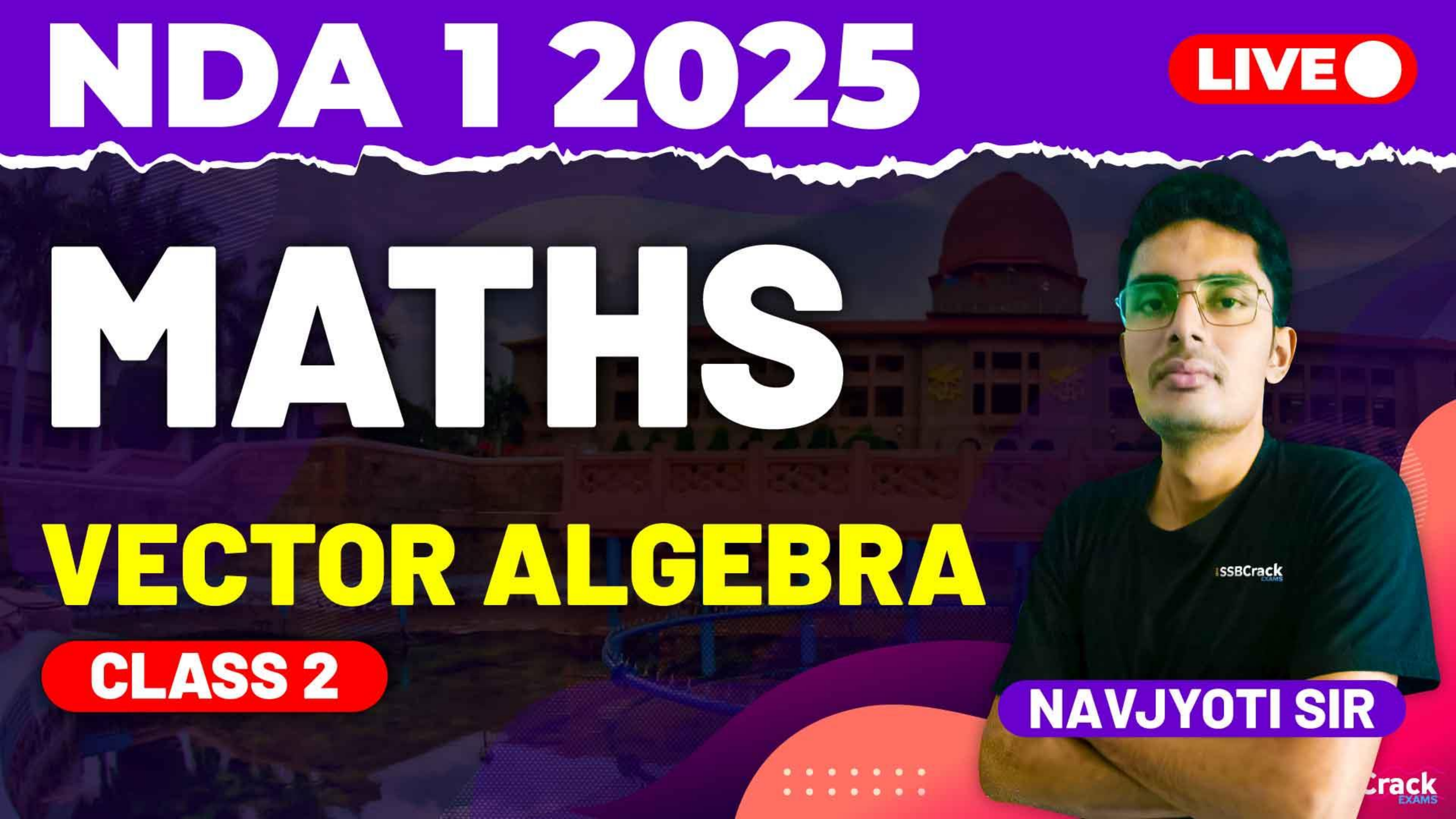

NDA 1 2025
LIVE
MATHS
VECTOR ALGEBRA
CLASS 2
NAVJYOTI SIR
SSBCrack EXAMS
Crack EXAMS

5 Nov 2024 Live Classes Schedule

8:00AM	05 NOVEMBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	05 NOVEMBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:30AM	OVERVIEW OF GD & LECTURETTE	ANURADHA MA'AM

NDA 1 2025 LIVE CLASSES

11:30AM	GK - MEDIEVAL HISTORY - CLASS 1	RUBY MA'AM
1:00PM	CHEMISTRY MCQ - CLASS 3	SHIVANGI MA'AM
4:00PM	MATHS - VECTOR ALGEBRA - CLASS 2	NAVJYOTI SIR
5:30PM	ENGLISH - ORDERING OF WORDS - CLASS 2	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

11:30AM	GK - MEDIEVAL HISTORY - CLASS 1	RUBY MA'AM
1:00PM	CHEMISTRY MCQ - CLASS 3	SHIVANGI MA'AM
5:30PM	ENGLISH - ORDERING OF WORDS - CLASS 2	ANURADHA MA'AM
7:00PM	MATHS - GEOMETRY - CLASS 1	NAVJYOTI SIR

AFCAT 1 2025 LIVE CLASSES

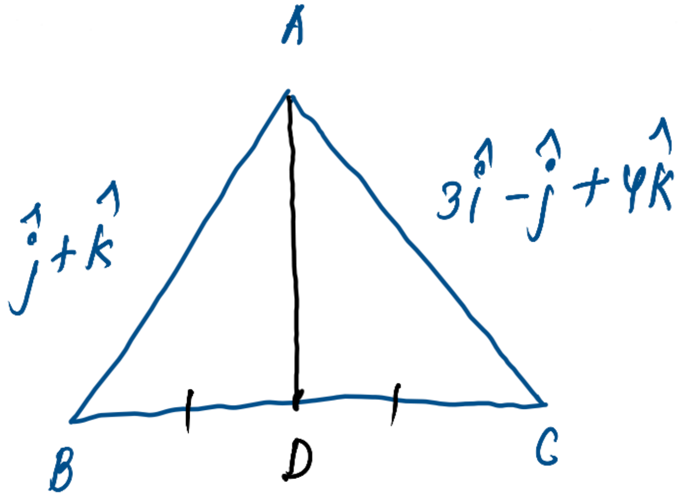
4:00PM	STATIC GK - COUNTRY CAPITAL CURRENCY - CLASS 1	DIVYANSHU SIR
5:30PM	ENGLISH - ORDERING OF WORDS - CLASS 2	ANURADHA MA'AM

SSBCrack EXAMS

QUESTION

The 2 vectors $\hat{j}+\hat{k}$ and $3\hat{i}-\hat{j}+4\hat{k}$ represents the two sides AB and AC, respectively of a ΔABC. The length of the median through A is

(A) $\frac{\sqrt{34}}{2}$ (B) $\frac{\sqrt{48}}{2}$ (C) $\sqrt{18}$ (D) None of these



$BD = DC$

$$\overrightarrow{AD} = \frac{1}{2}\left(\overrightarrow{AB} + \overrightarrow{AC}\right)$$

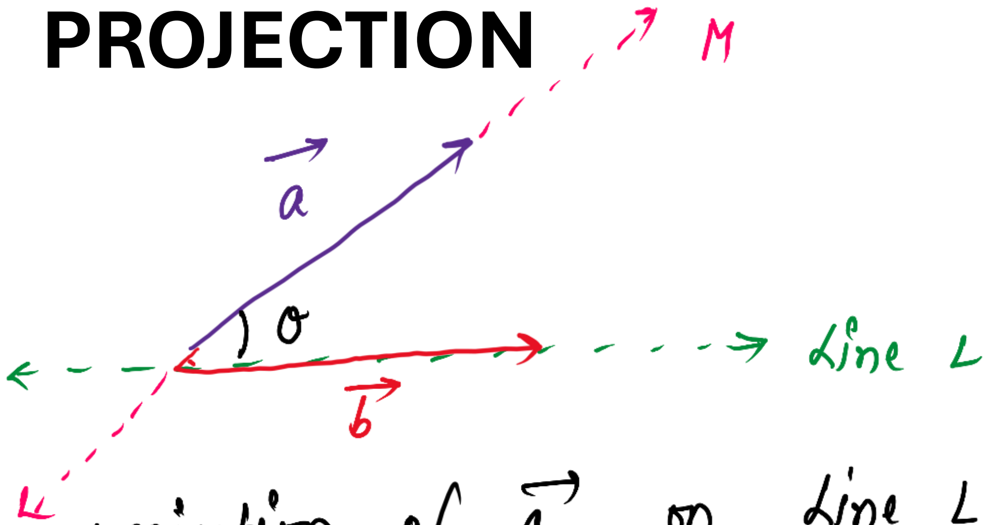
$$= \frac{1}{2}\left(\hat{j}+\hat{k} + 3\hat{i} - \hat{j} + 4\hat{k}\right)$$

$$= \frac{1}{2}\left(3\hat{i} + 5\hat{k}\right) = \frac{3}{2}\hat{i} + \frac{5}{2}\hat{k}$$

$$|\overrightarrow{AB}| = \sqrt{\left(\frac{3}{2}\right)^2 + \left(\frac{5}{2}\right)^2} = \sqrt{\frac{9+25}{4}} = \frac{\sqrt{34}}{2}$$

SSBCrack EXAMS

PROJECTION



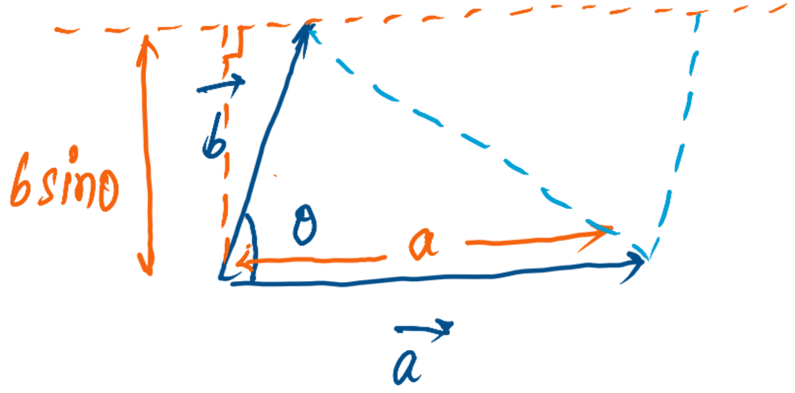
$$\text{projection of } \vec{a} \text{ on line } L = \frac{\vec{a}\cdot\vec{b}}{|\vec{b}|} = \underbrace{\vec{a}\cdot\hat{b}}$$

$$\text{projection of } \vec{b} \text{ on line } M = \frac{\vec{b}\cdot\vec{a}}{|\vec{a}|} = \underbrace{\vec{b}\cdot\hat{a}}$$

SSBCrack EXAMS

PROPERTIES – VECTOR PRODUCT

If $\vec{a}$ and $\vec{b}$ represent adjacent sides of a parallelogram, then its area $|\vec{a} \times \vec{b}|$



area of parallelogram = base x height

= a x b sinθ

= absinθ

= $|\vec{a} \times \vec{b}|$

If $\vec{a}$, $\vec{b}$ represent the adjacent sides of a triangle, then its area $= \frac{1}{2}|\vec{a} \times \vec{b}|$

SSBCrack EXAMS

PROPERTIES – VECTOR PRODUCT

Distributive property $\vec{a} \times (\vec{b} + \vec{c}) = \vec{a} \times \vec{b} + \vec{a} \times \vec{c}$

If α be a scalar, then $\alpha\ (\vec{a} \times \vec{b}) = (\alpha\,\vec{a}) \times \vec{b} = \vec{a} \times (\alpha\vec{b})$

(number)

PROPERTIES – VECTOR PRODUCT

If $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$, and $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$

Then, $\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix} = \hat{i}(a_2 b_3 - a_3 b_2) - \hat{j}(a_1 b_3 - a_3 b_1) + \hat{k}(a_1 b_2 - a_2 b_1)$

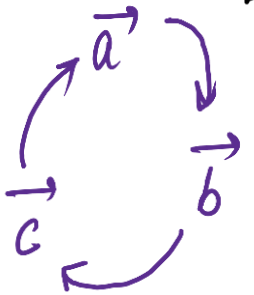
SCALAR TRIPLE PRODUCT

$$(\vec{a} \times \vec{b}) \cdot \vec{c} = [\vec{a}\ \vec{b}\ \vec{c}] = \vec{c} \cdot (\vec{a} \times \vec{b})$$

$$(\vec{b} \times \vec{c}) \cdot \vec{a} = [\vec{b}\ \vec{c}\ \vec{a}]$$

$$(\vec{c} \times \vec{a}) \cdot \vec{b} = [\vec{c}\ \vec{a}\ \vec{b}]$$

all three are equal, keeping the cycle



$$[\vec{a}\ \vec{b}\ \vec{c}] = \begin{cases} -[\vec{a}\ \vec{c}\ \vec{b}] \\ -[\vec{b}\ \vec{a}\ \vec{c}] \\ -[\vec{c}\ \vec{b}\ \vec{a}] \end{cases}$$

SSBCrack EXAMS

SCALAR TRIPLE PRODUCT

If three vectors **a**, **b** and **c** are collinear, then

$$[\mathbf{a}\ \mathbf{b}\ \mathbf{c}] = 0.$$

$$[\mathbf{a}\ \ \mathbf{b}\ \mathbf{c}+\mathbf{d}] = [\mathbf{a}\ \mathbf{b}\ \mathbf{c}] + [\mathbf{a}\ \mathbf{b}\ \mathbf{d}]$$

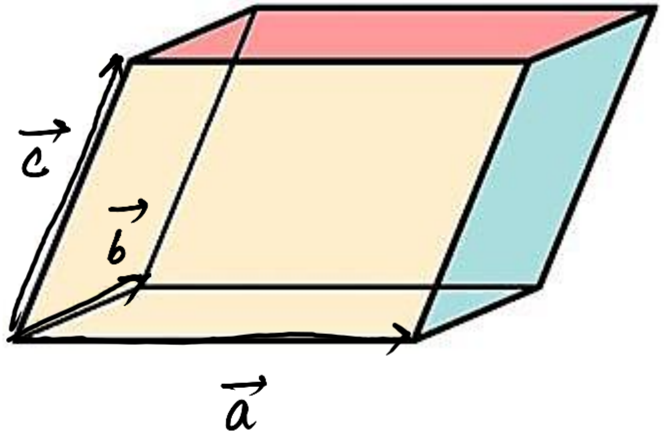
$$[\mathbf{a}+\mathbf{b}\ \mathbf{b}+\mathbf{c}\ \mathbf{c}+\mathbf{a}] = 2\,[\mathbf{a}\ \mathbf{b}\ \mathbf{c}]$$

$$[\mathbf{a}-\mathbf{b}\ \mathbf{b}-\mathbf{c}\ \mathbf{c}-\mathbf{a}] = \mathbf{0}$$

$$[\mathbf{a}\times\mathbf{b}\ \ \mathbf{b}\times\mathbf{c}\ \ \mathbf{c}\times\mathbf{a}] = [\mathbf{a}\ \mathbf{b}\ \mathbf{c}]^2$$

SCALAR TRIPLE PRODUCT

volume of parallelopiped = $[\vec{a}\ \vec{b}\ \vec{c}]$



If any two of the vectors $\bar{a}, \bar{b}, \bar{c}$ are equal, then $[\bar{a}\ \bar{b}\ \bar{c}] = 0$

The value of a scalar triple product is zero, if two of its vectors are parallel.

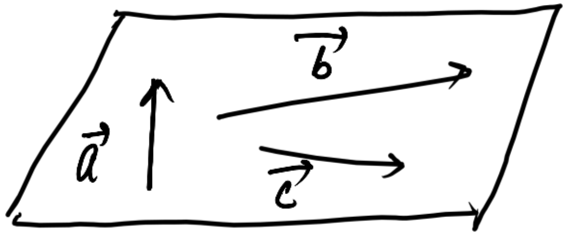
either two vectors out of $\vec{a}$, $\vec{b}$ & $\vec{c}$ are parallel or equal,

$[\vec{a}\ \vec{b}\ \vec{c}] = 0$

SSBCrack EXAMS

SCALAR TRIPLE PRODUCT

$\vec{a}, \vec{b}, \vec{c}$ are coplanar if and only if $[\vec{a}\ \vec{b}\ \vec{c}] = 0$



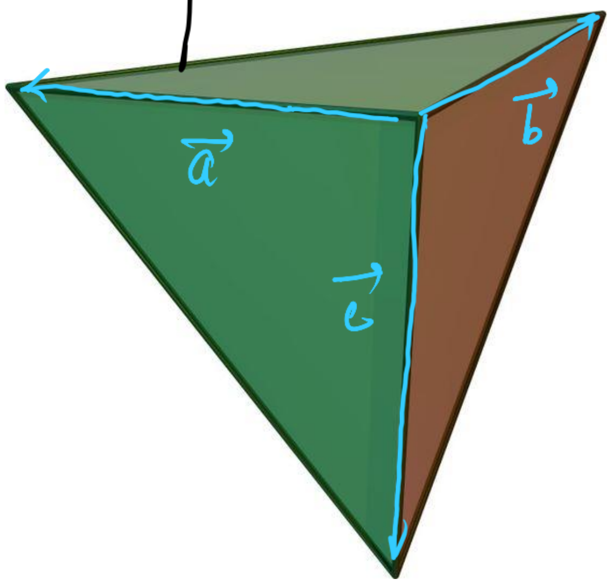
Four points A, B, C, D with position vectors $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ ✓

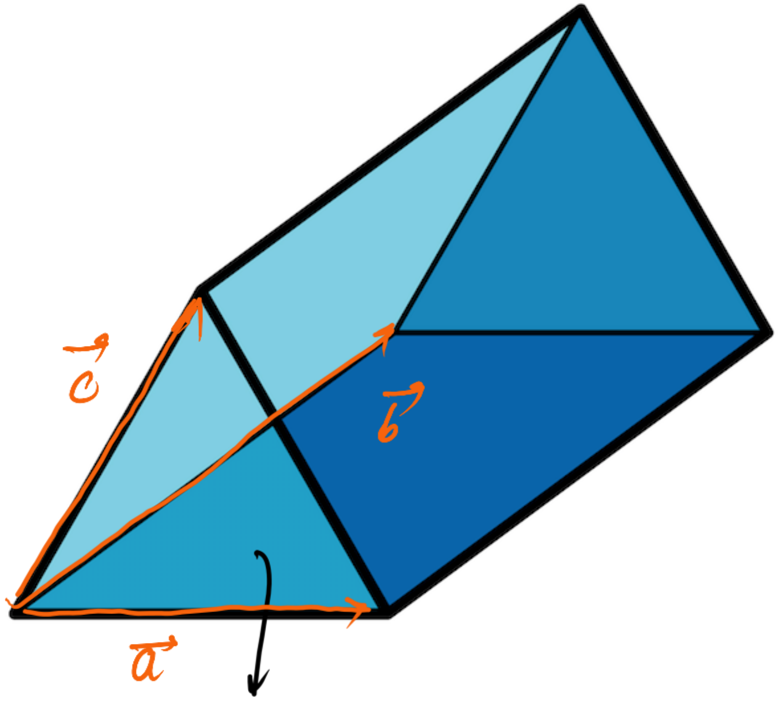
respectively are coplanar if and only if $[\overrightarrow{AB}\ \ \overrightarrow{AC}\ \ \overrightarrow{AD}] = 0$

i.e. if and only if $[\vec{b}-\vec{a}\ \ \vec{c}-\vec{a}\ \ \vec{d}-\vec{a}] = 0$

SCALAR TRIPLE PRODUCT

Tetrahedron (volume) $= \frac{1}{6}[\vec{a}\ \vec{b}\ \vec{c}]$





Triangular prism, (volume) $= \frac{1}{2}[\vec{a}\ \vec{b}\ \vec{c}]$

SSBCrack EXAMS

VECTOR TRIPLE PRODUCT

$$\vec{a} \times \vec{b} \times \vec{c}$$

$$\underline{(\vec{a} \times \vec{b}) \times \vec{c}} \qquad \underline{\vec{a} \times (\vec{b} \times \vec{c})}$$

SSBCrack EXAMS

VECTOR TRIPLE PRODUCT

$\bar{a} \times (\bar{b} \times \bar{c}) = (\bar{a}.\bar{c})\bar{b} - (\bar{a}.\bar{b})\ \bar{c} = \vec{c}\,(\vec{a}.\vec{b}) - \vec{b}\,(\vec{a}.\vec{c})$

$\vec{p} \times (\vec{q} \times \vec{r}) = (\vec{p}.\vec{r})\vec{q} - (\vec{p}.\vec{q})\vec{r}$

$(\bar{a} \times \bar{b}) \times \bar{c} = (\bar{a}.\bar{c})\bar{b} - (\bar{b}.\bar{c})\bar{a}$

$\bar{a} \times (\bar{b} \times \bar{c})$ is a vector perpendicular to $\bar{a}$ and lies in the plane of vectors $\bar{b}$ and $\bar{c}$

$\bar{a} \times (\bar{b} \times \bar{c}) \neq (\bar{a} \times \bar{b}) \times \bar{c}$

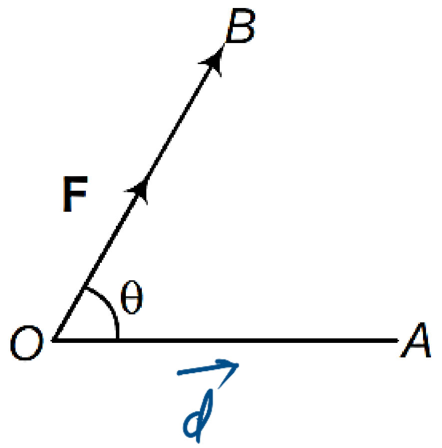
$\bar{a} \times (\bar{b} \times \bar{c}) \neq (\bar{a} \times \bar{b}) \times \bar{c}$

SSBCrack EXAMS

VECTORS IN MECHANICS

Let a particle be placed at O and a force $\mathbf{F}$ represented by $\mathbf{OB}$ be acting on the particle at O. Due to the application of force $\mathbf{F}$, the particle is displaced in the direction of $\mathbf{OA}$.

Let $\mathbf{OA}$ be the displacement $\mathbf{d}$.



Work done = Force in the direction of displacement

$$= \vec{F} \cdot \vec{d} = \underline{Fd\cos\theta}$$

SSBCrack EXAMS

VECTORS IN MECHANICS

Moment

(a) **About a point** Moment $= \mathbf{r} \times \mathbf{F}$

Where $\mathbf{r}$ be the position vector of any point P and $\mathbf{F}$ be the force about the point O.

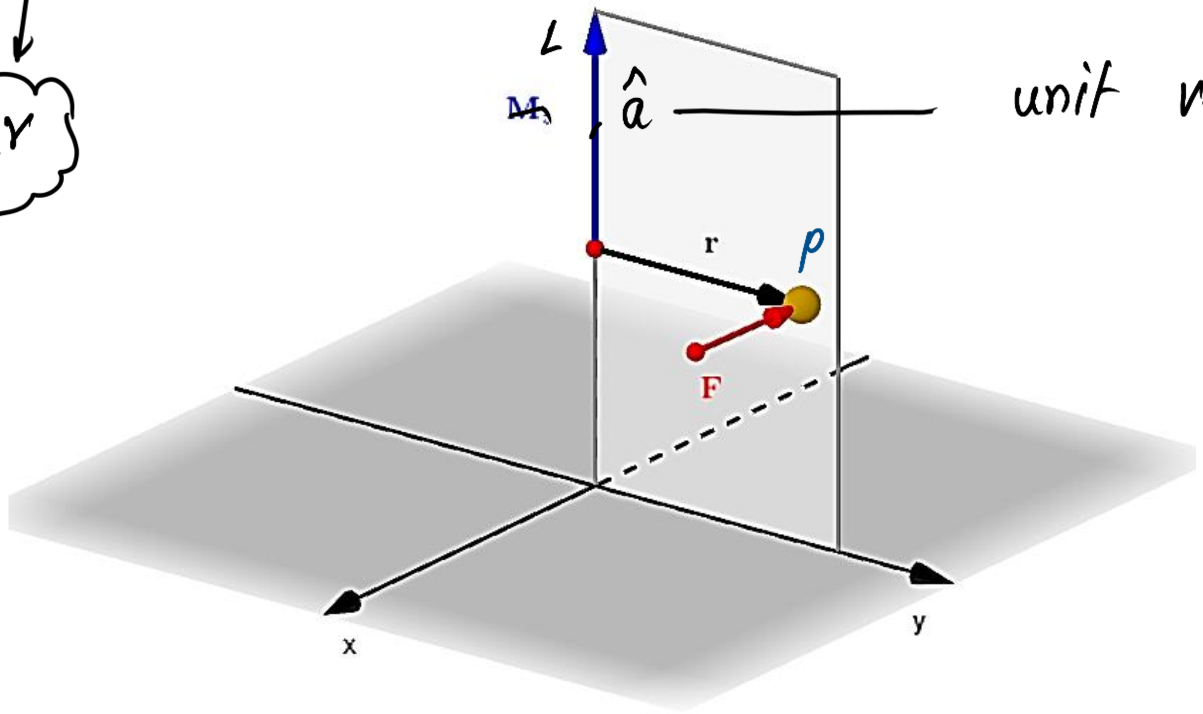
$$\vec{r} \times \vec{F} = rF\sin\theta \cdot \hat{n}$$ (vector)

$$|\vec{r} \times \vec{F}| = rF\sin\theta$$

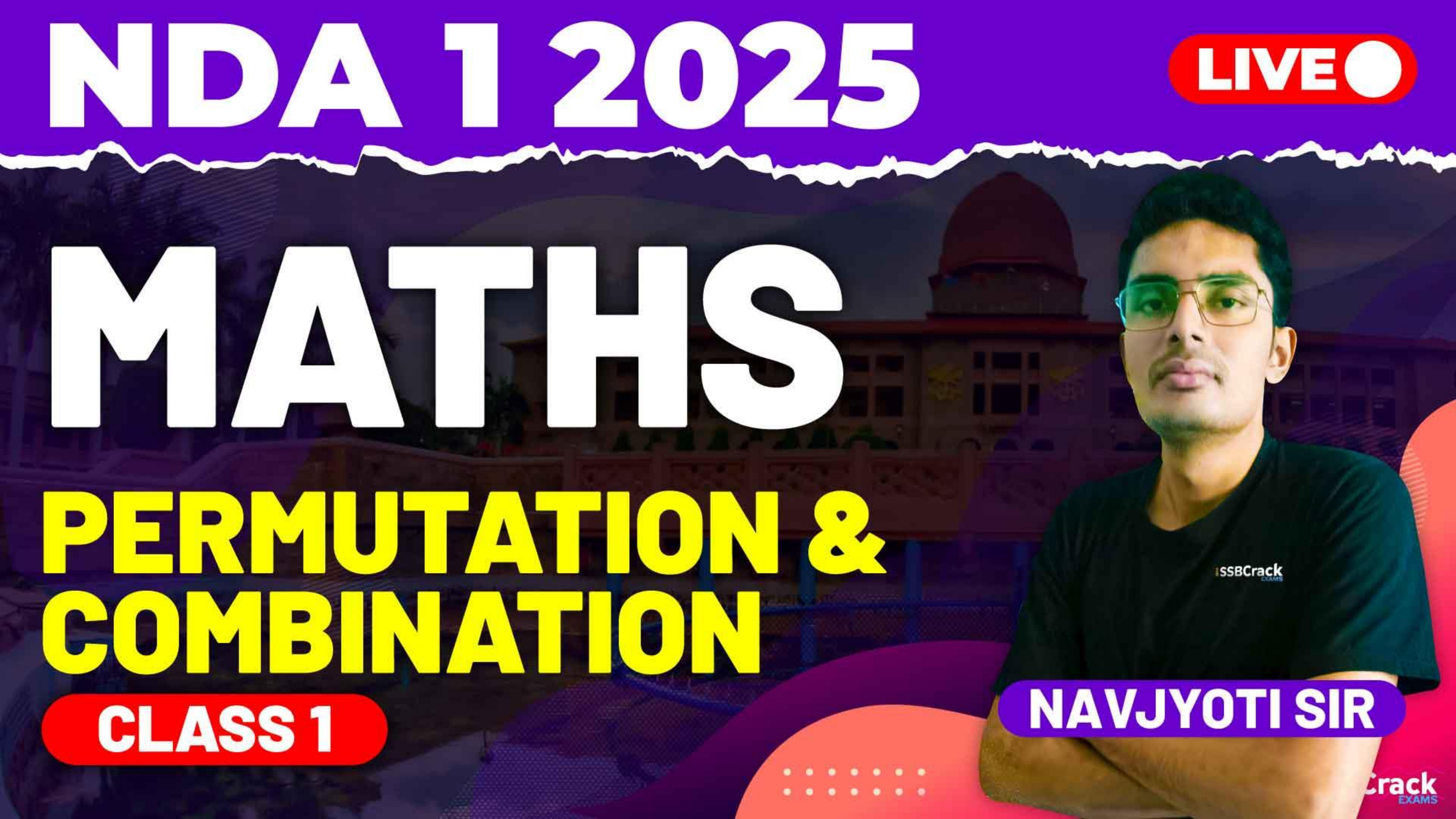
VECTORS IN MECHANICS

(b) **About a line** The moment of a force $\mathbf{F}$ acting at a point P about a line L is a scalar given by $(\mathbf{r} \times \mathbf{F}) \cdot \hat{\mathbf{a}}$.

scalar



unit vector along given line


NDA 1 2025
LIVE
MATHS
PERMUTATION &
COMBINATION
CLASS 1
NAVJYOTI SIR
SSBCrack EXAMS
Crack EXAMS