



# Functions

LECTURE

3

- 1. Rational Inequalities
- 2. Domain Questions



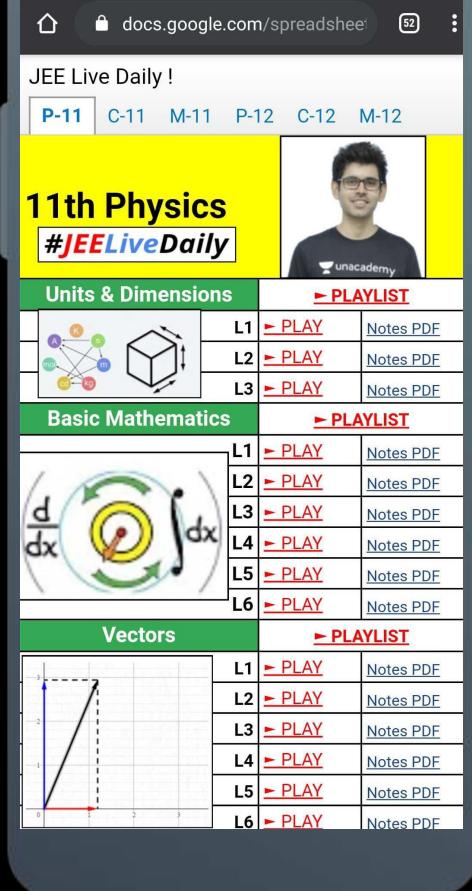
#*JEE*Live*Daily*



Sameer Chincholikar  
B.Tech, M.Tech - IIT-Roorkee

- ✓ 10+ years Teaching experience
- ✓ Taught 1 Million+ Students
- ✓ 100+ Aspiring Teachers Mentored

# tinyurl.com/jemobile



11:06 am 40%

IIT JEE Subscription

1 mo ₹6,000/month

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

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

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

**24 mo** ₹1,500/month  
₹36,000 ₹44,000 for 24 months  
**75% OFF**

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

11:09 am 41%

Confirm Details

IIT JEE Subscription  
24 months

**SAMEERLIVE** **Apply**

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

-10% -

**Total**

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

# Unacademy Subscription



# Functions

LECTURE

3

- 1. Rational Inequalities**
- 2. Domain Questions**

# Rational Inequalities

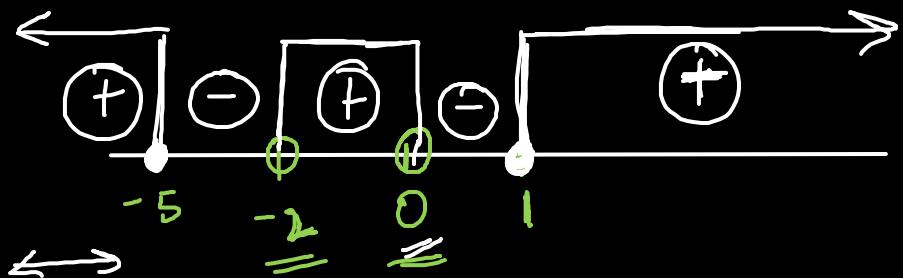




## Example

Solve for 'x' :  $\frac{(x-1)(x+5)}{x(x+2)} \geq 0$

- A.  $x \in (-\infty, -5] \cup [-2, 0] \cup [1, \infty)$
- B.  $x \in (-\infty, -5] \cup (-2, 0) \cup [1, \infty)$
- C.  $x \in (-\infty, -5] \cup [1, \infty)$
- D.  $x \in (-\infty, -5] \cup (-2, 0) \cup (1, \infty)$



$$(-\infty, -5] \cup (-2, 0) \cup [1, \infty)$$



## Example

Solve for 'x':  $\frac{(x)}{(x+4)} \leq \frac{(1)}{(x+1)}$

A.  $x \in [-4, -2] \cup [-1, 2]$

**B.**  $x \in (-4, -2] \cup (-1, 2]$

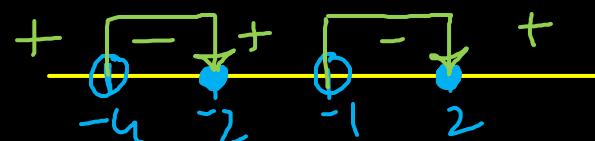
C.  $x \in (-\infty, -4) \cup (2, \infty)$

D.  $x \in (-\infty, -2) \cup (2, \infty)$

$$\frac{x}{x+4} - \frac{1}{x+1} \leq 0$$

$$\frac{(x-2)(x+2)}{(x+4)(x+1)} \leq 0$$

$$\frac{x(x+1) - (x+4)}{(x+4)(x+1)} \leq 0$$



$$x \in [-4, -2] \cup (-1, 2]$$

$$\frac{x^2 - 4}{(x+4)(x+1)} \leq 0$$



Example

Solve for 'x':  $\frac{(x+1)^4(x+3)}{(x-2)^3(x^2+1)} \geq 0$

$$\begin{array}{c} 8 > 4 \\ | \\ 4 > 2 \\ | \\ -8 < -4 \end{array}$$

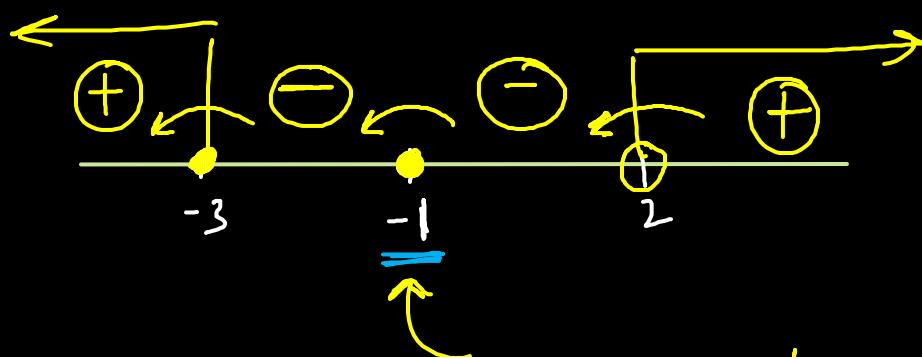
A.  $x \in [-3, -1] \cup [2, \infty)$

B.  $x \in [-\infty, -3] \cup [2, \infty)$

C.  $x \in (-\infty, -3] \cup (2, \infty) \cup \{-1\}$

D.  $x \in [-3, -1] \cup [-1, 2]$

$(x^2+1)$  is always  
+ve



$(x+1)^4$

greater or  
equal to

## Important points to remember

1. Sign of inequality changes on multiplying a negative number.

2. Never Cross multiply a variable.

3. We may cross multiply variable quantities if and only if we know its sign.



## Example

Number of positive integral values of x satisfying the inequality

( $x \neq 0$ )

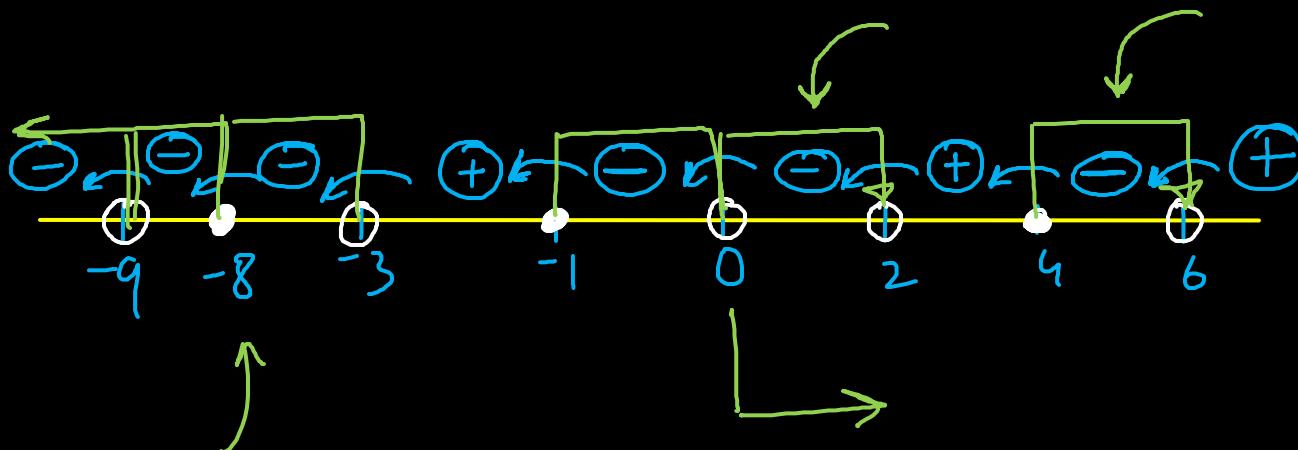
$$\frac{(x-4)^{2013} \cdot (x+8)^{2014} \cdot (x+1)}{x^{2016} \cdot (x-2)^3 \cdot (x+3)^5 \cdot (x-6) \cdot (x+9)^{2012}} \leq 0 \text{ is}$$

A. 0

B. 1

C. 2

D. 3



$$\boxed{x = \{1, 4, 5\}}$$



## Example

Solve for 'x':  $(x^2 - 6x + 3)(x^2 - 6x - 2) \leq 50$

A.  $x \in (-\infty, 2] \cup [4, \infty)$

B.  $x \in [-1, 7]$

C.  $\checkmark x \in [-1, 2] \cup [4, 7]$

D.  $x \in [2, 4]$

Let:  $\underline{(x^2 - 6x - 2)} = t$

$\checkmark \underline{(x^2 - 6x - 2 + 5)} = t+5$

$(t+5)(t) \leq 50$

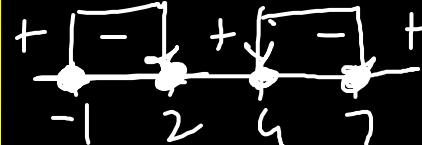
$t^2 + 5t - 50 \leq 0$

$(t + 10)(t - 5) \leq 0$

$$(x^2 - 6x - 2 + 10)(x^2 - 6x - 2 - 5) \leq 0$$

$$(x^2 - 6x + 8)(x^2 - 6x - 7) \leq 0$$

$$(x-2)(x-4)(x-7)(x+1) \leq 0$$



# Domain Questions





Example

Find the domain of following functions  $f(x) = \sqrt{\frac{(x^2 - 4)}{(x - 5)}}$

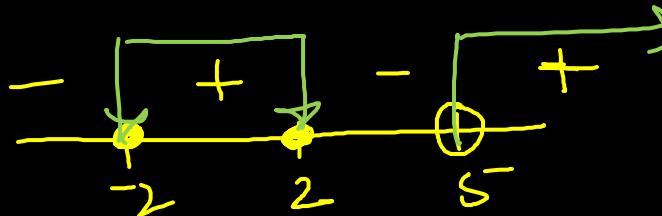
A.  $x \in [-2, 2] \cup [5, \infty)$

B.  $x \in [-2, 2] \cup (5, \infty)$

C.  $x \in (5, \infty)$

D.  $x \in \mathbb{R} - (-2, 2)$

$\frac{x^2 - 4}{x - 5} \geq 0$



✓  $\frac{(x-2)(x+2)}{(x-5)} \geq 0$



Example

Find the domain of following functions

A.  $x \in (0, \sqrt{3})$

C.  $x \in (-\sqrt{3}, 0)$

B.  $x \in (0, \sqrt{3}]$

D.  $x \in [-\sqrt{3}, 0)$

$$f(x) = \sqrt{2x+3} + \sqrt{\frac{3-x^2}{x}}$$

$$D = D_1 \cap D_2$$

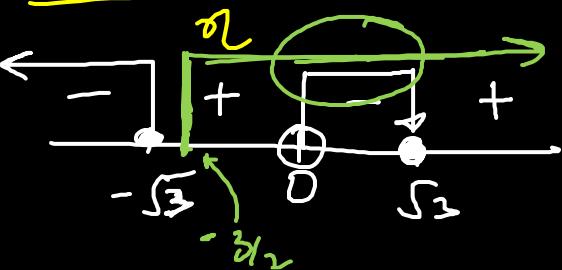
$D_1 : 2x+3 > 0$

$$x > -\frac{3}{2}$$

$D_2 : \frac{3-x^2}{x} > 0$

$$\frac{x^2-3}{x} \leq 0$$

$$\frac{(x-\sqrt{3})(x+\sqrt{3})}{x} \leq 0$$





## Example

Find the domain of following functions-  $f(x) = \frac{1}{\sqrt{(0.2)^{x^2+9x+5} - 125}}$

A.  $x \in \emptyset$

C.  $\checkmark x \in (-8, -1)$

B.  $x \in (-1, 0)$

D.  $x \in (-10, -5)$

$$\Rightarrow -n^2 - 9n - 5 > 3$$

$$\Rightarrow n^2 + 9n + 8 < 0$$

$$\Rightarrow (n+1)(n+8) \leq 0$$

$$\begin{array}{c} + \\ \diagdown \quad \diagup \\ - \quad + \\ \hline -8 \quad \uparrow \quad -1 \end{array}$$

$$(0.2)^{n^2 + 9n + 5} - 125 > 0$$

$$\left(\frac{1}{5}\right)^{n^2 + 9n + 5} > (5)^3$$

$$(5)^{-n^2 - 9n - 5} \geq (5)^3$$



## Example

Find the domain of following functions  $f(x) = \sqrt{4 - \sqrt{x^2 - 9}}$

A.  $(-\infty, -3] \cup [3, \infty)$

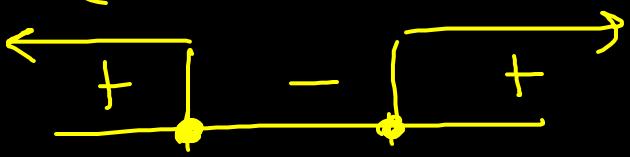
C.  $[-5, 5]$

B.  $[-5, -3] \cup [3, 5]$

D.  $(-5, -3] \cup [3, 5)$

$$x^2 - 9 \geq 0$$

$$(x-3)(x+3) \geq 0$$



$$[x \in (-\infty, -3] \cup [3, \infty)]$$

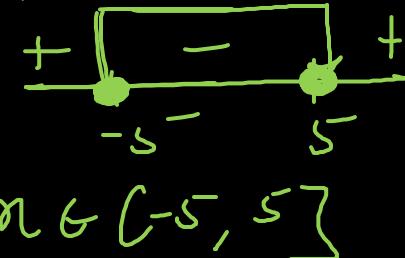
$$4 - \sqrt{x^2 - 9} \geq 0$$

$$4 \geq \sqrt{x^2 - 9}$$

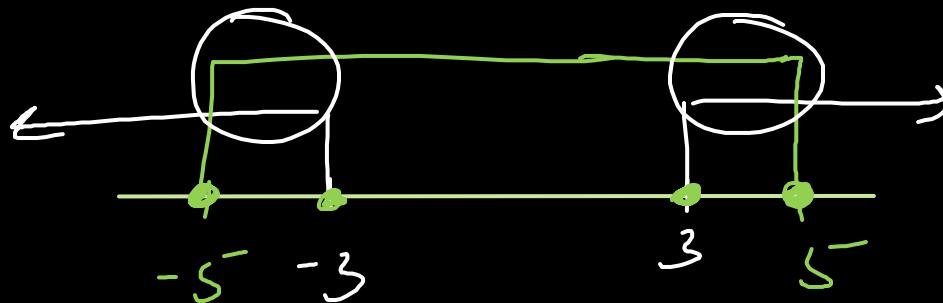
$$16 \geq x^2 - 9$$

$$x^2 - 25 \leq 0$$

$$(x-5)(x+5) \leq 0$$



$$x \in [-5, 5]$$



$$x \in [-5, -3] \cup [3, 5]$$

# MON - WED

11<sup>th</sup>



jee **LIVE** daily 2.0

7 PM

Namo Sir  
Physics



12<sup>th</sup>



jee **LIVE** quiz 2.0

4 PM

Nishant Sir  
Maths



8 PM

Paaras Sir  
Chemistry



5 PM

Anupam Sir  
Chemistry



9 PM

Sameer Sir  
Maths



6 PM

Jayant Sir  
Physics



# THURS - SAT

12<sup>th</sup>  jee **LIVE** daily 2.0

**7 PM** Jayant Sir  
Physics



**8 PM** Anupam Sir  
Chemistry



**9 PM** Nishant Sir  
Maths



11<sup>th</sup>  jee **LIVE** quiz 2.0

**4 PM** Sameer Sir  
Maths



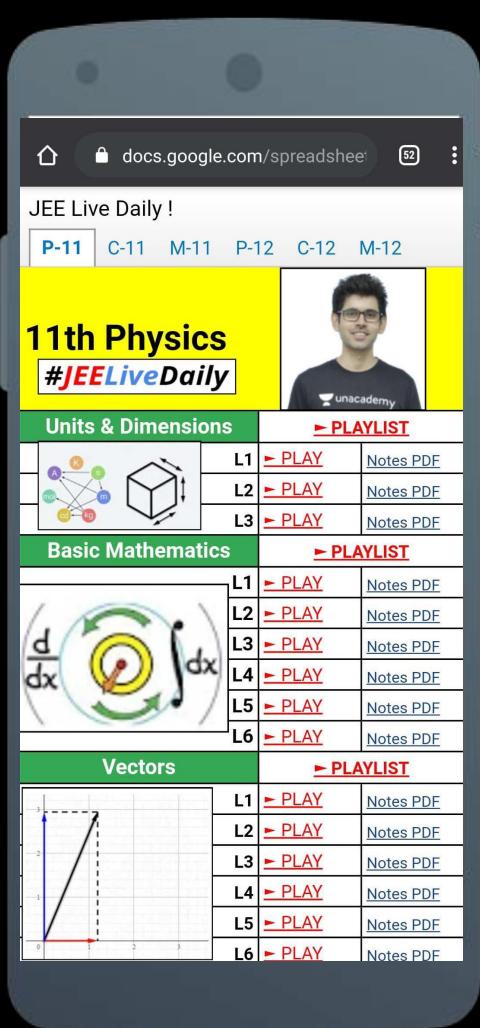
**5 PM** Paaras Sir  
Chemistry



**6 PM** Namo Sir  
Physics



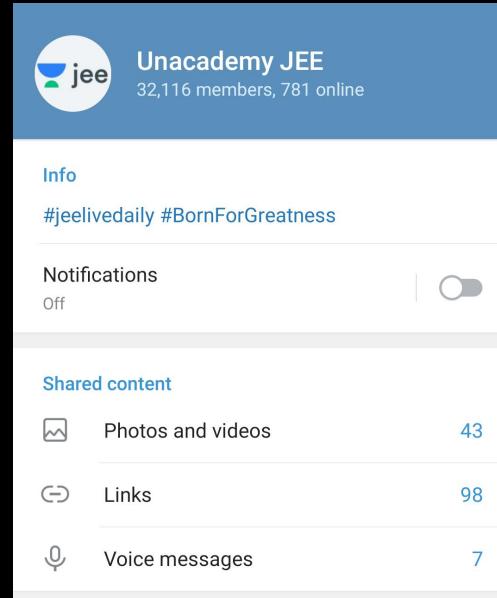
# tinyurl.com/jemobile





# Telegram APP

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



A screenshot of a Telegram group info page. The header shows the group name "Unacademy JEE" with 32,116 members and 781 online. Below the header, there's an "Info" section with the hashtags "#jeelivedaily #BornForGreatness". Under "Notifications", the switch is set to "Off". The "Shared content" section shows three categories with counts: Photos and videos (43), Links (98), and Voice messages (7). The background of the page is light blue.

Category	Count
Photos and videos	43
Links	98
Voice messages	7

# Unacademy Subscription

+ LIVE Classes

+ Interact with Educator

+ Live polls & Leaderboard

+ Test Series & Analysis

+ LIVE Doubt Clearing Sessions

The screenshot shows a live question from Rohit Sachan. The question asks for the structure of the major product X in a reaction between 4-nitrophenyl isocyanide and  $\text{FeCl}_3$ . The reaction scheme shows the nitrophenyl ring attacking the iron center, displacing a chloride ion. A handwritten note on the right side of the screen shows the mechanism:  $\text{E}^+ \rightarrow$  attacks on  $\epsilon$  rich system. It also shows the resulting product X with arrows indicating electron movement and labels like "e<sup>-</sup> deficient".

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

Q. In the following reaction,  $\text{FeCl}_3$  reacts with  $\text{X}$ , the structure of the major product  $\text{X}$  is -

16.  $\text{C}_6\text{H}_5\text{NCO} + \text{FeCl}_3 \rightarrow \text{X}$  (BIT-47)

Handwritten notes:

$\text{NO}_2^+$   
 $\text{E}^+ \rightarrow$  attacks on  
 $\epsilon$  rich system

$\text{HNO}_3 / \text{H}_2\text{SO}_4$

Disclaimer: The content is provided by the Learner and is reproduced by Unacademy. Unacademy disclaims any and all liability with regard to the Content.

The screenshot shows a test results summary. It includes a bar chart for Physics, a score of 88/120, and an accuracy of 73%. The interface also features sections for "View solutions" and "Share your results".

View solutions Share your results

Physics Chemistry Mathematics

Physics

Score 88/120 Accuracy 73%

NEGATIVE MARKING

YOU MISSED 0

# + India's BEST Educators

# Unacademy Subscription



HINDI PHYSICS  
Course on Units & Dimensions and Basic Mathematics

Starts on Apr 1, 3:00 PM • 10 lessons  
Namo Kaul



EMERGE for Class 11: JEE Main & Advanced 2022

Starts on Apr 1, 3:00 PM  
Anupam Gupta and 4 more



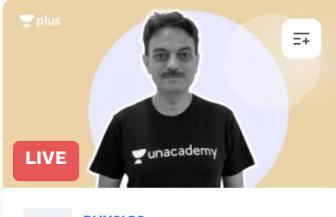
EVOLVE for Class 12: JEE Main & Advanced 2021

Starts on Apr 1, 11:30 AM  
Anupam Gupta and 3 more



EMERGE for Class 11: JEE Main & Advanced 2022

Starts on Apr 20, 4:00 PM  
Brijesh Jindal and 3 more



Complete Course on Physics for Class 11

Starts on Apr 2, 2020 • 11 lessons  
D C Pandey

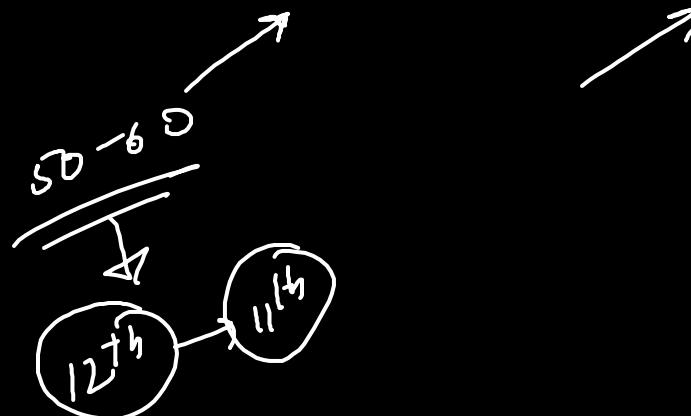
Question from ROHIT SACHAN:  
Sir please solve the one more doubt...

Chemical reaction diagram: A nitro group ( $\text{NO}_2^+$ ) attacks a benzene ring in an  $\text{e}^-$  rich system.

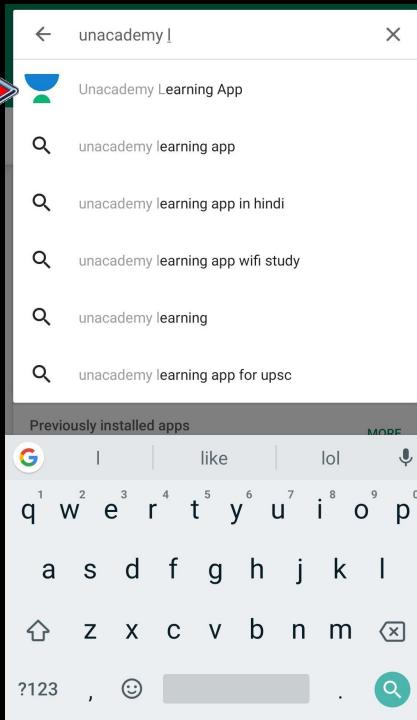
Participants:

- Siriran Dutta Chaudhuri nitration
- Rohit Sachan Sir B aa rha mera
- Siriran Dutta Chaudhuri right
- Shoaib Alam Left
- Vsvsgsg Right
- Prashant Singh joined
- Rohit Sachan Left

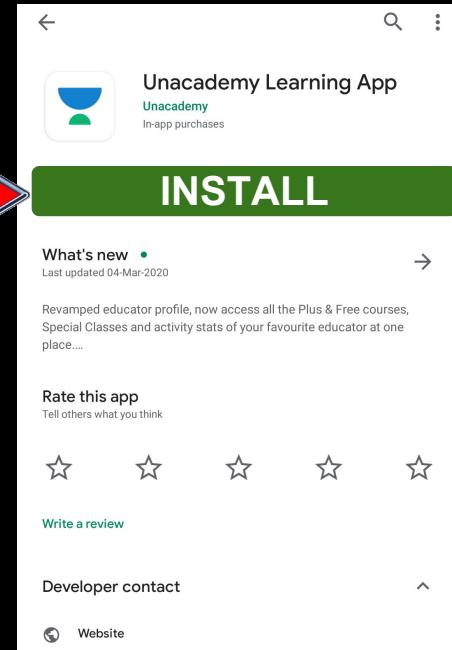
Chemical structure: A benzene ring with a nitro group ( $\text{NO}_2$ ) and a substituent.



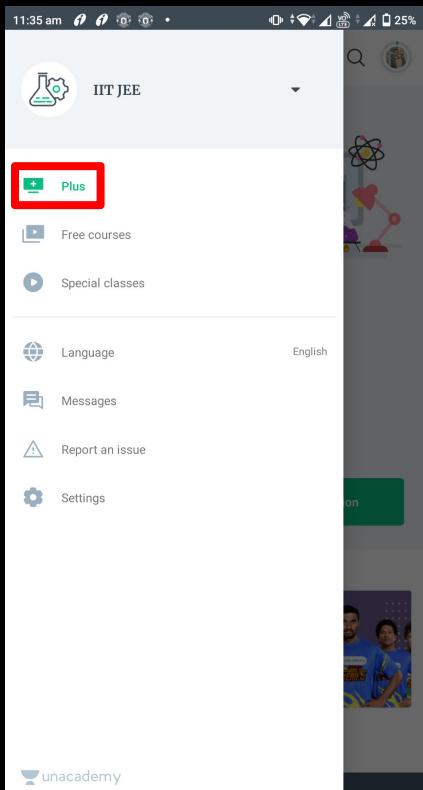
# Step 1



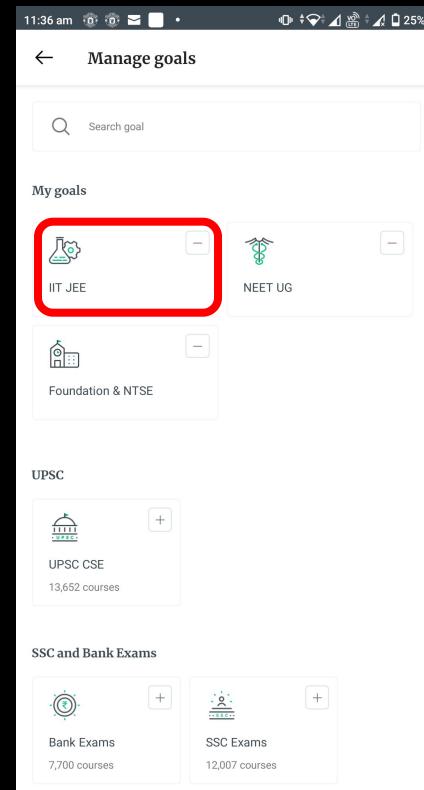
# Step 2



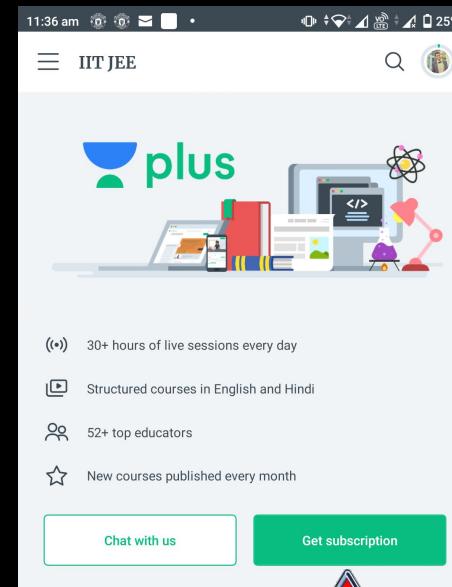
# Step 3



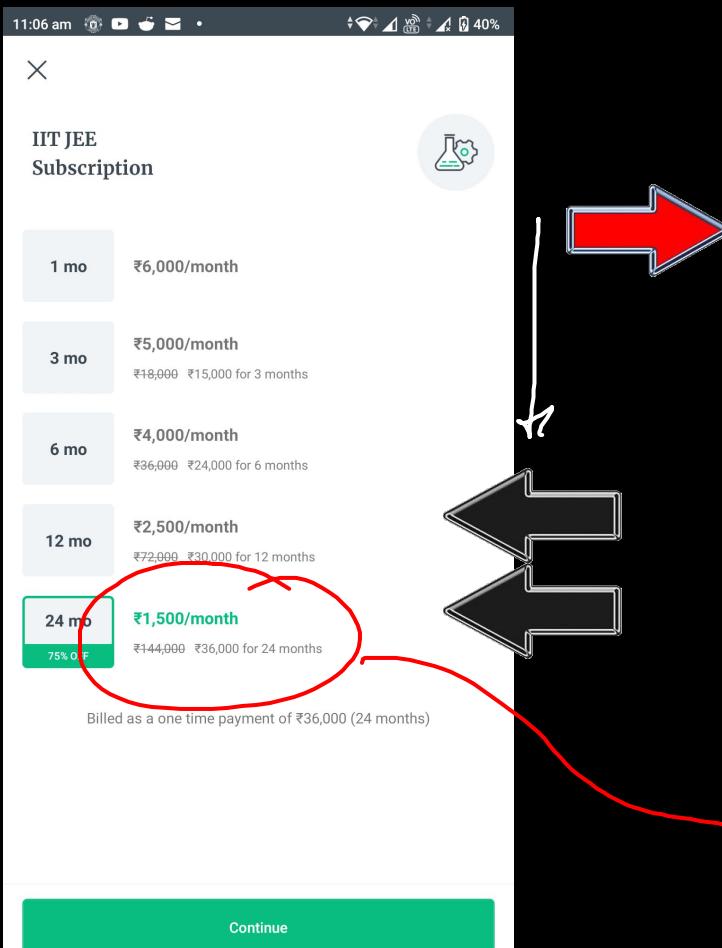
# Step 4



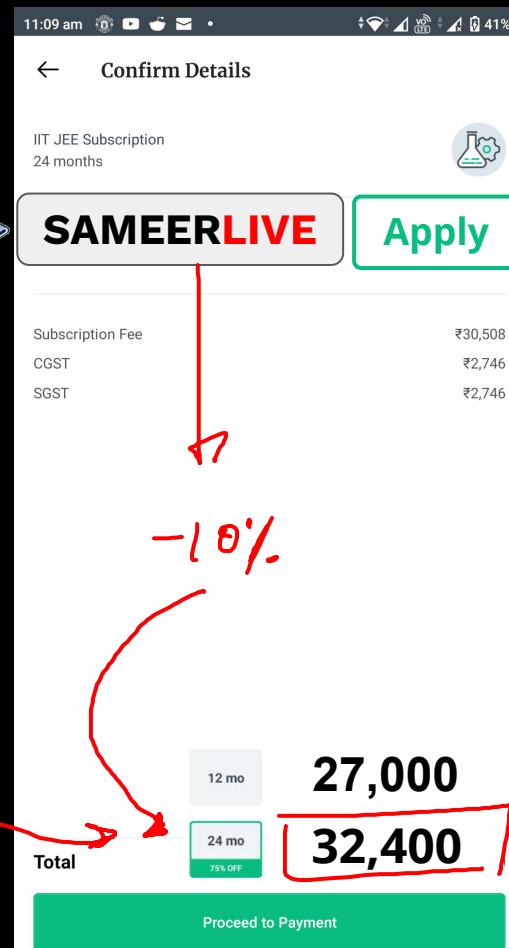
# Step 5



# Step 6

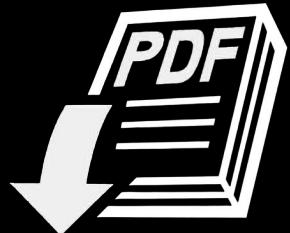


# Step 7





#*JEE**LiveDaily*



Download Now !

# Let's Crack it!



School at Unacademy

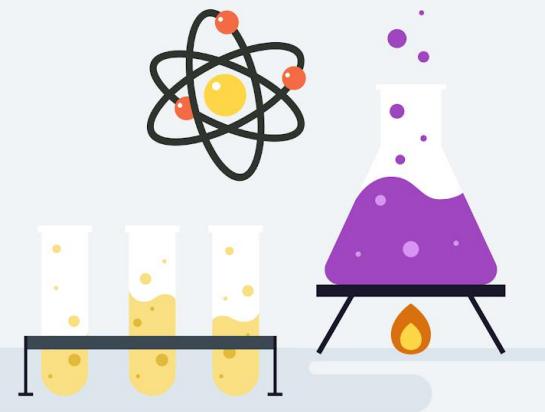
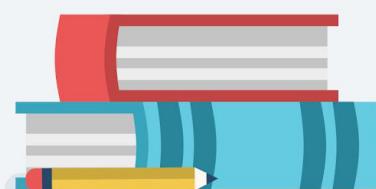




Use Referral Code

**SAMEERLIVE**

GET 10%  
OFF!



on your next **Unacademy Subscription**