Hwa Chong Institution 华侨中学
Mathematics (SMTP)

Name: _____ ( ) Class: _____ Date: _____

MA304.5.1 – Simple Trigonometric Equations

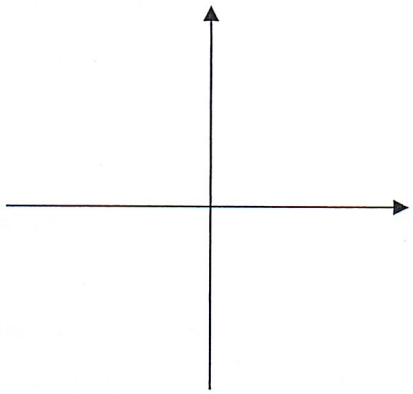
At the end of this unit, you should be able to

- **solve simple trigonometric equations**

E1. Determine which possible quadrants the angles A, B, C, D and E can lie such that

(a) $\sin A = 0.4$

(b) $\tan B = -3.5$



(c) $\cos C = 0.9$

(d) $\cos D, \tan D > 0$

(e) $\sin E < 0, \cos E > 0$

P1. Find the basic angle α for the following equations. You **do not** need the calculator for this.

(a) $\sin A = -0.5$

(b) $\tan A = 1$

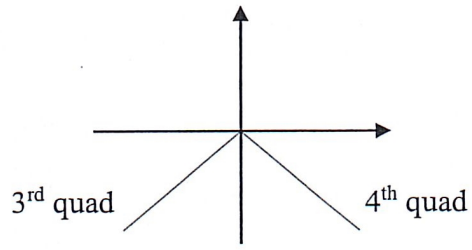
(c) $\cos A = -\frac{\sqrt{3}}{2}$

Basic trigonometric equations are of the following three forms: $\sin\theta = k$, $\cos\theta = k$ and $\tan\theta = k$. As the angle θ could be in any quadrant, depending on the sign of k, we have to rely on the *basic angle* α to help us determine the possible values of θ. We will illustrate this via an example.

E2. Solve for all values of θ such that $\sin\theta = -0.6$ for $0^\circ \le \theta < 360^\circ$

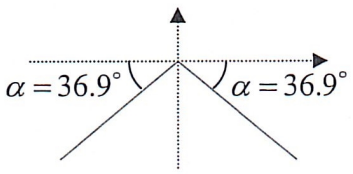
Step 1: Locate the possible quadrants of θ and draw out a diagram.

In this case, since sine is negative, the possible quadrants (based on ASTC) are the 3rd and 4th quadrants.



Step 2: Find the basic angle.

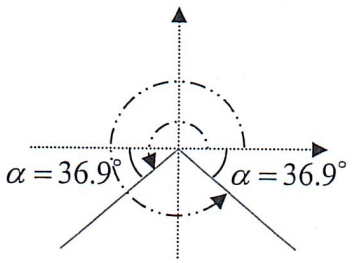
After locating the quadrants which θ can lie, find the basic angle α by solving $\sin\alpha = 0.6$, i.e. $\alpha = \sin^{-1} 0.6 = 36.9^\circ$.



Note that the basic angle is always positive and acute.

Step 3: Determine from the domain all the possible angles with the basic angle α.

The given domain is $0^\circ \le \theta < 360^\circ$, which is one complete round anticlockwise starting from the positive x-axis. Hence there are two such angles for θ:



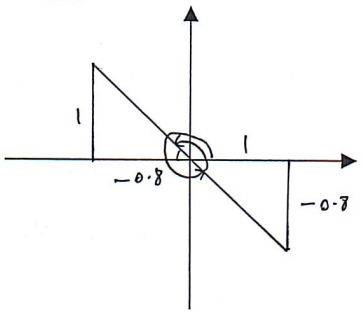
Step 4: Evaluate θ from diagram.

From the diagram, it is clear that θ can either be $180^\circ + \alpha$ or $360^\circ - \alpha$, i.e. 216.9° or 323.1°.

P2. Solve $\tan A = -0.8$ for $0 < A \le 2\pi$.

Step 1: Draw a diagram and locate the possible quadrants (See right diagram)

Step 2: Find the basic angle



Step 3: Determine all possible angles

Step 4: Evaluate all possible angles

P3. Solve $\dfrac{8\cos x + 1}{2 - \cos x} = 3$ for $-180^\circ < x \le 180^\circ$.

P4. Solve the following equations for x.

(a) $\sin^2 x = 0.5,\ 0 < x < \pi$

(b) $\cos^3 x = -\frac{1}{8},\ 180° < x < 360°$

(c) $\sin(-x) = 1,\ 0° < x < 180°$

P5. Factorise $4\sin x\cos x + 10\sin x + 2\cos x + 5$. Solve $4\sin x\cos x + 10\sin x + 2\cos x + 5 = 0$ for $0 < x < 2\pi$.