4.3 Right Triangle Trig

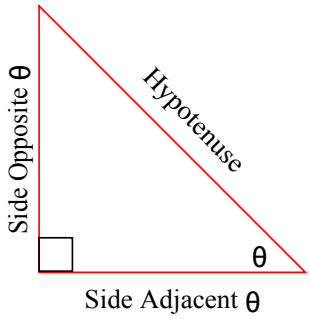
Honors - Precal

Let θ be an acute angle of a right triangle.

$\sin\theta = \frac{\text{opp}}{\text{hyp}}$ $\quad$ $\csc\theta = \frac{\text{hyp}}{\text{opp}}$

$\cos\theta = \frac{\text{adj}}{\text{hyp}}$ $\quad$ $\sec\theta = \frac{\text{hyp}}{\text{adj}}$

$\tan\theta = \frac{\text{opp}}{\text{adj}}$ $\quad$ $\cot\theta = \frac{\text{adj}}{\text{opp}}$



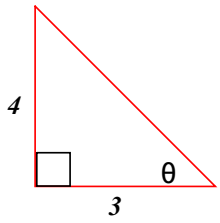
Example 1 - Evaluating Trig Functions

Evaluate the six trig function of θ in the given triangle

$\sin\theta =$ $\quad$ $\csc\theta =$

$\cos\theta =$ $\quad$ $\sec\theta =$

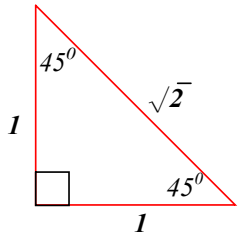
$\tan\theta =$ $\quad$ $\cot\theta =$



See p. 274; exercise 3

Example - Evaluating Trig Functions of 45^0

Find the exact values of $\sin 45^0, \cos 45^0, \tan 45^0$



$\sin 45^0 =$

$\cos 45^0 =$

$\tan 45^0 =$

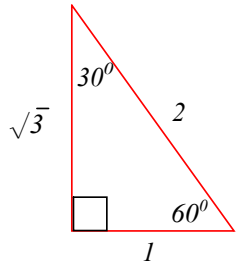
See p. 274; exercise 17

Example 3 - Evaluating Trig Functions of 30^0 & 60^0

$\sin 30^0 =$

$\cos 30^0 =$

$\tan 30^0 =$



$\sin 60^0 =$

$\cos 60^0 =$

$\tan 60^0 =$

See p. 275; exercise 19

Special Angles

	sin	*cos*	*tan*	*csc*	*sec*	*cot*
0^0						
30^0						
45^0						
60^0						
90^0						

Cofunctions of Complementary Angles are Equal

If θ is an acute angle :

$$\sin(90^0 - \theta) = \cos\theta \qquad \cos(90^0 - \theta) = \sin\theta$$

$$\tan(90^0 - \theta) = \cot\theta \qquad \cot(90^0 - \theta) = \tan\theta$$

$$\sec(90^0 - \theta) = \csc\theta \qquad \csc(90^0 - \theta) = \sec\theta$$

Fundamental Trig Identities

Reciprocal Identities

$$\sin\theta = \frac{1}{\csc\theta} \qquad \cos\theta = \frac{1}{\sec\theta} \qquad \tan\theta = \frac{1}{\cot\theta}$$

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

Quotient Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$1 + \tan^2\theta = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

Example 4 - Applying Trig Identities

Let θ be an acute angle s.t. $\sin\theta = 0.6$.
Find $\cos\theta$ and $\tan\theta$ using the trig identities.

See p. 275; exercise 29

Example 5 - Using Trig Identities

Use trig identities ot transform one side of the equation into the other $(0 < \theta < \pi/2)$

a.) $\cos\theta \sec\theta = 1$

b.) $(\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

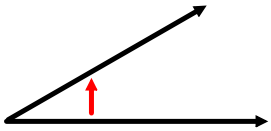
See p. 275; exercise 39

Evaluating Trig functions with a Calculator

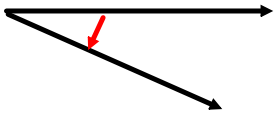
Set mode to degree

Applications using Right Triangles

Angle of Elevation

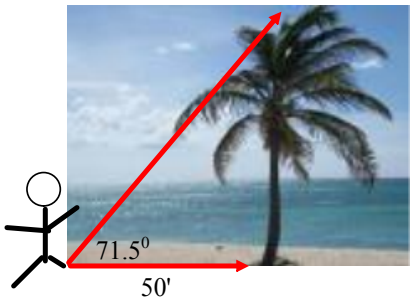


Angle of Depression



Example 7 - Using Trig to Solve a Right Triangle

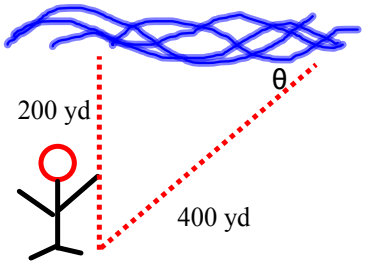
A surveyor is standing 50' from the base of a large tree.
The surveyor measures the angle of elevation to the top of the tree as 71.5^0.
How tall is the tree?



See p. 276; exercise 59

Example 8 - Using Trig to Solve a Right Triangle

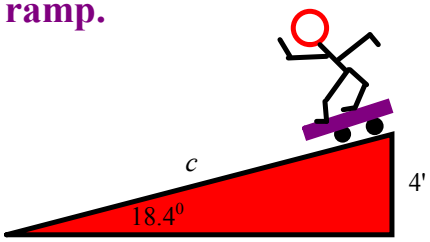
You are 200 yards from a river. Rather than walking directly to the river, you walk 400 yards along a straight path to the river's edge.
Find the acute angle θ between this path and the river's edge.



See p. 276; exercise 61

Example 9 - Solving a Right Triangle

Find the length *c* of the skateboard ramp.



See p. 276; exercise 63