

Cambridge International AS & A Level

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Mathematics

9709/32

Paper 3 Pure Mathematics 3

May/June 2022

Question No (2)

2 Solve the equation $3 \cos 2\theta = 3 \cos \theta + 2$, for $0^\circ \leq \theta \leq 360^\circ$.

Solution:

$$3 \cos 2\theta = 3 \cos \theta + 2, \quad \text{for } 0^\circ \leq \theta \leq 360^\circ$$

$$3(2 \cos^2 \theta - 1) = 3 \cos \theta + 2 \quad \because \text{Trigonometry identity, } \cos 2\theta = 2 \cos^2 \theta - 1$$

$$6 \cos^2 \theta - 3 = 3 \cos \theta + 2$$

$$6 \cos^2 \theta - 3 \cos \theta - 5 = 0$$

using the quadratic formula

$$\cos \theta = \frac{-(-3) \pm \sqrt{(3)^2 - 4(6)(-5)}}{2 \times 6}$$

$$\cos \theta = \frac{3 \pm \sqrt{9 + 120}}{12} = \frac{3 \pm \sqrt{129}}{12}$$

$$= \frac{3 \pm 11.35}{12} = \left(\frac{3 + 11.35}{12}, \frac{3 - 11.35}{12} \right)$$

$$\cos \theta = (1.195, -0.6958)$$

$$\cos \theta = 1.195 \quad \cos \theta = -0.6958$$

When

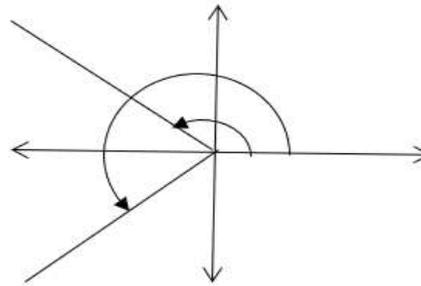
$$\cos \theta = 1.195$$

ignore

$$\because -1 \leq \cos \theta \leq 1)$$

When

$$\cos \theta = -0.6958$$



Basic angle

$$\alpha = \cos^{-1}(0.6958)$$

$$\alpha = 45.9^\circ = 46$$

Required angles

$$\theta = 180 - 45.9, 180 + 45.9$$

$$\theta = 134.1^\circ, 225.9^\circ$$

