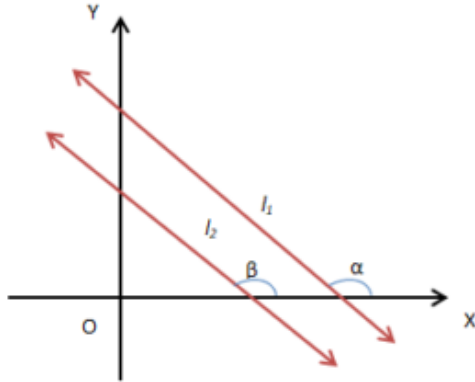


## Section Formula

# Straight Lines

2



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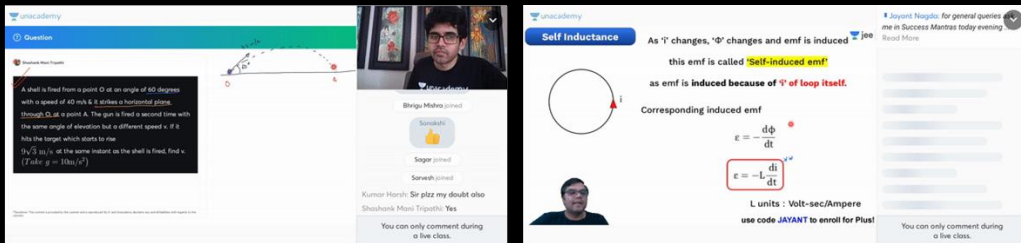
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A shell is fired from a point O at an angle of 60 degrees with a speed of 40 m/s. It strikes a horizontal plane through O at a point A. The gun is fired a second time with the same angle of elevation but a different speed  $v$ . If it hits the target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

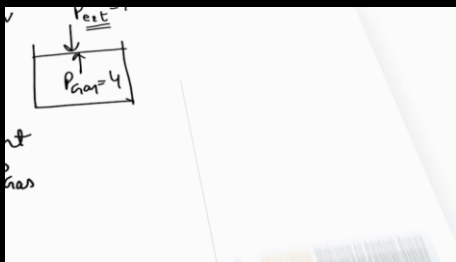
$$\mathcal{E} = -\frac{d\Phi}{dt}$$

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

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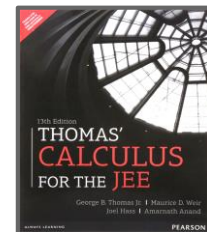
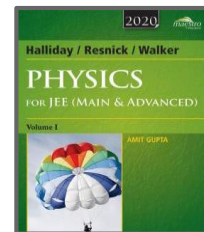
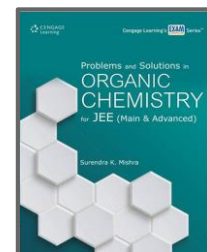
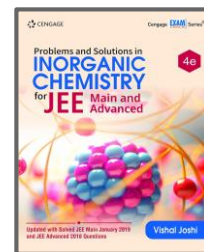
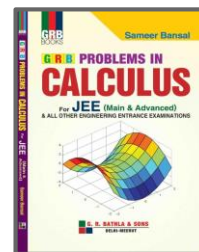
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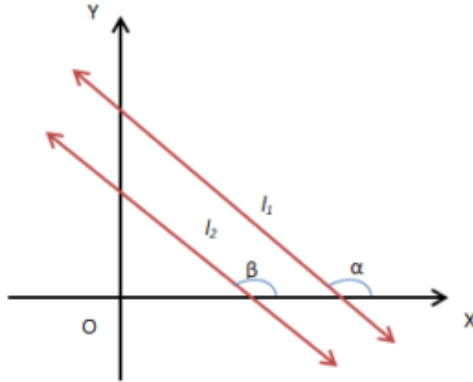


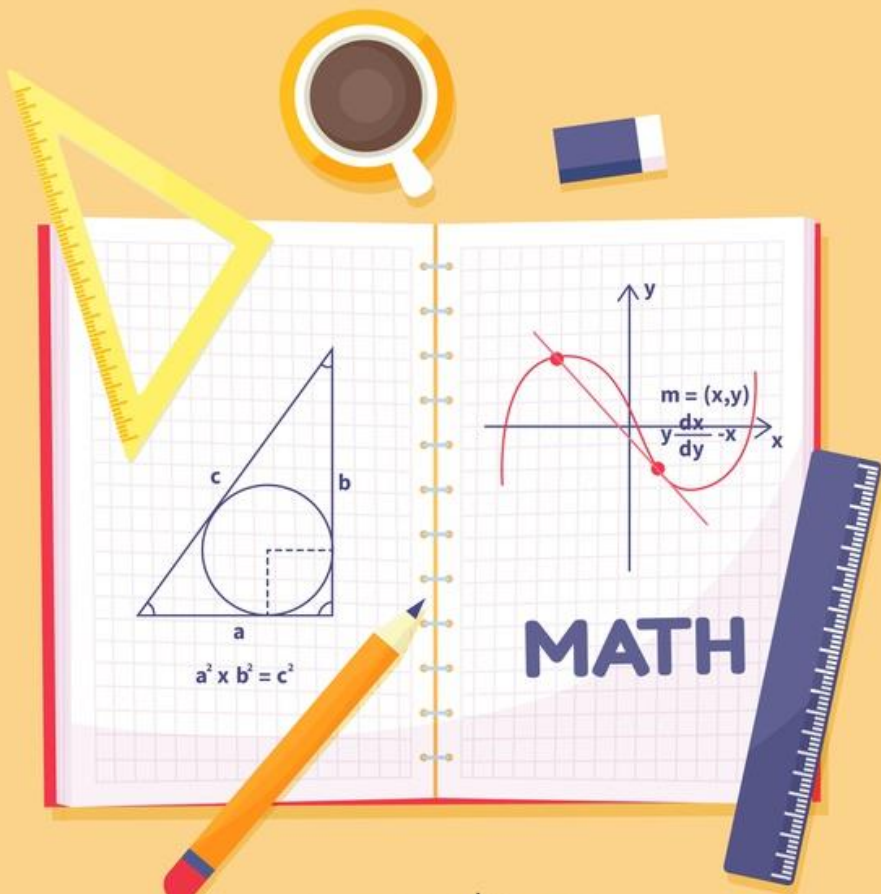


## Section Formula

# Straight Lines

2

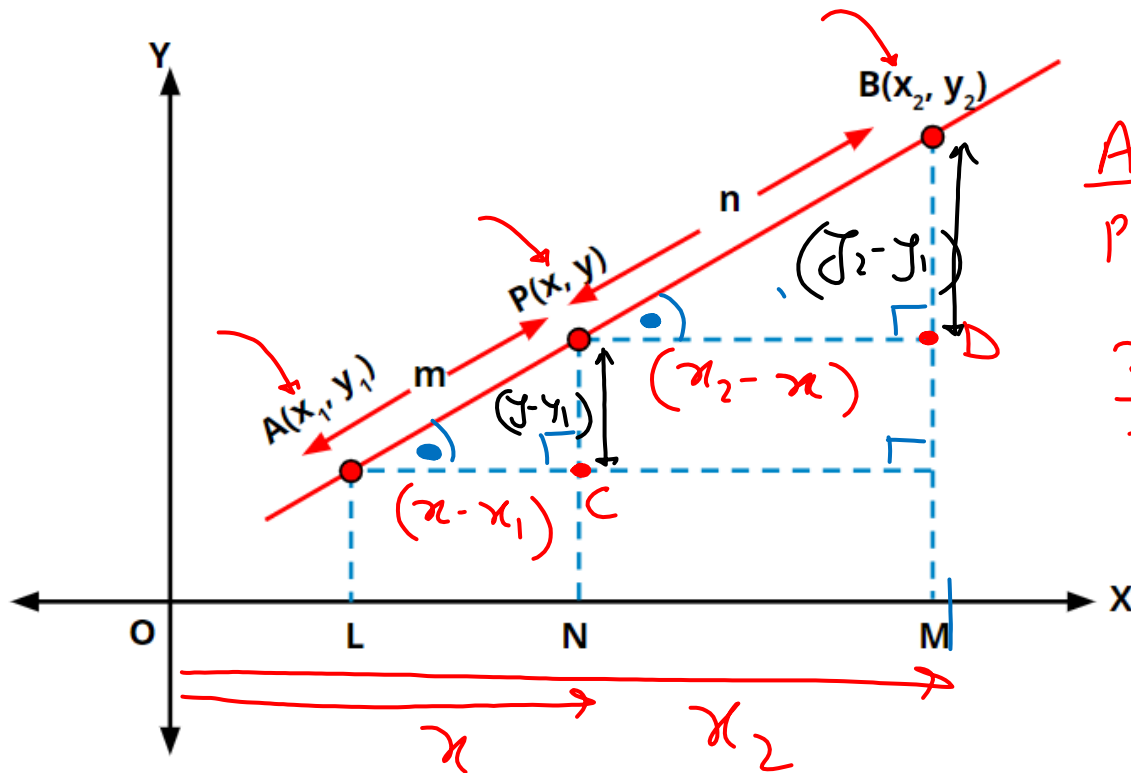




# Section Formula



## Section Formula: Internal Division



$$\frac{AC}{PD} = \frac{m}{n}$$

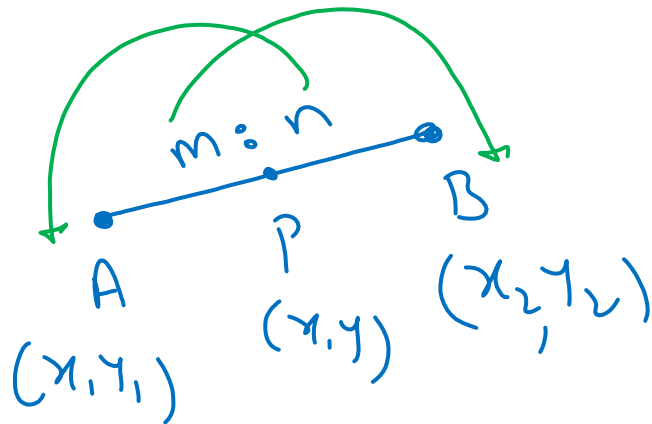
$$\frac{x - x_1}{x_2 - x} = \frac{m}{n}$$

$$nx - nx_1 = mx_2 - mx_1$$

$$(m+n)x = mx_2 + nx_1$$

$$x = \frac{mx_2 + nx_1}{m+n}$$

$$y = \frac{my_2 + ny_1}{m+n}$$





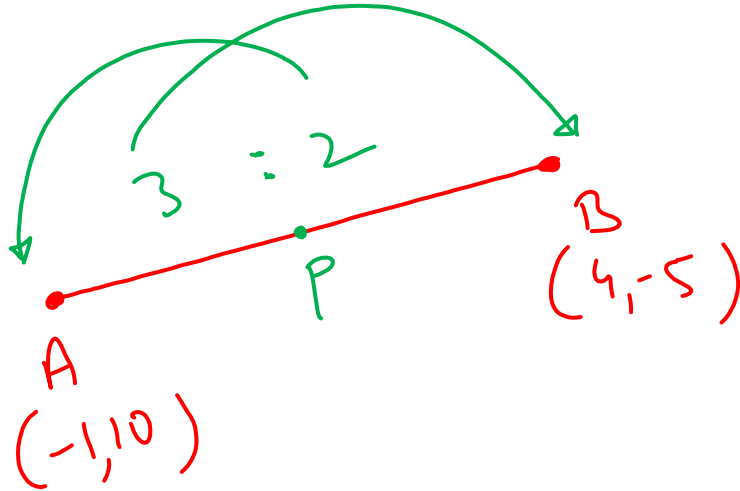
Find the coordinate of the point which divides A (-1, 10) and B (4, -5) in the ratio 3 : 2 internally.

A. (2, -1)

B. (-2, 1)

✓ C. (2, 1)

D. (-2, -1)



$$x = \frac{12 - 2}{5} = 2$$

$$y = \frac{-15 + 20}{5} = 1$$



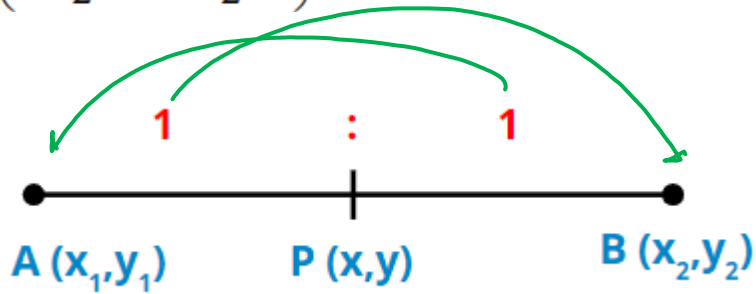




## Midpoint Formula

The midpoint of the line joining **A**( $x_1, y_1$ ) and **B**( $x_2, y_2$ ) is;

$$\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$





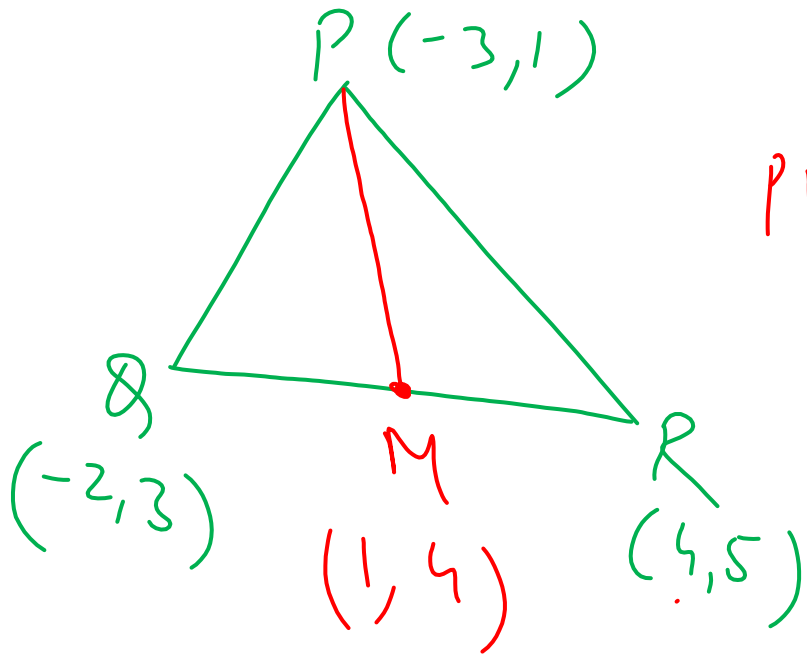
The vertices of triangle PQR are  $P(-3, 1)$ ,  $Q(-2, 3)$  and  $R(4, 5)$ . Find the length of median through vertex P.

A.  $\sqrt{10}$

✓ B. 5

C.  $\sqrt{5}$

D. 4

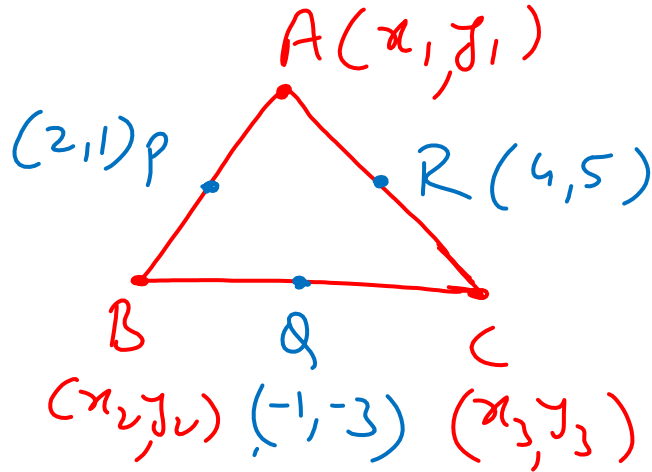


$$PM = \sqrt{16 + 9} = 5$$





If the midpoints of the sides of a triangle are  $(2, 1)$ ,  $(-1, -3)$ ,  $(4, 5)$  then find the coordinates of the vertices of the triangle.



$$x_p = \frac{x_1 + x_2}{2} = 2$$

$$\Rightarrow \boxed{x_1 + x_2 = 4} \text{--- (1)}$$

$$\& \boxed{x_2 + x_3 = -2} \text{--- (2)}$$

$$\& \boxed{x_3 + x_1 = 8} \text{--- (3)}$$

$$\textcircled{1} + \textcircled{2} + \textcircled{3} : 2(x_1 + x_2 + x_3) = 10$$

$$\boxed{x_1 + x_2 + x_3 = 5} \text{---(4)}$$

using eq<sup>n</sup> (4) & eq<sup>n</sup> (1):

$$x_3 = 1$$

using eq<sup>n</sup> (4) & eq<sup>n</sup> (2):

$$x_1 = 7$$

using eq<sup>n</sup> (4) & eq<sup>n</sup> (3):

$$x_2 = -3$$

Now for y-coordinates

$$\left. \begin{aligned} y_1 + y_2 &= 2 \\ y_2 + y_3 &= -6 \\ y_3 + y_1 &= 10 \end{aligned} \right\}$$

$$y_1 + y_2 + y_3 = 3$$

$$\Rightarrow \begin{cases} y_3 = 1 \\ y_1 = 9 \\ y_2 = -7 \end{cases}$$

Ans:

$$\begin{cases} (7, 9) \\ (-3, -7) \\ (1, 1) \end{cases}$$





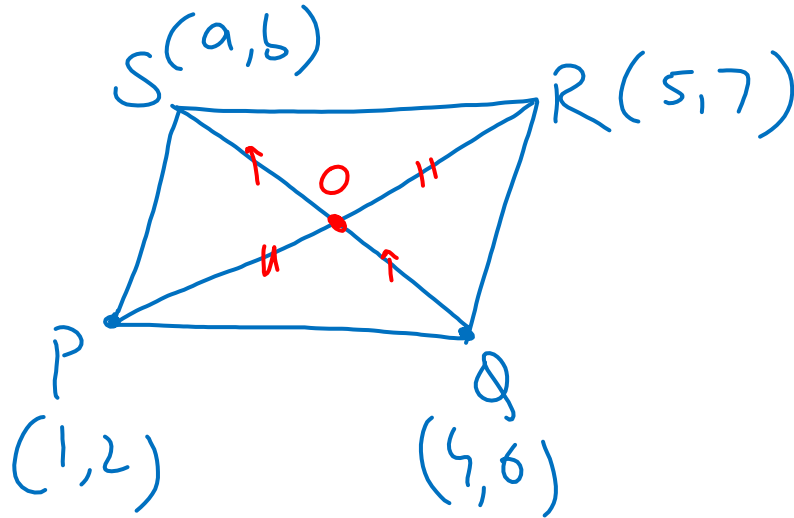
If  $P(1, 2)$ ,  $Q(4, 6)$ ,  $R(5, 7)$  and  $S(a, b)$  are the vertices of a parallelogram PQRS, then

A.  $a = 2, b = 4$

B.  $a = 3, b = 4$

☒ C.  $a = 2, b = 3$

D.  $a = 3, b = 5$



using PR:

$$O \equiv \left( 3, \frac{9}{2} \right)$$

using QS:

$$O \equiv \left( \frac{a+4}{2}, \frac{b+6}{2} \right)$$

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

$$\Rightarrow \textcircled{a=2}$$

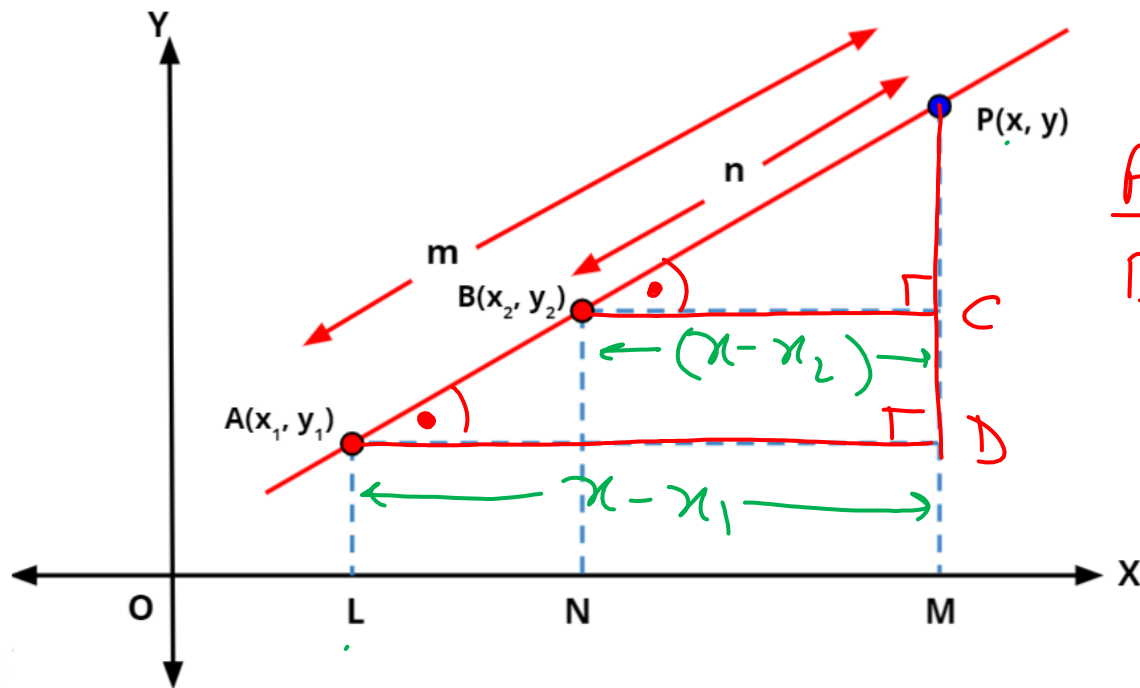
$$8 \quad \frac{b+6}{\cancel{x}} = \frac{9}{\cancel{x}}$$

$$\textcircled{b=3}$$



## Section Formula: External Division

'P' divided AB externally in the ratio of  $m : n \Rightarrow \frac{AP}{PB} = \frac{m}{n}$



$$\frac{AD}{BC} = \frac{m}{n}$$

$$\frac{x - x_1}{x - x_2} = \frac{m}{n}$$

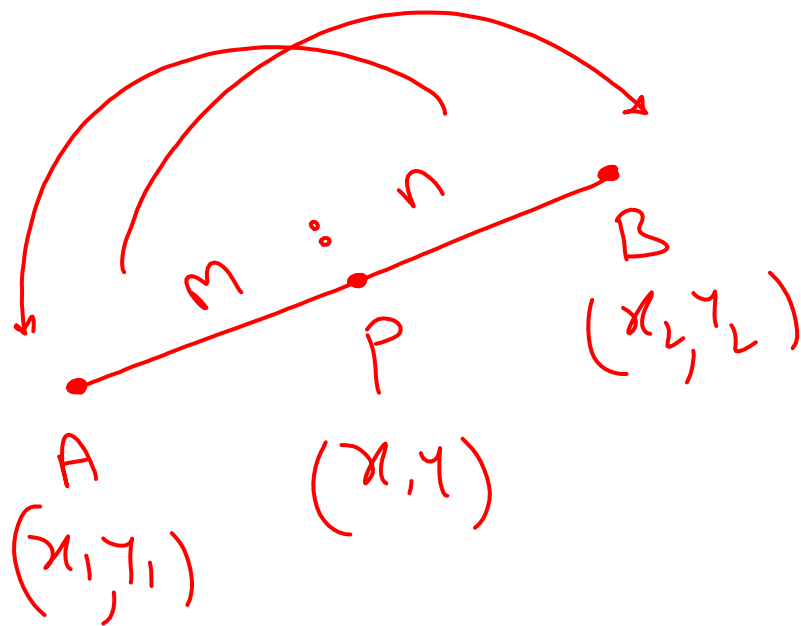
$$nx - nx_1 = mx - mx_2$$

$$nx - mx = nx_1 - mx_2$$

$$x = \frac{nx_1 - mx_2}{n - m}$$

$$x = \left( \frac{mx_2 - nx_1}{m - n} \right)$$

$$y = \frac{my_2 - ny_1}{m - n}$$



$$\frac{mx_2 + nx_1}{m + n}$$

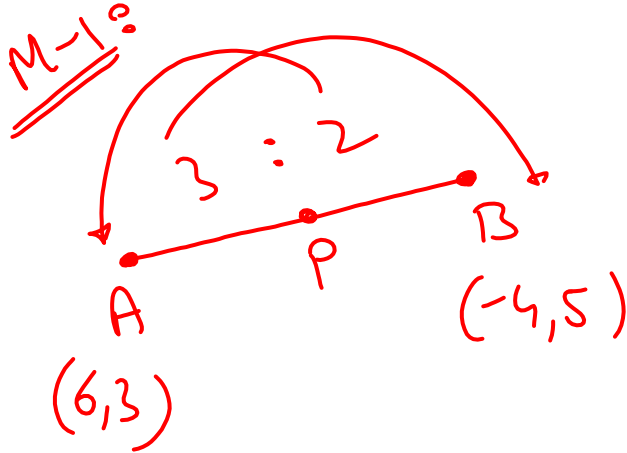
$$3 \cdot 2 \quad \frac{3}{2}$$

$$3 \cdot (-2) \quad \frac{3}{2}$$



If point P which divides  $A(6, 3)$  and  $B(-4, 5)$  externally in the ratio  $3 : 2$  and is also the midpoint of BD. Then find the coordinate of point D.

- ✓ **A.**  $(-44, 13)$       **B.**  $(-24, 9)$       **C.**  $(-20, 9)$       **D.**  $(20, 13)$



$$\text{For } [P] =$$

$$x = \frac{3(-4) - 2(6)}{3 - 2}$$

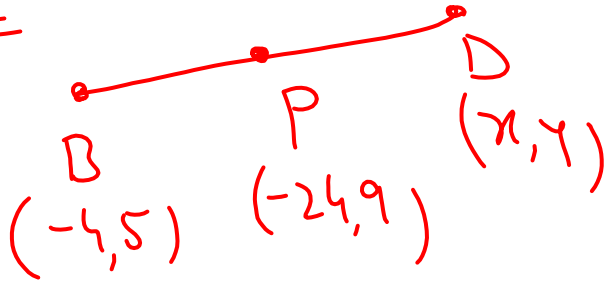
$$x = -24$$



$$y = \frac{3(5) - 2(3)}{3 - 2}$$

$$\boxed{y = 9}$$

Now:



$$\Rightarrow \frac{x - 4}{2} = -24$$

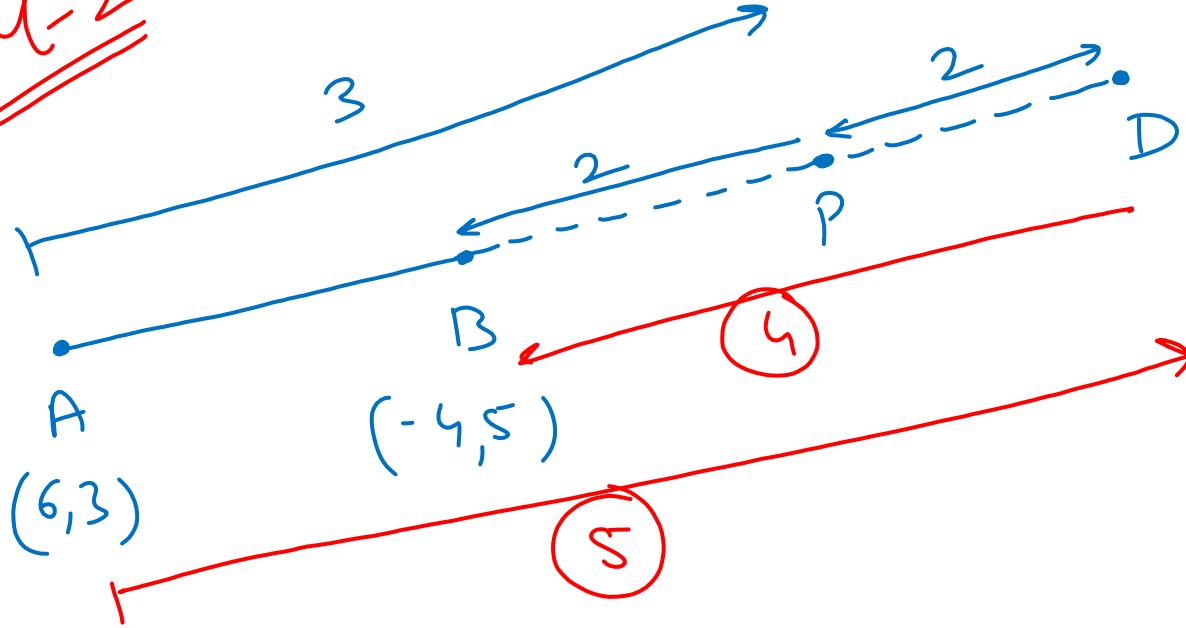
$$\Rightarrow x - 4 = -48$$

$$\Rightarrow \boxed{x = -44}$$

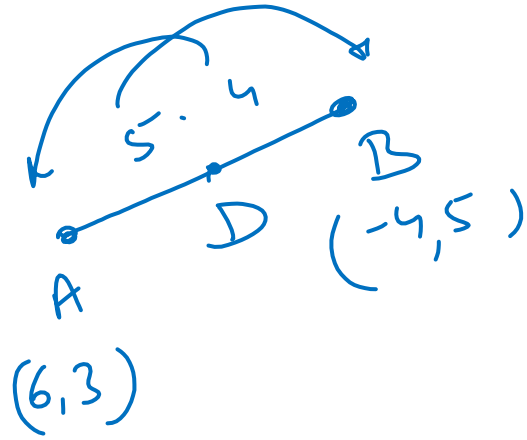
$$\& \frac{y + 5}{2} = 9$$

$$\boxed{y = 13}$$

M-2 :



$\Rightarrow$   $D$  divides  $AB$  externally in the ratio  $5:4$



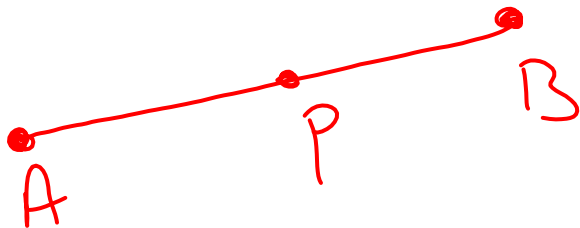
$$D \equiv \left( \frac{(-20) - (24)}{5-4} ; \frac{(25) - (12)}{5-4} \right)$$

$$\equiv \boxed{(-44, 13)}$$



## Important Result

If  $m/n$  is positive, the division is internal, but if  $m/n$  is negative, the division is external.



$$m = n$$

$$\frac{m}{n} \rightarrow \frac{(m/n)}{(n/n)} \rightarrow \frac{(\lambda)}{1}$$





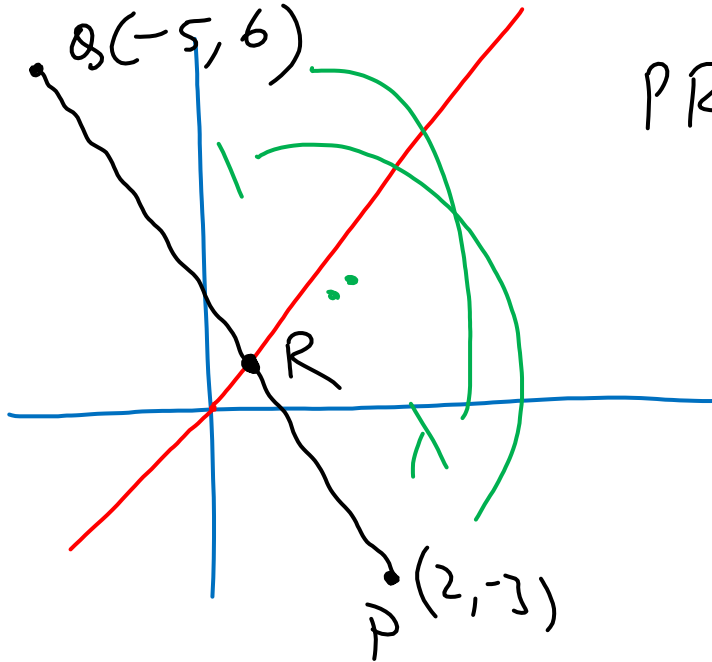
The line joining the points **P (2, -3)** & **Q (-5, 6)** is divided by  $y = x$  in the ratio

**A. 3 : 11**

**B. 5 : 3**

**C. 5 : 11**

**D. 6 : 5**



$$PR : RQ = ?$$

$$x_R = \frac{2 - 5\lambda}{\lambda + 1}$$

$$y_R = \frac{-3 + 6\lambda}{\lambda + 1}$$

$\therefore R$  lies on  $y = x$



$$\frac{2-5\lambda}{\cancel{\lambda+1}} = \frac{-3+6\lambda}{\cancel{\lambda+1}}$$

$$5 = 11\lambda$$

$$\boxed{\lambda = \frac{5}{11}}$$

$$PQ:RQ \equiv \lambda:1$$

$$\equiv \frac{5}{11}:1$$

$$\equiv \boxed{5:11}$$



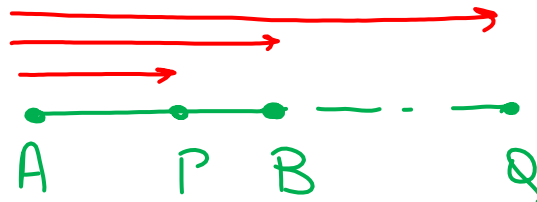
## Important Result

If P divides AB internally in the ratio  $m:n$  & Q divides AB externally in the ratio  $m:n$  then P & Q are said to be harmonic conjugate of each other w.r.t. AB.

**Mathematically,**

$$\frac{2}{AB} = \frac{1}{AP} + \frac{1}{AQ}$$

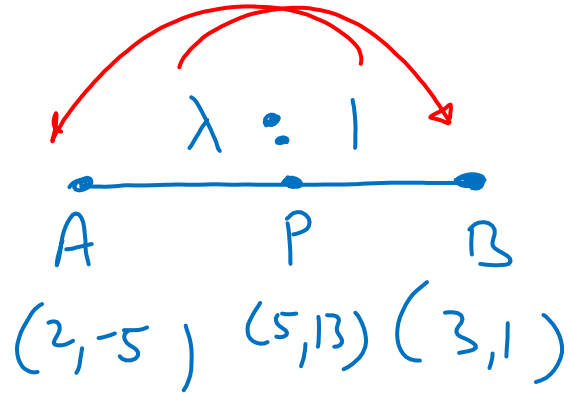
i.e. **AP, AB & AQ** are in **H.P.**







Find harmonic conjugate of  $(5, 13)$  w.r.t points  $(2, -5)$  and  $(3, 1)$



P

A

B

$$5 = \frac{3\lambda + 2}{\lambda + 1}$$

$$5\lambda + 5 = 3\lambda + 2$$

$$2\lambda = -3$$

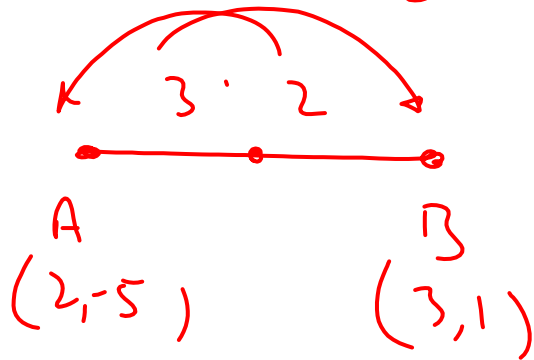
$$\lambda = -\frac{3}{2}$$

$\Rightarrow$  P is  
dividing  
AB externally  
in the ratio

$$3 : 2$$

for Q

(harmonic conjugate  
of 'P')



$$x = \frac{9 + 4}{5} = \left( \frac{13}{5} \right)$$

$$y = \frac{3 + (-10)}{5} = \left( -\frac{7}{5} \right)$$

$$Q \equiv \left( \frac{13}{5}, -\frac{7}{5} \right)$$





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Namo Sir | Physics

6:00 - 7:30 PM



Ashwani Sir | Chemistry

7:30 - 9:00 PM



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9:00 - 10:30 PM

12<sup>th</sup>



Jayant Sir | Physics

1:30 - 3:00 PM



Anupam Sir | Chemistry

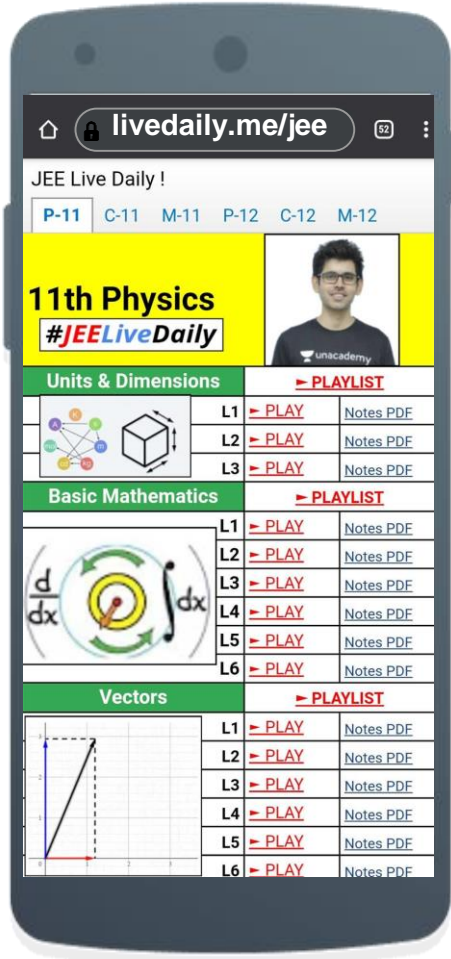
3:00 - 4:30 PM



Nishant Sir | Maths

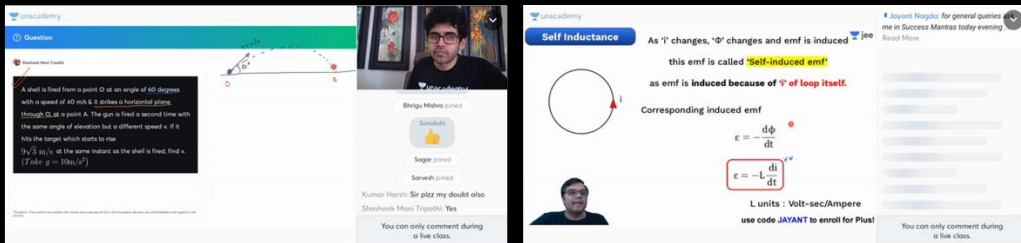
4:30 - 6:00 PM

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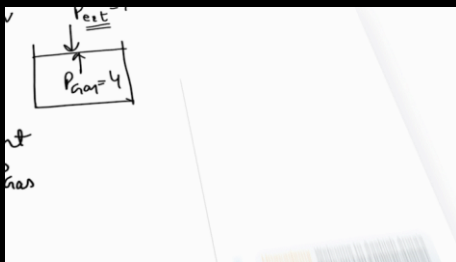




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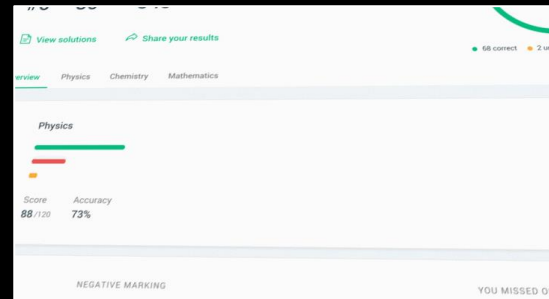
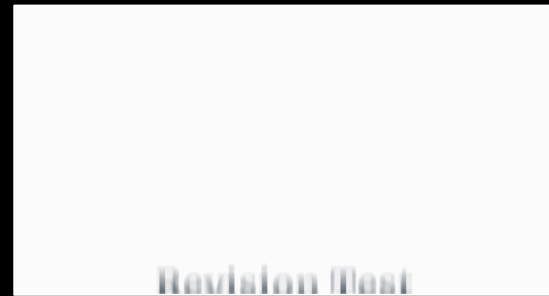


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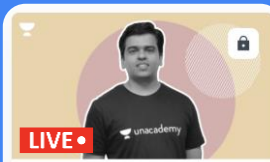


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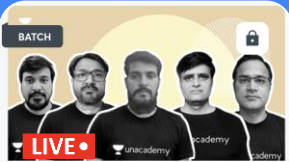
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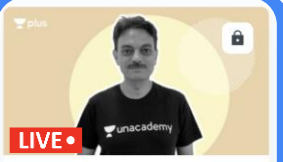
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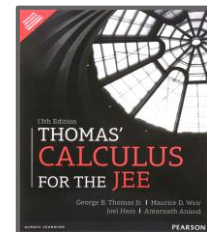
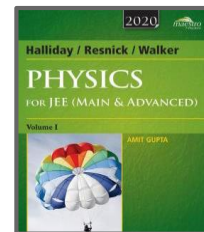
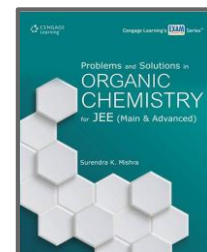
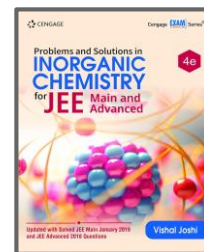
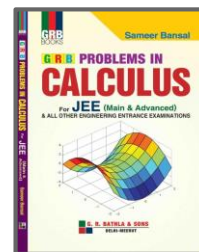
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Akshat Tiwari  
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99.50



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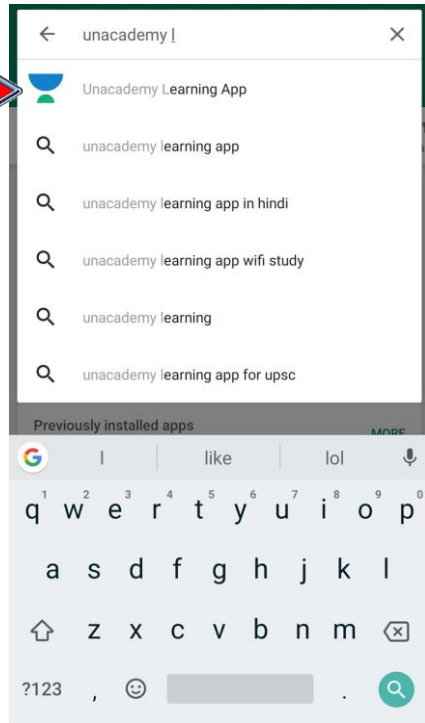


Naman Goyal  
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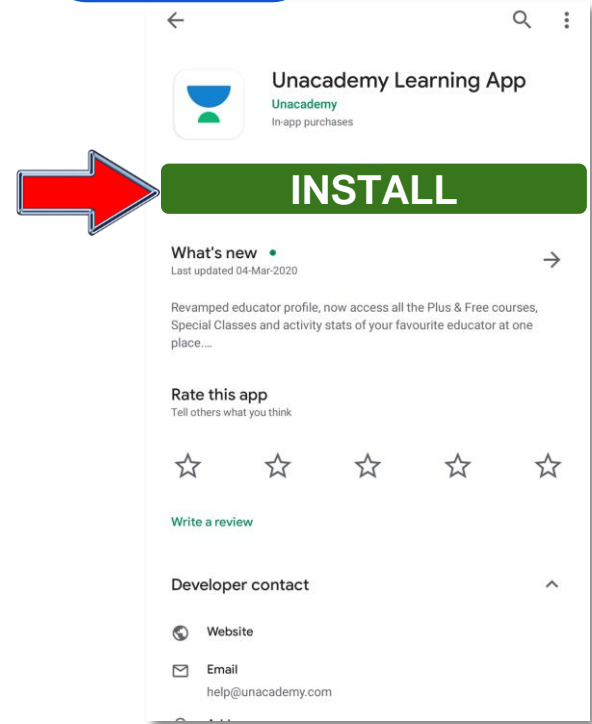


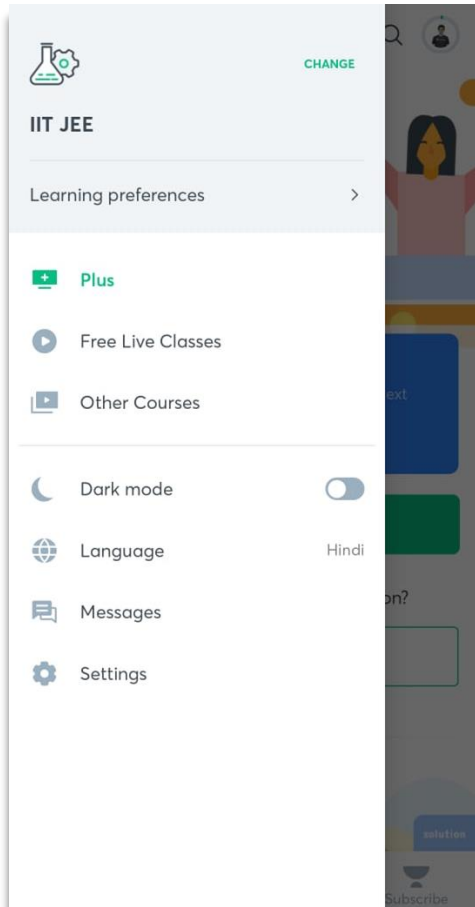
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