Inverse Trig

Used to "free" a variable from inside of a trig function.

Example: cos(x) = ½

Function	Inverse Relation
$\sin\theta = a$	$\sin^{-1} a = \theta$
$\cos\theta = a$	$\cos^{-1} a = \theta$
$\tan\theta = a$	$\tan^{-1} a = \theta$

Example #1: **Find all possible values of $\boldsymbol{sin^{-1}\left(\frac{1}{2}\right)}$**

Example #2: **Find all possible values of $\boldsymbol{\tan^{-1}1}$.**

Sign characteristics of the unit circle:

A. In which quadrant are all the ratios positive?

B. Which quadrant has only sine positive?

C. Which quadrant has only cosine positive?

D. What quadrant has only tangent positive?

Remember: "All Students Take Calculus"

You try: **Find $\boldsymbol{sin^{-1}\left(\frac{-\sqrt{3}}{2}\right)}$**

Example #3: **Solve for θ given that $\sin\theta = 0.4$, for $-90° \le \theta \le 90°$.**

Example #4: **Solve for θ given that $\tan\theta = -2$, for $-90° < \theta < 90°$.**

Because more than one value of θ produces the same output value for a given trigonometric function, it is necessary to restrict the domain of each trigonometric function in order to define the inverse trigonometric functions.

- Trigonometric functions with restricted domains are indicated with a capital letter.
- The domains of the Sine, Cosine, and Tangent functions are restricted as follows:

$\text{Sin}\theta = \sin\theta$ for $\{\theta | -\frac{\pi}{2} \le \theta \le \frac{\pi}{2}\}$

θ is restricted to Quadrants I and IV.

$\text{Cos}\theta = \cos\theta$ for $\{\theta | 0 \le \theta \le \pi\}$

θ is restricted to Quadrants I and II.

$\text{Tan}\theta = \tan\theta$ for $\{\theta | -\frac{\pi}{2} < \theta < \frac{\pi}{2}\}$

θ is restricted to Quadrants I and IV.

Example #5: **Evaluate each inverse trigonometric function. Give your answer in radians.**

$$\text{Cos}^{-1}\left(-\frac{\sqrt{3}}{2}\right)$$

$$\text{Sin}^{-1}\left(-\frac{\sqrt{2}}{2}\right)$$

$$\boldsymbol{Tan^{-1}\left(-\sqrt{3}\right)}$$

$$\mathbf{Sin^{-1}\,\frac{3}{2}}$$

Write about it:
Explain the difference between $\tan^{-1}a$ and $\mathrm{Tan}^{-1}a$.