

Trig Basics

$$\sin = \frac{\text{opp.}}{\text{hyp.}}$$

$$\cos = \frac{\text{adj.}}{\text{hyp.}}$$

$$\tan = \frac{\text{opp.}}{\text{adj.}}$$



Basic Angles

θ	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undef.

Tip: $\sin \theta = \frac{\sqrt{0,1,2,3,4}}{2}$

$\cos \theta = \frac{\sqrt{4,3,2,1,0}}{2}$

0, 30, 45, 60, 90
 $0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$

Degrees & Radians

1 revolution = $360^\circ = 2\pi$ ($180^\circ = \pi$)

Deg to rad $\rightarrow \theta \times \frac{2\pi}{360}$

Rad to deg $\rightarrow \theta \times \frac{360}{2\pi}$

Reciprocal Angles

$\operatorname{cosec} \theta = \frac{1}{\sin \theta}$

$\sec \theta = \frac{1}{\cos \theta}$

$\cot \theta = \frac{1}{\tan \theta}$

eg: $\operatorname{cosec} 30 = \frac{1}{\sin 30} = 2$

Finding Reference Angles

→ Easiest way is to check how many revolutions by dividing 360 and then Subtracting.

eg: 900°

$\rightarrow \frac{900}{360} = 2.5$ revolutions

$900 - (2 \times 360) = 180^\circ$

Infinite/General Solutions

→ Trig Functions have infinitely many solutions as $\sin \theta$ and $\cos \theta$ repeat every 360° or 2π . $\tan \theta$ repeats every 180° or π .

→ The number of answers for a trig function depends on the domain. If no domain given then there are infinite solutions.

eg: Find all possible answers for $\cos \theta = 0.5$

$\cos \theta = \text{positive}$ → QI = θ
 QIV = $360 - \theta$

$\theta = \cos^{-1}(0.5)$

$\theta = 60^\circ$

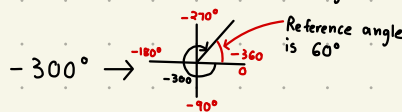
Since no domain given, infinite solutions

Answer 1 $\rightarrow 60 + 360 \cdot n$
 Answer 2 $\rightarrow 300 + 360 \cdot n$
 Where n is a whole number positive or negative

General Form for infinite solutions or $2\pi \cdot n$ for radians.

Negative Angles

→ Negative angles mean going in a clockwise direction instead of Counterclockwise. The reference angles can then be found normally.



eg: Solve $\sin \theta = -\frac{\sqrt{3}}{2}$ for $-2\pi \leq \theta \leq 2\pi$

$-2\pi \leq \theta \leq 2\pi$

$\sin \theta = \text{negative}$ → QIII = $\pi + \theta$
 QIV = $2\pi - \theta$

$\theta = \sin^{-1}\left(\frac{\sqrt{3}}{2}\right) \rightarrow \theta = \frac{\pi}{3}$

QIII answer $\rightarrow \pi + \frac{\pi}{3} = \frac{4\pi}{3}$

QIV answer $\rightarrow 2\pi - \frac{\pi}{3} = \frac{5\pi}{3}$

eg: $\sin(-210)$

Reference Angle $\rightarrow 210 - 180 = 30^\circ$

QII $\rightarrow \sin$ positive so $\sin(-210) = \sin(30) = \frac{1}{2}$

Since domain is from -2π to 2π , we have to add and subtract 2π and check if it's in the domain

$\frac{4}{3}\pi + 2\pi = \frac{10}{3}\pi \geq 2\pi$ ✗

$\frac{4}{3}\pi - 2\pi = -\frac{2}{3}\pi \geq -2\pi$ ✓

$\frac{5\pi}{3} + 2\pi = \frac{11\pi}{3} \geq 2\pi$ ✗

$\frac{5\pi}{3} - 2\pi = -\frac{\pi}{3} \geq -2\pi$ ✓

Answers = $\frac{4\pi}{3}, \frac{5\pi}{3}, -\frac{2\pi}{3}, -\frac{\pi}{3}$