

Lesson 69 Objective: SWBAT solve simple equations using reference angles.

Kickoff: $180^\circ \rightarrow \pi$ $90 \rightarrow \frac{\pi}{2}$

1) Find the supplement and complement angle of $\frac{3\pi}{5}$ if possible.

2) Find the reference angle of:

a) $210^\circ - 180 = 30^\circ$ b) $135^\circ - 90 = 45^\circ$ c) $-225^\circ + 360 = 135^\circ$

① $\text{Supp} \rightarrow \pi - \frac{3\pi}{5} = \frac{2\pi}{5}$ $\text{Comp} \rightarrow \frac{\pi}{2} - \frac{3\pi}{5} = -\frac{\pi}{10}$

Homework

Recall that a **reference angle** is the acute angle formed by the terminal side of the given angle and the x-axis.

- Reference angles may appear in all four quadrants.
- Angles in quadrant I are their own reference angles.

Find the reference angle for each angle below.

a) 300° b) 120° c) 40°

$\text{Ref } 60^\circ$ $\text{Ref } 60^\circ$ $\text{Ref } 40^\circ$

Recall that we can use reference angles to rewrite trigonometric functions as positive acute angles!

reference \neq !

Q: Quadrant
R: Reference Angle
F: Function (sin, cos, tan, csc, sec, cot)
S: Sign

$\frac{S}{T} \frac{A}{C}$

a) $\sin 175^\circ$ b) $\cos 340^\circ$ c) $\tan 210^\circ$

$\frac{II}{180-175=5}$ $\frac{I}{\cos 20}$ $\frac{III}{\tan 30}$

$\frac{S}{+}$

$\boxed{\sin 5^\circ}$

Reference angles can also be useful to solve for missing angles! (Simple Equations)

*inverse trig!

Examples: Find θ to the nearest degree from $0^\circ \leq \theta \leq 360^\circ$

1) $\tan \theta = -0.5095$, in quadrant II.

never use -!

$\tan^{-1}(0.5095)$
 $\text{Ref } \theta = 27^\circ$

2) Solve for all values of θ , $\sin \theta = 0.707$

$\sin^{-1}(0.707)$
 $\text{Ref } \theta = 45^\circ$

$\theta = 45^\circ$
 $\theta = 180 - 45 = 135^\circ$

$\frac{S}{T} \frac{A}{C}$

Examples: Find θ to the nearest degree from $0 \leq \theta \leq 2\pi$

3) $\cos \theta = -0.1293$, in quadrant III.

$\cos^{-1}(0.1293)$
 $\text{Ref } \theta = 83^\circ$

*Quad III add 180!

$\frac{180}{+83} \cdot \frac{III}{180} = \frac{263}{180}$

4) Solve for all values of θ , $\cos \theta = -0.5$

$\cos^{-1}(0.5)$
 $\text{Ref } \theta = 60^\circ$

$\theta = 180 - 60 = 120$
 $\theta = 180 + 60 = 240$

$\frac{S}{T} \frac{A}{C}$

$\theta = \frac{2\pi}{3}$
 $\theta = \frac{4\pi}{3}$