

Mathematics

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(Chapter 2)(Inverse Trigonometric Functions)

(Class XII)

(Exemplar Problems)

Objective Type Questions

Choose the correct answers from the given four options in the following (MCQ):

Question 35:

If $\cos^{-1}\alpha + \cos^{-1}\beta + \cos^{-1}\gamma = 3\pi$, then $\alpha(\beta + \gamma) + \beta(\gamma + \alpha) + \gamma(\alpha + \beta)$ equals

- (A) 0 (B) 1 (C) 6 (D) 12

Answer 35:

- (C) 6

Solution:

Given that: $\cos^{-1}\alpha + \cos^{-1}\beta + \cos^{-1}\gamma = 3\pi$

Now, we know that the principle value of $\cos^{-1}x$ is $[0, \pi]$.

$$\Rightarrow 0 \leq \cos^{-1}x \leq \pi$$

$$\Rightarrow \cos^{-1}\alpha + \cos^{-1}\beta + \cos^{-1}\gamma = 3\pi$$

\Rightarrow This is possible only if $\cos^{-1}\alpha = \cos^{-1}\beta = \cos^{-1}\gamma = \pi$

$$\Rightarrow \alpha = \beta = \gamma = \cos \pi$$

$$\Rightarrow \alpha = \beta = \gamma = -1$$

Now, we have

$$\alpha(\beta + \gamma) + \beta(\gamma + \alpha) + \gamma(\alpha + \beta)$$

$$= -1(-1 - 1) - 1(-1 - 1) - 1(-1 - 1)$$

$$\Rightarrow 2 + 2 + 2 = 6$$

Hence, the option (C) is correct.

