

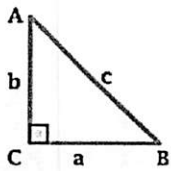
Trigonometry Section 2.2 Trigonometric Functions of Acute Angles:

Right Triangle Definitions of Trigonometric Functions:

Given an angle in a right triangle find the value of the six Trigonometric Functions

Given one trig ratio find the value of the other five Trigonometric Functions

Given a point in a coordinate plane find the value of the six Trigonometric Functions from the angle formed with the origin.



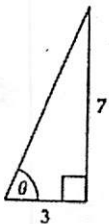
$$\sin = \text{---} \quad \cos = \text{---} \quad \tan = \text{---} \quad \csc = \text{---} \quad \sec = \text{---} \quad \cot = \text{---}$$

$$\sin A = \text{---} \quad \cos A = \text{---} \quad \tan A = \text{---} \quad \csc A = \text{---} \quad \sec A = \text{---} \quad \cot A = \text{---}$$

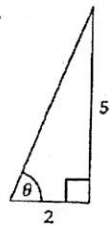
In Exercises 1 to 14,

find the values of the six trigonometric functions of θ for the right triangle with the given sides.

2.



5.



In Exercises 15 to 17, let θ be an acute angle of a right triangle for which $\sin \theta = \frac{3}{5}$, Find:

16- $\sec \theta$

In Exercises 18 to 20, let θ be an acute angle of a right triangle for which $\tan \theta = \frac{4}{3}$, Find:

18- $\sin \theta$

In Exercises 21 to 23, let θ be an acute angle of a right triangle for which $\sec \theta = \frac{13}{12}$, Find:

22- $\cot \theta$

In Exercises 24 to 26, let θ be an acute angle of a right triangle for which $\cos \theta = \frac{2}{3}$, Find:

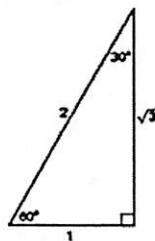
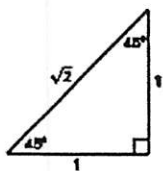
26- $\tan \theta$

In Exercises 21 to 23, let β be an acute angle of a right triangle for which $\sec \beta = \frac{13}{12}$, Find:

21- $\cos \beta$

23- $\csc \beta$

Evaluate Trigonometric Functions with "Special" Right Triangles: 45-45-90 and 30-60-90 triangles
 Find the exact value of a trig expression using the "Special" Right Triangles



θ		$\sin \theta$	$\cos \theta$	$\tan \theta$	$\csc \theta$	$\sec \theta$	$\cot \theta$
degrees	radians						
30°							
45°							
60°							

In Exercises 27 to 42, find the exact value of each expression:

28- $\csc 45^\circ - \sec 45^\circ$

32- $\sec 30^\circ \cos 30^\circ - \tan 60^\circ \cot 60^\circ$

36- $\csc \frac{\pi}{6} - \sec \frac{\pi}{3}$

33- $2 \sin 60^\circ - \sec 45^\circ \tan 60^\circ$

35- $\sin \frac{\pi}{3} + \cos \frac{\pi}{6}$

In Exercises 43 to 56,

use a calculator to find the value of the trigonometric function to four decimal places.

44. $\sec 88^\circ$

52. $\sec \frac{3\pi}{8}$

Key

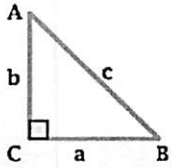
Trigonometry Section 2.2 Trigonometric Functions of Acute Angles:

Right Triangle Definitions of Trigonometric Functions:

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Given a point in a coordinate plane find the value of the six Trigonometric Functions from the angle formed with the origin.



$$\sin = \frac{\text{opp}}{\text{hyp}} \quad \cos = \frac{\text{adj}}{\text{hyp}} \quad \tan = \frac{\text{opp}}{\text{adj}} \quad \csc = \frac{\text{hyp}}{\text{opp}} \quad \sec = \frac{\text{hyp}}{\text{adj}} \quad \cot = \frac{\text{adj}}{\text{opp}}$$

$$\sin A = \frac{a}{c} \quad \cos A = \frac{b}{c} \quad \tan A = \frac{a}{b} \quad \csc A = \frac{c}{a} \quad \sec A = \frac{c}{b} \quad \cot A = \frac{b}{a}$$

In Exercises 1 to 14,

find the values of the six trigonometric functions of θ for the right triangle with the given sides.

2. $c = \sqrt{3^2 + 7^2} = \sqrt{58}$

$$\sin \theta = \frac{7}{\sqrt{58}} = \frac{7\sqrt{58}}{58}$$

$$\cos \theta = \frac{3}{\sqrt{58}} = \frac{3\sqrt{58}}{58}$$

$$\tan \theta = \frac{7}{3}$$

$$\csc \theta = \frac{\sqrt{58}}{7}$$

$$\sec \theta = \frac{\sqrt{58}}{3}$$

$$\cot \theta = \frac{3}{7}$$

5. $\sin \theta = \frac{5}{\sqrt{29}} = \frac{5\sqrt{29}}{29}$

$$\cos \theta = \frac{2}{\sqrt{29}} = \frac{2\sqrt{29}}{29}$$

$$\tan \theta = \frac{5}{2}$$

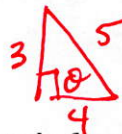
$$\csc \theta = \frac{\sqrt{29}}{5}$$

$$\sec \theta = \frac{\sqrt{29}}{2}$$

$$\cot \theta = \frac{2}{5}$$

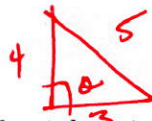
In Exercises 15 to 17, let θ be an acute angle of a right triangle for which $\sin \theta = \frac{3}{5}$, Find:

16- $\sec \theta = \frac{5}{3}$



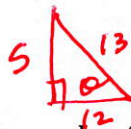
In Exercises 18 to 20, let θ be an acute angle of a right triangle for which $\tan \theta = \frac{4}{3}$, Find:

18- $\sin \theta = \frac{4}{5}$



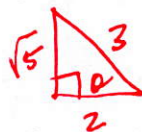
In Exercises 21 to 23, let θ be an acute angle of a right triangle for which $\sec \theta = \frac{13}{5}$, Find:

22- $\cot \theta = \frac{12}{5}$



In Exercises 24 to 26, let θ be an acute angle of a right triangle for which $\cos \theta = \frac{2}{3}$, Find:

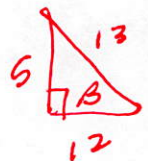
26- $\tan \theta = \frac{\sqrt{5}}{2}$



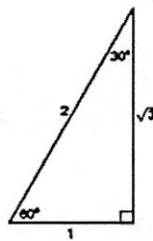
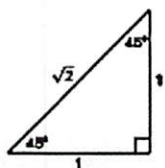
In Exercises 21 to 23, let β be an acute angle of a right triangle for which $\sec \beta = \frac{13}{5}$, Find:

21- $\cos \beta = \frac{5}{13}$

23- $\csc \beta = \frac{13}{5}$



Evaluate Trigonometric Functions with "Special" Right Triangles: 45-45-90 and 30-60-90 triangles
 Find the exact value of a trig expression using the "Special" Right Triangles



θ		$\sin \theta$	$\cos \theta$	$\tan \theta$	$\csc \theta$	$\sec \theta$	$\cot \theta$
degrees	radians						
30°	$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$	2	$\frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$	$\sqrt{3}$
45°	$\frac{\pi}{4}$	$\frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1	$\sqrt{2}$	$\sqrt{2}$	1
60°	$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$	$\frac{2\sqrt{3}}{3}$	2	$\frac{\sqrt{3}}{3}$

In Exercises 27 to 42, find the exact value of each expression:

28- $\csc 45^\circ - \sec 45^\circ$

$$\sqrt{2} - \sqrt{2} = 0$$

32- $\sec 30^\circ \cos 30^\circ - \tan 60^\circ \cot 60^\circ$

$$\frac{2\sqrt{3}}{3} \cdot \frac{\sqrt{3}}{2} - \sqrt{3} \cdot \frac{\sqrt{3}}{3} = 1 - 1 = 0$$

36- $\csc \frac{\pi}{6} - \sec \frac{\pi}{3}$

$$2 - 2 = 0$$

33- $2 \sin 60^\circ - \sec 45^\circ \tan 60^\circ$

$$2 \left(\frac{\sqrt{3}}{2} \right) - \sqrt{2} (\sqrt{3}) = \sqrt{3} - \sqrt{6}$$

35- $\sin \frac{\pi}{3} + \cos \frac{\pi}{6}$

$$\frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2} = \sqrt{3}$$

In Exercises 43 to 56,

use a calculator to find the value of the trigonometric function to four decimal places.

44. $\sec 88^\circ$

$$= \frac{1}{\cos 88^\circ} \approx 28.6537$$

52. $\sec \frac{3\pi}{8}$

$$= \frac{1}{\cos \frac{3\pi}{8}} = \frac{1}{\cos 67.5^\circ} \approx 2.6131$$

$$\frac{3\pi}{8} \cdot \frac{180}{\pi} = 67.5$$