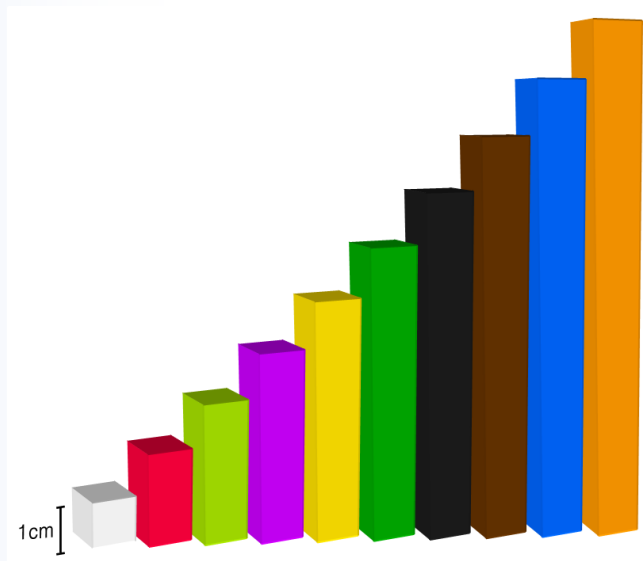


# Arithmetic Progression – 1

## Sequences & Series

1



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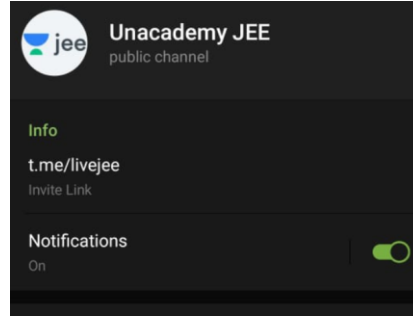
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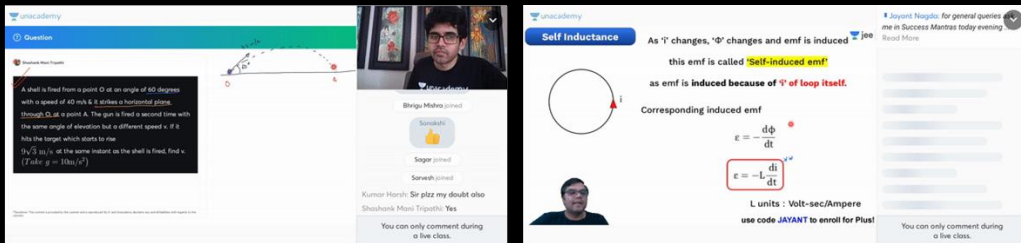
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A shell is fired from a point O at an angle of 60 degrees with a speed of 40 m/s & it strikes a horizontal plane through O at a point A. The gun is fired a second time with the same angle of elevation but a different speed  $v$ . If it hits the target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

Shreyas Mishra joined

Sagar joined

Saravali joined

Kumar Harsh: Sir plz my doubt also

Shashank Masi Tripathi: Yes

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**Self Inductance**

As  $\Phi$  changes,  $\frac{d\Phi}{dt}$  changes and emf is induced

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

as emf is induced because of  $\Phi$  of loop itself.

Corresponding induced emf

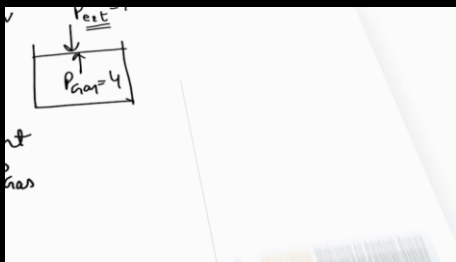
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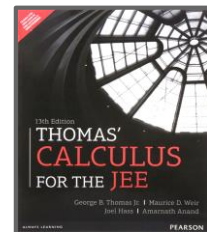
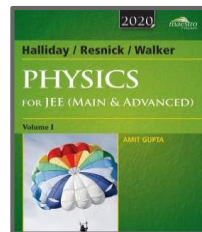
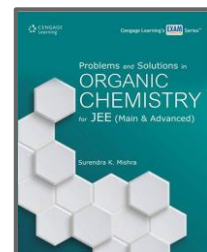
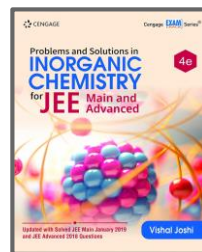
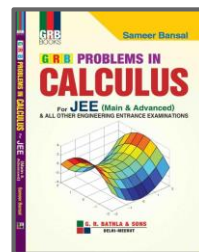
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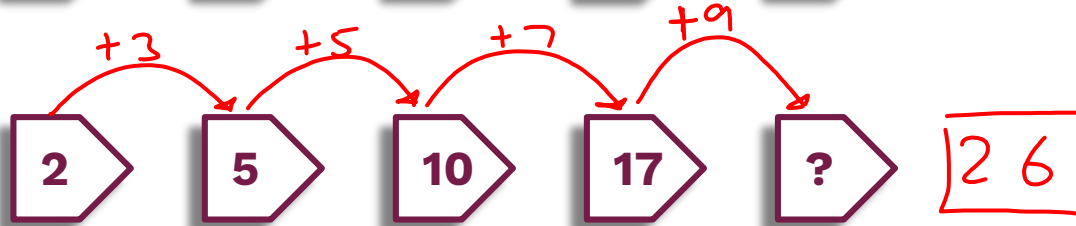
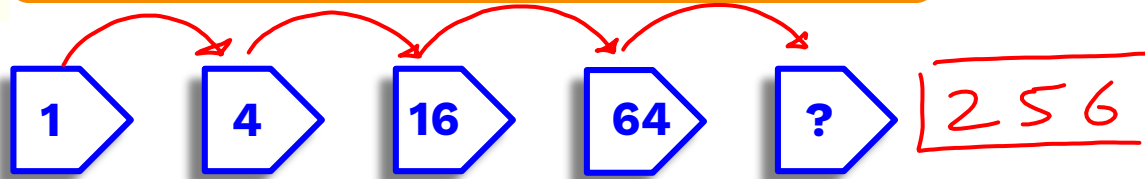
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# Sequences & Series



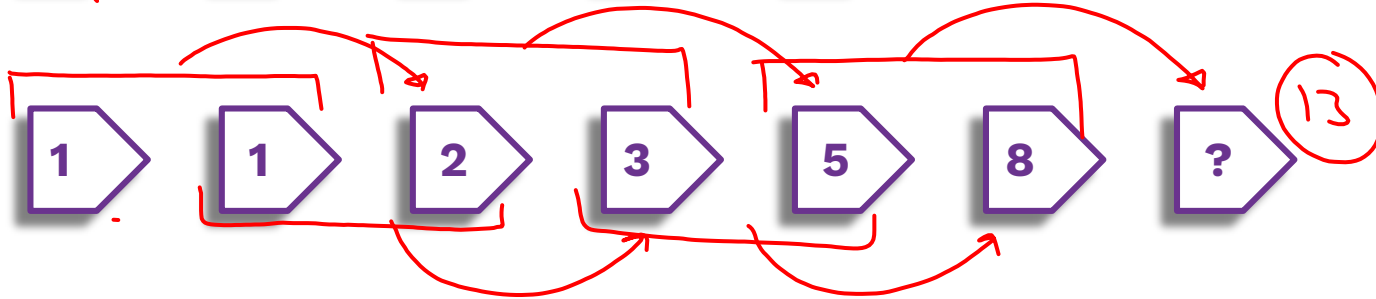


Can you find the next number?



Handwritten formula:  $n^2 + 1$

Green checkmarks indicate the formula is correct.



# Arithmetic Progression





## Arithmetic Progression (A.P.)

AP is a sequence whose terms increase or decrease by a fixed number. This fixed number is called the common difference.

**Eg:** 1, 4, 7, 10, 13.....

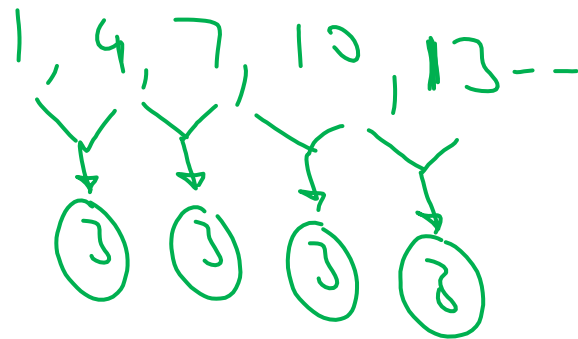
$$d = 3$$

**Eg:** 4, 2, 0, -2, -4, .....

$$d = -2$$

**Eg:** 3, 3, 3, 3, 3.....

$$d = 0$$







## General term of A.P.

If **a** is the first term and **d** the common difference, of AP

$$a, (a+d), (a+2d), (a+3d) \dots$$

Diagram illustrating the terms of an Arithmetic Progression (A.P.):

- $a$  is the first term, labeled  $T_1$ .
- $(a+d)$  is the second term, labeled  $T_2$ .
- $(a+2d)$  is the third term, labeled  $T_3$ .
- $(a+3d)$  is the fourth term, labeled  $T_4$ .

Arrows indicate the common difference  $d$  between consecutive terms:  $a \xrightarrow{+d} (a+d) \xrightarrow{+d} (a+2d) \xrightarrow{+d} (a+3d)$ .

$$T_n = a + (n-1)d$$



If 9 times the 9<sup>th</sup> term of an AP is equal to 13 times the 13<sup>th</sup> term, then the 22<sup>nd</sup> term of the AP is

~~A.~~ 0

B. 22

C. 198

D. 220

$$9(T_9) = 13(T_{13})$$

$$\Rightarrow 9(a + 8d) = 13(a + 12d)$$

$$\Rightarrow 9a + 72d = 13a + 156d$$

$$\Rightarrow \boxed{4a + 84d = 0}$$

$$a + 21d = 0 \text{ --- (1)}$$

Now.

$$\begin{aligned} T_{22} &= a + (22-1)d \\ &= a + 21d \\ &= 0 \end{aligned}$$



Find the number of terms in the sequence 4, 12, 20, ..... 108

A. 12

B. 13

☒ C. 14

D. 15

4, 12, 20, -----, 108  
↓  
 $T_n$

$$a = 4 ; d = 8$$

$$T_n = a + (n-1)d$$

$$108 = 4 + (n-1)8$$

$$\frac{104}{8} = (n-1)$$

$$13 + 1 = n$$

$$\boxed{n = 14}$$





The number of numbers lying between 100 and 500 that are divisible by 7 but not by 21 is

A. 57

B. 19

is  
✓ 38

**D. None of these**

Handwritten work for the division problem  $14 \overline{) 100}$ . The quotient is 7, and the remainder is 30. The remainder 30 is then divided by 7, resulting in a quotient of 4 and a remainder of 2. The final result is 2 + 5.

$$21 = 7 \times 3$$

$$\begin{array}{r} 71 \\ 7 \overline{) 500} \\ \underline{49} \phantom{0} \\ 10 \\ \underline{7} \\ 3 \end{array}$$

$$T_n = a + (n-1)d$$
$$497 = 105 + (n-1)7$$

$$\frac{392}{7} + 1 = n$$

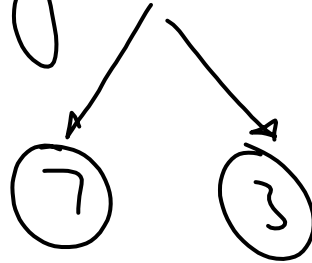
$\downarrow$   
 $T_n$



$$\Rightarrow n = 56 + 1$$

$$\boxed{n = 57}$$

Now. nos divisible by 21 also:



$$= \frac{1}{3}(57) = 19$$

(Required  
count)

$$= 57 - 19$$

$$= \boxed{38}$$





If  $a_1, a_2, a_3, \dots, a_n$  are in A.P., where  $a_i > 0$  for all  $i$ , then

$$\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \dots + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a_n}} =$$

✓ A.  $\frac{n-1}{\sqrt{a_1} + \sqrt{a_n}}$

B.  $\frac{n-3}{\sqrt{a_1} + \sqrt{a_n}}$

C.  $\frac{n}{\sqrt{a_1} + \sqrt{a_n}}$

D. None of these

$a_1, a_2, a_3, \dots, a_n \rightarrow \text{A.P.}$

$a_2 - a_1 = d$     $a_3 - a_2 = d$     $\dots$     $a_n - a_{n-1} = d$

$$= \frac{(\sqrt{a_1} - \sqrt{a_2})}{(\sqrt{a_1} + \sqrt{a_2})(\sqrt{a_1} - \sqrt{a_2})} + \frac{(\sqrt{a_2} - \sqrt{a_3})}{(a_2 - a_3)}$$

$$= \left( \frac{\sqrt{a_1} - \sqrt{a_2}}{a_1 - a_2} \right) + \left( \frac{\sqrt{a_2} - \sqrt{a_3}}{-d} \right) + \dots$$

$$= \frac{\sqrt{a_1} - \sqrt{a_2}}{(-d)}$$

$$a_n = a_1 + (n-1)d$$

$$\frac{a_n - a_1}{d} = (n-1); \boxed{\frac{a_1 - a_n}{(-d)} = (n-1)}$$

Now.

$$= \frac{\sqrt{a_1} - \sqrt{a_2}}{-d} + \frac{\sqrt{a_2} - \sqrt{a_3}}{-d} + \dots + \frac{\sqrt{a_{n-1}} - \sqrt{a_n}}{-d}$$

$$= \left( \frac{1}{-d} \right) \left[ \sqrt{a_1} - \cancel{\sqrt{a_2}} + \cancel{\sqrt{a_2}} - \cancel{\sqrt{a_3}} + \dots + \cancel{\sqrt{a_{n-1}}} - \sqrt{a_n} \right]$$

$$= \left( \frac{1}{-d} \right) \left[ \sqrt{a_1} - \sqrt{a_n} \right] \rightarrow \left( \frac{1}{-d} \right) \left( \frac{a_1 - a_n}{\sqrt{a_1} + \sqrt{a_n}} \right) \rightarrow \left( \frac{(n-1)}{\sqrt{a_1} + \sqrt{a_n}} \right)$$



The number of terms common to two A.P.s 3, 7, 11, ..., 407 and 2, 9, 16, ....., 709 is

A. 12

B. 13

✓ C. 14

D. 15

$d_1 = 4$  : 3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, ...

$d_2 = 7$  : 2, 9, 16, 23, 30, 37, 44, 51, 58, ...

Common term ka A.P :  $d = L \cdot (M \cdot (d_1, d_2))$



Now.

23, 51, - - - -  $T_n$

$$T_n < 407$$

$$23 + (n-1)28 < 407$$

$$(n-1) < \frac{384}{28}$$

$$(n-1) < \frac{96}{7}$$

$$n-1 < 13.714 \dots$$

$$n < 14.714 \dots$$

$$\therefore n = 14$$





## Sum of n terms of A.P.

$$S_n = (a) + (a+d) + (a+2d) + \dots + (a+(n-1)d)$$
$$S_n = (a+(n-1)d) + (a+(n-2)d) + \dots + a$$

---

$$2S_n = [2a+(n-1)d] + [2a+(n-1)d] + \dots + [2a+(n-1)d]$$

$$2S_n = n[2a+(n-1)d]$$

$$S_n = \frac{n}{2} (2a + (n-1)d)$$

$$S_n = \frac{n}{2} (a + \underbrace{a + (n-1)d})$$

$$S_n = \frac{n}{2} (a + l)$$



The sum of all two digit numbers which when divided by 4, yield unity as remainder, is

A. 1100

B. 1200

☒ C. 1210

D. None of these

one

13, 17, 21, ..., 97

$$\boxed{a=13}, \boxed{d=4}; T_n=97$$

$$T_n = 13 + (n-1)4 = 97$$

$$(n-1) = \frac{84}{4}$$

$$\rightarrow \boxed{n=22}$$

$$S_{22} = \frac{22}{2}(13+97) \\ = 11(110) = \boxed{1210}$$







The  $S_n$  denote the sum of the first  $n$  terms of an AP, if  $S_{2n} = 3S_n$ , then  $S_{3n} : S_n$  is equal to

A. 4

✓ B. 6

C. 8

D. 10

$$S_{2n} = 3S_n$$

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

$$4a + 4nd - 2d = 6a + 3nd - 3d$$

$$\Rightarrow 2a - nd - d = 0 \Rightarrow \boxed{(2a - d) = nd} \text{ --- (1)}$$

Now.

$$\frac{S_{3n}}{S_n} = \frac{\cancel{\left(\frac{3n}{2}\right)}(2a + \overbrace{(3n-1)d})}{\cancel{\left(\frac{n}{2}\right)}(2a + \underbrace{(n-1)d})}$$

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

using Eq<sup>n</sup>.

$$\frac{3(nd + 3nd)}{(nd + nd)} = \textcircled{6}$$







If the sum of first  $n$  terms of two A.P.'s are in the ratio  
 $3n + 8 : 7n + 15$ , then the ratio of their 12<sup>th</sup> term is

- A.  $8 : 7$     ☒ B.  $7 : 16$     C.  $74 : 169$     D.  $13 : 47$

$$\begin{cases} 1^{\text{st}} \text{ AP} : a_1, d_1, (S_n)_1 \\ 2^{\text{nd}} \text{ AP} : a_2, d_2, (S_n)_2 \end{cases}$$

$$\frac{(S_n)_1}{(S_n)_2} = \frac{\cancel{\left(\frac{n}{2}\right)}(2a_1 + (n-1)d_1)}{\cancel{\left(\frac{n}{2}\right)}(2a_2 + (n-1)d_2)} = \left( \frac{3n+8}{7n+15} \right) \quad \text{--- (1)}$$

Now:

$$\frac{(T_{12})_1}{(T_{12})_2} = \left( \frac{a_1 + 11d_1}{a_2 + 11d_2} \right)$$

using eq<sup>n</sup> ①:

$$\frac{a_1 + \left( \frac{n-1}{2} \right) d_1}{a_2 + \left( \frac{n-1}{2} \right) d_2} = \left( \frac{3n+8}{7n+15} \right)$$

$n = 23$

$$\Rightarrow \frac{a_1 + 11d_1}{a_2 + 11d_2} = \frac{3 \times 23 + 8}{7 \times 23 + 15}$$

$$= \frac{69 + 8}{161 + 15}$$

$$= \frac{77}{176} = \left( \frac{7}{16} \right)$$



The sum of integers from 1 to 100 that are divisible by 2 or 5 is

A. 2150

B. 3050

C. 2500

D. None of these

HW-1







# #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

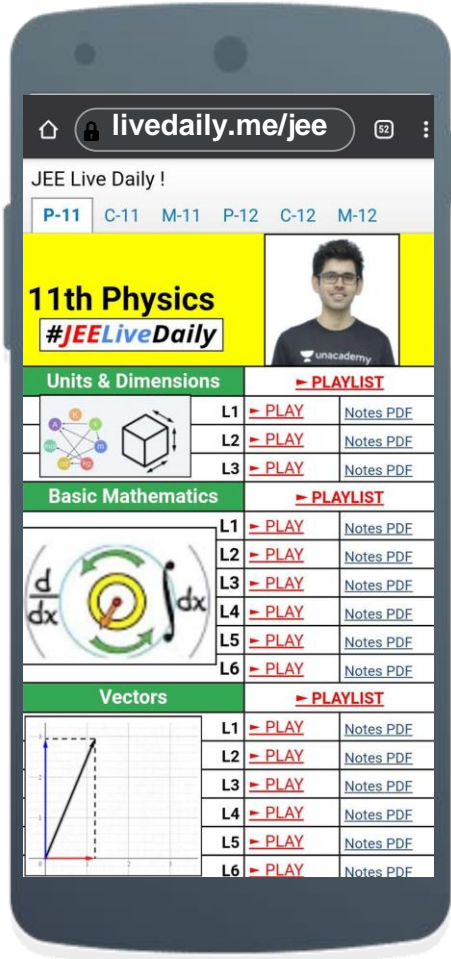
3:00 - 4:30 PM



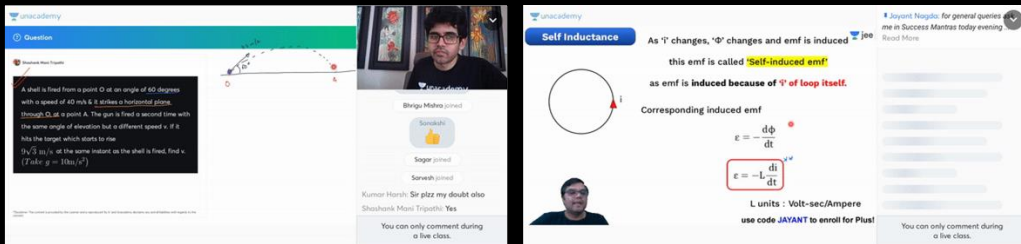
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4:30 - 6:00 PM

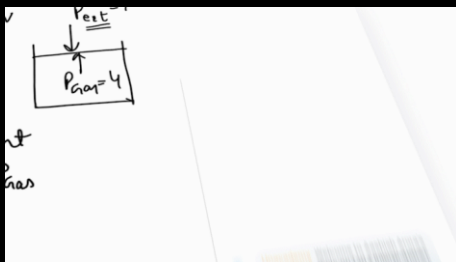
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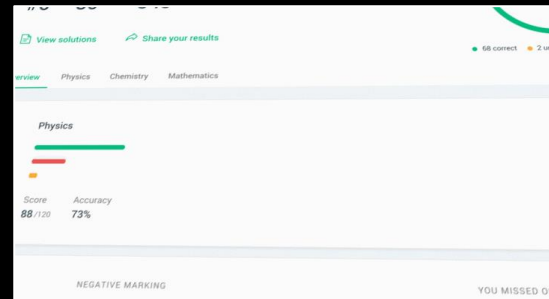
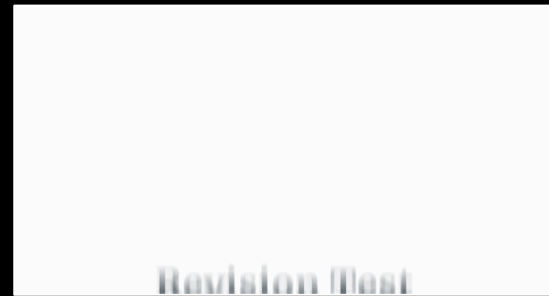


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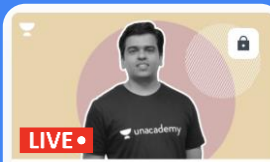


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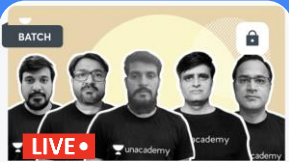
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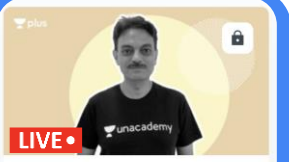
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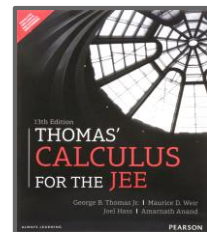
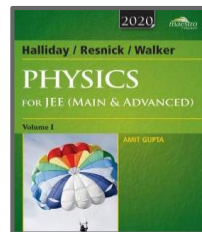
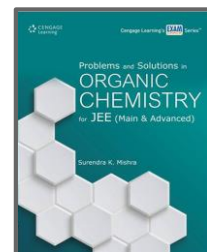
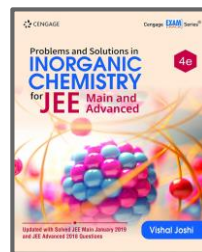
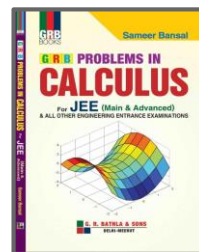
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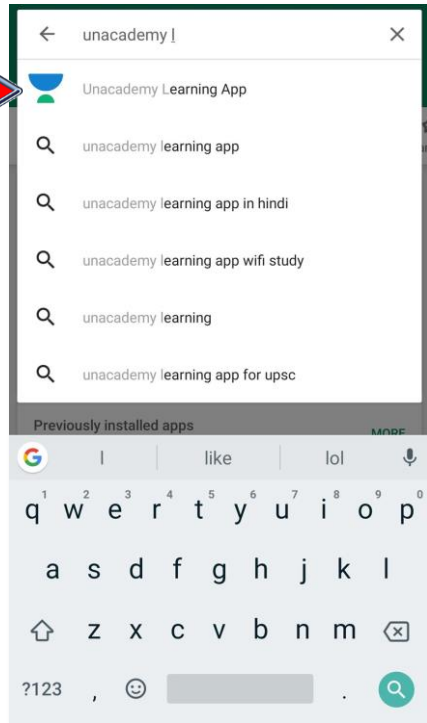


Naman Goyal  
98.48

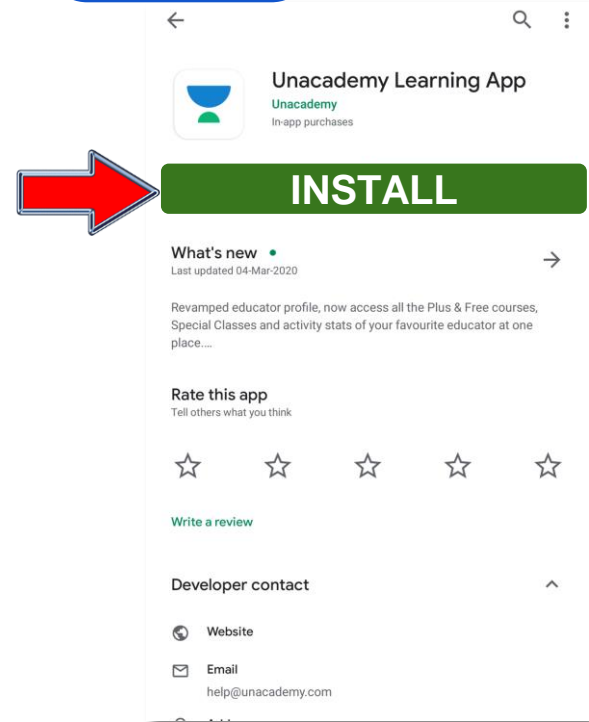


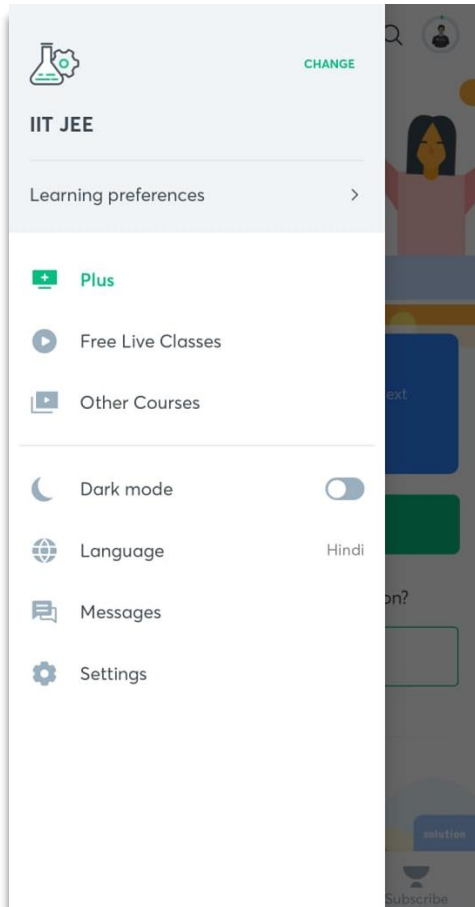
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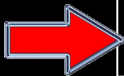
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