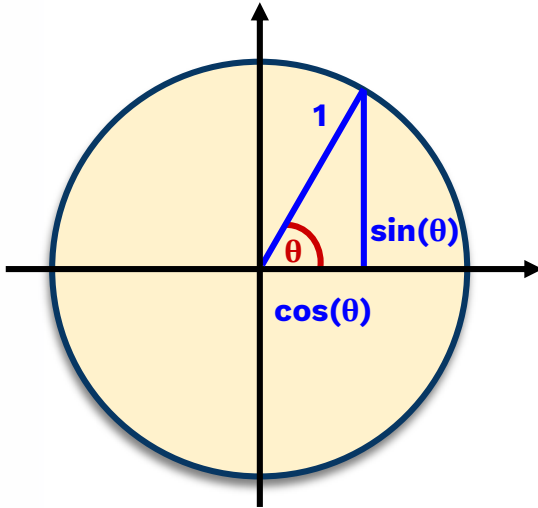


# Conditional Identities

## Trigonometry

12



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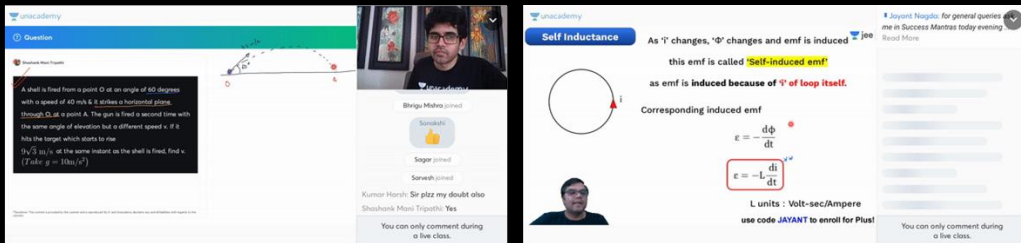
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Questions

A shell is fired from a point O at an angle of 60 degrees with a speed of 40 m/s & it strikes a horizontal plane through O at a point A. The gun is fired a second time with the same angle of elevation but a different speed  $v$ . If it hits the target which starts to rise  $(\sqrt{3}/2) \text{ m/s}^2$  at the same instant as the shell is fired, find  $v$ . (Take  $g = 10 \text{ m/s}^2$ )

Shruti Mishra joined

Sagar joined

Saravali joined

Kumar Harsh: Sir plz my doubt also

Shashank Masi Tripathi: Yes

You can only comment during a live class.

**Self Inductance**

As  $\vec{I}$  changes,  $\vec{\Phi}$  changes and emf is induced

this emf is called **Self-induced emf**

as emf is induced because of  $\vec{I}$  of loop itself.

Corresponding induced emf

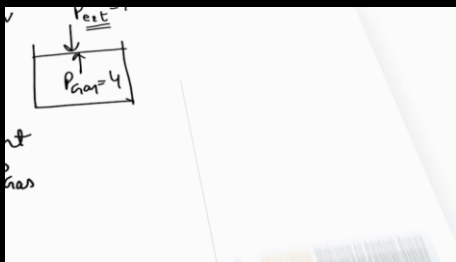
$$\mathcal{E} = -\frac{d\Phi}{dt}$$

$$\mathcal{E} = -L \frac{dI}{dt}$$

Units: Volt-sec/Ampere

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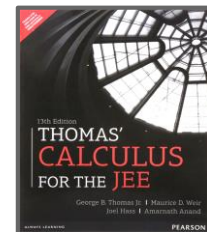
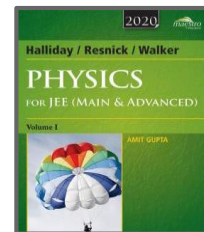
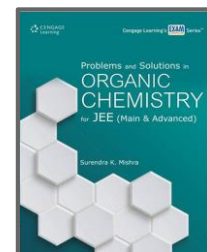
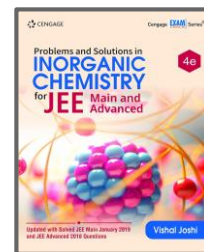
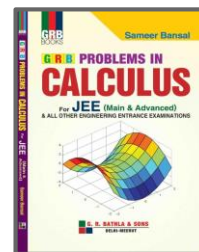
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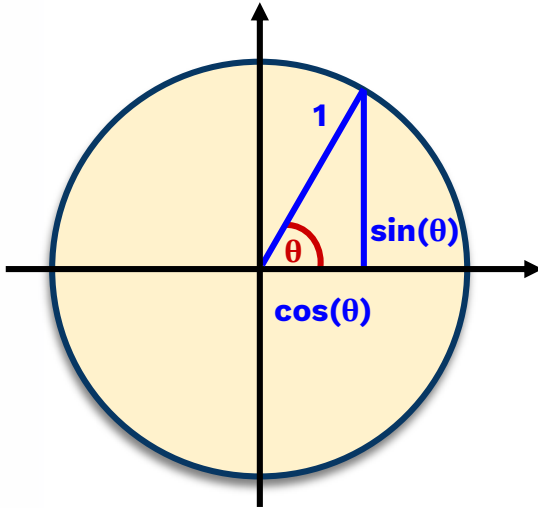


# LET'S BEGIN!!

# Conditional Identities

## Trigonometry

12



Practical Example

Cost: Rs. 2500  
Profit: Rs. 250  
All Tables

Budget Constraint: Rs. 50,000  
Space Constraint: 60 Pieces

Cost: Rs. 500  
Profit: Rs. 75  
All Chairs

Handwritten calculations on the screen:

$$\frac{50,000}{2500} = 20$$
$$\frac{50,000}{2500} = 20$$
$$\text{Prof} = 20 \times 250 = 5000$$

CONDITIONAL  
IDENTITIES



In  $\Delta ABC$  find the value of  $\left( \frac{\sin 2A + \sin 2B + \sin 2C}{\sin A \sin B \sin C} \right)$

A. 1

B. 2

C. 3

✓ D. 4

$$A + B + C = \pi \Rightarrow (A + B) = (\pi - C)$$

$$\sin 2A + \sin 2B + \sin 2C = \lambda \sin A \sin B \sin C$$

$$C = \pi - (A + B)$$

Shortcuts.

$$A = B = C = 60^\circ$$

~~$$3 \cdot \left( \frac{\sqrt{3}}{2} \right)$$~~

~~$$\left( \frac{\sqrt{3}}{2} \right) \left( \frac{\sqrt{3}}{2} \right) \left( \frac{\sqrt{3}}{2} \right)$$~~  
$$= 4$$

$$\sin 2A + \sin 2B + \sin 2C$$

$$2 \sin(\underline{A+B}) \cos(A-B) + \sin 2C$$

$\downarrow$   
 $(\pi - C)$

$$\underline{2 \sin C} \cos(A-B) + \underline{2 \sin C} \cos C$$

$$(2 \sin C)(\cos(A-B) + \cos C)$$

$$(2 \sin C) (\cos(A-B) + \cos(\pi - (A+B)))$$

$$(2 \sin C) (\cos(A-B) - \cos(A+B))$$

$$(2 \sin C) ((\cancel{\cos A \cos B} + \sin A \sin B) - (\cancel{\cos A \cos B} - \sin A \sin B))$$

$$= (2 \sin C) (2 \sin A \sin B)$$

$$= 4 \sin A \sin B \sin C$$





In a triangle ABC, value of

$$\frac{\sin A + \sin B + \sin C}{6 \cos \frac{A}{2} \cos \frac{B}{2} \cos \frac{C}{2}}$$

is equal to:

A.  $1/4$

B.  $2$

C.  $3$

✓ D.  $2/3$

$$\boxed{A + B + C = \pi} \Rightarrow (A + B) = (\pi - C)$$

$$\sin A + \sin B + \sin C$$

$$2 \sin\left(\frac{A+B}{2}\right) \cos\left(\frac{A-B}{2}\right) + \sin C$$

$$2 \sin\left(\frac{\pi - C}{2}\right) \cos\left(\frac{A-B}{2}\right) + \sin C$$

Shortcut :

$$A = B = C = 60^\circ$$

$$\cancel{3 \left( \frac{\sqrt{3}}{2} \right)}$$

$$\cancel{6 \left( \frac{\sqrt{3}}{2} \right) \left( \frac{\sqrt{3}}{2} \right) \left( \frac{\sqrt{3}}{2} \right)}$$

$$= \frac{2}{3}$$

$$\begin{aligned} & \underline{\underline{2 \cos \frac{C}{2} \cos \left( \frac{A-B}{2} \right) + 2 \sin \frac{C}{2} \cos \frac{C}{2}}} \\ &= 2 \cos \frac{C}{2} \left[ \cos \left( \frac{A-B}{2} \right) + \sin \frac{C}{2} \right] \\ &= \left( 2 \cos \frac{C}{2} \right) \left[ \cos \left( \frac{A-B}{2} \right) + \sin \left( \frac{\pi}{2} - \frac{A+B}{2} \right) \right] \\ &= \left( 2 \cos \frac{C}{2} \right) \left[ \cos \left( \frac{A-B}{2} \right) + \cos \left( \frac{A+B}{2} \right) \right] \end{aligned}$$

$$= \left( 2 \cos \frac{C}{2} \right) \left[ \left( \cos \frac{A}{2} \cos \frac{B}{2} + \cancel{\sin \frac{A}{2}} \cancel{\sin \frac{B}{2}} \right) + \left( \cos \frac{A}{2} \cos \frac{B}{2} - \cancel{\sin \frac{A}{2}} \cdot \sin \frac{B}{2} \right) \right]$$

$$= \left( 4 \cos \frac{A}{2} \cos \frac{B}{2} \cos \frac{C}{2} \right)$$



If  $x + y + z = \frac{\pi}{2}$ , then value of  $\left( \frac{\cos 2x + \cos 2y + \cos 2z - 1}{\sin x \cdot \sin y \cdot \sin z} \right)$  is equal to:

**A.** 4

**B.** 2

**C.** 1

**D.** None

$$\cos 2x + \cos 2y + \cos 2z - 1$$

$$2 \cos(x+y) \cos(x-y) + \cos 2z - 1$$
$$= 2 \cos\left(\frac{\pi}{2} - z\right) \cos\left(\frac{\pi}{2} - z\right) + \cos 2z - 1$$
$$= 2 \sin^2 z + \cos 2z - 1$$
$$= 2 \sin^2 z + 1 - 2 \sin^2 z = 0$$

$$A = B = C = 30^\circ$$

$$\frac{3\left(\frac{1}{2}\right) - 1}{\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)}$$

$$= 4$$

$$\underline{\underline{2 \sin z \cos(x-y) - 2 \sin^2 z}}$$

$$= (2 \sin z) (\cos(x-y) - \sin z)$$

$$= (2 \sin z) (\cos(x-y) - \cos(x+y))$$

$$= (2 \sin z) (2 \sin x \sin y)$$







In  $A+B+C = \pi$ , then  $\cos^2 A + \cos^2 B + \cos^2 C =$

$$E \cdot 1 - 2 \sin \frac{A}{2} \sin \frac{B}{2} \sin \frac{C}{2}$$

- A.  $\times 1 + 2 \cos A \cos B \cos C \rightarrow \frac{5}{4}$  B.  $\checkmark 1 - 2 \cos A \cos B \cos C = \frac{3}{4}$   
 C.  $\times 2 - 2 \cos A \cos B \cos C \rightarrow \frac{7}{4}$  D.  $\times 2 + 2 \cos A \cos B \cos C \rightarrow \frac{9}{4}$

$$\cos^2 A + \cos^2 B + \cos^2 C$$

$$\frac{1 + \cos 2A}{2} + \frac{1 + \cos 2B}{2} + \cos^2 C$$

$$1 + \frac{1}{2} (\cos 2A + \cos 2B) + \cos^2 C$$

$$\cos 2\theta = 2\cos^2 \theta - 1$$

$$\cos^2 \theta = \frac{1 + \cos 2\theta}{2}$$

$$\begin{aligned} \cos^2 B - \sin^2 A &= \cos^2 A - \sin^2 B \\ &= \cos(A+B) \cos(A-B) \end{aligned}$$

$$1 + \frac{1}{2} \left( \cancel{2} \cos(\underbrace{A+B}_{\downarrow (\pi-C)}) \cos(A-B) \right) + \cos^2 C$$

$$= 1 - \underline{\cos C} \cos(A-B) + \underline{\cos^2 C}$$

$$= 1 - \cos C \left[ \cos(A-B) - \cos C \right]$$

$\swarrow$   
 $(\pi - (A+B))$

$$= 1 - \cos C \left[ \underline{\cos(A-B)} + \underline{\cos(A+B)} \right]$$

$$= 1 - \cos C (2 \cos A \cos B)$$

$$= 1 - 2 \cos A \cos B \cos C$$

Shortcut:

$$A + B + C = \pi$$

$$\cos^2 A + \cos^2 B + \cos^2 C$$

$$A = B = C = 60^\circ$$

$$\frac{3}{4}$$



If  $A + B + C = \frac{\pi}{2}$ ,  $\tan A \tan B + \tan B \tan C + \tan C \tan A$  is equal to:

**A.** 1

**B.** 0

**C.**  $\tan A \tan B \tan C$

**D.**  $\cot A \cot B \cot C$

$$A + B + C = \frac{\pi}{2}$$

$$(A + B) = \left(\frac{\pi}{2} - C\right)$$

$$\tan(A + B) = \tan\left(\frac{\pi}{2} - C\right)$$

$$\frac{\tan A + \tan B}{1 - \tan A \tan B} = \cot C = \frac{1}{\tan C}$$

$$\tan A \tan C + \tan B \tan C = 1 - \tan A \tan B$$









If  $A + B + C = \pi$ , then  $\sin^2 A + \sin^2 B - \cos^2 C =$

**A.**  $1 + 2 \cos A \cos B \cos C$

**B.**  $1 - 2 \cos A \cos B \cos C$

**C.**  $2 - 2 \cos A \cos B \cos C$

**D.**  $2 + 2 \cos A \cos B \cos C$

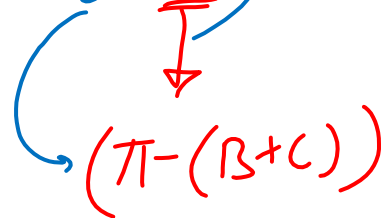
$$\sin^2 A - (\cos^2 C - \sin^2 B)$$

$$\sin^2 A - (\cos(\underbrace{B+C}_{\downarrow}) \cos(\underbrace{B-C}_{\downarrow}))$$

$(\pi - A)$

$$1 - \cos^2 A + \cos A \cos(B-C)$$

$$1 + \cos A (\cos(B-C) - \cos A)$$



$$(\pi - (B+C))$$

$$1 + \cos A (\cos(B-C) + \cos(B+C))$$

$$1 + 2 \cos A \cos B \cos C$$





If  $A + B + C = \pi$ , then  **$\sin 2A + \sin 2B - \sin 2C =$**

**A.**  $4 \sin A \sin B \sin C$

**B.**  $4 \cos A \cos B \sin C$

**C.**  $4 \cos A \sin B \cos C$

**D.**  $4 \sin A \cos B \cos C$

HW-1









If  $A + B + C = \frac{3\pi}{2}$ , then

$\cos 2A + \cos 2B + \cos 2C + 4 \sin A \sin B \sin C =$

A. 0

B. 1

C. 2

D. 4

HW-2







# #JEELiveDaily Schedule



11<sup>th</sup>



Namo Sir | Physics

6:00 - 7:30 PM



Ashwani Sir | Chemistry

7:30 - 9:00 PM



Sameer Sir | Maths

9:00 - 10:30 PM

12<sup>th</sup>



Jayant Sir | Physics

1:30 - 3:00 PM



Anupam Sir | Chemistry

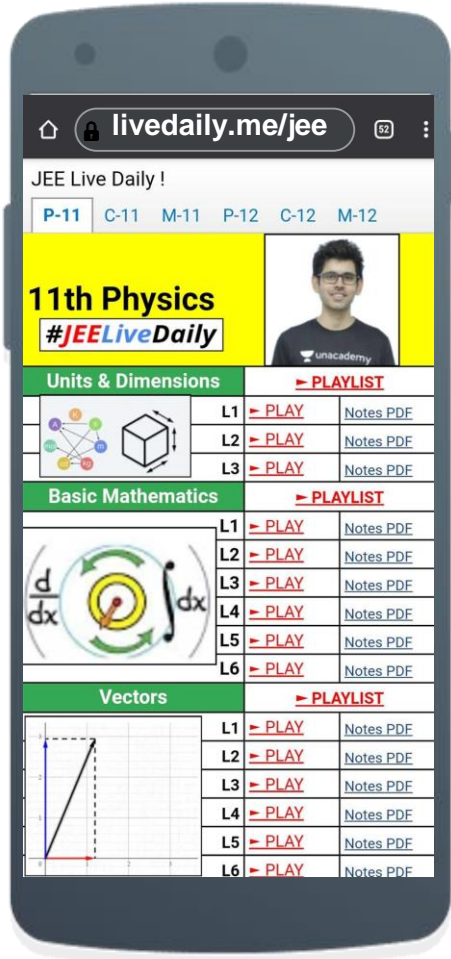
3:00 - 4:30 PM



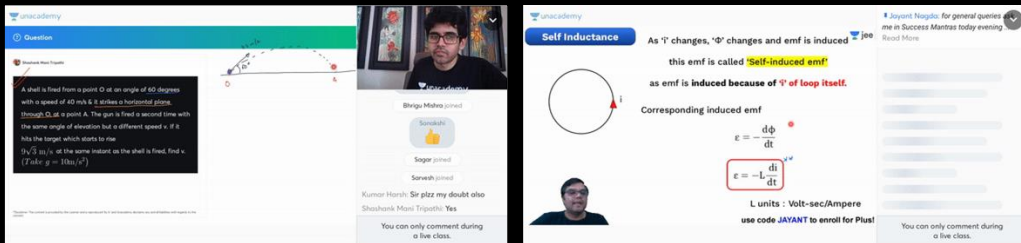
Nishant Sir | Maths

4:30 - 6:00 PM

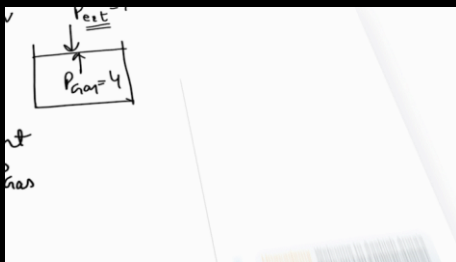
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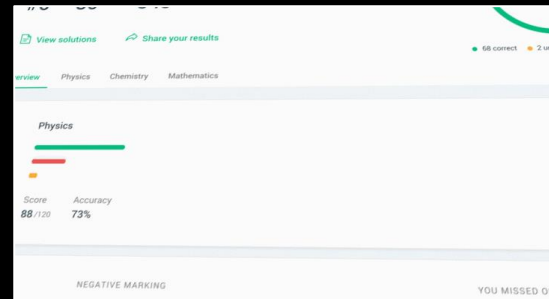
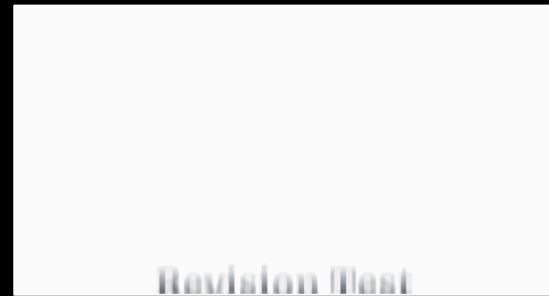


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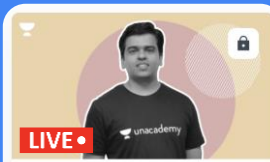
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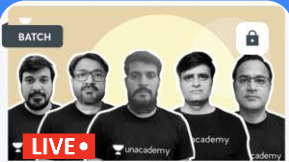
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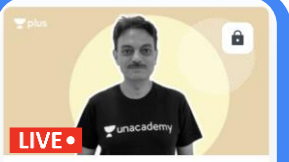
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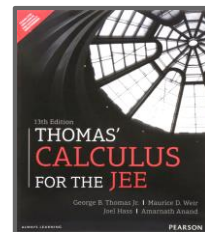
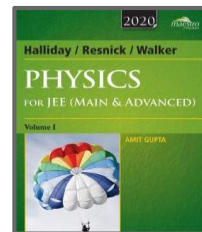
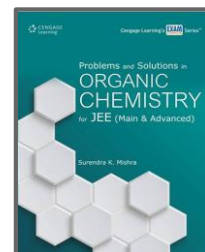
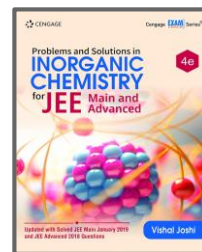
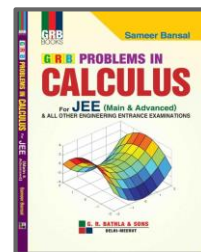
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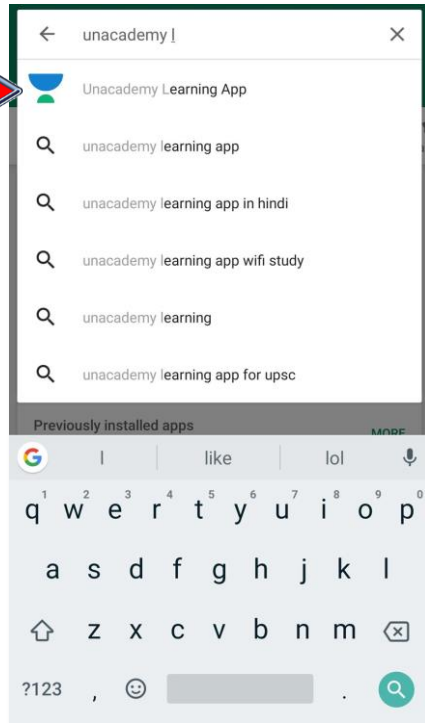


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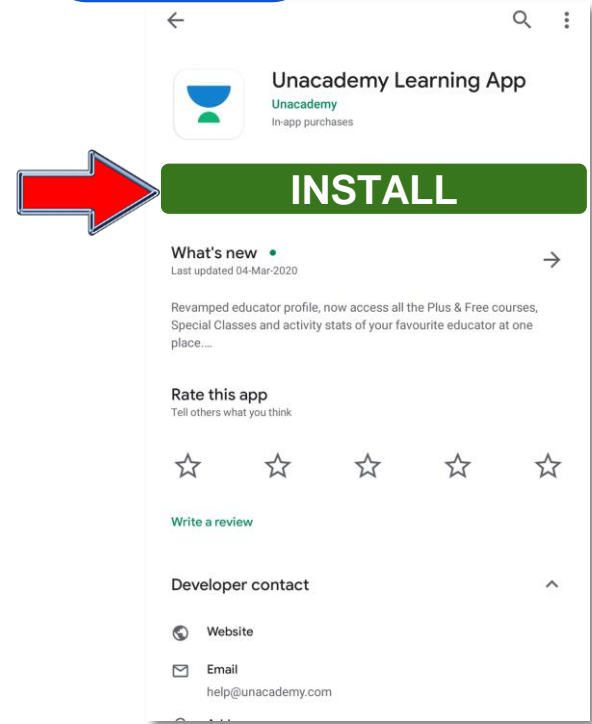


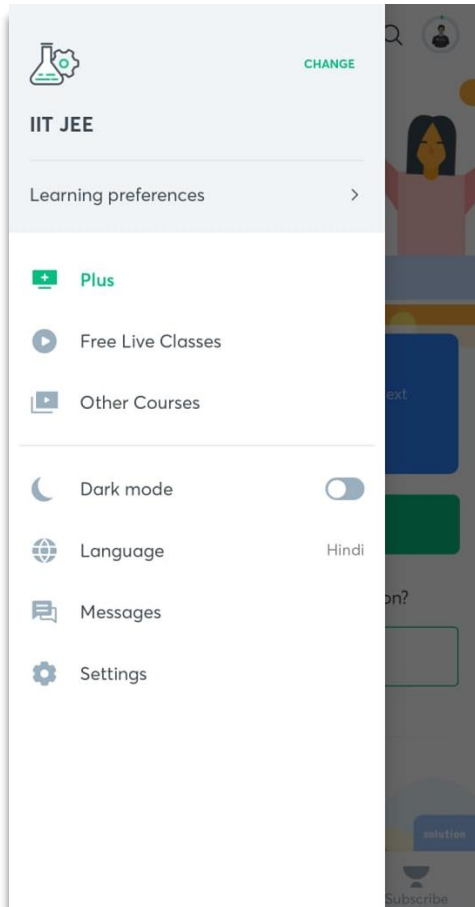
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## Step 1



## Step 2







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