Lesson 45 – Special Right Triangles

Integrated Math 2 - Santowski

OVERVIEW

- Where we've been
- (1) How we now understand angles ➔ Angles in Standard Position
- (2) How we determine the Trig Ratios of Angles in Standard Position
- Where we're going
- (1) How do you solve a trig equation?
- (2) How do you use right triangles do generate a sinusoidal function?

Lesson Objectives

- Know the trig ratios of all multiples of 30°, 45°, 60°, 90° angles
- Understand the concepts behind the trig ratios of special angles in all four quadrants
- Solve simple trig equations involving special trig ratios

(A) Review – Special Triangles

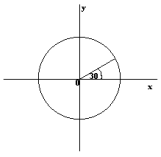
- Review 45°- 45°- 90° triangle
- sin(45°) =
- cos(45°) =
- tan(45°) =

(A) Review – Special Triangles

- Review 30°- 60°- 90° triangle ➔ 30°
- sin(30°) =
- cos(30°) =
- tan(30°) =
- Review 30°- 60°- 90° triangle ➔ 60°
- sin(60°) =
- cos(60°) =
- tan(60°) =

(B) Trig Ratios of First Quadrant Angles

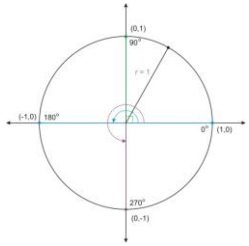
- We have already reviewed first quadrant angles in that we have discussed the sine and cosine of 30°, 45°, and 60° angles
- What about the quadrantal angles of 0 ° and 90°?
-



(B) Trig Ratios of First Quadrant Angles – Quadrantal Angles

- Let's go back to the x,y,r definitions of sine and cosine ratios and use ordered pairs of angles whose terminal arms lie on the positive x axis (0° angle) and the positive y axis (90° angle)

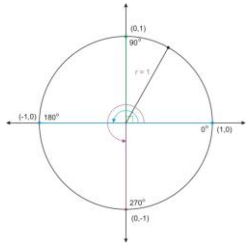
- sin(0°) =
- cos (0°) =
- tan(0°) =
- sin(90°) =
- cos(90°) =
- tan(90°) =



(B) Trig Ratios of First Quadrant Angles – Quadrantal Angles

- Let's go back to the x,y,r definitions of sine and cosine ratios and use ordered pairs of angles whose terminal arms lie on the positive x axis (0° angle) and the positive y axis (90° angle)

- sin(0°) = 0/1 = 0
- cos (0°) = 1/1 = 1
- tan(0°) = 0/1 = 0
- sin(90°) = 1/1 = 1
- cos(90°) = 0/1 = 0
- tan(90°) = 1/0 = undefined

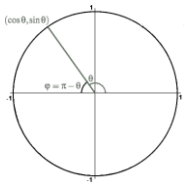


(B) Trig Ratios of First Quadrant Angles - Summary

	0°	30°	45°	60°	90°
sin θ	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos θ	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan θ	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	$\pm\infty$

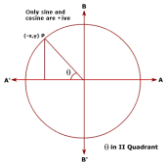
(C) Trig Ratios of Second Quadrant Angles

- Now let's apply the same ideas & concepts to considering special second quadrant angles of 120°, 135°, 150° and 180°



(C) Trig Ratios of Second Quadrant Angles

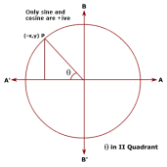
- Now let's apply the same ideas & concepts to considering special second quadrant angles of 120°, 135°, 150° and 180°



θ	Sin(θ)	Cos(θ)	Tan(θ)
120°			
150°			

(C) Trig Ratios of Second Quadrant Angles

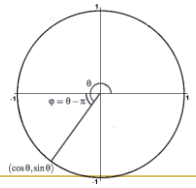
- Now let's apply the same ideas & concepts to considering special second quadrant angles of 120°, 135°, 150° and 180°



θ	Sin(θ)	Cos(θ)	Tan(θ)
135°			
180°			

(D) Trig Ratios of Third Quadrant Angles

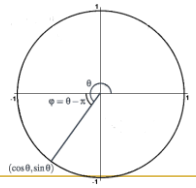
- Now let's apply the same ideas & concepts to considering special second quadrant angles of 210°, 225°, 240° and 270°



θ	Sin(θ)	Cos(θ)	Tan(θ)
210°			
240°			

(D) Trig Ratios of Third Quadrant Angles

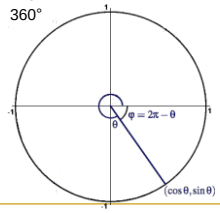
- Now let's apply the same ideas & concepts to considering special second quadrant angles of 210°, 225°, 240° and 270°



θ	Sin(θ)	Cos(θ)	Tan(θ)
225°			
270°			

(E) Trig Ratios of Fourth Quadrant Angles

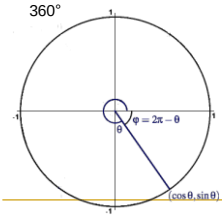
- Now let's apply the same ideas & concepts to considering special second quadrant angles of 300°, 315°, 330° and 360°



θ	Sin(θ)	Cos(θ)	Tan(θ)
300°			
330°			

(E) Trig Ratios of Fourth Quadrant Angles

- Now let's apply the same ideas & concepts to considering special second quadrant angles of 300°, 315°, 330° and 360°



θ	Sin(θ)	Cos(θ)	Tan(θ)
315°			
360°			

(F) Summary (As a Table of Values)

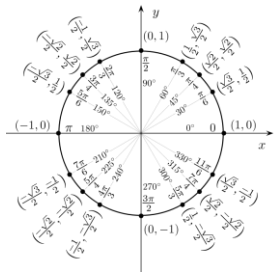
	0	30	45	60	90	120	135	150	180
sin									
cos									

▪	210	225	240	270	300	315	330	360
sin								
cos								

(G) Summary – As a "Unit Circle"

- The Unit Circle is a tool used in understanding sines and cosines of angles found in right triangles.
- It is so named because its radius is exactly one unit in length, usually just called "one".
- The circle's center is at the origin, and its circumference comprises the set of all points that are exactly one unit from the origin while lying in the plane.

(G) Summary – As a "Unit Circle"

- 

Angles in Standard Position – Interactive Applet

- Go to the link below and work through the ideas presented so far with respect to angles in standard position
- Angles In Trigonometry from AnalyzeMath

(H) Examples

- Complete the worksheet:
- http://www.edhelper.com/math/trigonometry104.htm
- http://www.edhelper.com/math/trigonometry108.htm

(H) Trig Equations

- Simplify or solve

(a) $\sin 30° \cos 30° - \tan 30°$

(b) $\sin 45° \sin 30° - (\tan 60°)^2$

(c) $\dfrac{\sin 150°}{\sec 210°} - \csc(-330°)$

(b) $\sin(\theta) = -\dfrac{1}{2}$

(c) $2\cos(\theta) = 1$

(d) $\sqrt{3}\tan(\theta) = 1$

Homework

- Nelson 11, Chap 6.3, p532, Q3,4,6,8,9,10ac,11ab,12