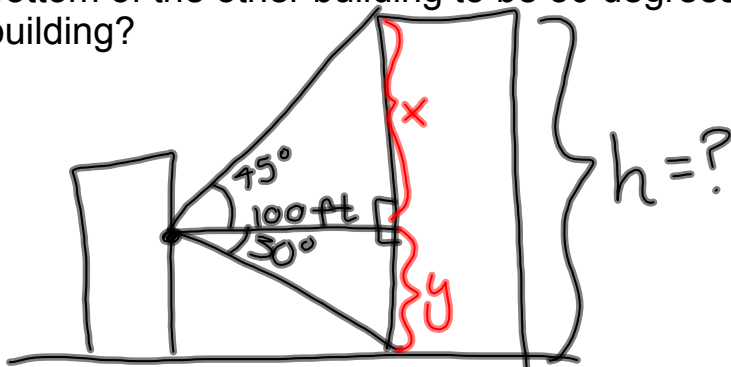
** Angles of elevation and depression are always measured from the horizontal

$40 \text{ ft} \cdot \tan 70^\circ = \frac{h}{40 \text{ ft}} \cdot 40 \text{ ft}$

$h = \boxed{40 \tan 70^\circ \text{ ft}}$

$\approx 110 \text{ ft}$

Similar to #26: A window washer on the side of one building, 100 feet from another building, measures the angle of elevation of the top of the other building to be 45 degrees, and the angle of depression to the bottom of the other building to be 30 degrees. How tall is the other building?



$$\tan 45^\circ = \frac{x}{100}$$

$$x = 100 \tan 45^\circ = 100 \text{ ft}$$

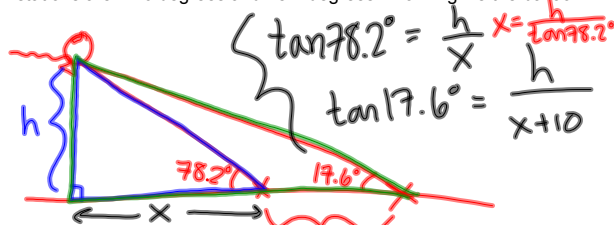
$$\tan 30^\circ = \frac{y}{100}$$

$$y = 100 \tan 30^\circ = 100 \cdot \frac{1}{\sqrt{3}}$$



$$h = 100 + \frac{100}{\sqrt{3}} \text{ ft}$$

24. A weather balloon is directly west of two observing stations that are 10 miles apart. The angles of elevation of the balloon from the two stations are 17.6 degrees and 78.2 degrees. How high is the balloon?



$$\tan 78.2^\circ = \frac{h}{x} \quad x = \frac{h}{\tan 78.2^\circ}$$

$$\tan 17.6^\circ = \frac{h}{x+10}$$

$$\tan 17.6^\circ = \frac{h}{\frac{h}{\tan 78.2^\circ} + 10}$$

$$\tan 17.6^\circ = \frac{h \tan 78.2^\circ}{h + 10 \tan 78.2^\circ}$$

$$\tan 17.6^\circ (h + 10 \tan 78.2^\circ) = h \tan 78.2^\circ$$

... solve for h

$$2(x+3) = 5x$$

$$2x+6 = 5x$$

$$6 = 5x - 2x$$

$$6 = x(5-2) \rightarrow x = \frac{6}{3} = 2$$

Homework:5.1 # 83-97 odd5.2 # 19, 21, 23, 29**Quiz #1 FRIDAY** covering:

- reciprocal, ratio, and cofunction identities
- 6 basic Trig functions as ratios of sides of a right triangle
- 30-60-90 and 45-45-90 triangles