



Transformation Formulae Ex 8.2 Q3(i)

$$\cos 55^\circ + \cos 65^\circ + \cos 175^\circ = 0$$

$$\cos 175^\circ = -\cos 5^\circ$$

substitute above value in the equation we get

$$\cos 55^\circ + \cos 65^\circ = \cos 5^\circ$$

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

$$\cos 55^\circ + \cos 65^\circ = 2 \cos \left( \frac{65+55}{2} \right) \cos \left( \frac{65-55}{2} \right) = 2 \cos 60^\circ \cos 5^\circ = 2 \times \frac{1}{2} \times \cos 5^\circ = \cos 5^\circ$$

Hence Proved

Transformation Formulae Ex 8.2 Q3(ii)

$$\sin 50^\circ - \sin 70^\circ + \sin 10^\circ = 0$$

$$(\sin 50^\circ - \sin 70^\circ) + \sin 10^\circ$$

$$\Rightarrow \left( 2 \sin \left( \frac{50^\circ - 70^\circ}{2} \right) \cos \left( \frac{50^\circ + 70^\circ}{2} \right) \right) + \sin 10^\circ \quad \left[ \because \sin C - \sin D = 2 \sin \left( \frac{C-D}{2} \right) \cos \left( \frac{C+D}{2} \right) \right]$$

$$= 2 \sin(-10^\circ) \cos 60^\circ + \sin 10^\circ$$

$$= -2 \sin 10^\circ \times \frac{1}{2} + \sin 10^\circ \quad \left[ \because \cos 60^\circ = \frac{1}{2} \right]$$

$$= 0$$

$$= \text{RHS}$$

Transformation Formulae Ex 8.2 Q3(iii)

$$\cos 80^\circ + \cos 40^\circ - \cos 20^\circ = 0$$

$$(\cos 80^\circ + \cos 40^\circ) - \cos 20^\circ$$

$$= 2 \cos \left( \frac{80^\circ + 40^\circ}{2} \right) \cos \left( \frac{80^\circ - 40^\circ}{2} \right) - \cos 20^\circ \quad \left[ \because \cos C + \cos D = 2 \cos \left( \frac{C+D}{2} \right) \cos \left( \frac{C-D}{2} \right) \right]$$

$$= 2 \cos 60^\circ \cos 20^\circ - \cos 20^\circ$$

$$= 2 \times \frac{1}{2} \cos 20^\circ - \cos 20^\circ$$

$$= \cos 20^\circ - \cos 20^\circ$$

$$= 0$$

$$= \text{RHS}$$

Transformation Formulae Ex 8.2 Q3(iv)

$$\cos 20^\circ + \cos 100^\circ + \cos 140^\circ = 0$$

$$\Rightarrow (\cos 20^\circ + \cos 100^\circ) + \cos 140^\circ$$

$$= 2 \cos \left( \frac{20^\circ + 100^\circ}{2} \right) \cos \left( \frac{20^\circ - 100^\circ}{2} \right) + \cos 140^\circ \quad \left[ \because \cos C + \cos D = 2 \cos \left( \frac{C+D}{2} \right) \cos \left( \frac{C-D}{2} \right) \right]$$

$$= 2 \cos 60^\circ \cos(-40^\circ) + \cos 140^\circ$$

$$= 2 \times \frac{1}{2} \cos 40^\circ + \cos 140^\circ \quad \left[ \because \cos 60^\circ = \frac{1}{2} \right]$$

$$= \cos 40^\circ + \cos(180^\circ - 40^\circ)$$

$$= \cos 40^\circ - \cos 40^\circ$$

$$= 0$$

$$= \text{RHS}$$

Transformation Formulae Ex 8.2 Q3(v)

$$\begin{aligned}
 \sin \frac{5\pi}{18} - \cos \frac{4\pi}{9} &= \sqrt{3} \sin \frac{\pi}{9} \\
 \text{LHS} &= \sin \frac{5\pi}{18} - \cos \frac{4\pi}{9} \\
 &= \sin 50^\circ - \cos 80^\circ \\
 &= \sin 50^\circ - \sin 10^\circ \\
 &= 2 \sin \left( \frac{50^\circ - 10^\circ}{2} \right) \cos \left( \frac{50^\circ + 10^\circ}{2} \right) \\
 &= 2 \sin 20^\circ \cos 30^\circ \\
 &= 2 \sin 20^\circ \times \frac{\sqrt{3}}{2} \\
 &= \sqrt{3} \sin \frac{\pi}{9}
 \end{aligned}$$

Transformation Formulae Ex 8.2 Q3(vi)

$$\cos \frac{\pi}{12} - \sin \frac{\pi}{12} = \frac{1}{\sqrt{2}}$$

Multiplying and dividing by  $\sqrt{2}$  on LHS

$$\begin{aligned}
 &= \sqrt{2} \left( \frac{1}{\sqrt{2}} \cos \frac{\pi}{12} - \frac{1}{\sqrt{2}} \sin \frac{\pi}{12} \right) \\
 &= \sqrt{2} \left( \sin \frac{\pi}{4} \cos \frac{\pi}{12} - \cos \frac{\pi}{4} \sin \frac{\pi}{12} \right) & \left[ \because \frac{1}{\sqrt{2}} = \cos \frac{\pi}{4} = \sin \frac{\pi}{4} \right] \\
 &= \sqrt{2} \left( \sin \left( \frac{\pi}{4} - \frac{\pi}{12} \right) \right) & [\because \sin(A - B) = \sin A \cos B - \cos A \sin B] \\
 &= \sqrt{2} \left( \sin \frac{\pi}{6} \right) \\
 &= \sqrt{2} \times \frac{1}{2} \\
 &= \frac{1}{\sqrt{2}} \\
 &= \text{RHS}
 \end{aligned}$$

Transformation Formulae Ex 8.2 Q3(vii)

$$\sin 80^\circ - \cos 70^\circ = \cos 50^\circ$$

$$\text{LHS} = \sin 80^\circ = \cos 50^\circ + \cos 70^\circ$$

Now,

$$\begin{aligned}
 \cos C + \cos D &= 2 \cos \frac{C+D}{2} \cos \frac{C-D}{2} \\
 \text{RHS} &= \cos 50^\circ + \cos 70^\circ \\
 &= 2 \cos \left( \frac{50^\circ + 70^\circ}{2} \right) \cos \left( \frac{50^\circ - 70^\circ}{2} \right) \\
 &= 2 \cos 60^\circ \cos (-10^\circ) \\
 &= 2 \times \frac{1}{2} \cos 10^\circ & [\cos(-\theta) = \cos \theta] \\
 &= \cos 10^\circ \\
 &= \sin 80^\circ \\
 &= \text{LHS} & [\because \cos \theta = \sin(90^\circ - \theta)]
 \end{aligned}$$

Transformation Formulae Ex 8.2 Q3(viii)

$$\sin 51^\circ + \cos 81^\circ = \cos 21^\circ$$

$$\sin 51^\circ = \cos 21^\circ - \cos 81^\circ$$

$$\text{RHS} = \cos 21^\circ - \cos 81^\circ$$

$$\begin{aligned}
 &= -2 \sin(51^\circ) \sin(-30^\circ) & \left[ \because \cos C - \cos D = -2 \sin \frac{C+D}{2} \sin \frac{C-D}{2} \right] \\
 &= +2 \sin 51^\circ \sin 30^\circ \\
 &= 2 \sin 51^\circ \times \frac{1}{2} \\
 &= \sin 51^\circ \\
 &= \text{LHS}
 \end{aligned}$$

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