Part D

We have seen that for any principal angle greater than 90°, the values of the primary trig ratios are either the same as, or the negatives of the ratios for the related acute angle. These relationships are based on angles in standard position in the Cartesian Plane and depend on the quadrant in which the terminal arm of the angle lies.

Answer the following question based on what you have learned from this investigation.

1. Complete the table below to summarize the signs of the trig ratios for a principal angle that lies in each of the 4 quadrants.

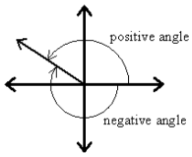
Trigonometric Ratio	Quadrant			
	1	2	3	4
Sine	+			
Cosine	+			
Tangent	+			

2. Using the special angles learned last class, and your answers to question 1, determine the possible measures of each angle based on the information given.
(Hint #1: There are two possible angles for each question)
(Hint #2: You should be able to check your answer using a calculator)

a) $\sin\theta = \frac{1}{2}$ b) $\sin\theta = \frac{\sqrt{3}}{2}$ c) $\cos\theta = -\frac{1}{2}$ d) $\tan\theta = -1$

3. State the relative acute angle for each of the following principal angles. Draw a sketch to help with your answers.

a) $\theta = 120°$ b) $\theta = 135°$
c) $\theta = 300°$ d) $\theta = 200°$



4. We can measure negative angles on the Cartesian Plane, if we measure the angle from the positive x-axis in a clockwise direction. Complete the table below.

Measure of the Negative Angle: α	Measure of the Corresponding Positive Angle: β	$\sin\alpha$	$\sin\beta$	$\cos\alpha$	$\cos\beta$	$\tan\alpha$	$\tan\beta$
-100°							
-240°							
-150°							
-315°							

MBF 3C
4.2 - Part 2

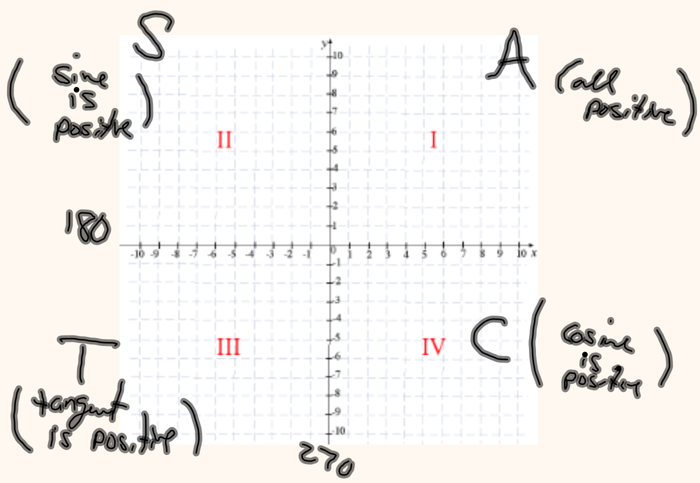
Co-Terminal and Related Angles Part 2

Angles in 4 Quadrants

We have seen that the sign of the trig ratios depends on the quadrant that the terminal arm lies in.

Trigonometric Ratio	Quadrant			
	1	2	3	4
Sine	+	+	-	-
Cosine	+	-	-	+
Tangent	+	-	+	-

It is helpful to focus on the quadrants where particular ratios are positive.



Example

Consider:

$\cos 60^{\circ} = 0.5$ $\quad$ $\cos 300^{\circ} = 0.5$

$\cos 420^{\circ} = 0.5$ $\quad$ $\cos 660^{\circ} = 0.5$

So if $\cos \theta = 0.5$ then there are infinite solutions for the angle θ.

But θ will always fall in quadrant 1 or 4, since these are the only quadrants in which the cosine ratio is positive.

Examples

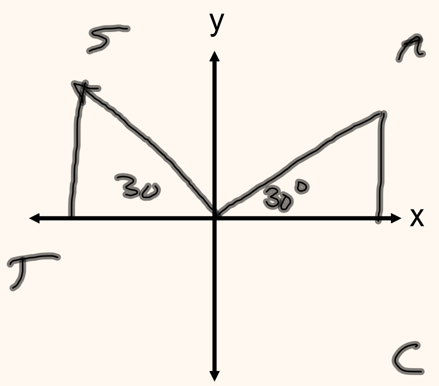
eg. If $\sin \theta = 0.5$, then determine θ such that $0^{\circ} \leq \theta \leq 360^{\circ}$

related angle $= 30^{\circ}$

Since θ is in Q II

Then $\theta = 180 - 30$

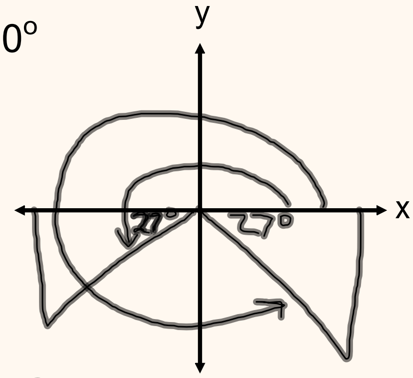
$= 150^{\circ}$



The Good News:

Examples

eg. Find the value of θ if $0^\circ \le \theta \le 360^\circ$



a) $\sin \theta = -0.45$

$\theta = \sin^{-1}(0.45)$

$\theta = 27^\circ$

$\theta = 180 + 27$

$\boxed{\theta = 207^\circ}$

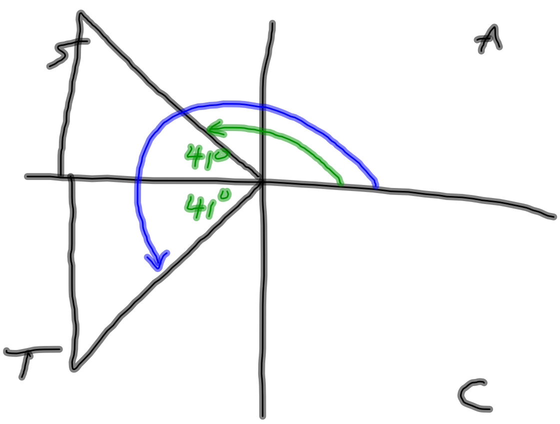
$\theta = 360 - 27$

$\boxed{\theta = 333^\circ}$

b)

c)

b) $\cos \theta = -0.76$



$\theta = \cos^{-1}(0.76)$

$= 41^\circ$

$\theta = 180 - 41$

$\boxed{\theta = 139^\circ}$

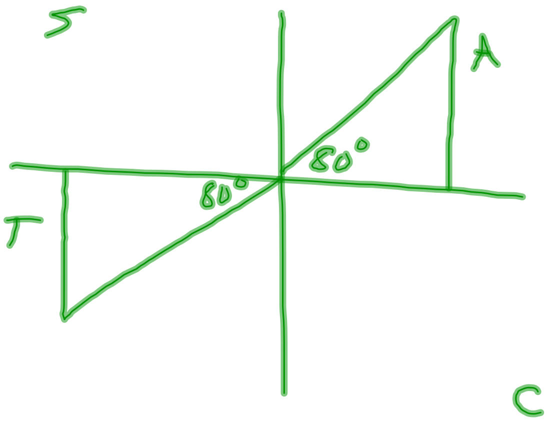
$\theta = 180 + 41$

$\boxed{\theta = 221^\circ}$

c) tan θ = 5.68

$\theta = \tan^{-1}(5.68)$

$\boxed{\theta = 80^\circ}$



$\theta = 180 + 80$

$\boxed{\theta = 260^\circ}$

Unit Circle

Consider a circle with radius 1 unit. This circle is shown in the diagram below.

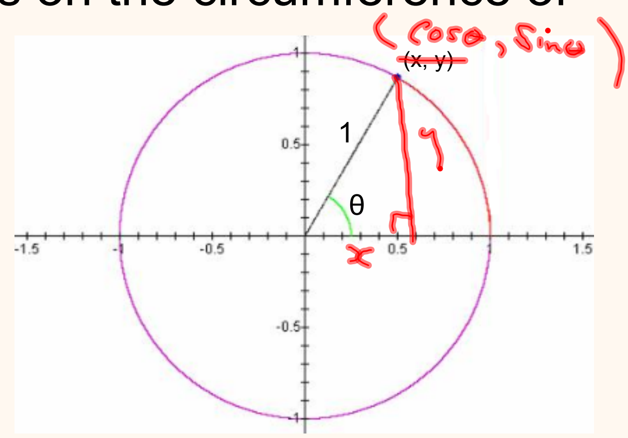
We can use trig ratios to represent the coordinates of points on the circumference of the circle.

$\sin\theta = y$

$\cos\theta = x$

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

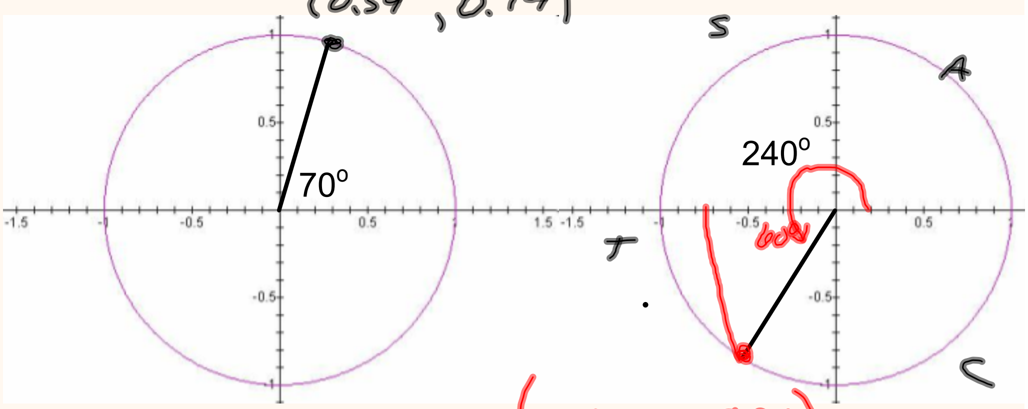
$\boxed{\tan\theta = \frac{\sin\theta}{\cos\theta}}$



Unit Circle

Determine the location of each point on the unit circle with a given principal angle. $(0.34, 0.94)$

a)

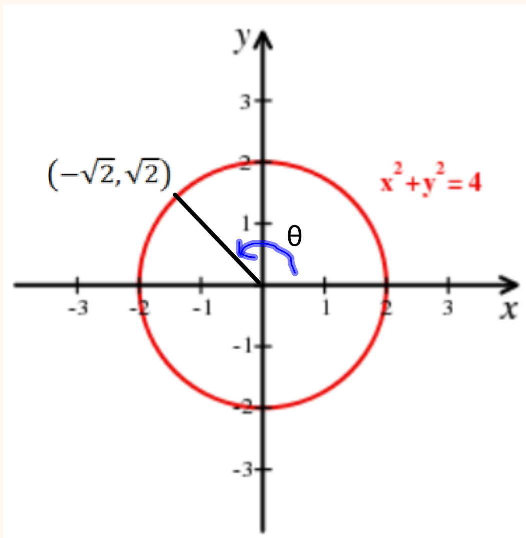


$(-0.5, -0.87)$

$\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$

Circle Question

Determine the measure of θ.



Homework:

Pg. 238 # 4ab, 5

Determine θ, if

a) $\cos\theta = 0.6018$

b) $\sin\theta = -0.342$

c) $\tan\theta = -0.7$

Pg. 239 #7 - 10