PreCalculus 11

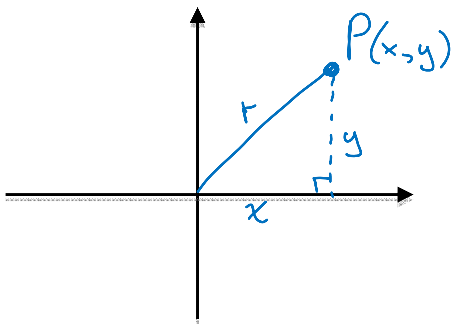
Name____________________

Date_______________

2. Trig Ratios of Any Angle

Yesterday we drew the angles in *Standard Position*. Now if we consider any point *P(x , y)* on the terminal arm, we can define the three primary trig ratios as:

SOH CAH TOA becomes

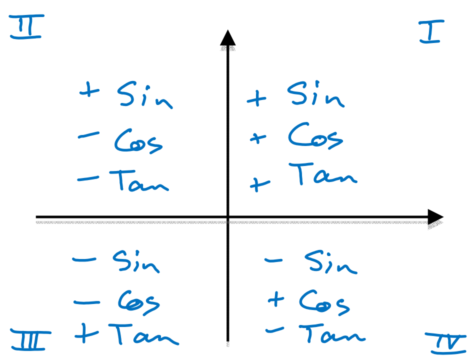


$\sin\theta = y/r$

$\cos\theta = x/r$

$\tan\theta = y/x$ where $r = \sqrt{x^2 + y^2}$

→ r is always defined to be positive, but x and y may be negative depending upon which quadrant terminal arm is in. Therefore, the sin, cos and tan ratios may also be positive or negative.



To remember the quadrants in which the ratios are pos, All Soup Turns Cold.

A S T C

Example 1: p. 91 The point *P(-8 , 15)* lies on the terminal arm of angle Θ, in standard position. Determine the exact trig ratios for sinΘ , cosΘ , and tanΘ.

$x = -8$

$y = 15$

$r = \sqrt{225 + 64}$

$= \sqrt{289}$

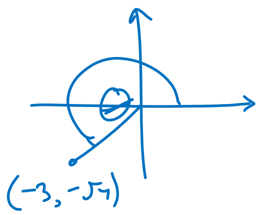
$= 17$

$\sin\theta = y/r = \frac{15}{17}$

$\cos\theta = \frac{x}{r} = -8/17$

$\tan\theta = y/x = \frac{15}{-8}$

Example 2: p. 92 - Suppose θ is an angle in standard position with terminal arm in quadrant III, and cosθ = -3/4. What are the exact values of sinθ and tanθ ?



$\cos\theta = \frac{x}{r} = \frac{-3}{4}$

$x = -3$

$y = \sqrt{7}$ or $-\sqrt{7}$?

$r = 4$

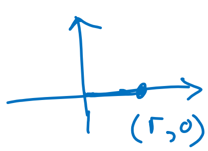
$\sin\theta = \frac{y}{r} = \frac{-\sqrt{7}}{4}$

$\tan\theta = y/x = \frac{\sqrt{7}}{3}$

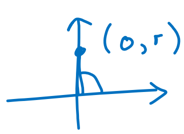
What about values that aren't positive or negative? What if cos θ = 0 ?

A quadrantal angle is an angle in standard position whose terminal arm lies on the x axis or the y axis.

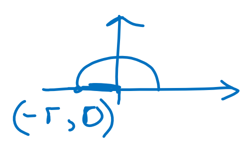
Example 3: p. 93 – Determine the values of sinθ, cosθ, and tanθ for quadrantal angles of 0°, 90°, 180° and 270°.



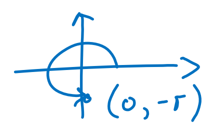
$x = r$
$y = 0$
$r = r$



$x = 0$
$y = r$
$r = r$



$x = -r$
$y = 0$
$r = r$



$x = 0$
$y = -r$
$r = r$

		0°	90°	180°	270°
y/r	sinΘ	0	1	0	-1
x/r	cosΘ	1	0	-1	0
y/x	tanΘ	0	undefined	0	undefined

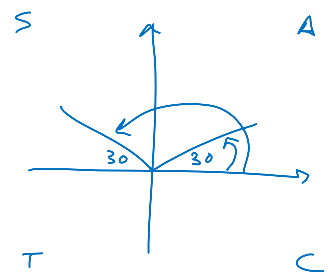
Finding an angle can get more complicated when you don't know the quadrant in which it lies. (there may be two possibilities) Draw a diagram!

Example 4: Solve for Θ to the nearest degree where $0^o \le \Theta < 360^o$. between 0° & 360°

a) $\sin\theta = 0.5$

↳ 2nd Sin → 30°

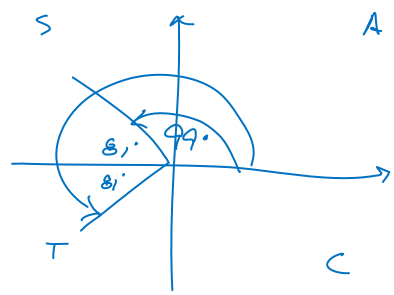
$\theta = 30^\circ$ or 150°



b) $\cos\theta = -0.156$

↳ 2nd Cos → 99°

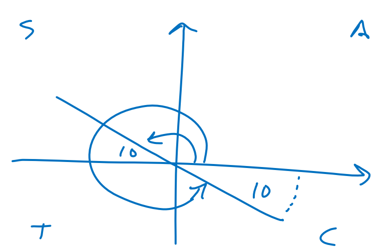
$\theta = 99^\circ$ or 261°



c) $\tan\theta = -0.179$

↳ 2nd Tan → −10

$\theta = 170^\circ$ or 350°



d) $\cos\theta = -1.125$ Impossible for Sin & Cos ratios!

Assignment: p. 96 # 3, 4, 5(ac), 7, 8(ac), 12