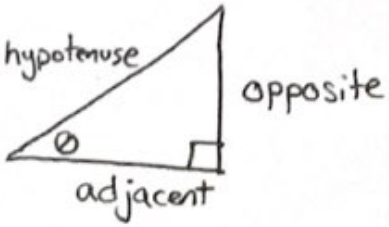
Lesson 3: Section 1.4

Trig Functions:

- Given



$\sin(\theta) = \frac{opp}{hyp}$ $\quad \csc(\theta) = \frac{1}{\sin(\theta)} = \frac{hyp}{opp}$

$\cos(\theta) = \frac{adj}{hyp}$ $\quad \sec(\theta) = \frac{1}{\cos(\theta)} = \frac{hyp}{opp}$

$\tan(\theta) = \frac{opp}{adj}$ $\quad \cot(\theta) = \frac{1}{\tan(\theta)} = \frac{adj}{opp}$

- Trig functions are <u>periodic</u> (their graphs keep repeating)

Period of sin, cos, csc, sec $= 2\pi$

Period of tan, cot $= \pi$

- We can shift/stretch trig functions:

$$a \cdot \sin(bx+c) + d$$

a = vertical stretch / compression

b = frequency (horizontal stretch/compression)

c = horizontal shift

d = vertical shift

$$\text{new period} = \frac{\text{old period}}{b}$$

Important Identities

- $\sin^2(\theta) + \cos^2(\theta) = 1$
- $\sin(\alpha+\beta) = \sin(\alpha)\cos(\beta) + \cos(\alpha)\sin(\beta)$
- $\cos(\alpha+\beta) = \cos(\alpha)\cos(\beta) - \sin(\alpha)\sin(\beta)$

Inverse Trig Functions

- Trig functions are <u>not</u> one-to-one on $(-\infty, \infty)$, so we must restrict their domains in order to have inverses

	Domain	Range
$\sin^{-1}(x)$	$[-1, 1]$	$[-\frac{\pi}{2}, \frac{\pi}{2}]$
$\cos^{-1}(x)$	$[-1, 1]$	$[0, \pi]$
$\tan^{-1}(x)$	$(-\infty, \infty)$	$(-\frac{\pi}{2}, \frac{\pi}{2})$

- arcsin, arccos, arctan are different names for $\sin^{-1}$, $\cos^{-1}$, and $\tan^{-1}$.

Practice Problems

1. Find the exact value of
$$\sin^{-1}\left(\sin\left(\frac{7\pi}{6}\right)\right).$$

2. For which positive numbers x does
$$\sin\left(2\cos^{-1}(7x)\right)$$
make sense?
For these values of x, use a right triangle to give an algebraic expression equal to
$$\sin\left(2\cos^{-1}(7x)\right).$$