The Addition Formulae

Specification: AQA 7357: E6, E8 · Edexcel 9MA0: 5.6, 5.8

INDEPENDENT

You do

A · Expanding No calculator. Give exact values.

1 Expand and simplify:
(a) $\sin(x + 30°)$
(b) $\cos(x + 30°)$
(c) $\sin(x - 45°)$
(d) $\cos(x - 60°)$

2 Expand and simplify (angles in radians):
(a) $\sin(\theta + \frac{\pi}{3})$
(b) $\cos(\theta - \frac{\pi}{6})$
(c) $\sin(\theta + \frac{\pi}{2})$
(d) $\cos(\theta + \pi)$

3 Write in terms of $\tan x$:
(a) $\tan(x + 45°)$
(b) $\tan(x - 60°)$

B · Backwards Write as a single trig ratio. Then find the exact value. No calculator.

4 (a) $\sin 40° \cos 20° + \cos 40° \sin 20°$
(b) $\cos 75° \cos 15° - \sin 75° \sin 15°$
(c) $\sin 100° \cos 55° - \cos 100° \sin 55°$
(d) $\cos 80° \cos 20° + \sin 80° \sin 20°$

5 (a) $\dfrac{\tan 25° + \tan 20°}{1 - \tan 25° \tan 20°}$
(b) $\dfrac{\tan 100° - \tan 40°}{1 + \tan 100° \tan 40°}$

6 Write as a single trig ratio:
(a) $\sin 3\theta \cos \theta + \cos 3\theta \sin \theta$
(b) $\cos 5x \cos 2x + \sin 5x \sin 2x$
(c) $\sin(A + B) \cos B - \cos(A + B) \sin B$

C · Reasoning No calculator.

7 Use $A = 60°$ and $B = 30°$ to show that $\cos(A - B)$ is not equal to $\cos A - \cos B$.

8 Use the addition formulae to show that:
(a) $\sin(90° - \theta) \equiv \cos \theta$
(b) $\cos(180° + \theta) \equiv -\cos \theta$
(c) $\tan(\theta + 180°) \equiv \tan \theta$

9 Put $A = B$ in the formula for $\cos(A - B)$. What identity do you get?

D · Show that

10 Show that $\sin(x + 60°) + \sin(x - 60°) \equiv \sin x$.

11 Show that $\cos(x + 30°) - \cos(x - 30°) \equiv -\sin x$.

12 Show that $\dfrac{\sin(A + B)}{\cos A \cos B} \equiv \tan A + \tan B$.

13 Show that $\cos(x + \frac{\pi}{4}) + \sin(x + \frac{\pi}{4}) \equiv \sqrt{2} \cos x$.

E · Exam-style question AQA-style. Use the mark scheme to self-assess.

14 (a) Show that $\sin(\theta + 30°) + \cos(\theta + 60°) \equiv \cos \theta$. [3 marks]
(b) Hence solve $\sin(\theta + 30°) + \cos(\theta + 60°) = 0.4$ for $0° \le \theta < 360°$. Give your answers to 1 decimal place. [3 marks]