

# Functions



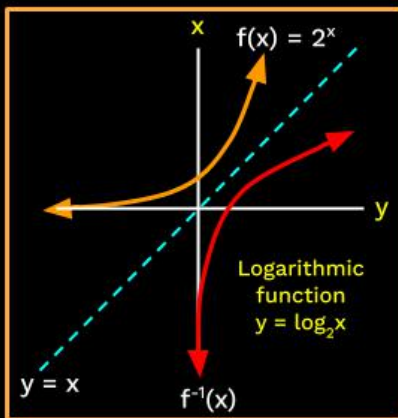
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LECTURE

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## Logarithmic Function - 2



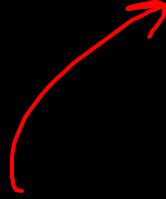


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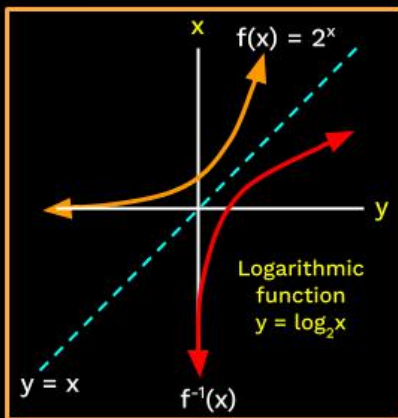
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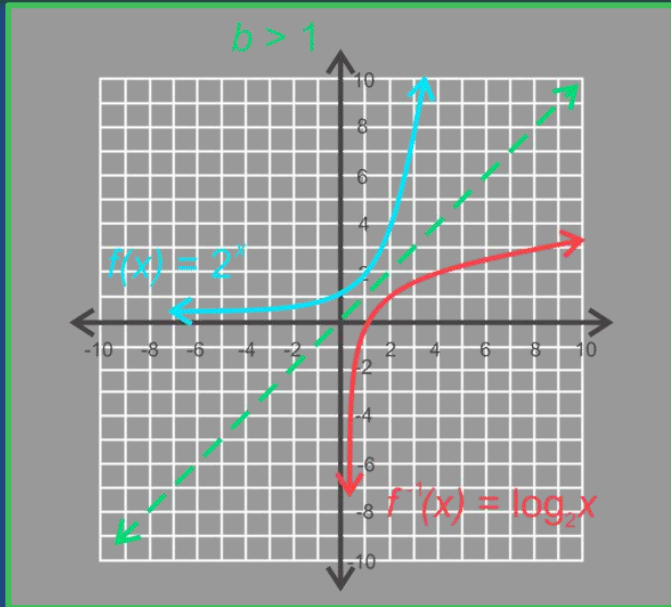
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**8**

## Logarithmic Function - 2



# Properties of Log Function (Quick Recap)



# Properties of Log Function

**Property 1**

$$\log_a 1 = 0 \quad (a \neq 1, a > 0)$$

**Property 2**

$$\log_a a = 1 \quad (a \neq 1, a > 0)$$

**Property 3**

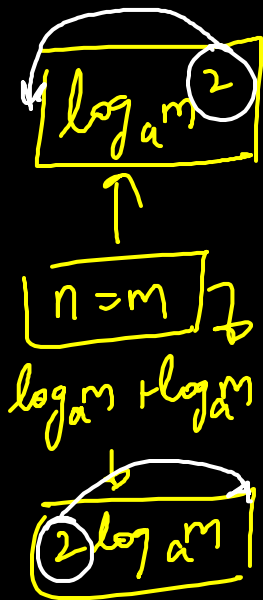
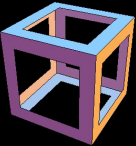
$$\log_a m + \log_a n = \log_a (m \cdot n)$$

**Property 4**

$$\log_a m - \log_a n = \log_a \left( \frac{m}{n} \right)$$

**Property 5**

$$\log_a (m)^\alpha = \alpha \cdot \log_a m$$



# Properties of Log Function

## Property 6

$$\log_{(a^\beta)} m = \frac{1}{\beta} \log_a m$$

\*

## Property 7

$$\log_a m = \frac{\log_b m}{\log_b a}$$

$b=m$

## Property 8

$$\log_a m = \frac{1}{\log_m a}$$

## Property 9

$$a^{\log_a x} = x$$

## Property 10

$$a^{\log_b c} = c^{\log_b a}$$





Example

$$\log_{11}\left(1 - \frac{1}{3}\right) + \log_{11}\left(1 - \frac{1}{4}\right) + \log_{11}\left(1 - \frac{1}{5}\right) + \cdots + \log_{11}\left(1 - \frac{1}{242}\right)$$

When **simplified has the value** equal to:

A. 2

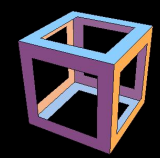
B. -2

C. 6

D. None of these

$$\log_{11} \left[ \left( \frac{2}{2} \right) \left( \frac{3}{4} \right) \left( \frac{4}{5} \right) \cdots \left( \frac{241}{242} \right) \right]$$

$$\begin{aligned} \log_{11} \left( \frac{2}{242} \right) &= \log_{11} \left( \frac{1}{121} \right) \\ &= \log_{11} (11^{-2}) = -2 \end{aligned}$$





### Example

If  $\log_7 2 = m$ , then  $\log_{49} 28$  is equal to

JEE - (1999)

A.  $2(1 + 2m)$

✓ B.  $\frac{1 + 2m}{2}$

C.  $\frac{2}{1 + 2m}$

D.  $1 + m$

$$\log_{49} 28$$

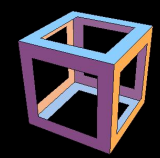
$$= \log_{(7^2)} (7 \times 4)$$

$$= \frac{1}{(2)} \log_7 (7 \times 4)$$

$$= \frac{1}{2} (\log_7 7 + \log_7 4)$$

$$= \frac{1}{2} (1 + 2 \log_7 2)$$

$$= \boxed{\frac{1}{2} (1 + 2m)}$$



### Example

The value of  $\underline{\underline{81^{(1/\log_5 3)}}} + 27^{\log_9 36} + 3^{4/\log_7 9}$  is equal to

A. 49

B. 625

C. 216

☒ D. 890

$$(3^4)^{\log_3 5}$$

$$\downarrow$$
$$(\underline{3})^{\log_3 (5^4)}$$

$$\downarrow$$
$$\boxed{5^4} //$$

$$+ (3^3)^{\log_{(3^2)} (6^2)}$$

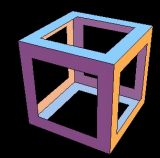
$$\downarrow$$
$$(\underline{3})^{\frac{2}{2} \log_3 6}$$

$$\downarrow$$
$$\underline{3}^{\log_3 (6^3)}$$
$$\rightarrow \boxed{6^3} //$$

$$+ (3)^{(\frac{4}{2}) \log_3 7}$$

$$\downarrow$$
$$(\underline{3})^{(\frac{4}{2}) \log_3 7}$$

$$\downarrow$$
$$\boxed{7^2} //$$





Example

If  $\log_5 a \cdot \log_a x = 2$ , then  $x$  is equal to

A. 125

B.  $a^2$

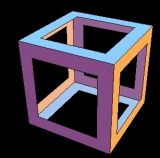
C. 25

D. None of these

$$\frac{\log_5 a}{\log_5 a} \times \frac{\log_5 x}{\log_5 a} = 2$$

$$\log_5 x = 2$$

$$x = 5^2 = 25$$





### Example

If  $\log_{12} 16 = a$ , then the value of  $\log_6 27$  in terms of 'a' is:

A.  $3 \left( \frac{4-2a}{4+2a} \right)$

~~B.  $3 \left( \frac{4-2a}{4-a} \right)$~~

C.  $3 \left( \frac{4-2a}{4+a} \right)$

D. None

$$\begin{aligned} & \log_6 27 \\ &= 3 \log_6 3 \\ &= \frac{3}{\log_3 6} \end{aligned}$$

$$= \frac{3}{\log_3 3 + \log_3 2}$$

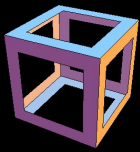
$$= \frac{3}{1 + \log_3 2}$$

$$a = \log_{12} 16$$

$$a = 4 \log_{12} 2$$

$$a = \frac{4}{\log_2 12}$$

$$a = \frac{4}{2 + \log_2 3}$$



$$a = \frac{4}{(2 + \log_2 3)}$$

$$\downarrow$$
$$2 + \log_2 3 = \frac{4}{a}$$

$$\log_2 3 = \left( \frac{4}{a} - 2 \right)$$

$$\downarrow$$
$$\log_3 2 = \left( \frac{a}{4-2a} \right) - \textcircled{2}$$

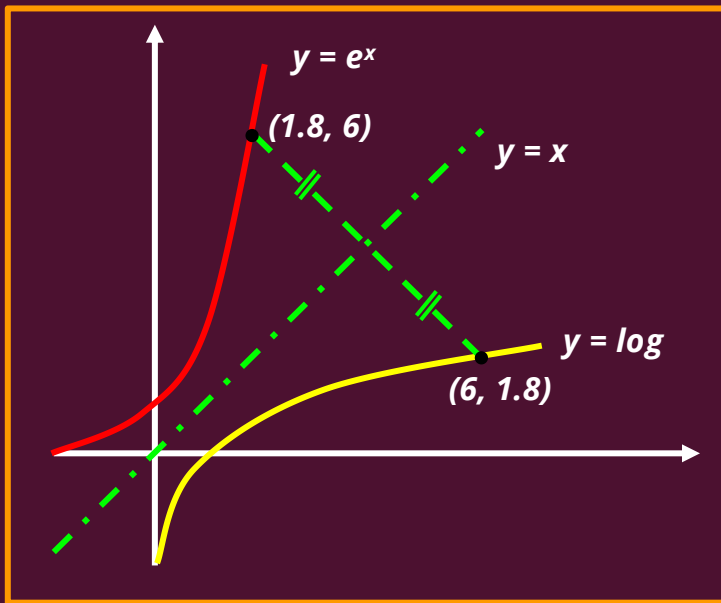
using Eq<sup>n</sup> ② in Eq<sup>n</sup> ①

$$= \frac{3}{1 + \left( \frac{a}{4-2a} \right)}$$

$$= \frac{3(4-2a)}{(4-2a+a)}$$

$$= 3 \left( \frac{4-2a}{4-a} \right)$$

## Solving Log Equations



$$20$$

$$\log_2(x-4) = 4$$

$$(x-4) = 2^4$$

$$x = 20$$

### Example

The sum of values of  $x$  satisfying the following equation is:

$$\log_4(x+1) + \log_4(x+4) = 1$$

A. -5

B. 5

C. 0

D. None

$$\log_4(x+1)(x+4) = 1$$

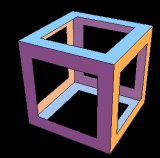
$$\left. \begin{array}{l} x = 0 \\ x = -5 \end{array} \right\} \begin{array}{l} \text{Domain} \\ \text{Restriction} \end{array}$$

$$(x+1)(x+4) = 4$$

$$x^2 + 5x + 4 = 4$$

$$x(x+5) = 0$$

$$x = 0, -5$$



### Example

The number of solutions of  $\log_4(x-1) = \log_2(x-3)$  is / are

A. 3

B. 1

C. 2

D. 0

$$\log_2(x-1) = \log_2(x-3)$$

$$\frac{1}{2} \log_2(x-1) = \log_2(x-3)$$

$$\log_2(x-1) = \log_2(x-3)^2$$

$$(x-1) = (x-3)^2$$

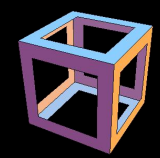
$$x-1 = x^2 - 6x + 9$$

$$x^2 - 7x + 10 = 0$$

$$(x-5)(x-2) = 0$$

$$\boxed{x = 2, 5}$$

X      ✓



### Example

The sum of values of  $x$  satisfying the following equation is:

$$\underline{16^{\log_4 |1-2x|}} = 5x^2 - 4$$

A. -5

B. 1

C. -4

D. None

$$\begin{aligned} \text{Since } 4^2 &= 16, \log_4 |1-2x| = 2 \\ \Rightarrow 4^2 &= 16^{\log_4 |1-2x|} = 5x^2 - 4 \end{aligned}$$

$$|1-2x|^2 = 5x^2 - 4$$

$$1 + 4x^2 - 4x = 5x^2 - 4$$

$$x^2 + 4x - 5 = 0$$

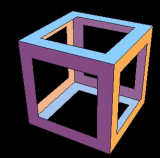
$$(x+5)(x-1) = 0$$

$$\boxed{x = -5, 1}$$

↓

$$\boxed{\text{Sum} = -4}$$





### Example

The **number of values of  $x$**  satisfying the following equation is:

$$x^{\left(\frac{\log x + 5}{2}\right)} = 10^{5 + \log x}$$

$$\left(\log_x \rightarrow \log_{10} x\right)$$

**A.** 2

**B.** 3

**C.** 5

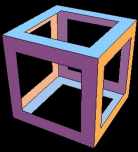
**D.** None of these

$$\log x^{\left(\frac{\log x + 5}{2}\right)} = \log (10)^{(5 + \log x)}$$

$$\left(\frac{\log x + 5}{2}\right)(\log x) = (5 + \log x)(1)$$

Let:

$$\left(\frac{t + 5}{2}\right)(t) = (5 + t)$$



$$(t^2 + 5t) = 10 + 2t$$

$$t^2 + 3t - 10 = 0$$

$$(t+5)(t-2) = 0$$

$$t = -5 ; t = 2$$

$$\log x = -5 \quad \log x = 2$$
$$\boxed{x = 10^{-5}} ; \boxed{x = 10^2}$$



Example

Solve **for x**:  $1 + 6 \log_{(x+2)} 4 = \log_{(4)} (x + 2)$

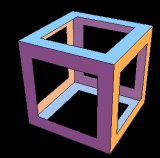
**A.** 62

**B.** 14

**C.**  $\frac{-31}{16}$

**D.**  $\frac{-127}{64}$





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Physics



**8 PM**

**Paaras Sir**  
Chemistry



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Maths



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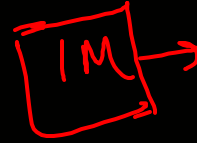


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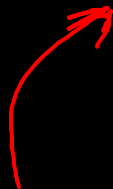
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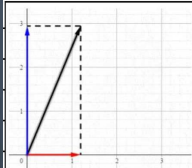
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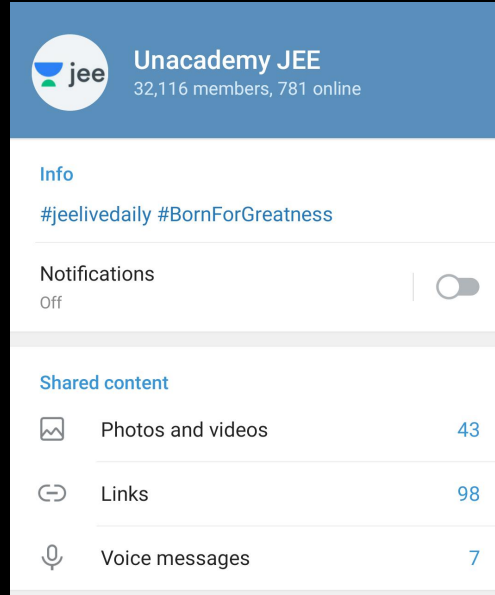
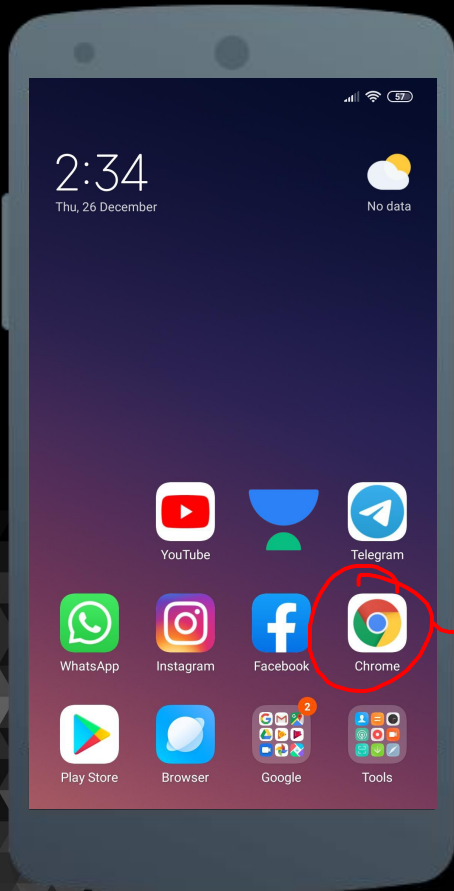
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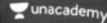


The screenshot shows a live class interface on the Unacademy platform. At the top, the Unacademy logo is visible. Below it, a question is displayed: "ROHIT SACHAN: Sir please solve the one more doubt...". The question text is partially obscured by a chemical reaction diagram. The diagram shows the nitration of aniline. The starting material is aniline (a benzene ring with an -NH<sub>2</sub> group). It reacts with HNO<sub>3</sub> / H<sub>2</sub>SO<sub>4</sub>. The product is nitroaniline (a benzene ring with an -NH<sub>2</sub> group and a -NO<sub>2</sub> group). Handwritten notes in red ink explain the mechanism: "e<sup>-</sup> deficient" points to the nitro group, and "e<sup>-</sup> rich system" points to the amino group. A handwritten note also says "NO<sub>2</sub><sup>+</sup> E<sup>+</sup> → attacks on e<sup>-</sup> rich system". On the right side of the screen, there is a video feed of the educator, Rohit Sachan, and a list of participants: Chaudhuri nitrATion, Rohit Sachan Sir B aa rha mera, Sinchan Dutta Chaudhuri right, Shoalb Alam Left, Vsvsgs Right, Prashant Singh joined, and Rohit Sachan Left.

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


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


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


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


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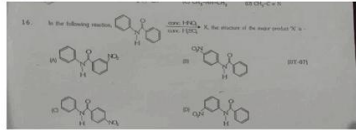
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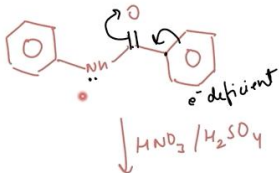
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Question





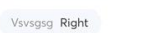









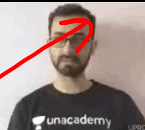
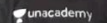
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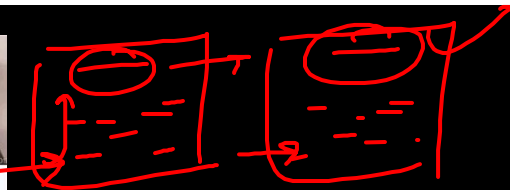




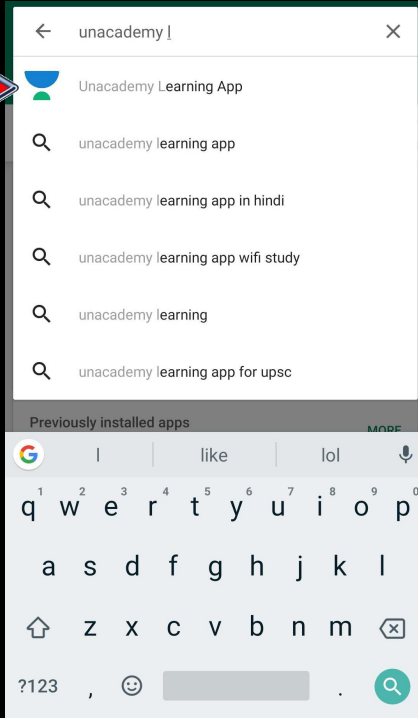
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$$\text{E}^+ \rightarrow \text{attacks on } e^- \text{ rich system}$$

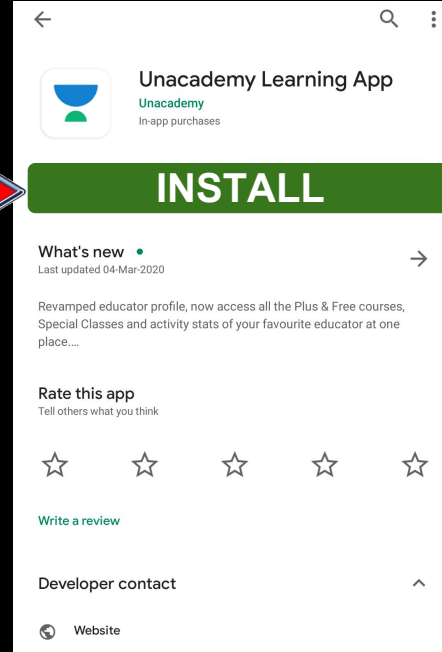




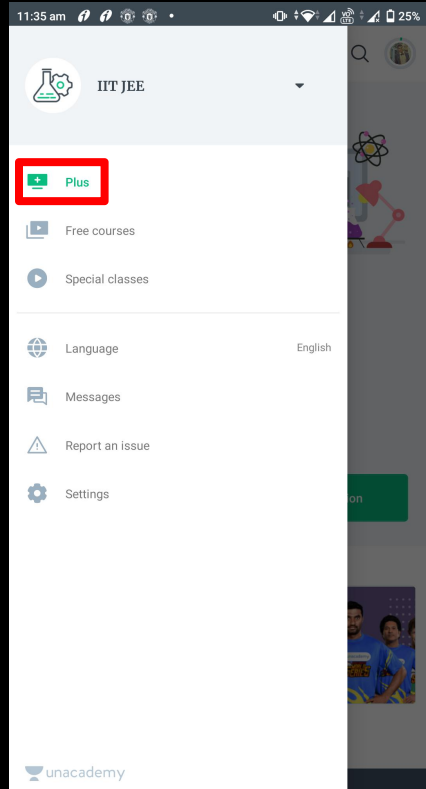
## Step 1



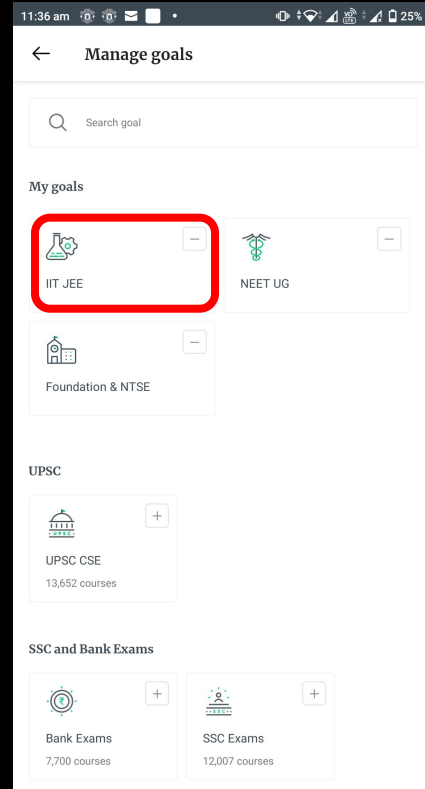
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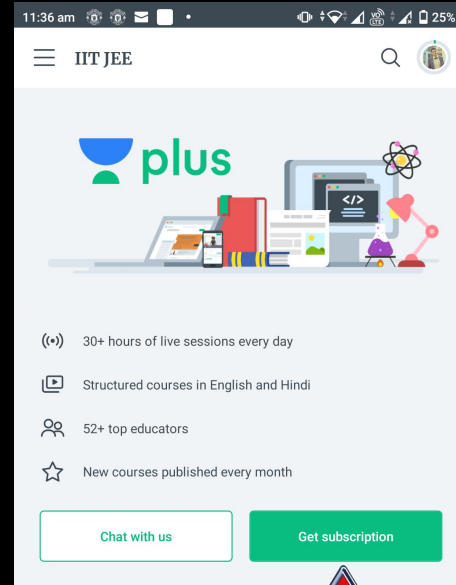
## Step 3



## Step 4



## Step 5



# Step 6

11:06 am

✕

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3 mo ₹5,000/month  
₹18,000 ₹15,000 for 3 months

6 mo ₹4,000/month  
₹36,000 ₹24,000 for 6 months

12 mo ₹2,500/month  
₹72,000 ₹30,000 for 12 months

24 mo **₹1,500/month**  
₹144,000 ₹36,000 for 24 months  
75% OFF

Billed as a one time payment of ₹36,000 (24 months)

Continue

# Step 7

11:09 am

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IIT JEE Subscription  
24 months

**SAMEERLIVE** Apply

Subscription Fee ₹30,508  
CGST ₹2,746  
SGST ₹2,746

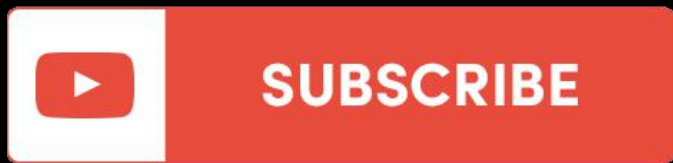
10%

12 mo 27,000  
24 mo **32,400**  
75% OFF

Total

Proceed to Payment

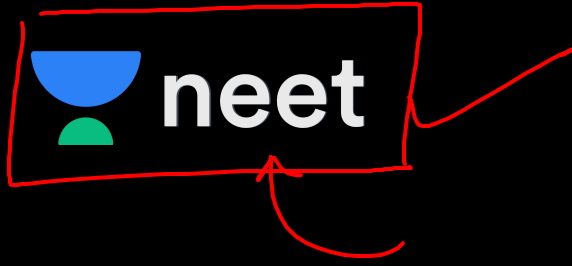
1350



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