

# *Functions*



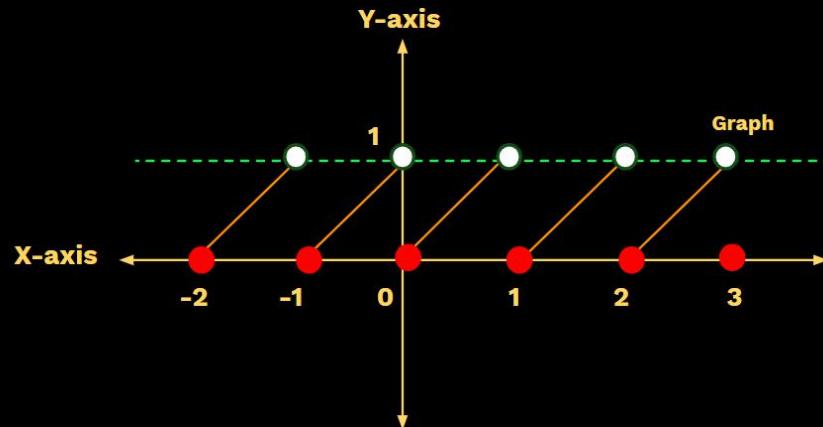
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**G.I.F & F.P.F.**



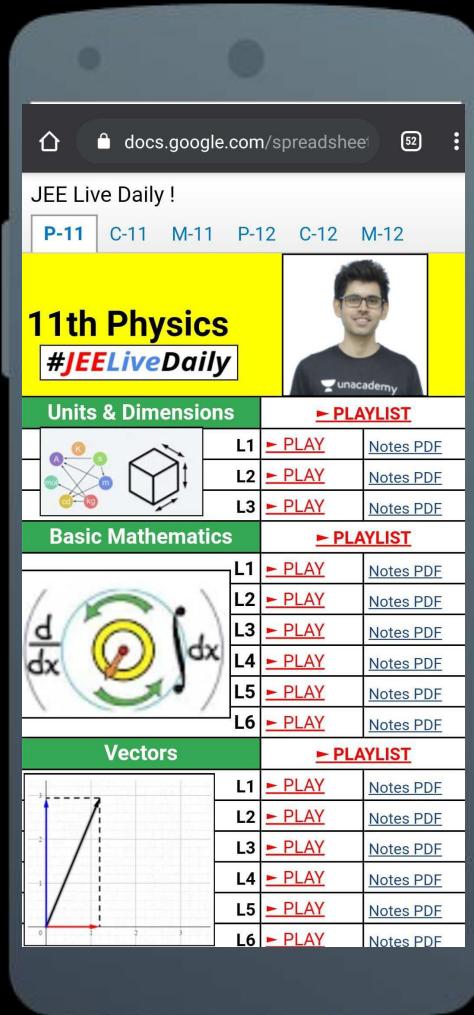


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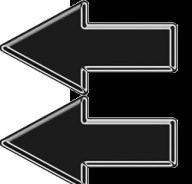
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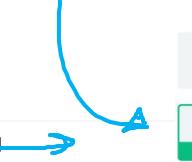
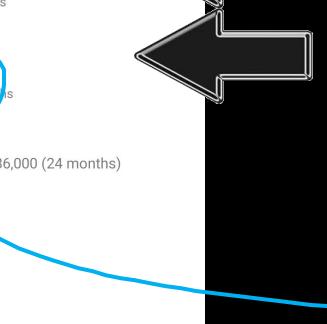
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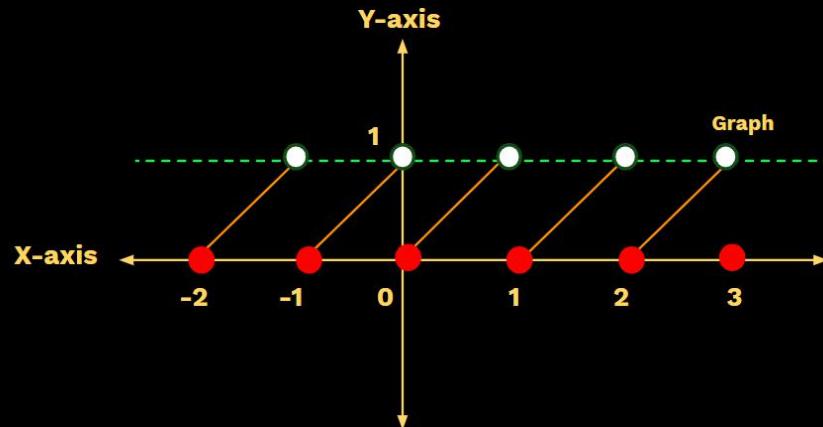
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**G.I.F & F.P.F.**



# Greatest Integer Function



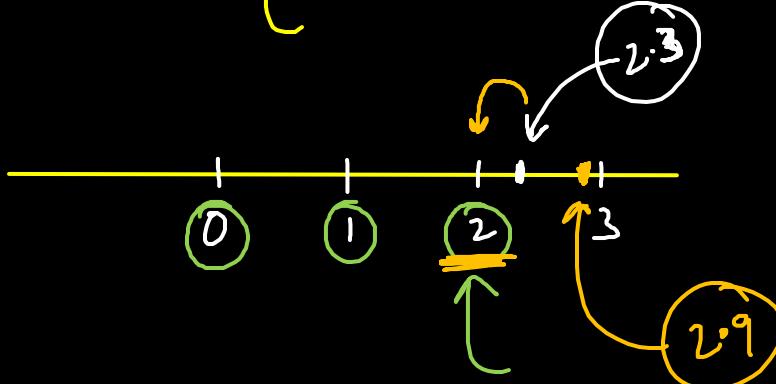
# Greatest Integer Function:

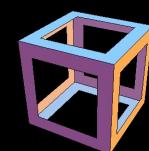
Definition: Greatest integer less than or equal to  $x$ .

$$f(x) = [x]$$

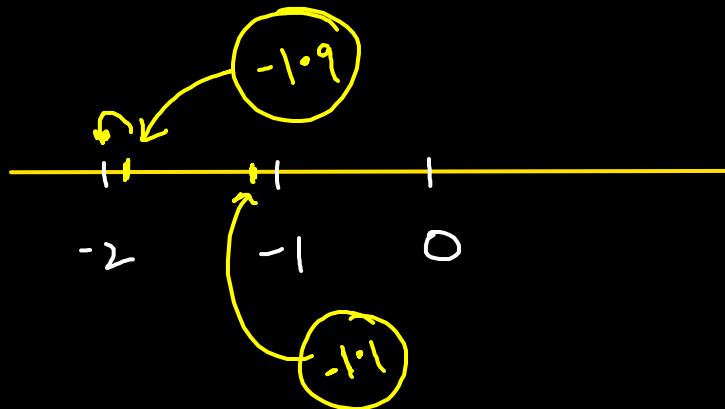
Eg:  $[2.3] = 2$

Eg:  $[2.9] = 2$



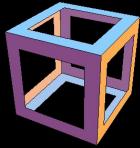


$$\underline{\text{Ex:}} \quad [-1 \cdot 9] = -2 \quad \left\{ \quad \underline{\text{Ex:}} \quad [-1 \cdot 1] = -2 \right.$$



$$\underline{\text{Ex:}} \quad [4] = 4 \quad ($$

A number line diagram illustrating a mapping between two sets of integers. The left set of integers is {0, 1, 2, 3, 4}. The right set of integers is {1, 2, 3, 4}. Arrows indicate the mapping: 0 is mapped to 1, 1 is mapped to 2, 2 is mapped to 3, 3 is mapped to 4, and 4 is mapped to 4. A bracket on the right side groups the numbers 1, 2, 3, and 4.



## G.I.F.: Domain and Range ✓

Definition: Greatest integer less than or equal to x.

$$f(x) = [x]$$

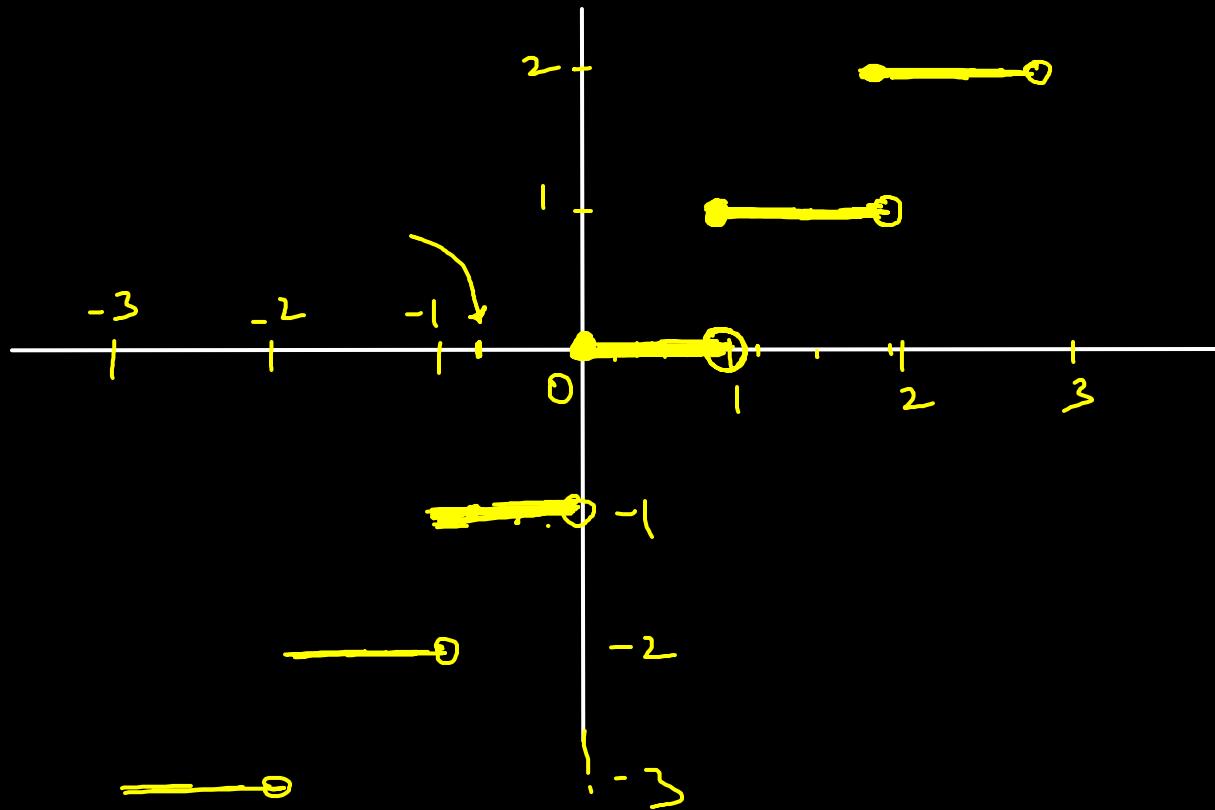
Domain:

$$x \in \mathbb{R}$$

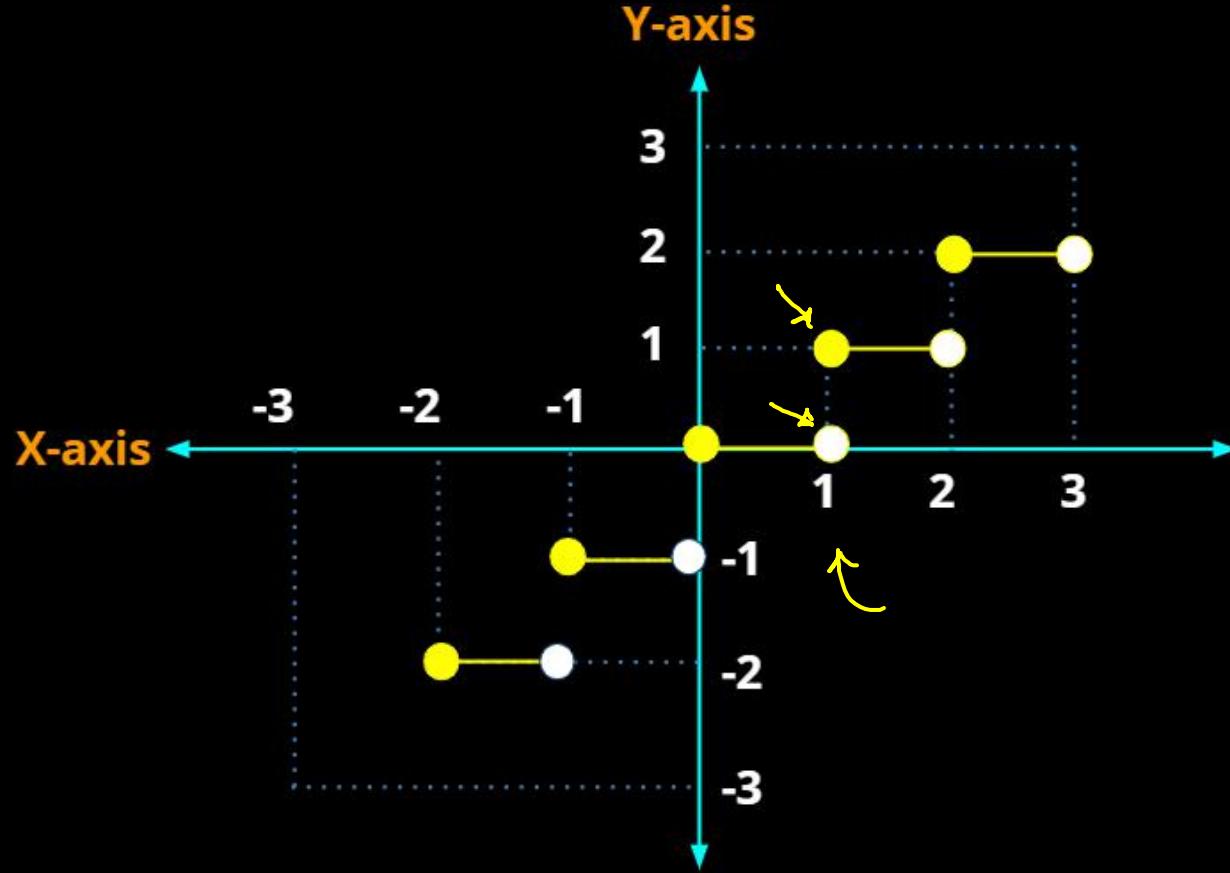
Range:

Integers ✓

G.I.F.: Graph [•]  $\rightarrow$  Step Function



# G.I.F.: Graph



# Properties of G.I.F.



# Properties of Greatest Integer Function:

1

$$[x + n] = [x] + n$$

$$; \quad [2 \cdot 7 + 10] = [2 \cdot 7] + 10 = 2 + 10 = 12$$

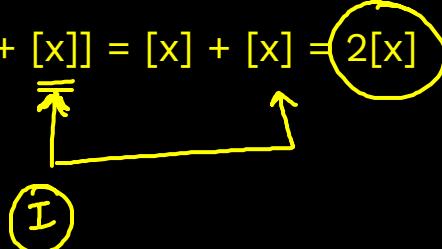
(n is integer)



$$[12 \cdot 7] \rightarrow 12$$

2

$$[x + [x]] = [x] + [x] = 2[x]$$



3

$$[x] + [-x] = \begin{cases} \rightarrow -1, & \text{if } x \notin I \\ \rightarrow 0, & \text{if } x \in I \end{cases}$$

$$[4] + [-4] = 0$$

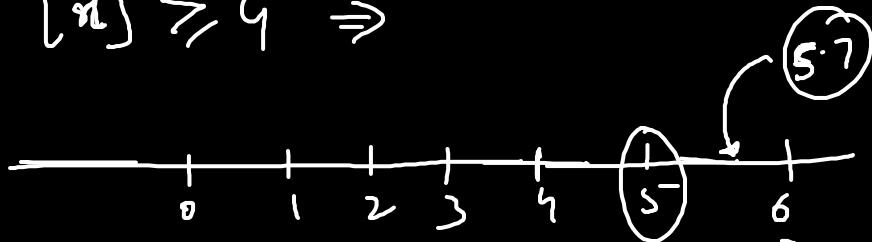
$$[2.6] + [-2.6] = -1$$

4

**Inequalities:**

a  $\lceil x \rceil \geq n \Rightarrow x \geq n$ , where  $n \in I$

$$\lceil x \rceil \geq 4 \Rightarrow$$



b  $\lceil x \rceil \leq n \Rightarrow x < n, n \in I \Rightarrow x < (n+1)$

$$\lceil x \rceil \leq 4 \Rightarrow x < 5$$

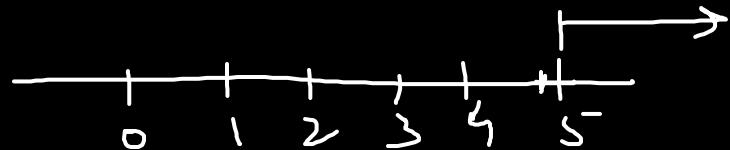


## Inequalities:

**C**

$$[x] > n \Rightarrow x \geq n + 1, n \in I$$

Eg:  $[x] > 4 \Rightarrow x \geq 5$

**d**

$$[x] < n \Rightarrow x < n, n \in I$$

$$[x] < 4 \Rightarrow x < 4$$





## Example

The number of solutions of:  $[x] + [-x] = x^2 - 5x + 5$

A. 2

B. 3

C. 4

D. 0

$$[x] + [-x] = -1$$

when  $x \notin \mathbb{Z}$

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

$$x^2 - 5x + 6 = 0$$

$$x = 2, 3$$

ignore

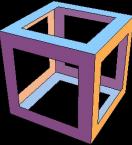
$$[x] + [-x] = 0$$

when  $x \in \mathbb{Z}$

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

ignore

$$x = \frac{5 \pm \sqrt{25 - 20}}{2}$$





## Example

Solve for  $x$ :  $-2 < -x < 3.5$

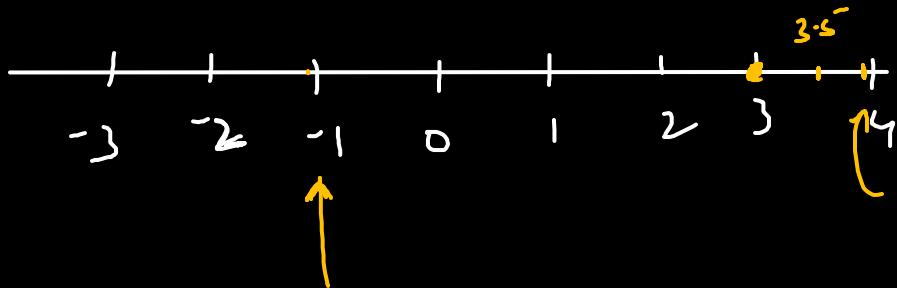
$\textcircled{t}$  ↗

A.  $(-4, 1]$

B.  $(3.5, 2)$

C.  $[-3, 2)$

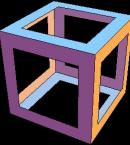
D. None



$$-1 \leq t < 4$$

$$\left\{ \begin{array}{l} 1 \geq x > -4 \\ 1 \geq -x < 4 \end{array} \right.$$

$$-1 \leq (-x) < 4$$





## Example

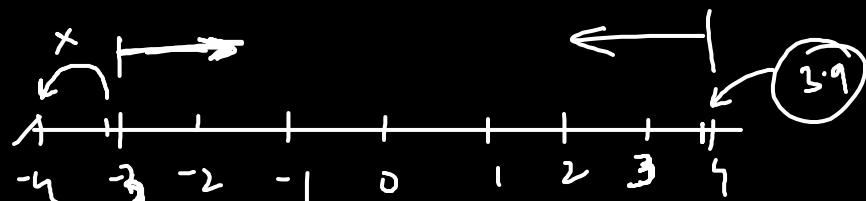
Solve for  $x$ :  $-3 \leq [2x + 4] \leq 3$ ,

A.  $\left[ \frac{-7}{2}, \frac{-1}{2} \right]$

B.  $\left[ -4, \frac{-1}{2} \right]$

C.  $\left[ \frac{-7}{2}, 0 \right)$

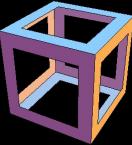
D.  $[-4, 0)$



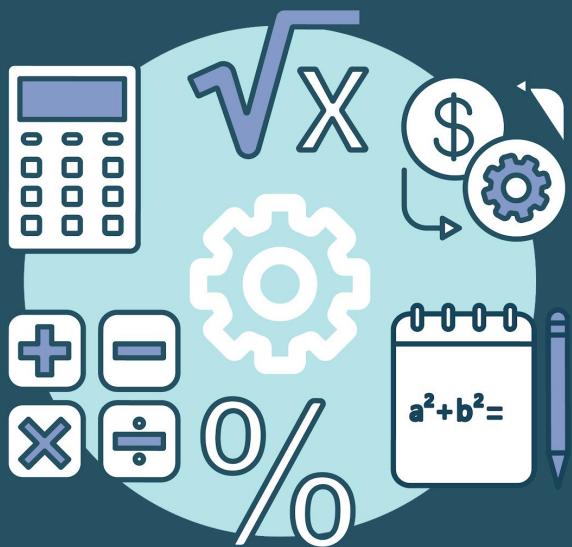
$$\left\{ \begin{array}{l} -7 \leq 2x < 0 \\ \boxed{-\frac{7}{2} \leq x < 0} \end{array} \right.$$

$$-3 \leq t < 4$$

$$-3 \leq 2x + 4 < 4$$



# Fractional Part Function

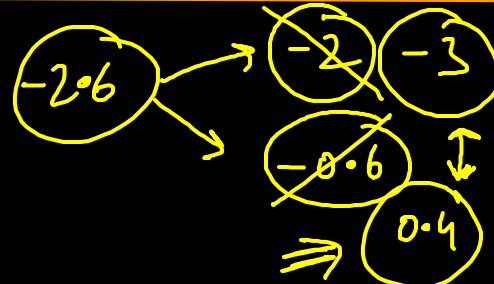
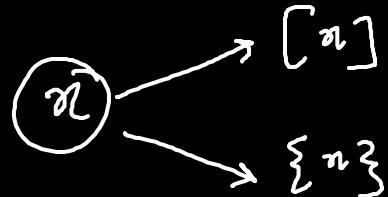


# Fractional Part Function:

$\{ \cdot \}$

**Definition:**

$$x = [x] + \{x\} \quad *$$



$$f(x) = \{x\} = x - [x]$$

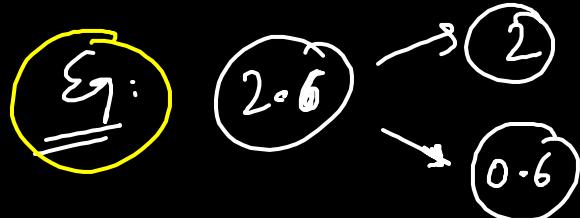
=

Eg:  $\{-1.9\}$

$$= -1.9 - [-1.9]$$

$$= -1.9 - (-2)$$

$$= \boxed{0.1} \quad \checkmark$$



$$\{ -1.9 \} = 0.1$$

$$\{ 2.6 \} = 0.6$$

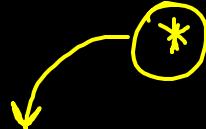
$$\{ 3.6 \} = 0.6$$

# F.P.F.: Domain and Range

$$\mathcal{N} = \{n\} \rightarrow [n] = \{n\}$$
$$\sum \{n\} = 0$$

**Definition:**

$$f(x) = \{x\} = x - [x]$$



**Domain:**

R



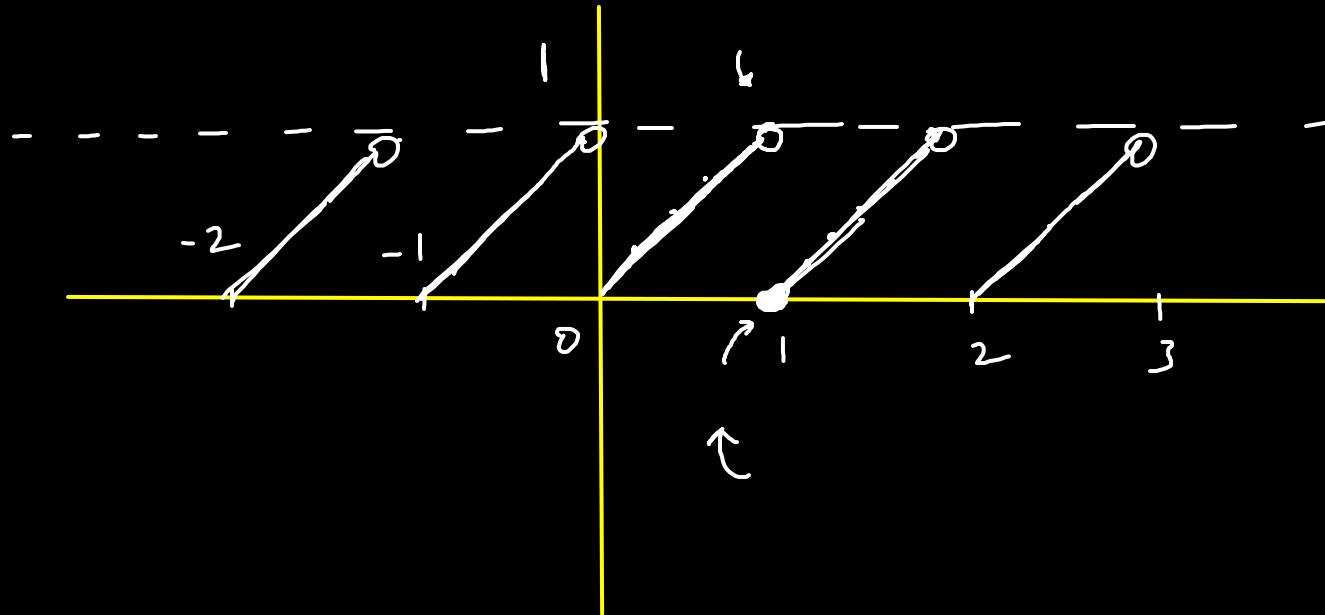
**Range:**

$$[0, 1)$$



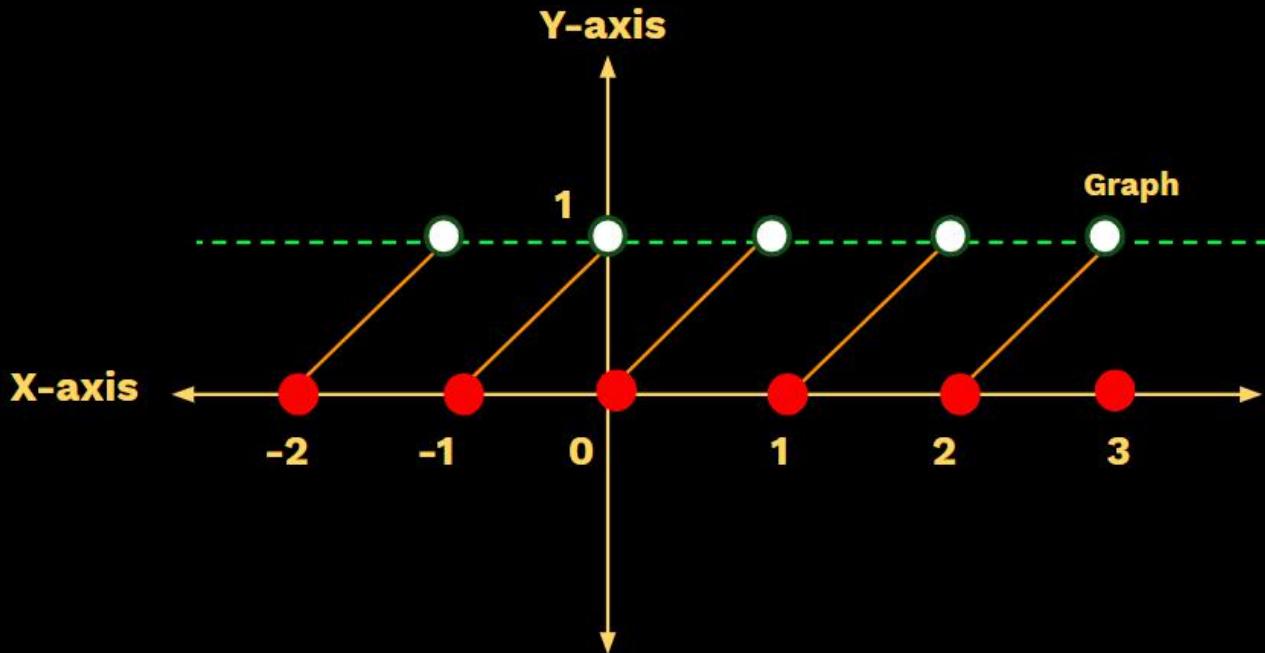
# F.P.F.: Graph

$$\{n\} = \underline{n} - \lceil n \rceil$$



$$\{x\} \in [0, 1)$$

# F.P.F.: Graph





## Example

Solve for  $x$ :  $3[x] + 2\{x\} + 2x = 1$

A.  $\frac{3}{4}$

B.  $\frac{1}{4}$

C.  $\frac{2}{3}$

D.  $\frac{1}{2}$

$$3[n] + 2\{n\} + 2n = 1$$

$$3[n] + 2\{n\} + 2([n] + \{n\}) = 1$$

$$5[n] + 4\{n\} = 1$$

$$\lceil n \rceil + \{n\} = 1$$

$$\{n\} = \left( 1 - \lceil n \rceil \right) \quad \text{---} \quad \begin{cases} 1 \\ \frac{1}{4} \end{cases}$$

$\therefore \boxed{\{n\} \in \{0, 1\}}$

$\because \lceil n \rceil = 0 \rightarrow \{n\} = \frac{1}{4}$

$$\lceil n \rceil = 1 \rightarrow \{n\} = -1 \times$$

$$\lceil n \rceil = -1 \rightarrow \{n\} = 3/2 \times$$

$$\begin{aligned} \because n &= \lceil n \rceil + \{n\} \\ &= 0 + \frac{1}{4} \\ &= \frac{1}{4} \end{aligned}$$



## Example

Following equation has:  $x = 4\{x\} - [x]$ .

A. Two integral solutions

B. ✓ One integral and one non-integral solutions

C. Two non-integral solutions

D. No solutions

$$n = [n] + \{n\}$$

$$[n] + \{n\} = 4\{n\} - [n]$$

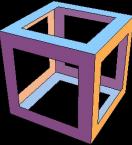
$$[n] = 0 \rightarrow \{n\} = 0 \rightarrow 0$$

$$\{n\} = 1 \rightarrow \{n\} = \frac{2}{3} \rightarrow \frac{5}{3}$$

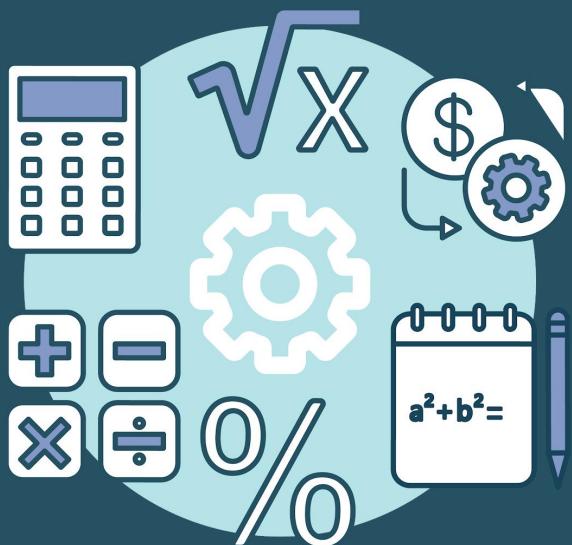
$$2[n] = 3\{n\}$$

$$\boxed{\{n\} = \frac{2}{3}[n]} \rightarrow 1$$

$$\boxed{\therefore \{n\} \in [0,1]}$$



# HomeWork Questions



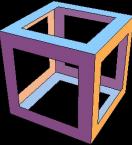


## Example

If  $y = 3[x] + 2 = 2[x + 4]$ . Find the value of:  $[x + y]$ .

- A.** 26
- B.** 20
- C.** 14
- D.** None

$KW^{-1}$





## Example

$y = [2x - 1] = 3[x - 6]$ . Find the possible values of  $[3x + y]$ .

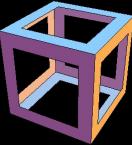
A. 84

B. 85

C. 103

D. 104

$\text{Hw-2}$



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Maths



6 PM

Jayant Sir  
Physics



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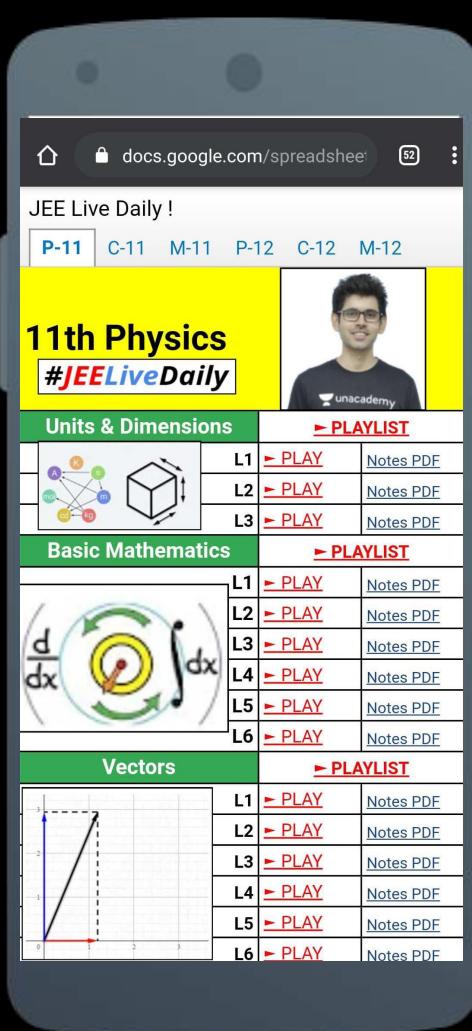


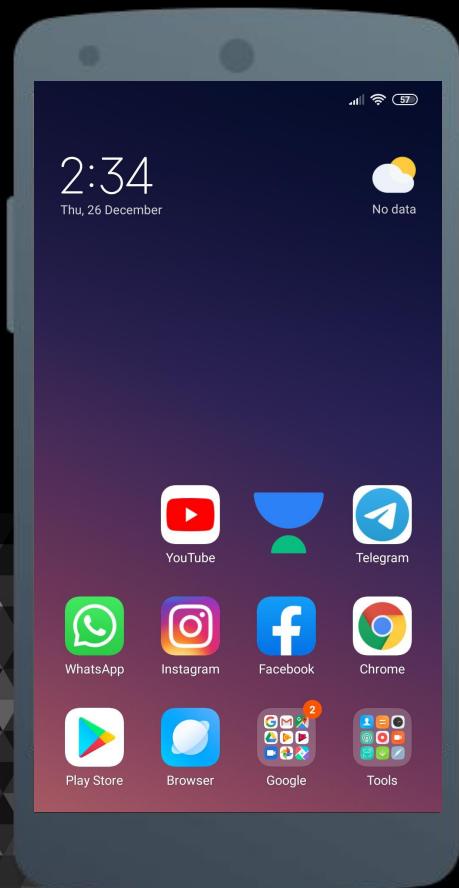
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Namo Sir  
Physics



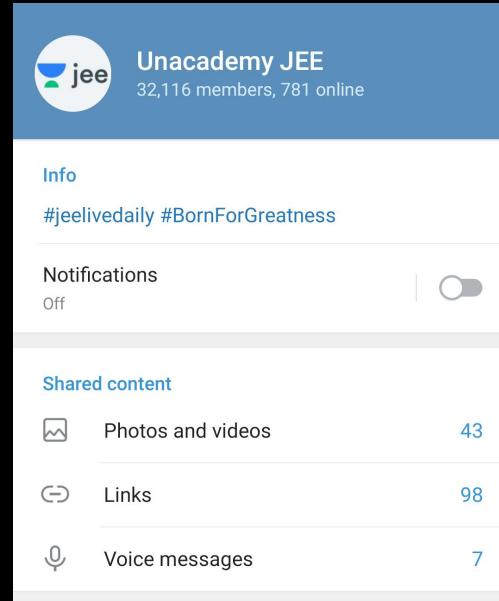
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[tinyurl.com/unacademychat](http://tinyurl.com/unacademychat)



The screenshot shows the Telegram group info page for "Unacademy JEE". The group has 32,116 members and 781 online users. The "Info" section includes the group's hashtags: #jeelivedaily #BornForGreatness. The "Notifications" section shows they are currently off. The "Shared content" section displays the count of shared items: Photos and videos (43), Links (98), and Voice messages (7).

| Category          | Count |
|-------------------|-------|
| Photos and videos | 43    |
| Links             | 98    |
| Voice messages    | 7     |

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The screenshot shows a Unacademy 'Question' page. At the top right is a profile picture of Rohit Sachan. Below it is a list of user interactions:

- Srinchana Dutta Chaudhuri nitration
- Rohit Sachan Sir Baa rha mera
- Sinchana Dutta Chaudhuri right
- Shoib Alam Left
- Vsvsgsg Right
- Prashant Singh joined
- Rohit Sachan Left

The main content area displays a question about a chemical reaction:

Q. In the following reaction,  $\text{NO}_2^+$  reacts with  $\text{X}$ , the structure of the major product  $\text{X}'$  is -

Reaction scheme:

$\text{NO}_2^+ + \text{X} \rightarrow \text{X}'$

Options:

- $\text{X}' = \text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{NH}_2$
- $\text{X}' = \text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{NH}_2$
- $\text{X}' = \text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{NH}_2$

Handwritten notes on the right side of the reaction scheme:

$\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{NH}_2$  (with arrows indicating electron movement)  $\downarrow \text{HNO}_3 / \text{H}_2\text{SO}_4$  (with handwritten note: e<sup>-</sup> deficient)

$\text{E}^+ \rightarrow$  attacks on e<sup>-</sup> rich system

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The screenshot shows a 'View results' page for a Physics test. At the top, there are tabs for 'View solutions' and 'Share your results'. Below that, a navigation bar includes 'Overview', 'Physics', 'Chemistry', and 'Mathematics'. The 'Physics' section displays a progress bar and statistics:

Score: 88/120 Accuracy: 73%

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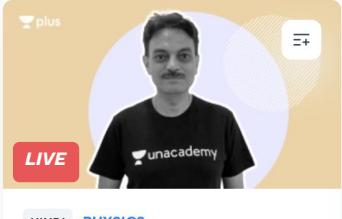
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Question

ROHIT SACHAN:  
Sir please solve the one more doubt...

16. In the following reaction,  $\text{NO}_2^+$  attacks on  $\text{e}^-$  rich system. X, the structure of the major product 'X' is -

$\text{NO}_2^+$  → attacks on  
 $\text{e}^-$  rich system

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Sirchana Dutta Chaudhuri nitration

Rohit Sachan Sir Baa rha mera

Sirchana Dutta Chaudhuri right

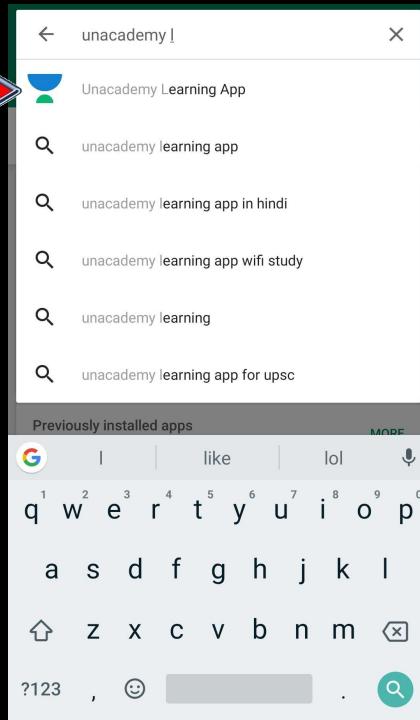
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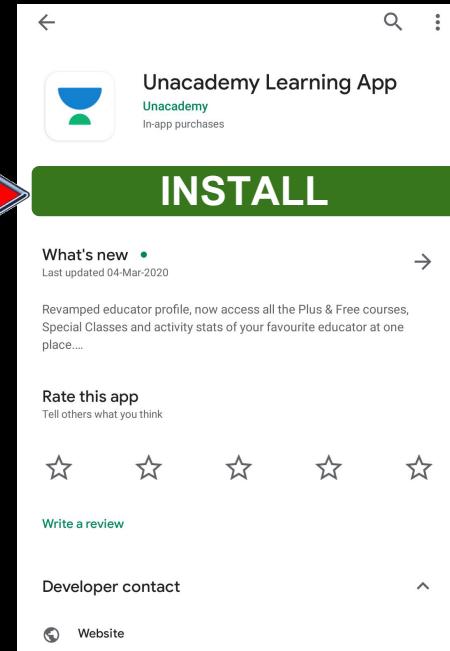
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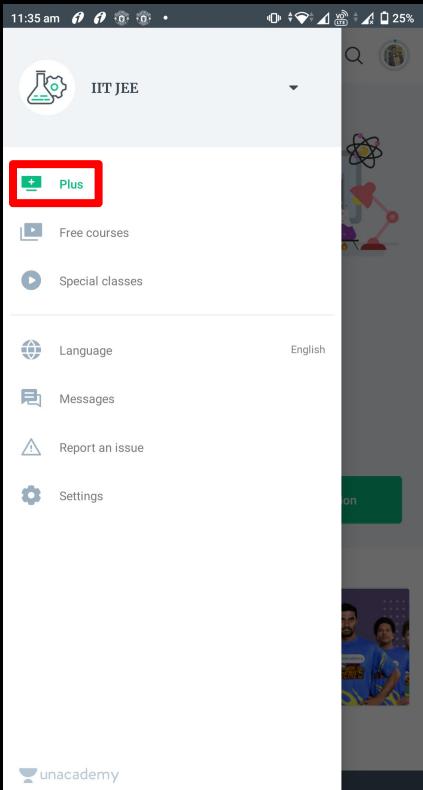
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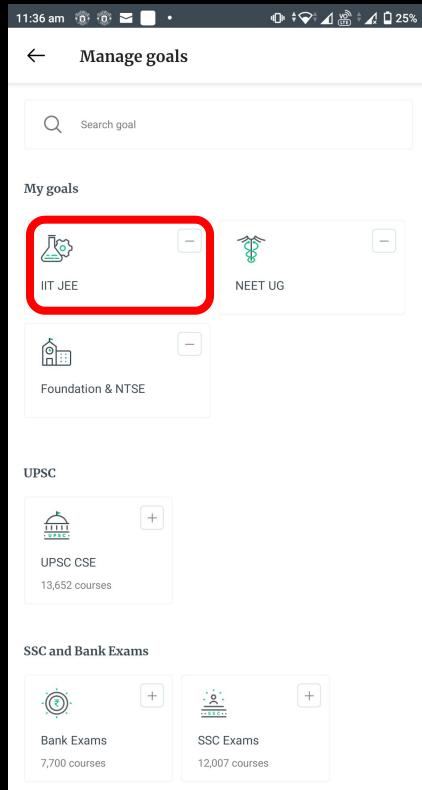
# Step 2



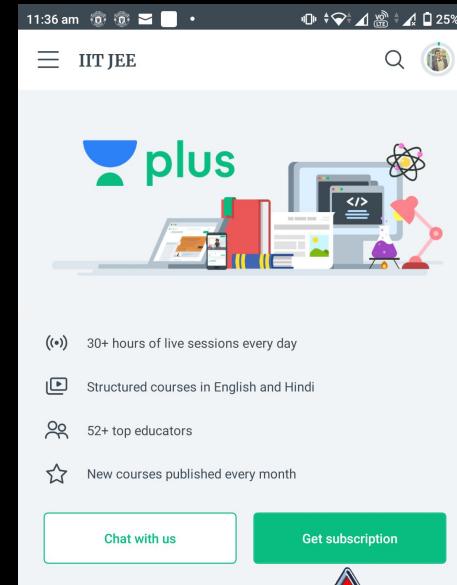
# Step 3



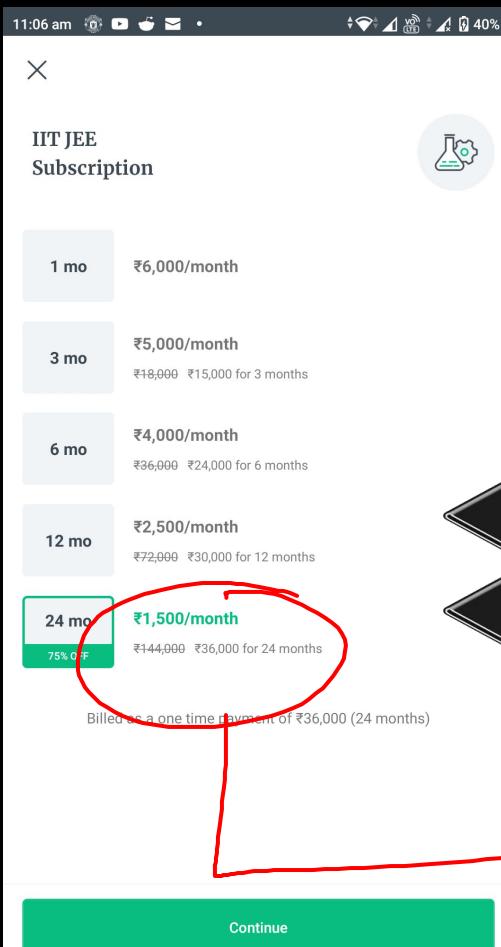
# Step 4



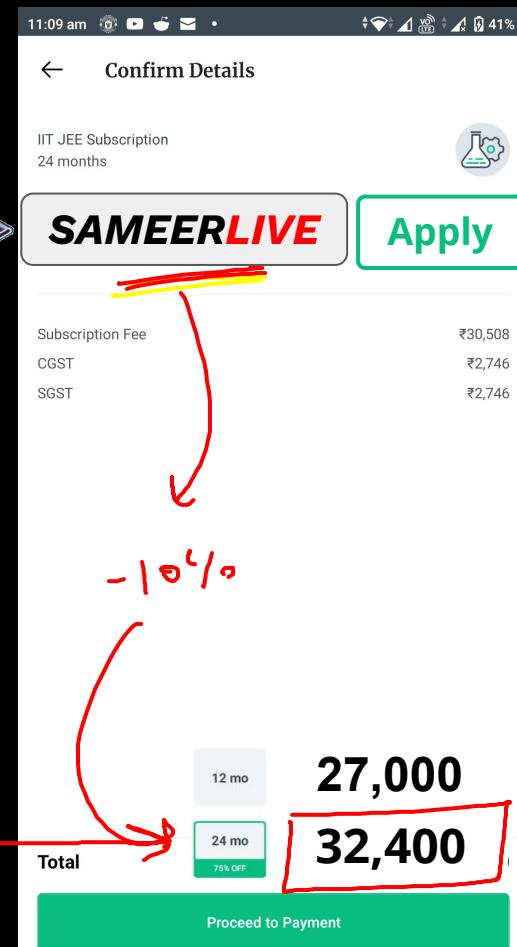
# Step 5



# Step 6



# Step 7





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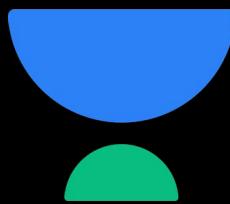


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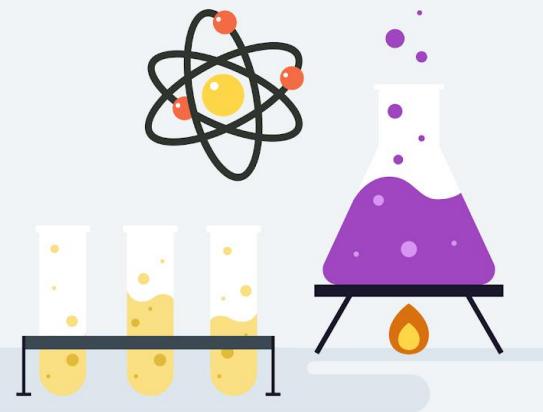
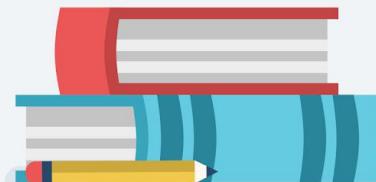




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