Pythagorean Identities

*There are three so-called "Pythagorean identities" that can be used to simplify expressions containing trigonometric functions. The three Pythagorean identities are:

$\sin^2 x + \cos^2 x = 1$ $\qquad 1 + \cot^2 x = \csc^2 x$ $\qquad \tan^2 x + 1 = \sec^2 x$

*These identities can be used to determine function values.

Example: If the cot x = $\frac{\sqrt{3}}{2}$, what is the value of csc x if the angle is in Quadrant 3?

Using the second Pythagorean identity, we substitute the given value for cot x.

$$1 + \left(\frac{\sqrt{3}}{2}\right)^2 = \csc^2 x$$

$$1 + \frac{3}{4} = \csc^2 x$$

$$\frac{7}{4} = \csc^2 x$$

$$\frac{-\sqrt{7}}{2} = \csc x$$ (The *csc* function is negative in quadrant 3).