Lesson 74 Objective: SWBAT solve first degree trigonometric functions.

Kickoff- Verify each of the following using trig identities.

1) $\csc^2 x \tan^2 x - 1 = \tan^2 x$

$\dfrac{1}{\sin^2 x}\left(\dfrac{\sin^2 x}{\cos^2 x}\right) - 1$

$\dfrac{1}{\cos^2 x} - 1$

$\sec^2 x - 1$

$\tan^2 x \checkmark$

$\dfrac{\cos^2 x}{\cos^2 x} + \dfrac{\sin^2 x}{\cos^2 x} = \dfrac{1}{\cos^2 x}$

$1 + \tan^2 x = \sec^2 x$

2) $\dfrac{1}{\tan x} + \tan x = \dfrac{\sec^2 x}{\tan x}$

$\dfrac{\tan x}{1}\cdot\dfrac{\sec^2 x}{\tan x}$

$\boxed{1 + \tan^2 x}$

$\dfrac{\sec^2 x}{\tan x}$

$\dfrac{\sec^2 x}{\tan x}$

3) $\dfrac{\cos^2 x - \sin^2 x}{1 - \tan^2 x} = \cos^2 x$

1) $\csc^2 x \tan^2 x - 1 = \tan^2 x$

$\dfrac{1}{\sin^2 x}\cdot\dfrac{\sin^2 x}{\cos^2 x} - 1$

$\dfrac{1}{\cos^2 x} - 1$

$\sec^2 x - 1$

$\tan^2 x =$

2) $\dfrac{1}{\tan x} + \tan x = \dfrac{\sec^2 x}{\tan x}$

$\dfrac{1 + \tan^2 x}{\tan x}$

$\dfrac{\sec^2 x}{\tan x} =$

3) $\dfrac{\cos^2 x - \sin^2 x}{1 - \tan^2 x} = \cos^2 x$

$\dfrac{\cos^2 x + \sin^2 x}{(\cos^2 x)1 - \dfrac{\sin^2 x}{\cos^2 x}}$

$\dfrac{\cos^2 x - \sin^2 x}{\dfrac{\cos^2 x - \sin^2 x}{\cos^2 x}}$

$\dfrac{\cos^2 x - \sin^2 x}{1}\cdot\dfrac{\cos^2 x}{\cos^2 x - \sin^2 x}$
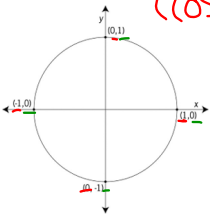
$\cos^2 x =$

HW

First Degree Trig Equations

Recall the Exact Value Chart!

θ	30	45	60
$\sin\theta$	$\dfrac{1}{2}$	$\dfrac{\sqrt{2}}{2}$	$\dfrac{\sqrt{3}}{2}$
$\cos\theta$	$\dfrac{\sqrt{3}}{2}$	$\dfrac{\sqrt{2}}{2}$	$\dfrac{1}{2}$
$\tan\theta$	$\dfrac{1}{\sqrt{3}} \to \dfrac{\sqrt{3}}{3}$	$\dfrac{\sqrt{2}}{\sqrt{2}} \to 1$	$\dfrac{\sqrt{3}}{1} \to \sqrt{3}$

Recall the Unit Circle!

$(\cos\theta, \sin\theta)$

θ	0°, 360° 0, 2π	90° $\dfrac{\pi}{2}$	180° π	270° $\dfrac{3\pi}{2}$
$\sin\theta$	0	1	0	-1
$\cos\theta$	1	0	-1	0
$\tan\theta$	0	DNE	0	DNE

Recall How to Find an Angle Using Trigonometry

Find each angle to the nearest degree

1) $\sin\theta = .987$

$\sin^{-1}(.987)$

≈ 81

$\theta = 81°$

$\theta = 99°$

2) $\cos\theta = .5 \to \dfrac{1}{2}$

≈ 60

$\theta = 60$

$\theta = 360 - 60 = 300$

3) $\csc\theta = 2$

$\dfrac{1}{\sin\theta} = \dfrac{2}{1}$

$\sin\theta = \dfrac{1}{2}$

≈ 30

$\theta = 30$

$\theta = 150$

S A
T C

Panel 1 (top left)

Solving First Degree Trig Equations   *LOL*

Step 1: Replace trig function w/ x

Let x = trig function.

Step 2: Solve normally

Step 3: Put back trig function.

Step 4: Find reference x

Step 5: Solve for the missing x's (ASTC)

Solve each trigonometric equation to the nearest degree for all values within $0° \le \theta \le 360°$.

1) $\sin\theta = \frac{\sqrt{2}}{2}$

ref x 45

$\theta = 45$

$\theta = 180$
$\quad - 45$
$\quad \overline{135}$

2) $\cos\theta = -\frac{\sqrt{3}}{2}$

ref x 30

$\theta = 180-30 = 150$

$\theta = 180+30 = 210$

Panel 2 (top right)

3) $5\cos\theta - 1 = 1$

Let x = cos θ

$5x - 1 = 1$

$x = \frac{2}{5}$

$\cos\theta = \frac{2}{5}$

$\cos^{-1}(2/5) \to 66°$

$\theta = 66°$

$\theta = 360-66 = 294°$

4) $3\sin\theta - \sqrt{3} = \sin\theta$

5) $8(\csc\theta - 1) = \csc\theta + 2$

Let x = csc θ

$8(x-1) = x+2$

$8x - 8 = x + 2$

$7x - 8 = 2$

$7x = 10$

$x = \frac{10}{7}$

$\csc\theta = \frac{10}{7}$

$\frac{1}{\sin\theta} = \frac{10}{7}$

$\sin\theta = \frac{7}{10}$

$\sin^{-1}(7/10) \to 44$

$\theta = 44$

$\theta = 136$

6) $\cot\theta + \sqrt{3} = 0$

Panel 3 (bottom left)

Solve each trigonometric equation to the nearest degree for all values within $0 < \theta \le 2\pi$.

7) $\sec\theta = -2$

8) $-1 + \tan\theta = 0$

9) $-4 = -4 + \sin\theta$

10) $4 + \csc\theta = 6$

Panel 4 (bottom right)

11) $-4 + 3\sec\theta = 2$

Let x = sec θ

$-4 + 3x = 2$

$+4 \qquad +4$

$\frac{3x}{3} = \frac{6}{3}$

$x = 2$

$\sec\theta = 2$

$\frac{1}{\cos\theta} = 2$

$\cos\theta = 1/2 \to$ ref x 60 (π/3)

$\theta = 60 \to \pi/3$

$\theta = 300 \to \frac{5\pi}{3}$

$\frac{\pi}{3} \qquad \pi/3$

$\frac{4\pi}{3} \qquad \frac{5\pi}{3}$

12) $-6 = -4(1 - \cos\theta)$

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