

## Trigonometry Functions - Class XI

### Past Year JEE Questions

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#### Questions

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##### Question: 01

The value of  $\cos \frac{\pi}{2^2} \cdot \cos \frac{\pi}{2^3} \dots \cos \frac{\pi}{2^{10}} \sin \frac{\pi}{2^{10}}$  is -

- A.  $\frac{1}{2^{10}}$
- B.  $\frac{1}{2}$
- C.  $\frac{1}{1024}$
- D.  $\frac{1}{512}$

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#### Solutions

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##### Solution: 01

##### Explanation

Given  $\cos \frac{\pi}{2^2} \cdot \cos \frac{\pi}{2^3} \dots \cos \frac{\pi}{2^{10}} \sin \frac{\pi}{2^{10}}$

Let  $\frac{\pi}{2^{10}} = \theta$

$$\therefore \frac{\pi}{2^9} = 2\theta$$

$$\frac{\pi}{2^8} = 2^2\theta$$

$$\frac{\pi}{2^7} = 2^3\theta$$

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$$\frac{\pi}{2^2} = 2^8\theta$$

So given term becomes,

$$\cos 2^8\theta \cdot \cos 2^7\theta \dots \cos \theta \cdot \sin \frac{\pi}{2^{10}}$$

$$= (\cos \theta \cdot \cos 2\theta \dots \cos 2^8\theta) \sin \frac{\pi}{2^{10}}$$

$$= \frac{\sin 2^8\theta}{2^8 \sin \theta} \sin \frac{\pi}{2^{10}}$$

$$= \frac{\sin 2^8 \left( \frac{\pi}{2^{10}} \right)}{2^8 \sin \frac{\pi}{2^{10}}} \sin \frac{\pi}{2^{10}}$$

$$= \frac{\sin \left( \frac{\pi}{2} \right)}{2^8}$$

$$= \frac{1}{2^8} = \frac{1}{512}$$

**Note :**

$$(\cos \theta \cdot \cos 2\theta \cdot \dots \cdot \cos 2^{n-1}\theta) = \frac{\sin 2^n \theta}{2^n \sin \theta}$$