



3055 BA SANGAM COLLEGE

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Worksheet 10

School: Ba Sangam College

Year / Level: 13

Subject: Mathematics

Name of student: _____

Strand	4 – Trigonometry
Sub strand	4.3 – Trigonometric Equations
Content Learning Outcome	Choose suitable strategies for finding solutions to Trigonometric Equations.

Solving Trigonometric Equations

Ref. Yr 13 Mathematics Textbook Pg 91 – 95

Example 1 Solve $\cos 2x + \cos x = 0$

Answer

Using identity: • $\cos 2A = 2\cos^2 A - 1$

$$\cos 2x + \cos x = 0$$

$$2\cos^2 x - 1 + \cos x = 0$$

$$(2\cos x - 1)(\cos x + 1) = 0$$

Either

$$(2\cos x - 1) = 0$$

$$\cos x = 1/2$$

$$x = \cos^{-1}(1/2) = \frac{\pi}{3}$$

Or

$$(\cos x + 1) = 0$$

$$\cos x = -1$$

$$x = \cos^{-1}(-1) = \pi$$

{ factorise trinomial }

A Short-cut Method

Let k be $\cos x$

$$2k^2 + k - 1$$

↓ factors ↓

$$2k \quad -1$$

$$k \quad 1$$

$$= (2k - 1)(k + 1)$$

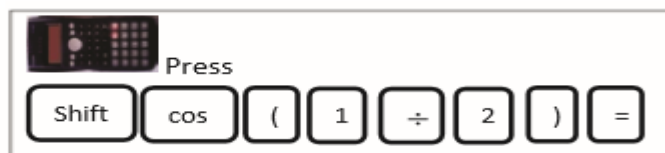
$$= (2\cos x - 1)(\cos x + 1)$$

Cross multiply to give middle term k

From case 1, it can be seen that cosine is positive and hence it lies in the first and the fourth quadrant.

• **Acute angle:**

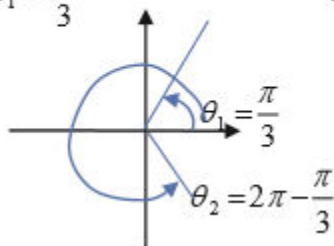
$$\theta = \cos^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{3}$$



• Cos is positive, the angle lies in the 1st and 4th quadrants of the xy -plane.


$$\theta_1 = \frac{\pi}{3}$$

$$\theta_2 = 2\pi - \frac{\pi}{3} = \frac{6\pi - \pi}{3} = \frac{5\pi}{3}$$



$$x = \frac{\pi}{3}, \frac{5\pi}{3} \text{ or } \theta \in \left\{ \frac{\pi}{3}, \frac{5\pi}{3} \right\}$$

Example 2 Solve $\tan^2 \theta = \tan \theta$ for $0^\circ \leq \theta \leq 180^\circ$

 **Answer**

Rearranging and factorizing

$$\tan^2 \theta = \tan \theta$$

$$\tan^2 \theta - \tan \theta = 0$$

$$\tan \theta (\tan \theta - 1) = 0$$

Either

$$\tan \theta = 0$$

$$\theta = \tan^{-1} 0$$

$$\theta = 0$$

Or

$$\tan \theta - 1 = 0$$

$$\tan \theta = 1$$

$$\theta = \tan^{-1}(1) = 45^\circ$$

$$\theta = 0^\circ, 45^\circ \text{ or } \theta \in \{0^\circ, 45^\circ\}$$

ACTIVITY: Solve

(3 marks each)

1.

$$\cos 2\theta + \sin \theta = 0 \text{ for } 0 \leq \theta \leq 2\pi.$$

2.

$$\cos 2\theta + \cos \theta + 1 = 0 \text{ for } 0 \leq \theta \leq 2\pi.$$

3.

$$\cos \theta (2\cos \theta + \sqrt{3}) = 0 \text{ for } 0^\circ \leq \theta \leq 180^\circ.$$

