Day 1: Prerequisite Skills

Primary Trigonometry Ratios and CAST Rule: sine, cosine, tan
Angles and Their Location in the xy-plane

- An angle is formed when a ray is rotated about a fixed point called the **vertex**.
- The ray is called the **initial arm** and the beginning of the angle and the **terminal arm** at the end of the angle.
- Angles are often labelled with Greek letters, such as θ, α, β, γ.
- An angle is in **standard position** if the vertex of the angle is at the origin and the initial arm lies along the positive x-axis. The terminal arm can be anywhere on the arc of rotation. See Diagram 1.
- An angle can be positive or negative. A **positive angle** is formed by counter-clockwise rotation of the terminal arm. A **negative angle** is formed by a clockwise rotation of the terminal arm.
- The xy-plane is divided into four quadrants by the x and y axes. The terminal arm can lie anywhere in the xy-plane. See Diagram 2.
- **Co-terminal angles** share the same terminal arm and the same initial arm.
- The **principal angle** is the angle between 0^o and 360^o.
- The **related angle** is the angle formed by the terminal arm of an angle in standard position and the x-axis. The related acute angle is always positive and lies between 0° and 90°.

Diagram 1:

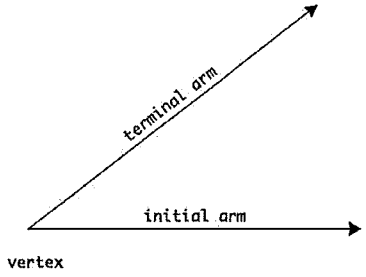
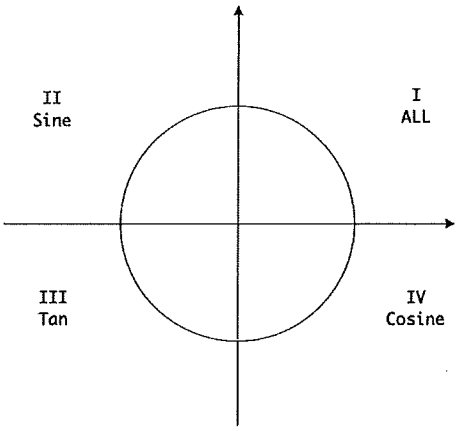


Diagram 2:

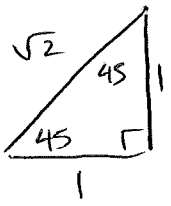


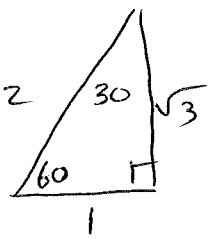
Reciprocal Trigonometry Ratios: csc, sec, cot

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

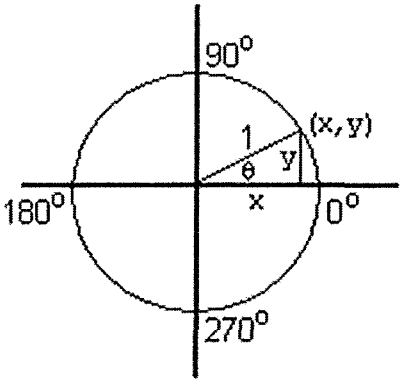
Exact Trigonometry Ratios of special angles 30°, 60°, 90°

θ	sinθ	cosθ	tanθ
30°	1/2	√3/2	1/√3
45°	√2/2	√2/2	1
60°	√3/2	1/2	√3/1
90°	1	0	undefined





The Unit Circle



UNIT CIRCLE :

- Radius = 1 unit
- Centre at origin
- θ in standard position

Distance between 2 points: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Trigonometry Identities

The Pythagorean Identities: $\sin^2\theta + \cos^2\theta = 1$

Quotient Identities $\tan\theta = \frac{\sin\theta}{\cos\theta}$ $\cot\theta = \frac{\cos\theta}{\sin\theta}$

Example 1. Determine the EXACT primary trig ratios for the following angles:

a) 60°

$\sin 60 = \frac{\sqrt{3}}{2}$

$\cos 60 = \frac{1}{2}$

$\tan 60 = \sqrt{3}$

$\csc 60 = 2/\sqrt{3} = \frac{2\sqrt{3}}{3}$

$\sec 60 = 2$

$\cot 60 = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

b) 225° $\alpha = 45°$

$\sin 225° = -\frac{\sqrt{2}}{2}$

$\cos 225° = -\frac{\sqrt{2}}{2}$

$\tan 225° = 1$

$\csc 225 = -\sqrt{2}$

$\sec 225 = -\sqrt{2}$

$\cot 225° = 1$

c) 330° $\alpha = 30°$

$\sin 330° = -\frac{1}{2}$

$\cos 330° = \frac{\sqrt{3}}{2}$

$\tan 330° = \frac{-1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$

$\csc 330° = -2$

$\sec 330° = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

$\cot 330° = -\sqrt{3}$

d) 120° $\alpha = 60$

$\sin 120° = \frac{\sqrt{3}}{2}$

$\cos 120 = -\frac{1}{2}$

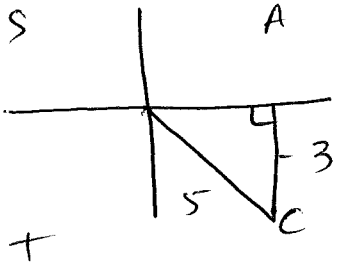
$\tan 120° = -\sqrt{3}$

$\csc 120° = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

$\sec 120 = -2$

$\cot 120° = \frac{\sqrt{3}}{3}$

Example 2. For $\angle\theta$, $\sin\theta = \frac{-3}{5}$ and $\cos\theta = \frac{4}{5}$. Find $\angle\theta$.



$\theta = 360 - \alpha$

$= 360 - 37°$

$= 323°$

$\alpha = \cos^{-1}(4/5)$

$= 37°$