# YAKEEN NEET 2.0

2026

## Vectors

PHYSICS | Lecture – 05

By – Saleem Ahmed Sir

## Todays Goal

- Polygon Law
- Parallelogram Law
- Unit vector
- Position Vector.

# Polygon Law

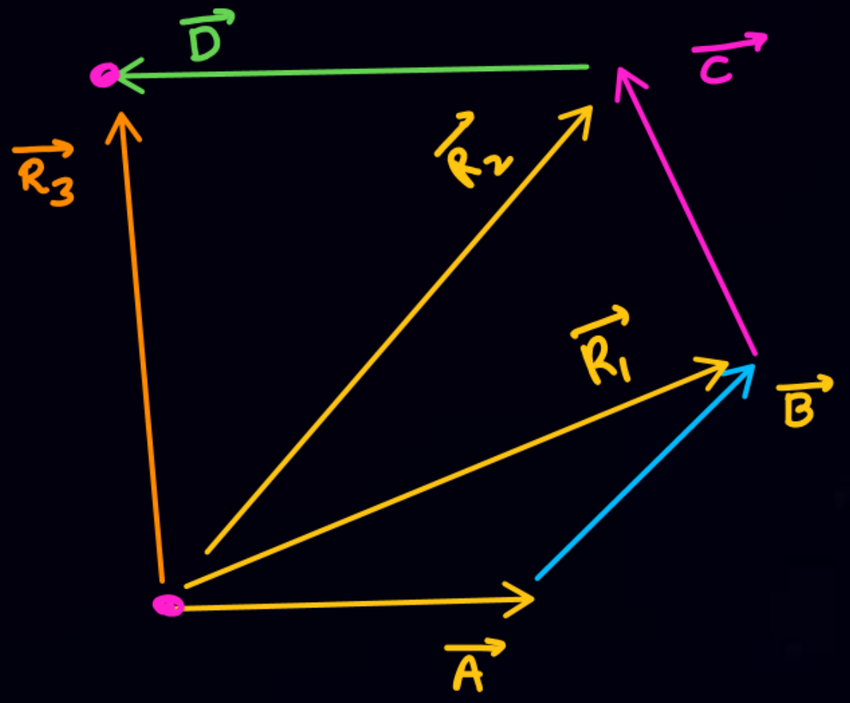
$\vec{R_1} = \vec{A} + \vec{B}$

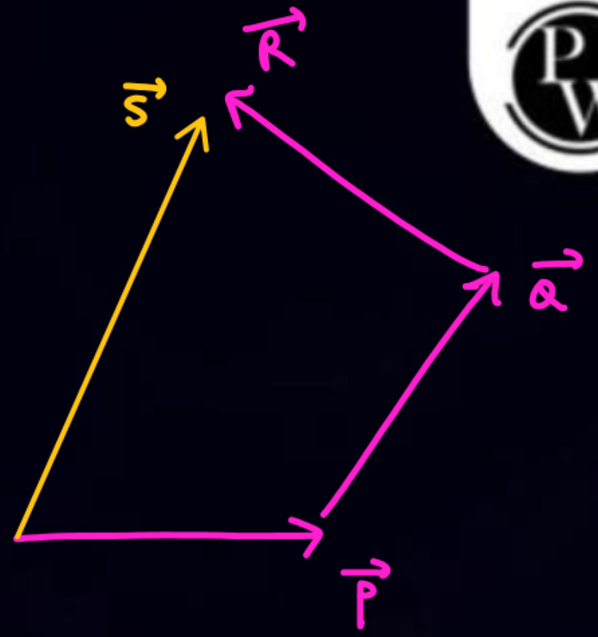
$\vec{R_2} = \vec{R_1} + \vec{C}$

$\vec{R_2} = \vec{A} + \vec{B} + \vec{C}$

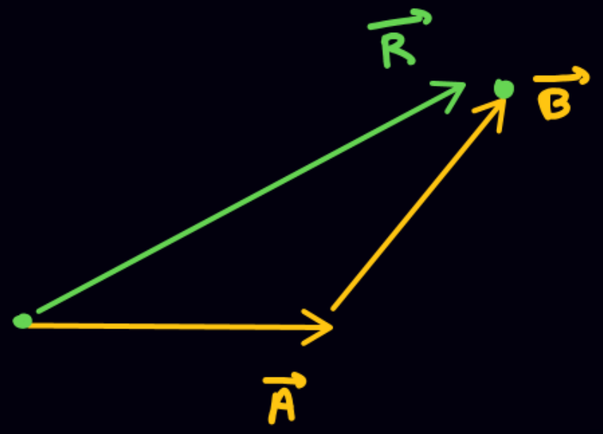
$\vec{R_3} = \vec{R_2} + \vec{D}$

$\vec{R_3} = \vec{A} + \vec{B} + \vec{C} + \vec{D}$

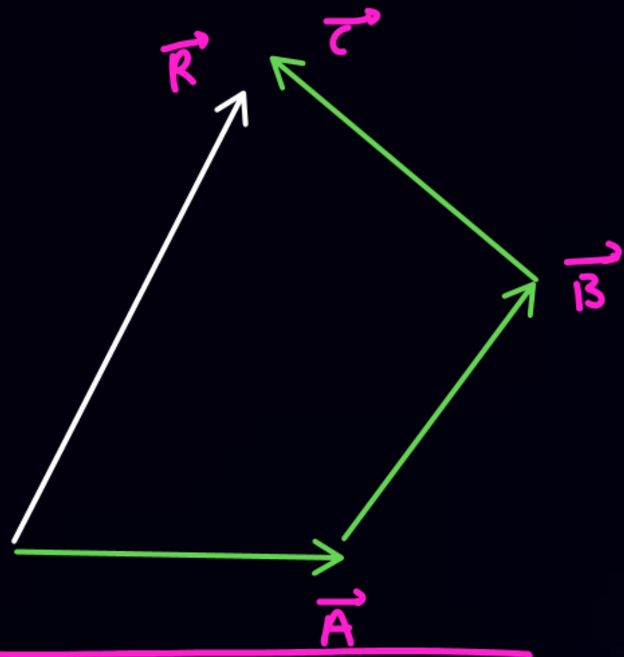



$\vec{S} = \vec{P} + \vec{Q} + \vec{R}$

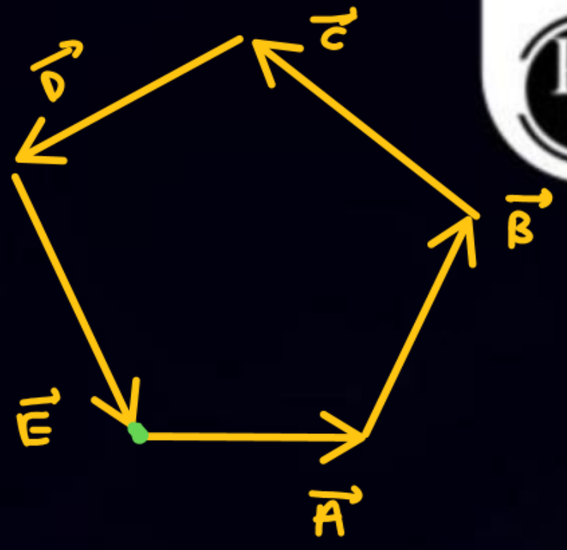



$$\vec{R} = \vec{A} + \vec{B}$$



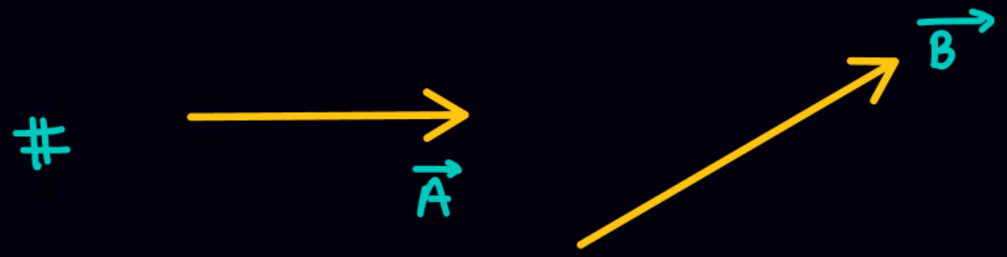

$$\vec{R} = \vec{A} + \vec{B} + \vec{C}$$

Pahle Vector ki tail ko
Last Vector ki head se
Connect karne wala Vector
will give you resultant.

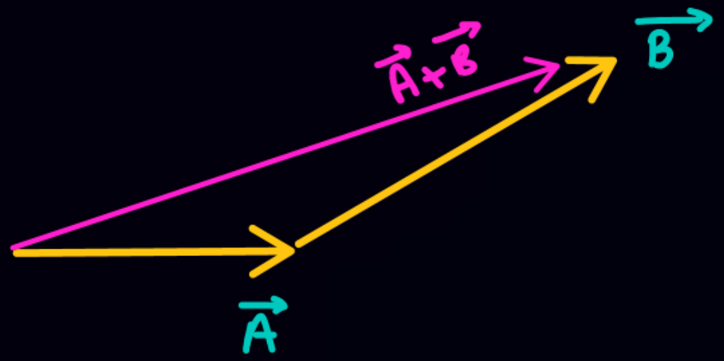



$$\vec{A} + \vec{B} + \vec{C} + \vec{D} + \vec{E} = \vec{0}$$

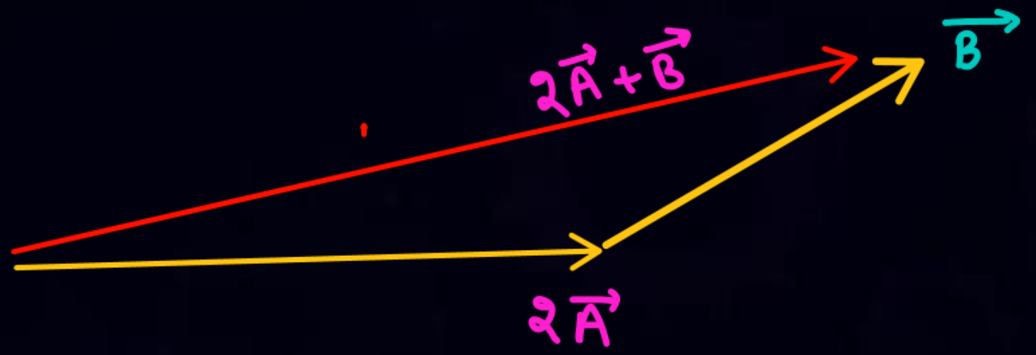
(Zero Vector)
(Null Vector)

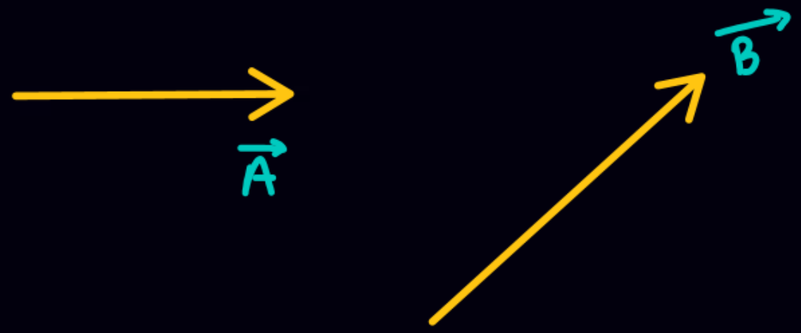



① $\vec{A}+\vec{B}$



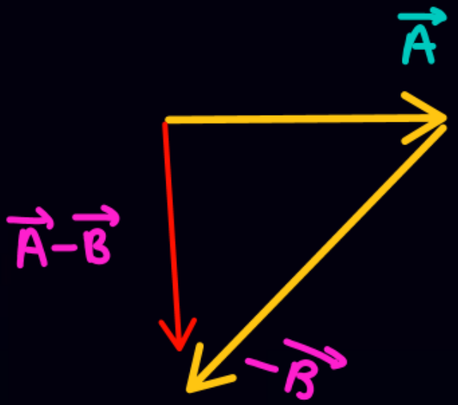

② $2\vec{A}+\vec{B}$

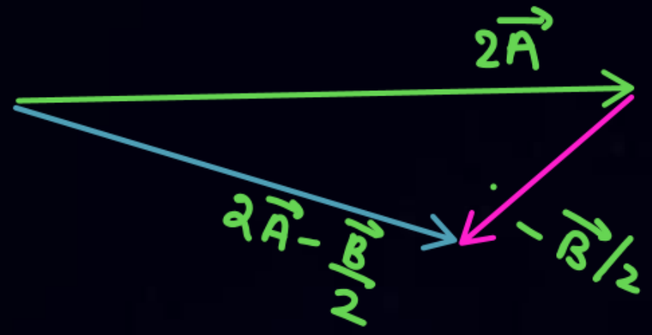


# 


① $\vec{A}-\vec{B}$

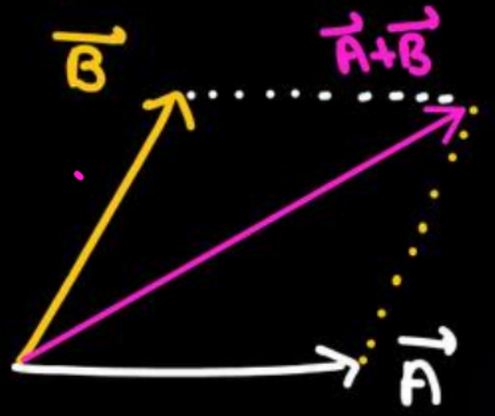
② $2\vec{A}-\frac{\vec{B}}{2}$

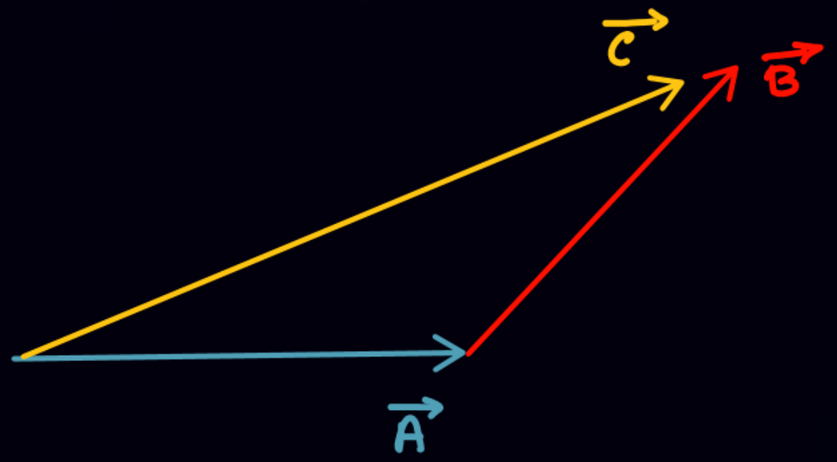


# Parallelogram Law of Vector addition

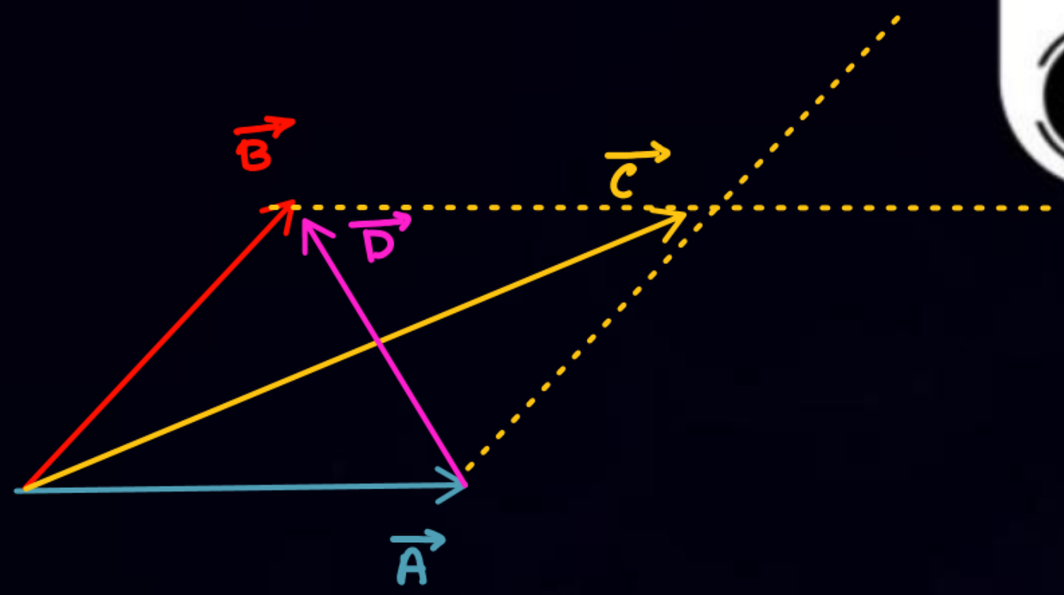
If two coinitial vectors are given then resultant of these two vectors are given by **diagonal** of parallelogram made from two given vector by shifting them parallel to their coinitial vector & other **diagonal** of the parallelogram gives difference of vectors.






$\vec{C} = \vec{A} + \vec{B}$

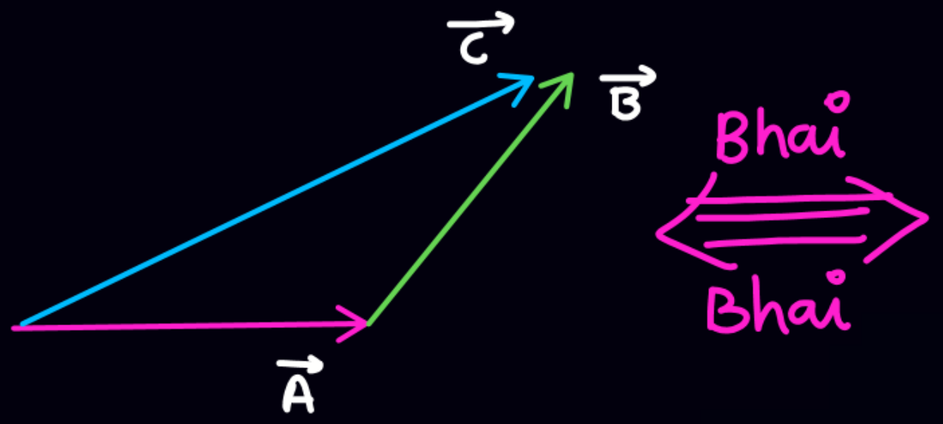
(Triangle Law)




$\vec{C} = \vec{A} + \vec{B}$

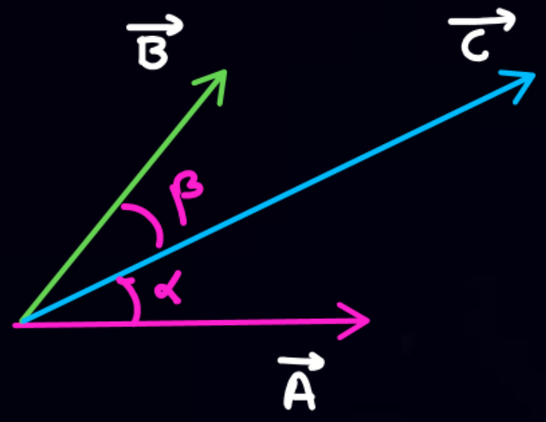
$\vec{A} + \vec{D} = \vec{B}$

$\vec{D} = \vec{B} - \vec{A}$




Bhai

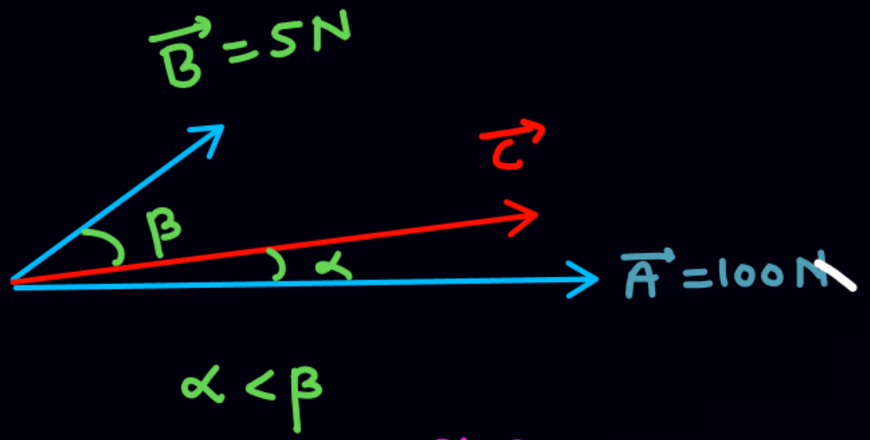
Bhai



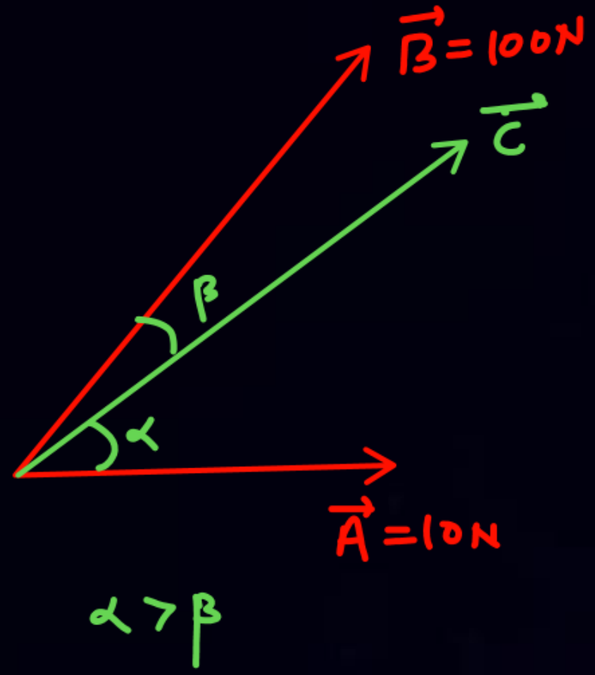

If $A > B \Rightarrow \alpha < \beta$

$A < B \Rightarrow \alpha > \beta$

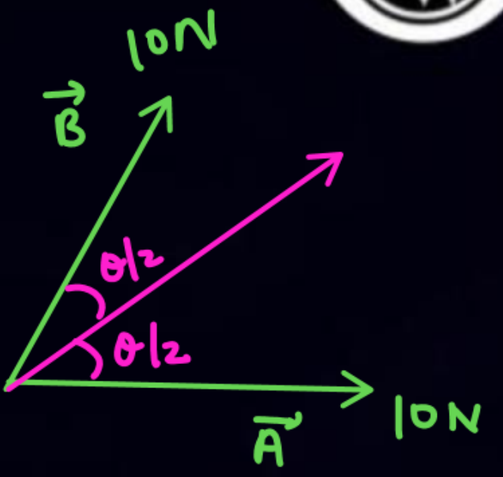
$A = B \Rightarrow \alpha = \beta$




$\alpha < \beta$



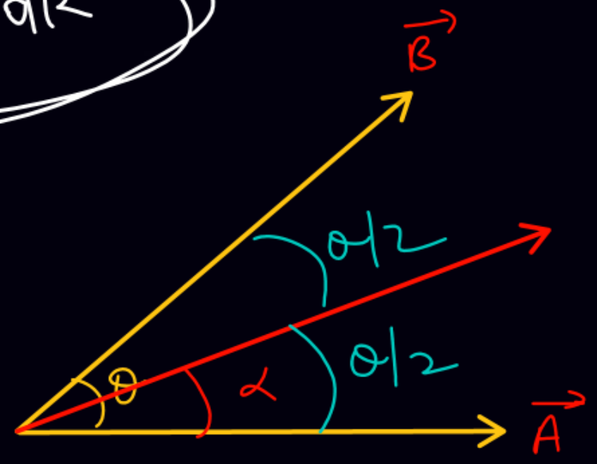

$\alpha > \beta$




SKC

* Do equal magnitude wale vector ka resultant Done vector ka bilkul Beech se Niklegaa (Angle bisector)

Q5 एक




$A = x$
$B = x$

$$C = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

$$C = \sqrt{x^2 + x^2 + 2x^2\cos\theta}$$

$$C = \sqrt{2x^2 + 2x^2\cos\theta}$$

$$C = \sqrt{2x^2(1+\cos\theta)}$$

$$C = \sqrt{2x^2\left(1 + 2\cos^2\frac{\theta}{2} - 1\right)}$$

$$C = \sqrt{4x^2\cos^2\theta/2}$$

$$\boxed{C = 2x\cos\theta/2}$$

$$\alpha = \theta/2$$

$$\tan\alpha = \frac{x\sin\theta}{x + x\cos\theta} = \frac{\sin\theta}{1+\cos\theta}$$

$$= \frac{2\sin\theta/2\cos\theta/2}{1 + 2\cos^2\theta/2 - 1}$$

$$\tan\alpha = \frac{2\sin\theta/2\cos\theta/2}{2\cos^2\theta/2} = \frac{\sin\theta/2}{\cos\theta/2}$$

$$\boxed{\tan\alpha = \tan\theta/2}$$

5 बार

$\sin 2\theta = 2\sin\theta\cos\theta$

$\sin\theta = 2\sin\theta/2\cos\theta/2$

$\cos 2\theta = \cos^2\theta - \sin^2\theta = 2\cos^2\theta - 1 = 1 - 2\sin^2\theta$

$2\theta = \alpha$

$\theta = \frac{\alpha}{2}$

$\cos\alpha = \cos^2\frac{\alpha}{2} - \sin^2\frac{\alpha}{2} = 2\cos^2\frac{\alpha}{2} - 1 = 1 - 2\sin^2\frac{\alpha}{2}$

## Unit vector. $\hat{A}$

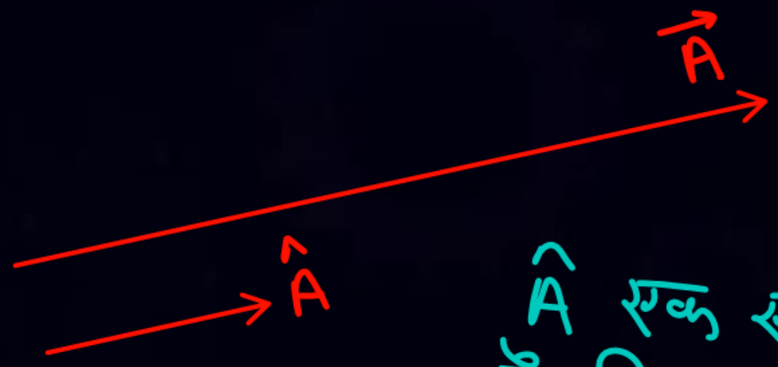
- होता तो Vector ही है
- jiska magnitude 1 hota.
- It is used to give direction.
- Unit less, Dimensionless
- $\hat{A}$
- $|\hat{A}| = 1 \qquad |\hat{B}| = 1$

* Angle b/w $\vec{A}$ & $\hat{A}$ ⟶ Zero
* $\vec{A}$ & $\hat{A}$ are parallel vector.

$\vec{A}$ = (magnitude) (Direction)

$\vec{A} = |\vec{A}|\ \hat{A}$

$\hat{A}$ → dir$^n$
$\hat{A}$ → Unit vector




$\hat{A}$ एक ऐसा Vector है जिसका mag. 1 और Direction $\vec{A}$ की तरफ है.

Unit vector

Unit vector along the +ve x-Axis = $\hat{i}$

Unit vector along the +ve y-Axis = $\hat{j}$

" " " +ve z-Axis = $\hat{k}$

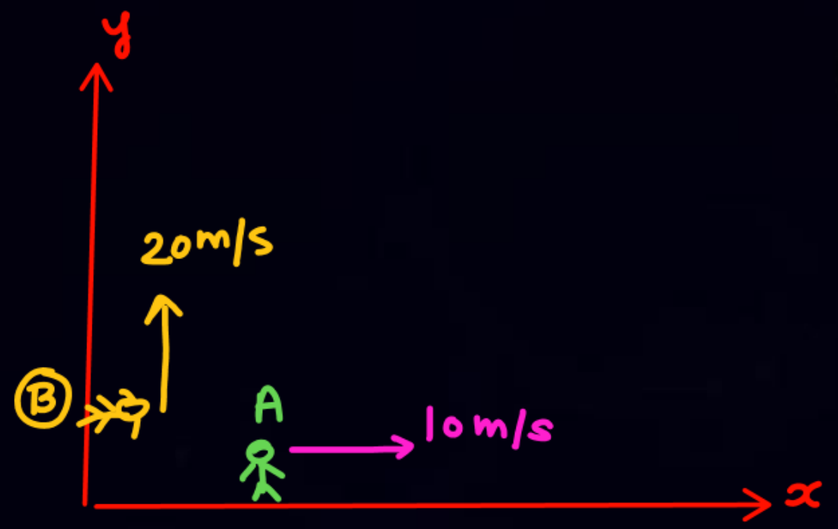
" " " −Ve x Axis = $-\hat{i}$

Velocity of $\ddot{A}$ = 10 m/s (Along +x- Axis)

= 10m/s ($\hat{i}$)

Velocity of B = 20m/s (along +y- Axis)

= 20m/s $\hat{j}$

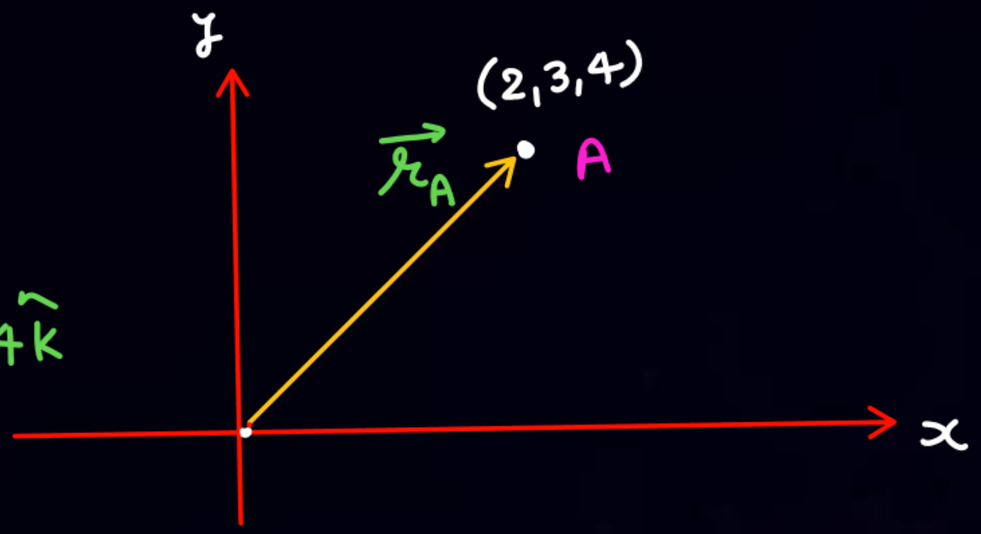


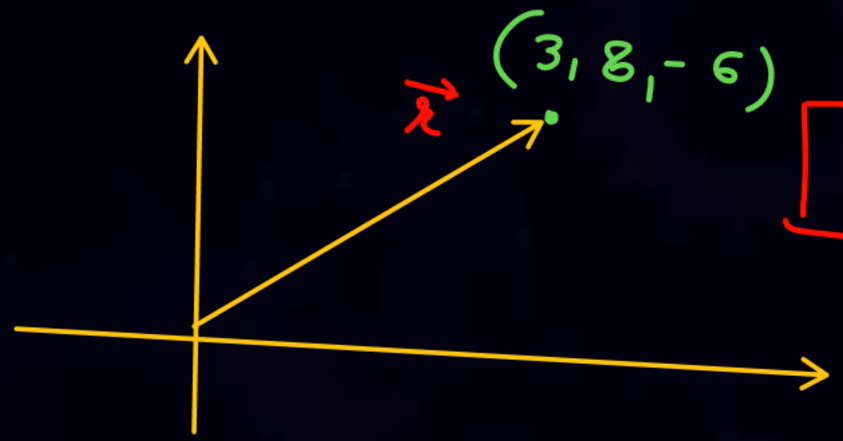

$\vec{V_A}$ के लिए magnitude के साथ dir^ दे दी means

(magnitude) × (Direction की तरफ का Unit Vector)

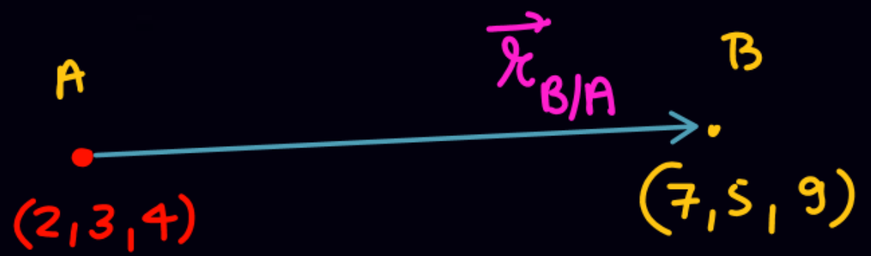
## Position vector.

position vector of A
wrt origin $= \vec{r}_A = 2\hat{i} + 3\hat{j} + 4\hat{k}$



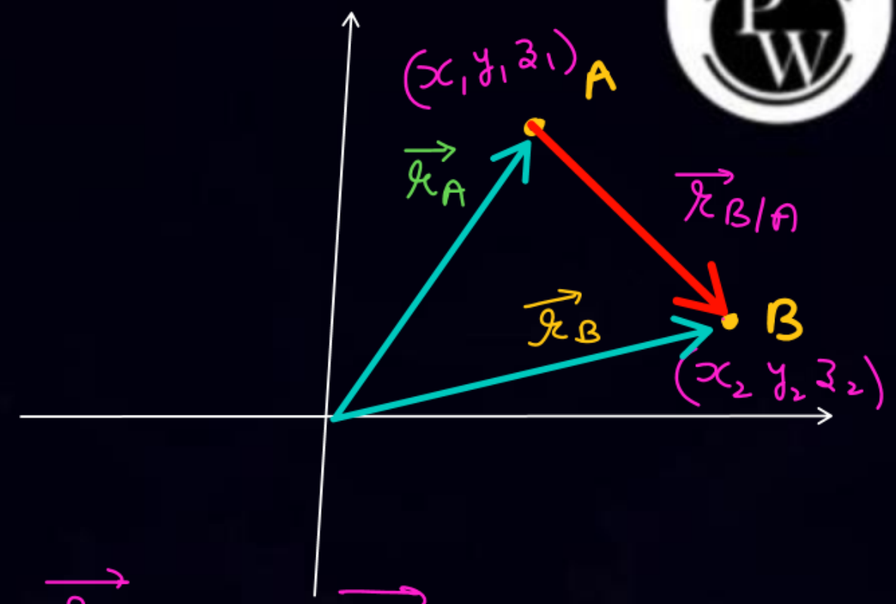

$\vec{r} = 3\hat{i} + 8\hat{j} - 6\hat{k}$




Position vector of B wrt A $= \vec{r}_{B/A}$

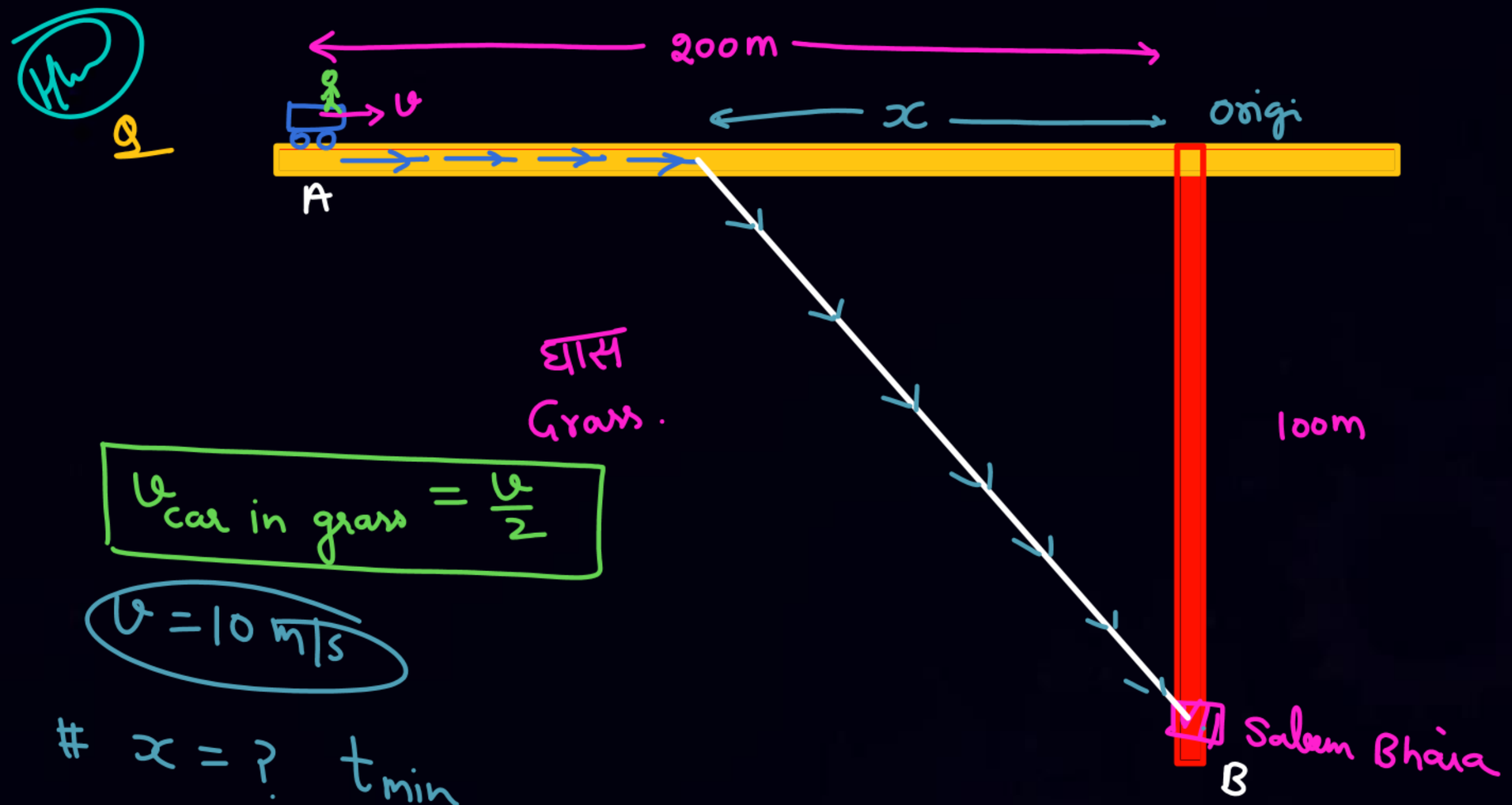
$= (7-2)\hat{i} + (5-3)\hat{j} + (9-4)\hat{k}$

$\vec{r}_{B/A} = 5\hat{i} + 2\hat{j} + 5\hat{k}$




$\vec{r}_A + \vec{r}_{B/A} = \vec{r}_B$

$\vec{r}_{B/A} = \vec{r}_B - \vec{r}_A$




$v_{car\ in\ grass} = \frac{v}{2}$

$v = 10\ m/s$

# $x = ?$ $t_{min}$

$t_{min}$

Find position vector of B wrt A $\vec{r}_{B/A}$

① 


$\vec{r}_{B/A} = 2\hat{i} + 5\hat{j} + \hat{k}$

② 


$\vec{r}_{B/A} = -10\hat{i} + 5\hat{j} - 3\hat{k}$

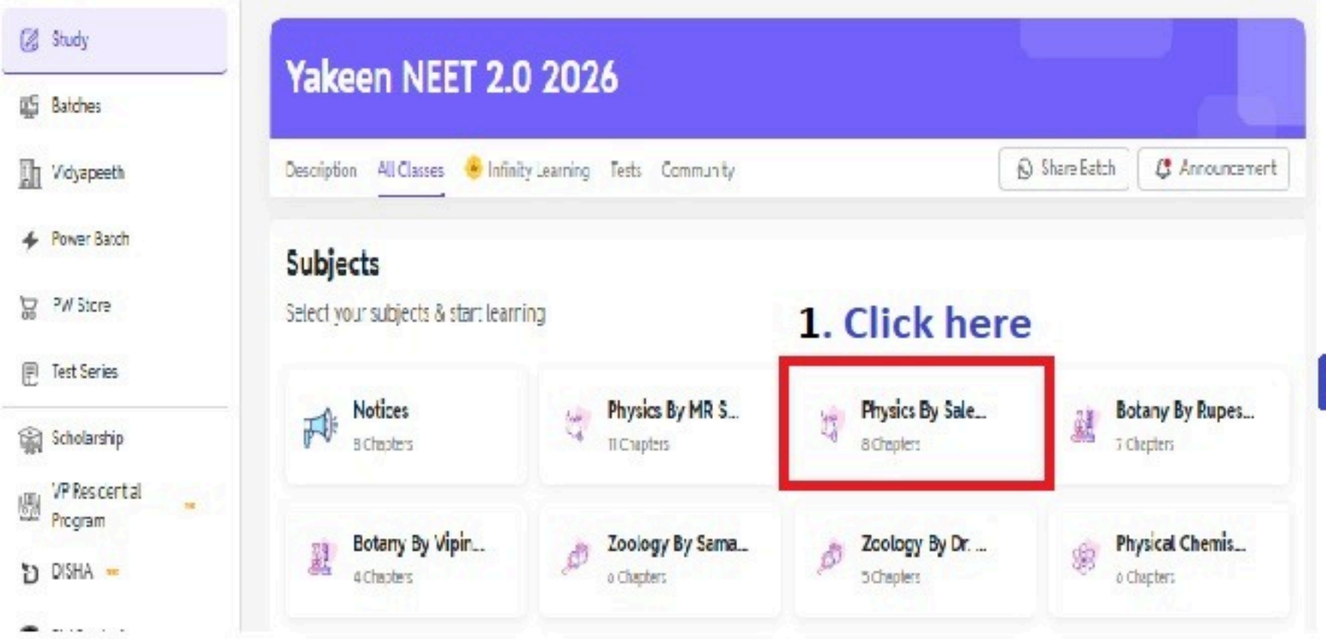
③ 


$\vec{r}_{B/A} = 2\hat{i} + 4\hat{j} + 6\hat{k}$

④ 


$\vec{r}_{A/B} = -2\hat{i} - 5\hat{j} - \hat{k}$

$\vec{r}_{B/A} = -\vec{r}_{A/B}$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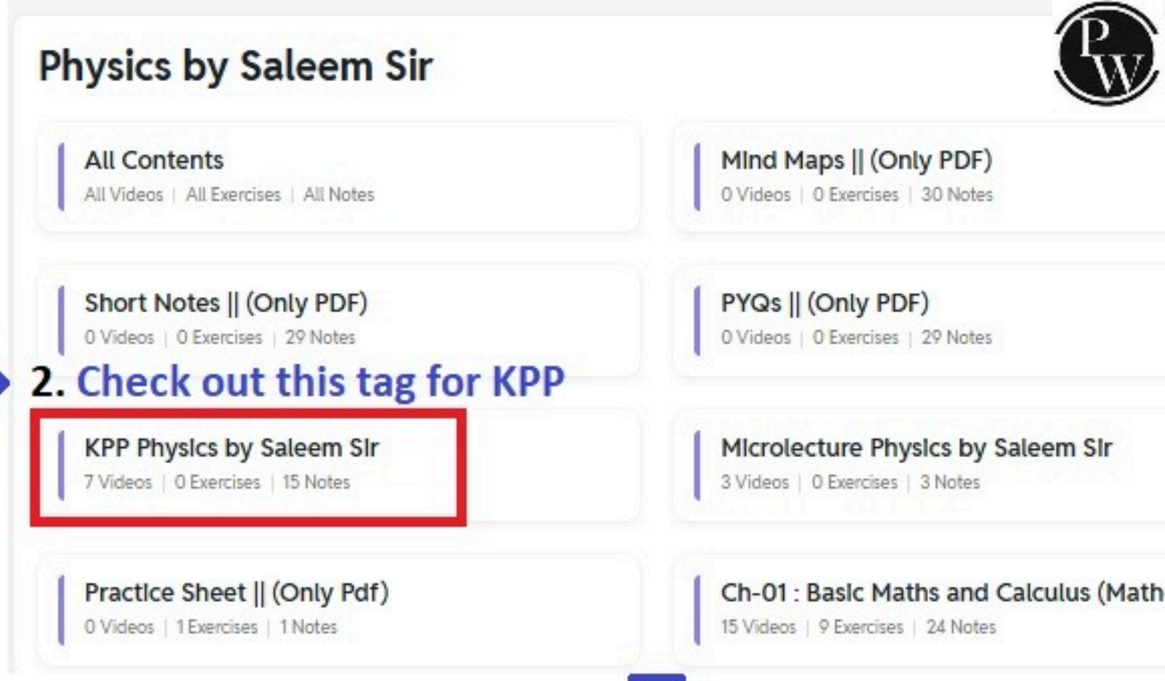
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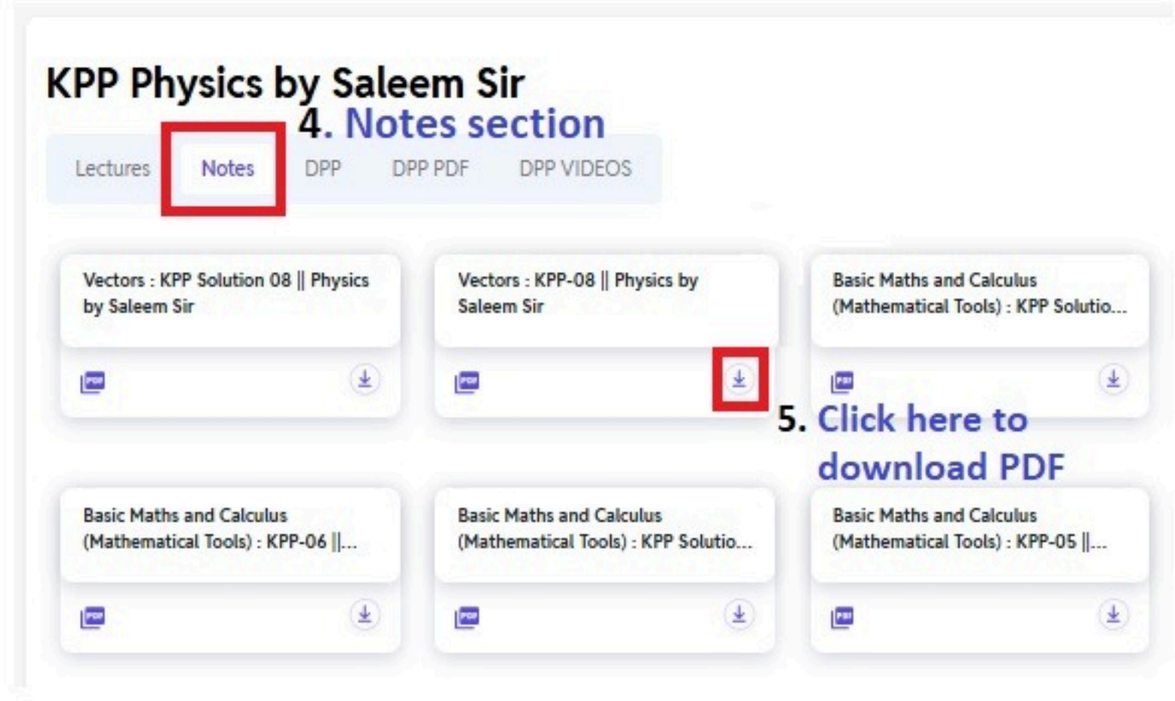
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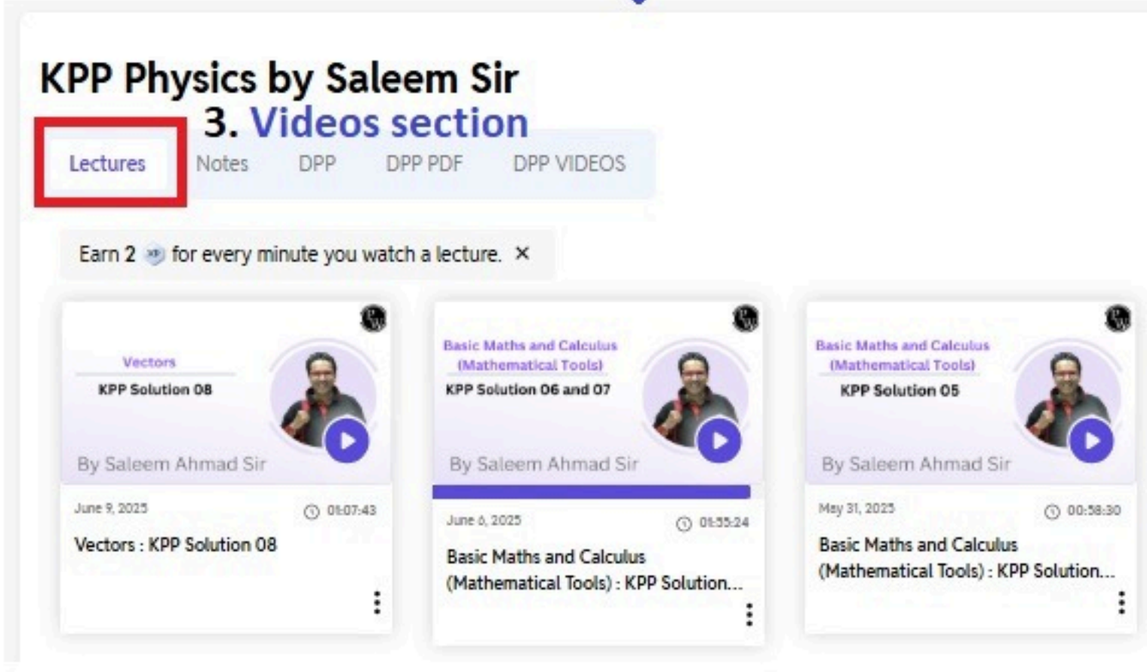
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## Homework

- Solve KPP-08 If you have not
- Revise full vector notes. & Basic maths
  → 1 hour

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