

Definition: The average value of a periodic function which has a range from 0 to 2π is defined as

$$\langle f \rangle = \frac{1}{2\pi} \int_0^{2\pi} f(\theta) d\theta.$$

Determine $\langle \cos^2 \theta \rangle$

- A) $\langle \cos^2 \theta \rangle = 0$
 - B) $\langle \cos^2 \theta \rangle = \frac{1}{2}$
 - C) $\langle \cos^2 \theta \rangle = 1$
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$$\cos^2 \theta = \frac{1 + \cos 2\theta}{2},$$

$$\langle 1 \rangle = 1,$$

$$\langle \cos \theta \rangle = 0,$$

$$\langle \cos 2\theta \rangle = 0.$$

$$\text{Therefore, } \langle \cos^2 \theta \rangle = \left\langle \frac{1}{2} \right\rangle + \left\langle \frac{\cos 2\theta}{2} \right\rangle = \frac{1}{2} + 0 = \frac{1}{2}.$$

Answer **B**.