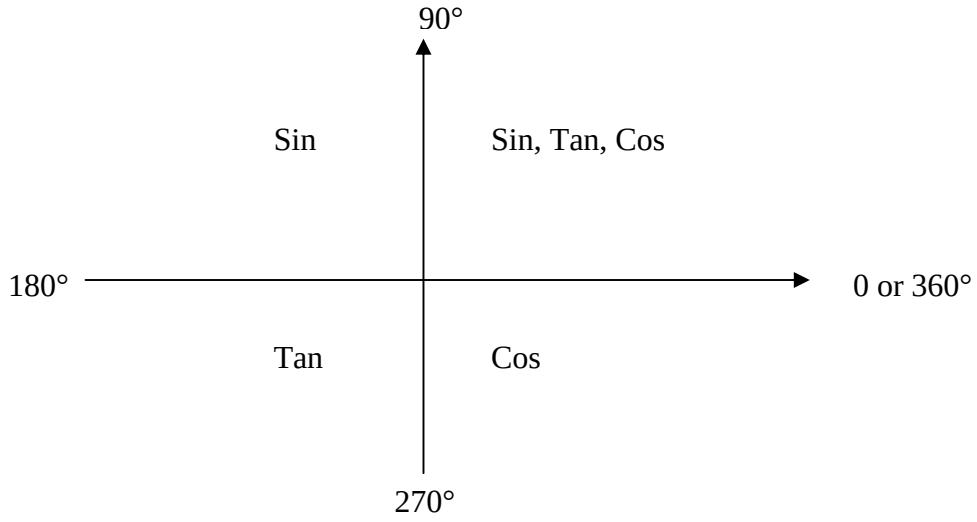
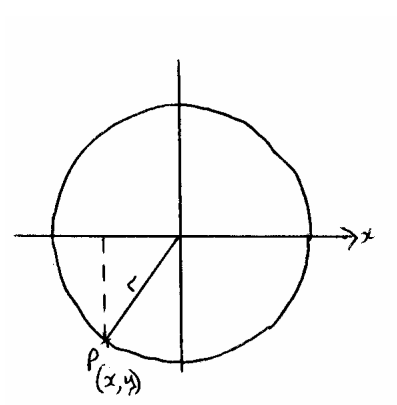
Expressing Angles in Term of Equivalent Acute Trigonometric Ratios

Angle	Positive	Negative
0-90	All	None
90-180	Sin	Cos,Tan
180-270	Tan	Sin,Cos
270-360	Cos	Sin, Tan



Learn the saying "All Sinners Tan Cos they can!!

Why?



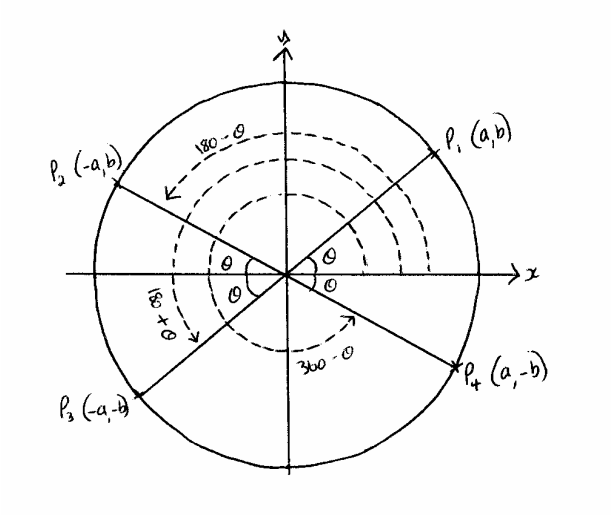
In 3rd Quadrant: –

$$\sin\theta = \frac{y}{r} \qquad = \frac{-ve}{+ve} = -ve$$

$$\cos\theta = \frac{x}{r} \qquad = \frac{-ve}{+ve} = -ve$$

$$\tan\theta = \frac{y}{x} \qquad = \frac{-ve}{-ve} = +ve$$

Similar Angles



for $\sin\theta = \frac{y}{r}$ so: –

$\sin\theta = \frac{b}{r}$ $\qquad\qquad$ $\sin\theta = \sin 180 - \theta$

$\sin(180 - \theta) = \frac{b}{r}$ $\qquad\qquad$ $\sin 180 + \theta = \sin 360 - \theta$

$\sin(180 + \theta) = -\frac{b}{r}$ $\qquad\qquad$ $\sin 180 + \theta = -\sin\theta$

$\sin(360 - \theta) = -\frac{b}{r}$ $\qquad\qquad$ $\sin 360 - \theta = -\sin\theta$ etc

The results for sine, cosine and tangent are:-

Quadrant 2

$\sin(180 - \theta) = \sin\theta$

$\cos(180 - \theta) = -\cos\theta$

$\tan(180 - \theta) = -\tan\theta$

Notice the connection with the quadrants.

It is telling us where the answers will be positive or negative.

Quadrant 3

$\sin(180 + \theta) = -\sin\theta$

$\cos(180 + \theta) = -\cos\theta$

$\tan(180 + \theta) = \tan\theta$

Quadrant 4

$\sin((360 - \theta) = -\sin\theta$

$\cos(360 - \theta) = \cos\theta$

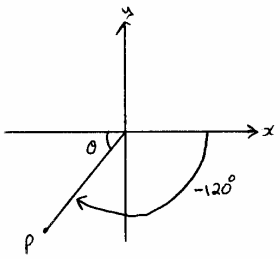
$\tan(360 - \theta) = -\tan\theta$

Example 1. Express in terms of trigonometric ratios of acute angles, the angle sin (-120°).

In the 3rd quadrant sin is negative

$= -\sin\theta$

$= -\sin 60°$



Example 2. Express in terms of trigonometric ratios of acute angles, the angle tan (530°)

In the 2nd quadrant tan is negative

$= -\tan\theta$

$= -\tan 10°$