Key Concept Trigonometric Functions in Right Triangles

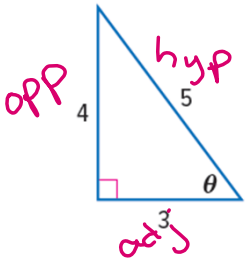
Words If θ is the measure of an acute angle of a right triangle, then the following trigonometric functions involving the opposite side *opp*, the adjacent side *adj*, and the hypotenuse *hyp* are true.

Symbols

$\sin$ (sine) $\theta = \frac{\text{opp}}{\text{hyp}}$ $\quad$ $\csc$ (cosecant) $\theta = \frac{\text{hyp}}{\text{opp}}$

$\cos$ (cosine) $\theta = \frac{\text{adj}}{\text{hyp}}$ $\quad$ $\sec$ (secant) $\theta = \frac{\text{hyp}}{\text{adj}}$

$\tan$ (tangent) $\theta = \frac{\text{opp}}{\text{adj}}$ $\quad$ $\cot$ (cotangent) $\theta = \frac{\text{adj}}{\text{opp}}$



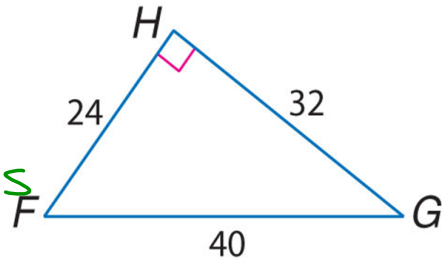
Examples

$\sin\theta = \frac{4}{5}$ $\quad$ $\cos\theta = \frac{3}{5}$ $\quad$ $\tan\theta = \frac{4}{3}$

$\csc\theta = \frac{5}{4}$ $\quad$ $\sec\theta = \frac{5}{3}$ $\quad$ $\cot\theta = \frac{3}{4}$

Find the values of the six trigonometric functions for angle *G*.

Reduce Fractions



$$\sin G = \frac{\text{opp}}{\text{hyp}} = \frac{24}{40} \text{ or } \frac{3}{5}$$

$$\cos G = \frac{\text{adj}}{\text{hyp}} = \frac{32}{40} \text{ or } \frac{4}{5}$$

$$\tan G = \frac{\text{opp}}{\text{adj}} = \frac{24}{32} \text{ or } \frac{3}{4}$$

$$\cot G = \frac{\text{adj}}{\text{opp}} = \frac{32}{24} \text{ or } \frac{4}{3}$$

$$\csc G = \frac{\text{hyp}}{\text{opp}} = \frac{40}{24} \text{ or } \frac{5}{3}$$

$$\sec G = \frac{\text{hyp}}{\text{adj}} = \frac{40}{32} \text{ or } \frac{5}{4}$$

If $\tan A = \frac{5}{3}$ find the exact values of the five remaining trigonometric functions for *A*.

Step 1: Draw right triangle and label what you know (remember: $\tan\theta = \frac{\text{opp}}{\text{adj}}$)

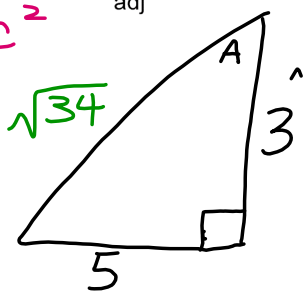
Step 2: Use Pythagorean Theorem to find C $a^2+b^2=c^2$

Step 3: Find the five remaining trig functions.

$5^2 + 3^2 = c^2$

$25 + 9 = c^2$

$34 = c^2$ $c = \sqrt{34}$



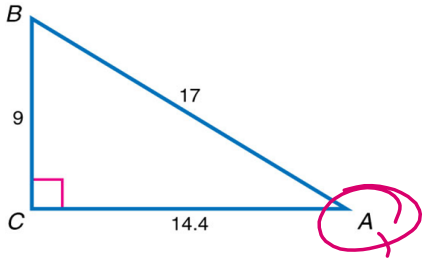
Answer:

$$\sin A = \frac{5\sqrt{34}}{34};\ \cos A = \frac{3\sqrt{34}}{34};\ \csc A = \frac{\sqrt{34}}{5};\ \sec A = \frac{\sqrt{34}}{3};\ \cot A = \frac{3}{5}$$

Key Concept Inverse Trigonometric Ratios

Words	If $\angle A$ is an acute angle and the sine of A is x, then the inverse sine of x is the measure of $\angle A$.
Symbols	If $\sin A = x$, then $\sin^{-1} x = m\angle A$.
Example	$\sin A = \frac{1}{2} \rightarrow \sin^{-1}\frac{1}{2} = m\angle A \rightarrow m\angle A = 30°$
Words	If $\angle A$ is an acute angle and the cosine of A is x, then the inverse cosine of x is the measure of $\angle A$.
Symbols	If $\cos A = x$, then $\cos^{-1} x = m\angle A$.
Example	$\cos A = \frac{\sqrt{2}}{2} \rightarrow \cos^{-1}\frac{\sqrt{2}}{2} = m\angle A \rightarrow m\angle A = 45°$
Words	If $\angle A$ is an acute angle and the tangent of A is x, then the inverse tangent of x is the measure of $\angle A$.
Symbols	If $\tan A = x$, then $\tan^{-1} x = m\angle A$.
Example	$\tan A = \sqrt{3} \rightarrow \tan^{-1}\sqrt{3} = m\angle A \rightarrow m\angle A = 60°$

Find the measure of angle A.



$\sin A = \frac{9}{17}$

$\sin^{-1} A \frac{9}{17} =$