Thursday, April 23, 2020

Coterminal Angles

and

Angles measured in Radians

Coterminal Angles: Two or more angles in Standard Position that have the same terminal side.

They start and stop in the same spot, but are a different number of degrees.

Coterminal Angles Demonstration:

http://mr-cox.weebly.com/coterminal-angles.html

Given $\theta = 72^\circ$

The following angles are coterminal with 72°:

Positive Coterminal ∠'s: 432°, 792°, 1152°, 1512°...

72° + 360° ↗

+360° +360° +360° +360°

Negative Coterminal ∠'s: -288°, -648°, -1008°, -1368°...

72° - 360° ↗

- 360° - 360° - 360° - 360°

When measuring in degrees you can find a coterminal angle of any given angle θ by adding or subracting 360° as many times as you want to or need to.

Coterminal Angle: θ ± any multiple of 360°

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Find a positive and a negative coterminal angle for each given angle. $\theta = 940^\circ$

Pos: $940 + 360 = \boxed{1300^\circ}$

or $940 - 360 = \boxed{580^\circ}$

Neg: $940 - 360 = 580^\circ$

$580 - 360 = 220^\circ$

$220 - 360 = \boxed{-140^\circ}$

Find a positive and a negative coterminal angle for each given angle. $\theta = -610^\circ$

Neg: $-610 - 360 = \boxed{-970^\circ}$

or

$-610 + 360 = \boxed{-250^\circ}$

Pos: $-610 + 360 = -250^\circ$

$-250 + 360 = \boxed{110^\circ}$

Sometimes you have to add or subtract 360° more than once. Rather than add or subtract 360° over and over again you can add or subtract multiples of 360° to speed up the process:

Below are two of the more commonly used multiples of 360°:

360° twice:

$2(360) = \boxed{720^\circ}$

360° three times:

$3(360) = \boxed{1080^\circ}$

We usually like angles to be measured somewhere between 0° and 360° so that they are somewhere within one full turn of the initial side in a positive direction.

Use the concept of coterminal angles to find a coterminal angle in degrees such that $0^\circ \le \theta \le 360^\circ$

1. $\theta = 810^\circ$

$810 - 360 = 450^\circ$
$450 - 360 = \boxed{90^\circ}$

OR

use a multiple of 360°

$810 - 720 = 90^\circ$

Use the concept of coterminal angles to find a coterminal angle in degrees such that $0^\circ \le \theta \le 360^\circ$

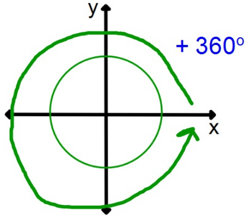
2. $\theta = -1300^\circ$

This angle is so large negative lets start with a multiple of 360° → 1080°

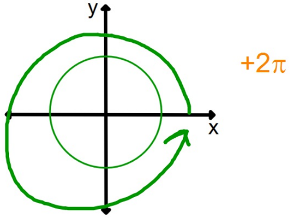
$-1300 + 1080 = -220$
$-220 + 360 = \boxed{140^\circ}$

Units used to measure angles:
- Degrees
- Radians

One full turn around a circle measured in degrees = 360°



One full turn around a circle measured in radians = 2π radians



Therefore, the relationship between degrees and radians is: $\frac{2\pi}{2} = \frac{360^\circ}{2}$

This can be simplified into: $\pi = 180^\circ$

This relationship: $\pi = 180^\circ$

can be written as the following two conversion factors:

$$\frac{\pi}{180^\circ} \quad or \quad \frac{180^\circ}{\pi}$$

Conversion Factors: $\frac{\pi}{180^\circ}$ $\frac{180^\circ}{\pi}$

Convert each angle into degrees. Round to the nearest tenth when needed.

1. $\frac{5\cancel{\pi}}{6} \cdot \frac{180^\circ}{\cancel{\pi}}$

$= \boxed{150^\circ}$

2. $\frac{3\cancel{\pi}}{2} \cdot \frac{180^\circ}{\cancel{\pi}}$

$= \boxed{270^\circ}$

Conversion Factors: $\frac{\pi}{180^\circ}$ $\frac{180^\circ}{\pi}$

Convert each angle into radians. Give answer in terms of π and as a simplified fraction.

1. $\overset{\div 60}{60\cancel{^\circ}} \cdot \frac{\pi}{\underset{\div 60}{\cancel{180}\cancel{^\circ}}}$

$= \boxed{\frac{\pi}{3}}$

2. $\overset{\div 45}{225\cancel{^\circ}} \cdot \frac{\pi}{180\cancel{^\circ}} \div 45$

$= \boxed{\frac{5\pi}{4}}$

You can now do Practice #21