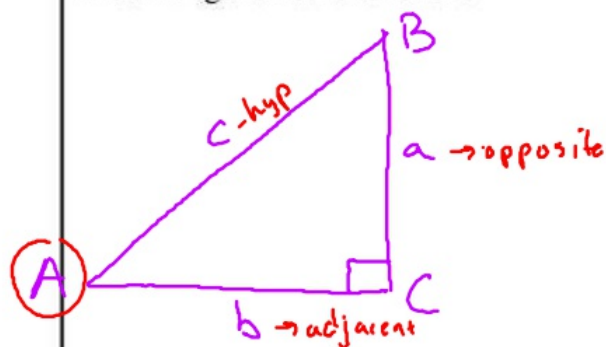## What you'll Learn About

- Right Triangle Trigonometry/ Two Famous Triangles
- Evaluating Trig Functions with a calculator/Applications of right triangle trig

The six trigonometric functions

Sin
Opp
Hyp

Cosine
Adj
Hyp

Tan
Opp
Adj

reciprocal functions

$$\text{Sine} = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \sin A = \frac{a}{c}$$

$$\text{cosine} = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \cos A = \frac{b}{c}$$

$$\text{tangent} = \frac{\text{opposite}}{\text{adjacent}} \qquad \boxed{\tan A = \frac{a}{b} \qquad \tan A = \frac{\sin A}{\cos A}}$$

$$\text{cosecant} = \text{reciprocal} = \frac{hyp}{opp} \rightarrow \boxed{\csc A = \frac{c}{a}}$$
$$\text{of sine}$$

$$\text{secant} = \text{reciprocal} = \frac{hyp}{adj} \rightarrow \boxed{\sec A = \frac{c}{b}}$$
$$\text{of cosine}$$

$$\text{cotangent} = \frac{\text{adjacent}}{\text{opposite}} \qquad \boxed{\cot A = \frac{b}{a}}$$

Find the values of all six trigonometric functions.

opp $\sqrt{7}$ 4 → hyp
θ → theta
3
adj
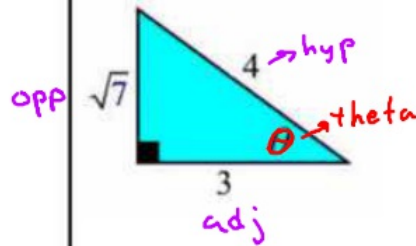
$\sin(\theta) = \sqrt{7}/4$ $\csc\theta = 4/\sqrt{7}$

$\cos(\theta) = 3/4$ $\sec\theta = 4/3$

$\tan(\theta) = \dfrac{\sqrt{7}}{3}$ $\cot\theta = 3/\sqrt{7}$

$a^2 + b^2 = c^2$

$3^2 + 2^2 = c^2$

$9 + 4 = c^2$

$13 = c^2$

$\sqrt{13} = c$

$C = \sqrt{13}$
2 opp
θ
3 adj
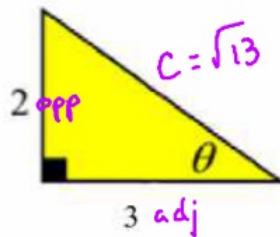
$\sin\theta = 2/\sqrt{13}$ $\csc\theta = \sqrt{13}/2$

$\boxed{\cos\theta = 3/\sqrt{13}}$ $\sec\theta = \sqrt{13}/3$

$\tan\theta = 2/3$ $\cot\theta = 3/2$

$a^2 + b^2 = c^2$

$a^2 + 2^2 = 3^2$

$a^2 + 4 = 9$

$a^2 = 5$

$a = \sqrt{5}$

2 opp
3
θ
$a = \sqrt{5}$
adj
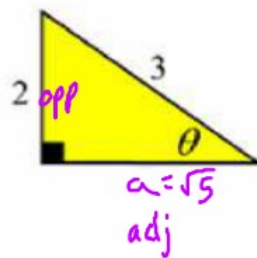
$\sin\theta = 2/3$ $\csc\theta = 3/2$

$\cos\theta = \sqrt{5}/3$ $\sec\theta = 3/\sqrt{5}$

$\tan\theta = 2/\sqrt{5}$ $\cot\theta = \sqrt{5}/2$
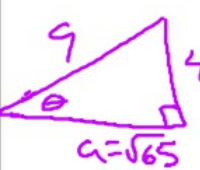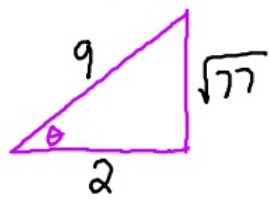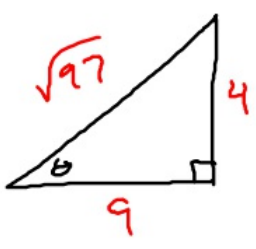
Assume that θ is an acute angle in a right triangle satisfying the given conditions. Evaluate the remaining trigonometric functions.
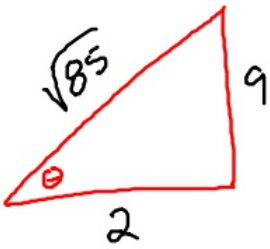
$\text{leg} = \sqrt{hyp^2 - leg^2}$

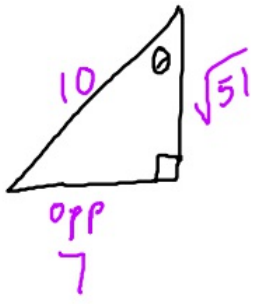$a = \sqrt{9^2 - 4^2}$

$a = \sqrt{81 - 16}$

$a = \sqrt{65}$

A) $\sin\theta = \dfrac{4}{9} = \dfrac{opp}{hyp}$ $\csc\theta = \dfrac{9}{4}$

$a = \sqrt{65}$
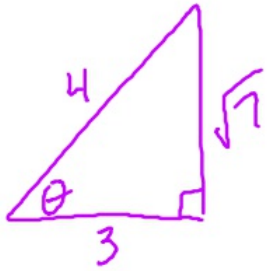
$\cos\theta = \sqrt{65}/9$

$\sec\theta = 9/\sqrt{65}$

$\tan\theta = 4/\sqrt{65}$

$\cot\theta = \sqrt{65}/4$

B) $\cos\theta = \dfrac{2}{9}$ $\dfrac{adj}{hyp}$ $\sec\theta = \dfrac{9}{2}$

9    $\sqrt{77}$

2

$hyp = \sqrt{leg^2 + leg^2}$

C) $\tan\theta = \dfrac{4}{9}$ $\dfrac{opp}{adj}$ $\cot\theta = \dfrac{9}{4}$

$\sqrt{97}$ 4

9

D) $\cot\theta = \dfrac{2}{9}$ $\tan\theta = \dfrac{9}{2}$ $\dfrac{opp}{adj}$

$\sqrt{85}$ 9

2

E) $\csc\theta = \dfrac{10}{7}$ $\sin\theta = \dfrac{7}{10}$ $\dfrac{opp}{hyp}$

10    $\sqrt{51}$

opp

7

F) $\sec\theta = \dfrac{4}{3}$ $\cos\theta = \dfrac{3}{4}$

4    $\sqrt{7}$

3

Evaluate using a calculator. Make sure your calculator is in the correct mode. Give answers to 3 decimal places and then draw the triangle that represents the situation.
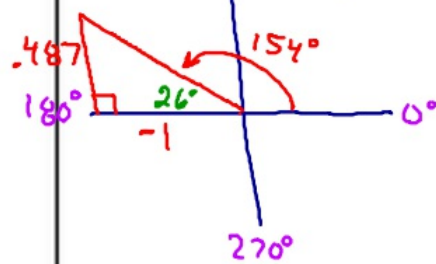
A) $\sin 53° = \dfrac{.798}{1}$ $\dfrac{opp}{hyp}$

B) $\cos \dfrac{2\pi}{5}$

1

.798

θ=53°

.601

$= \dfrac{.487}{-1}$

C) $\tan 154° = -\dfrac{.487}{1} = \dfrac{opp}{adj}$

90°

.487

180°

26°

154°

-1

0°

270°

D) $\cot \dfrac{\pi}{9}$

E) $\csc 220°$

F) $\sec \dfrac{8\pi}{5}$