6.2 Angles in Standard Position in All Quadrants

Wednesday, March 30, 2016 1:27 PM

Pre-Calculus 11
6.2 Angles in Standard Position in All Quadrants
Name______________________ ______________________

2 | 1
3 | 4

The terminal arm of an angle in Quadrant 1 can be successively reflected in both axes to form angles in all 4 quadrants. Each angle is in standard position. The <u>reference angle</u> for all 4 angles is the acute angle that the terminal arm makes with the <u>x-axis</u>.

α (alpha)

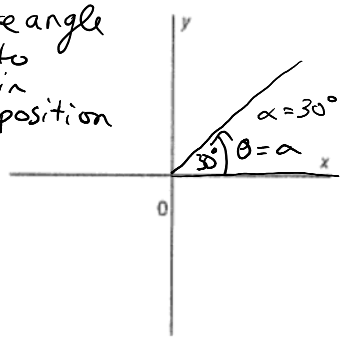
θ

For example, each of the following angles in standard position have the same reference angle of 30°.

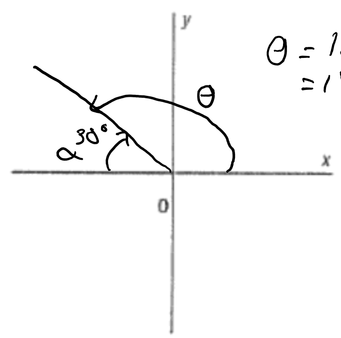
Quadrant I

Reference angle is equal to the angle in standard position

$\theta = \alpha$



Quadrant II

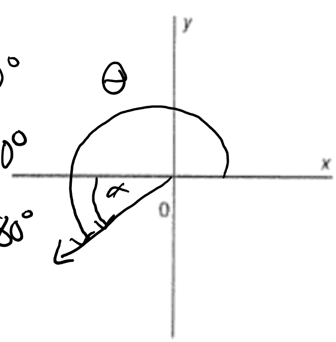


$\theta = 180 - 30$
$= 150°$

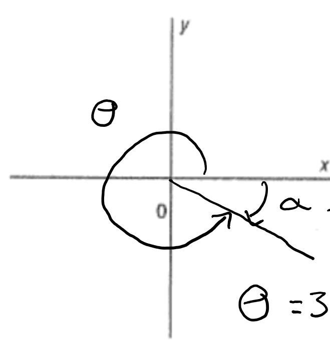
Quadrant III

$\theta = 210°$

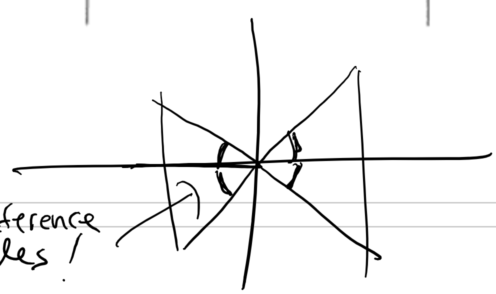
$\alpha = \theta - 180°$
$= 210° - 180°$
$= 30°$



Quadrant IV



$\theta = 360° - 30°$
$= 330°$



all reference angles!

In the previous lesson, the trigonometric ratios of an angle in standard position in Quadrant 1 were related to the coordinates of a point on the terminal arm of the angle. These relationships can be extended to define the primary trigonometric ratios for any angle in standard position.

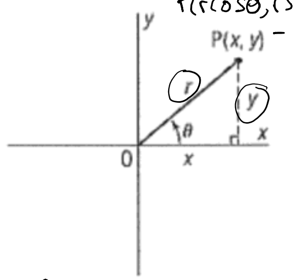
Quadrant 1 **Quadrant 2**

angles!

In the previous lesson, the trigonometric ratios of an angle in standard position in Quadrant 1 were related to the coordinates of a point on the terminal arm of the angle. These relationships can be extended to define the primary trigonometric ratios for any angle in standard position.

Quadrant 1

P(rcosθ, rsinθ)



$r\cos\theta = x$

$\cos\theta = \frac{x}{r}$

$r\sin\theta = y$

$\sin\theta = y/r$

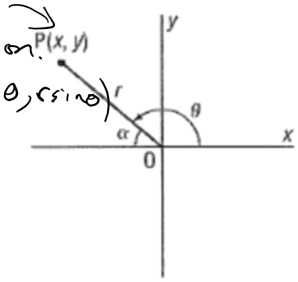
$\tan\theta = y/x$

always for Quadrant I!

Quadrant 2

neg. x direction!

(-rcosθ, rsinθ)



$-r\cos\theta = x$

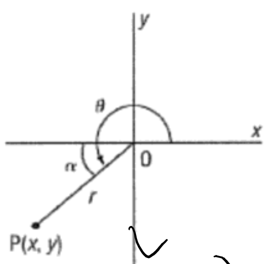
$\cos\theta = -\frac{x}{r}$

$r\sin\theta = y$

$\sin\theta = y/r$

$\tan\theta = -y/x$ (-x direction)

Quadrant 3



P(-rcosθ, -rsinθ)

$-r\cos\theta = x$

$\cos\theta = -x/r$

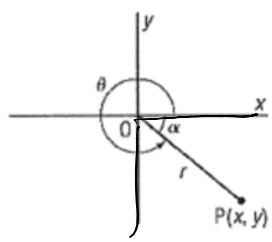
$\tan\theta = -y/-x$

$\tan\theta = y/x$

$-r\sin\theta = y$

$\sin\theta = -y/r$

Quadrant 4



P(rcosθ, -rsinθ)

$\cos\theta = x/r$

$\sin\theta = -y/r$

$\tan\theta = -y/x$

Trigonometric Ratios of Angles in Standard Position

For any angle θ in standard position, where $0° \leq \theta \leq 360°$, with terminal point $P(x, y)$, the primary trigonometric ratios are defined as:

$\cos\theta = \frac{x}{r}$ $\quad \sin\theta = \frac{y}{r}$ $\quad \tan\theta = \frac{y}{x}$

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

Assignment p.448 #3-5

Example 1

The Point B(-2,-4) is on the terminal arm of an angle θ in standard position.

a. Determine the primary trigonometric ratios of θ

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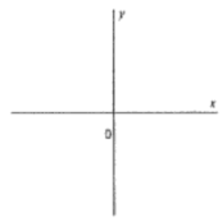
b. Determine the measure of θ to the nearest degree.

The definitions of the trigonometric ratios can be used to determine the _______________ for the primary trigonometric ratios of angles related to the special angles _______________________.

45-45-90 Triangle

30-60-90 Triangle

CAST Rule:



Example 2

a. State the quadrants in which $\cos\theta = \frac{1}{\sqrt{2}}$

b. Determine which values of θ satisfy $\cos\theta = \frac{1}{\sqrt{2}}$ for $0^o \leq \theta \leq 360^o$