

MEMO 2025-12 EJ-00003(1) Trigonometry – Compound angles

- (1) Write the following in expanded form and simplify where possible:

[Without using a calculator.]

(a) $\sin(\theta + 45^\circ)$

$$= \sin \theta \cdot \cos 45^\circ + \cos \theta \cdot \sin 45^\circ$$

$$= \sin \theta \cdot \frac{\sqrt{2}}{2} + \cos \theta \cdot \frac{\sqrt{2}}{2}$$

$$= \frac{\sqrt{2}}{2} (\sin \theta + \cos \theta)$$

(b) $\cos(P + 30^\circ)$

$$= \cos P \cdot \cos 30^\circ - \sin P \cdot \sin 30^\circ$$

$$= \cos P \cdot \frac{\sqrt{3}}{2} - \sin P \cdot \frac{1}{2}$$

$$= \frac{\sqrt{3} \cos P - \sin P}{2}$$

(c) $\sin(60^\circ - y)$

$$= \sin 60^\circ \cdot \cos y - \cos 60^\circ \cdot \sin y$$

$$= \frac{\sqrt{3}}{2} \cdot \cos y - \frac{1}{2} \cdot \sin y$$

$$= \frac{\sqrt{3} \cos y - \sin y}{2}$$

- (2) Express the following as a single trigonometrical function and simplify:

(a) $\cos \alpha \cdot \cos 3\alpha - \sin \alpha \cdot \sin 3\alpha$

$$= \cos(\alpha + 3\alpha)$$

$$= \cos 4\alpha$$

(b) $\sin 20^\circ \cdot \cos 30^\circ + \cos 20^\circ \cdot \sin 30^\circ$

$$= \sin(20^\circ + 30^\circ)$$

$$= \sin 50^\circ$$

(c) $\cos 3A \cdot \sin 2A - \sin 3A \cdot \cos 2A$

$$= \sin 2A \cdot \cos 3A - \cos 2A \cdot \sin 3A$$

$$= \sin(2A - 3A)$$

$$= \sin(-A)$$

$$= -\sin A$$

(3) Calculate the value of the following without using a calculator:

$$\begin{aligned} \text{(a)} \quad & \cos 95^\circ \cdot \sin 5^\circ - \sin 95^\circ \cdot \cos 5^\circ \\ &= \sin 5^\circ \cdot \cos 95^\circ - \cos 5^\circ \cdot \sin 95^\circ \\ &= \sin(5^\circ - 95^\circ) \\ &= \sin(-90^\circ) \\ &= -\sin 90^\circ \\ &= -1 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & \sin 33^\circ \cdot \cos 12^\circ + \cos 33^\circ \cdot \sin 12^\circ \\ &= \sin(33^\circ + 12^\circ) \\ &= \sin 45^\circ \\ &= \frac{\sqrt{2}}{2} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad & \cos 155^\circ \cdot \cos 35^\circ + \sin 155^\circ \cdot \sin 35^\circ \\ &= \cos(155^\circ - 35^\circ) \\ &= \cos 120^\circ \\ &= \cos(180^\circ - 60^\circ) \\ &= -\cos 60^\circ \\ &= -\frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad & \sin 40^\circ \cdot \cos 10^\circ - \cos 40^\circ \cdot \cos 80^\circ \\ &= \sin(40^\circ - 10^\circ) \\ &= \sin 30^\circ \\ &= \frac{1}{2} \end{aligned}$$