Trig 7.1

parking lot

Identify and use trig identities

identity $2(x+5) = 2x + 10$

equation $x + 3 = 5$

counterexample

reciprocal $\frac{a}{b} \rightarrow \frac{b}{a}$

quotient $\div$

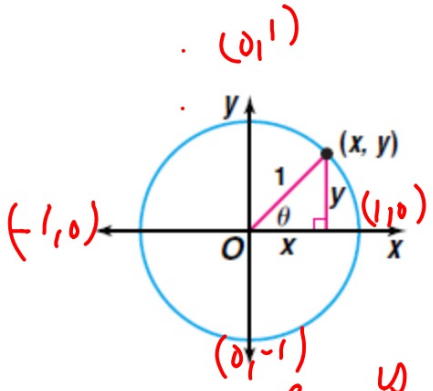
symmetry

trig identities

pythagorean

opposite angle

parking lot
whiteboards (if time)



sinΘ $= \frac{opp}{hyp} = \frac{y}{1}$

cosΘ $= \frac{adj}{hyp} = \frac{x}{1}$

tanΘ $= \frac{opp}{adj} = \frac{y}{x}$

Identity: an equation that applies to all values

Conditional Equation: specifies values without necessarily naming them

$2(x+3) = 10$

$2x + 6 = 10$

$-6 \quad -6$

$2x = 4$

$\frac{2x}{2} = \frac{4}{2}$

$x = 2$

$2(x+3) = 2x + 6$

$2x + 6 = 2x + 6$

$-6 \qquad -6$

$2x = 2x$

$-2x \quad -2x$

$0 = 0$

Callback to geometry: All you need is one exception...

1 **Prove that $\sin x \cos x = \tan x$ is *not* a trigonometric identity by producing a counterexample.**

$30°$

$\sin 30 \cdot \cos 30 = \tan 30$

$\frac{1}{2} \cdot \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{3}$

$\frac{\sqrt{3}}{4} = \frac{\sqrt{3}}{3}$

Definitions: Start parking lot

The following trigonometric identities hold for all values of θ where each expression is defined.

$$\sin\theta = \frac{1}{\csc\theta} \qquad \cos\theta = \frac{1}{\sec\theta}$$

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta}$$

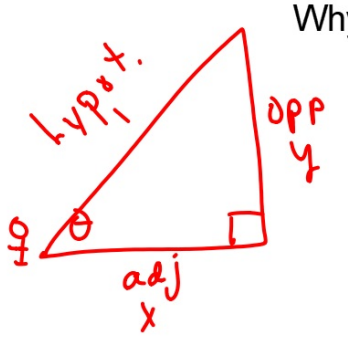
$$\tan\theta = \frac{1}{\cot\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

It's not even Summer and I already have a tan

The following trigonometric identities hold for all values of θ where each expression is defined.

$$\frac{\sin\theta}{\cos\theta} = \tan\theta \qquad \frac{\cos\theta}{\sin\theta} = \cot\theta$$

Why? (RT triangle)



$\sin\theta = \frac{y}{1}$

$\cos\theta = \frac{x}{1}$

$\tan\theta = \frac{y}{x}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

Memorize (unit circle)

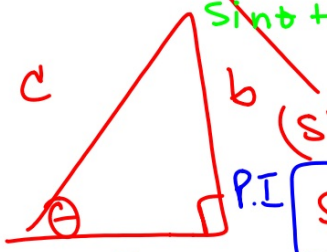
Pythagorean Identities

The following trigonometric identities hold for all values of θ where each expression is defined.

$\sin^2\theta + \cos^2\theta = 1$ $\quad \tan^2\theta + 1 = \sec^2\theta$ $\quad 1 + \cot^2\theta = \csc^2\theta$

derive derive

$\sin\theta + \cos\theta = 1$



P.I $(\sin\theta)^2 + (\cos\theta)^2$

$\sin^2\theta + \cos^2\theta = 1$

$\frac{\sin^2\theta}{\sin^2\theta} + \frac{\cos^2\theta}{\sin^2\theta} = \frac{1}{\sin^2\theta}$

$\frac{a^2}{c^2} + \frac{b^2}{c^2} = \frac{c^2}{c^2}$

$\left(\frac{a}{c}\right)^2 + \left(\frac{b}{c}\right)^2 = 1$

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

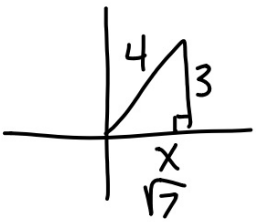
$\frac{\sin^2\theta}{\cos^2\theta} + \frac{\cos^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$

$\sin^2\theta + \cos^2\theta = 1$

Might be reciprocals
Might need reference triangle

2 **Use the given information to find the trigonometric value.**

a. If $\sec\theta = \frac{3}{2}$, find $\cos\theta$. $= \frac{2}{3}$



$\tan\theta = \frac{3}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{3\sqrt{7}}{7}$

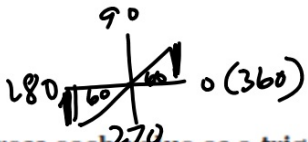
$x^2 + 3^2 = 4^2$

$x^2 + 9 = 16$

$x^2 = 7$

b. If $\csc\theta = \frac{4}{3}$, find $\tan\theta$.

$\frac{\text{hyp}}{\text{opp}}$

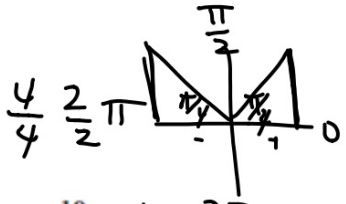


3 **Express each value as a trigonometric function of an angle in Quadrant I.**

a. $\sin 600^\circ = -\sin 60$

$\tan 600^\circ = \tan 60^\circ$

(Compare to Quadrant 1 reference angle)
Uses same reference angle:
is the sign same or opposite?



$\sin \frac{19\pi}{4} = \sin \frac{\pi}{4}$

b. $\sin \frac{19\pi}{4}$ $\frac{11\pi}{4}$

$\frac{8\pi}{4} = 3\pi$

c. $\cos(-410^\circ)$

d. $\tan \frac{37\pi}{6}$

Opposite-Angle Identities	The following trigonometric identities hold for all values of A.
	sinA $\sin(-A) = -\sin A$
	cosA $\cos(-A) = \cos A$

19-43 odd

CW
CCW

.

Same reference triangles but in different quadrants: what has changed?
same or opposite?

What quadrant?
Sides of reference triangle
Answer the question

Use the given information to determine the exact trigonometric value.

8. $\cos\theta = \frac{2}{3}, 0° < \theta < 90°; \sec\theta$

9. $\cot\theta = -\frac{\sqrt{5}}{2}, \frac{\pi}{2} < \theta < \pi; \tan\theta$

Express each value as a trigonometric function of an angle in Quadrant I.

same sign or opposite?

12. $\cos \frac{7\pi}{3}$

13. $\csc(-330^\circ)$

Try to get to a single trig function: what can you substitute?
(parking lot)

Simplify each expression.

14. $\frac{\csc \theta}{\cot \theta}$

4 Simplify $\sin x + \sin x \cot^2 x$.

Rules of algebra apply:
you can factor
combine like terms
you can substitute...
(parking lot)

15. $\cos x \csc x \tan x$

16. $\cos x \cot x + \sin x$