Course Number

Instructor

Date

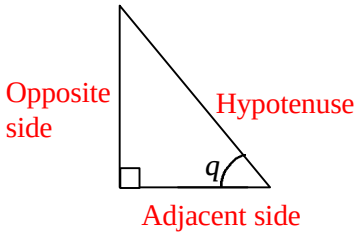
Section 4.3 Right Triangle Trigonometry

Objective: In this lesson you learned how to evaluate trigonometric functions of acute angles and how to use the fundamental trigonometric identities.

What you should learn
How to evaluate trigonometric functions of acute angles

I. The Six Trigonometric Functions (Pages 303–305)

In the right triangle shown below, label the three sides of the triangle relative to the angle labeled q as (a) the **hypotenuse,** (b) the **opposite side,** and (c) the **adjacent side.**



Let q be an acute angle of a right triangle. Define the six trigonometric functions of the angle q using opp = the length of the side opposite q, adj = the length of the side adjacent to q, and hyp = the length of the hypotenuse.

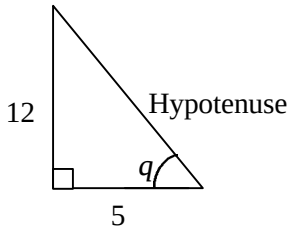
sin q = opp/hyp cos q = adj/hyp

tan q = opp/adj csc q = hyp/opp

sec q = hyp/adj cot q = adj/opp

The cosecant function is the reciprocal of the sine function. The cotangent function is the reciprocal of the tangent function. The secant function is the reciprocal of the cosine function.

Example 1: In the right triangle below, find sin q, cos q, and tan q.



sin q = 12/13; cos q = 5/13; tan q = 12/5

Give the sines, cosines, and tangents of the following special angles:

$\sin 30° = \sin \frac{p}{6} =$ 1/2

$\cos 30° = \cos \frac{p}{6} =$ $\sqrt{3}/2$

$\tan 30° = \tan \frac{p}{6} =$ $\sqrt{3}/3$

$\sin 45° = \sin \frac{p}{4} =$ $\sqrt{2}/2$

$\cos 45° = \cos \frac{p}{4} =$ $\sqrt{2}/2$

$\tan 45° = \tan \frac{p}{4} =$ 1

$\sin 60° = \sin \frac{p}{3} =$ $\sqrt{3}/2$

$\cos 60° = \cos \frac{p}{3} =$ 1/2

$\tan 60° = \tan \frac{p}{3} =$ $\sqrt{3}$

Cofunctions of complementary angles are ___equal___. If q is an acute angle, then:

$\sin(90° - q) =$ ___cos q___ $\cos(90° - q) =$ ___sin q___

$\tan(90° - q) =$ ___cot q___ $\cot(90° - q) =$ ___tan q___

$\sec(90° - q) =$ ___csc q___ $\csc(90° - q) =$ ___sec q___

II. Trigonometric Identities (Pages 306–307)

What you should learn
How to use the fundamental trigonometric identities

List six reciprocal identities:

1) $\sin q = 1/(\csc q)$

2) $\cos q = 1/(\sec q)$

3) $\tan q = 1/(\cot q)$

4) $\csc q = 1/(\sin q)$

5) $\sec q = 1/(\cos q)$

6) $\cot q = 1/(\tan q)$

List two quotient identities:

1) $\tan q = (\sin q)/(\cos q)$

2) $\cot q = (\cos q)/(\sin q)$

List three Pythagorean identities:

1) $\sin^2 q + \cos^2 q = 1$

2) $1 + \tan^2 q = \sec^2 q$

3) $1 + \cot^2 q = \csc^2 q$

III. Evaluating Trigonometric Functions with a Calculator (Page 307)

What you should learn
How to use a calculator to evaluate trigonometric functions

To use a calculator to evaluate trigonometric functions of angles measured in degrees, . . . be sure to first set the calculator in degree mode.

Example 2: Use a calculator to evaluate (a) tan 35.4°, and (b) cos 3.25°

(a) 0.7106630094

(b) 0.9983916706

IV. Applications Involving Right Triangles (Pages 307–309)

What you should learn
How to use trigonometric functions to model and solve real-life problems

What does it mean to "solve a right triangle?"

Usually you are given one side of a right triangle and one of the acute angles and are asked to find one of the other sides, or you are given two sides and are asked to find one of the acute angles.

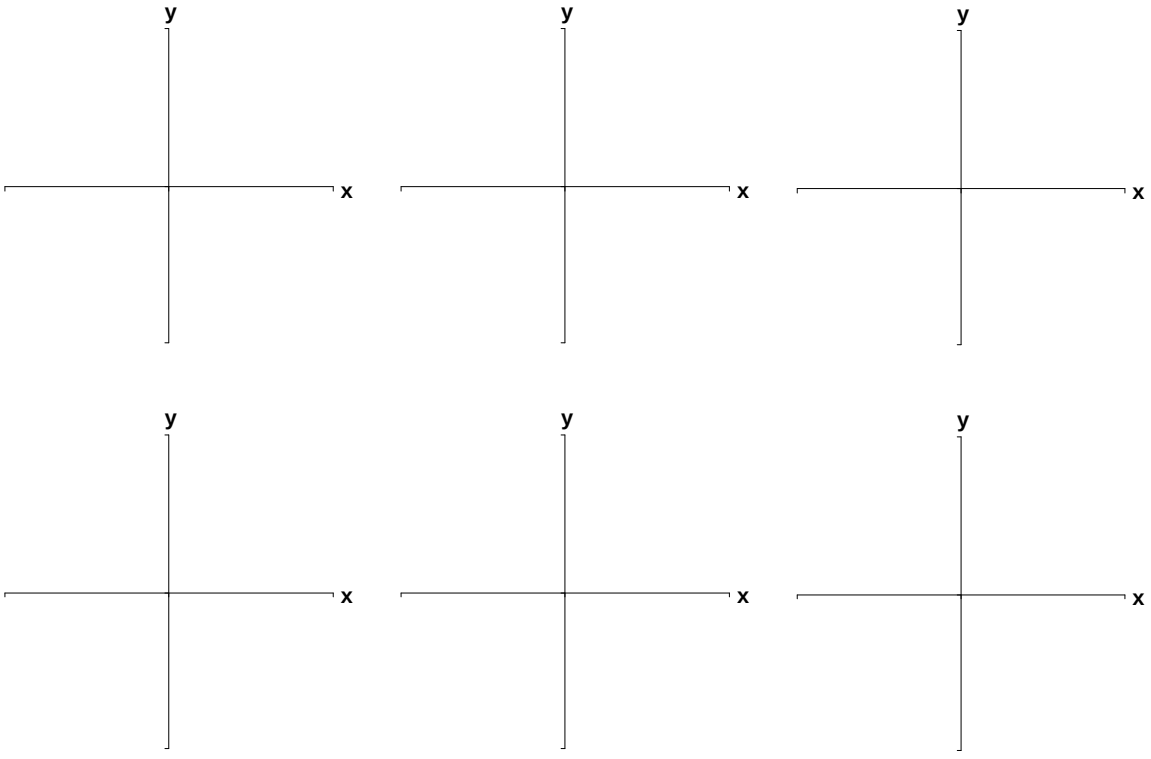
An **angle of elevation** is . . . the angle from the horizontal upward to an object.

An **angle of depression** is . . . the angle from the horizontal downward to an object.

Describe a real-life situation in which solving a right triangle would be appropriate or useful.

Answers will vary.

Additional notes



Homework Assignment

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Exercises