

LC 2016 (SET A): PAPER 2

QUESTION 3 (25 MARKS)

Question 3 (a)

$$\begin{aligned}
 & \text{LHS} \\
 & \frac{\cos 7A + \cos A}{\sin 7A - \sin A} \\
 & = \frac{2 \cos \left(\frac{7A+A}{2} \right) \cos \left(\frac{7A-A}{2} \right)}{2 \cos \left(\frac{7A+A}{2} \right) \sin \left(\frac{7A-A}{2} \right)} \\
 & = \frac{2 \cos 4A \cos 3A}{2 \cos 4A \sin 3A} = \frac{\cos 3A}{\sin 3A} \\
 & = \frac{1}{\tan 3A}
 \end{aligned}$$

$$\begin{aligned}
 & \text{RHS} \\
 & \cot 3A = \frac{1}{\tan 3A}
 \end{aligned}$$

FORMULAE AND TABLES BOOK

Trigonometry (page 13/15)

$$\tan A = \frac{\sin A}{\cos A}, \cot A = \frac{\cos A}{\sin A}$$

$$\cos A + \cos B = 2 \cos \left(\frac{A+B}{2} \right) \cos \left(\frac{A-B}{2} \right)$$

$$\sin A - \sin B = 2 \cos \left(\frac{A+B}{2} \right) \sin \left(\frac{A-B}{2} \right)$$

MARKING SCHEME NOTES

Question 3 (a) [Scale 15C (0, 5, 10, 15)]

- 5: • sum to product formula with some substitution
 10: • sum to product formula fully substituted

Question 3 (b)

METHOD 1

$$\begin{aligned}
 \cos 2\theta &= \frac{1}{9} \\
 \cos 2\theta &= \cos^2 \theta - \sin^2 \theta \\
 &= \cos^2 \theta - (1 - \cos^2 \theta) \\
 &= \cos^2 \theta - 1 + \cos^2 \theta \\
 &= 2 \cos^2 \theta - 1
 \end{aligned}$$

$$\begin{aligned}
 2 \cos^2 \theta - 1 &= \frac{1}{9} \\
 2 \cos^2 \theta &= \frac{10}{9} \\
 \cos^2 \theta &= \frac{5}{9} \\
 \therefore \cos \theta &= \pm \frac{\sqrt{5}}{3}
 \end{aligned}$$

FORMULAE AND TABLES BOOK

Trigonometry (page 13/14)

$$\cos^2 A + \sin^2 A = 1$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$\cos^2 \theta = \frac{1}{2}(1 + \cos 2\theta)$$

METHOD 2

$$\begin{aligned}
 \cos^2 \theta &= \frac{1}{2}(1 + \cos 2\theta) \\
 &= \frac{1}{2}\left(1 + \frac{1}{9}\right) \\
 &= \frac{1}{2}\left(\frac{10}{9}\right) = \frac{5}{9} \\
 \therefore \cos \theta &= \pm \frac{\sqrt{5}}{3}
 \end{aligned}$$

MARKING SCHEME NOTES

Question 3 (b) [Scale 10D (0, 3, 5, 8, 10)]

3: • Use of a relevant formula in $\cos 2\theta$

- $\cos^{-1}\left(\frac{1}{9}\right) = 83.62^\circ$
- $\theta = 41.8^\circ$

5: • correct substitution

- $\theta = 41.8^\circ$ and $\theta = 132.2^\circ$ or $\theta = 221.8^\circ$

8: • one value only (e.g. $+\frac{\sqrt{5}}{3}$)

- values found for $\cos 41.8^\circ$ and $\cos 138.2^\circ$ or $\cos 221.8^\circ$