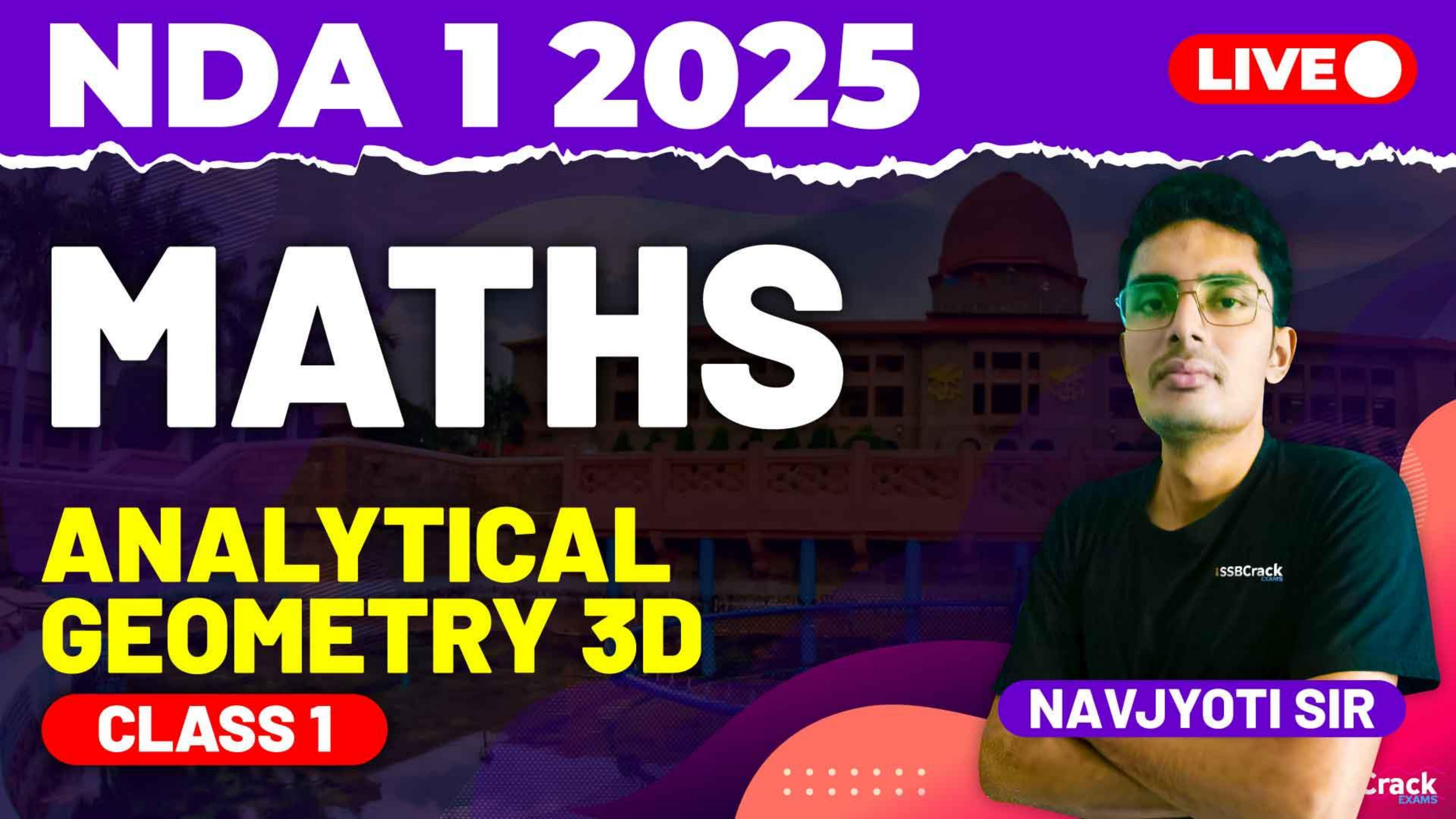

NDA 1 2025
LIVE
MATHS
ANALYTICAL
GEOMETRY 3D
CLASS 1
SSBCrack
EXAMS
NAVJYOTI SIR
Crack
EXAMS

SSBCrack EXAMS

28 Oct 2024 Live Classes Schedule

8:00AM	28 OCTOBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	28 OCTOBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

NDA 1 2025 LIVE CLASSES

11:30AM	GK - POLITY - CONSTITUTIONAL BODIES	RUBY MA'AM
1:00PM	CHEMISTRY - CARBON	SHIVANGI MA'AM
4:00PM	MATHS - ANALYTICAL GEOMETRY 3D - CLASS 1	NAVJYOTI SIR
5:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 1	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

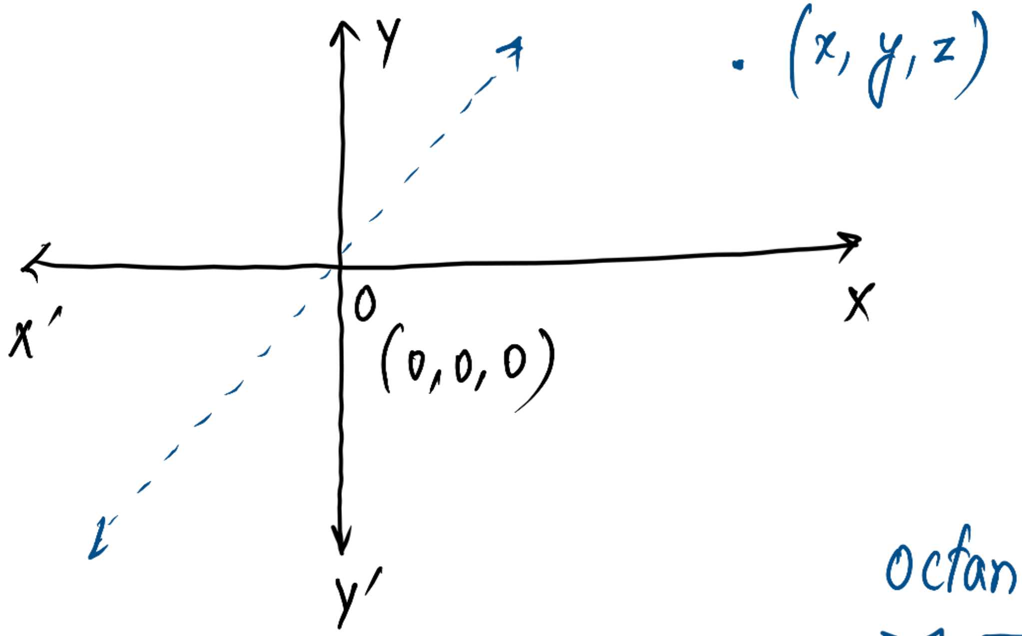
11:30AM	GK - POLITY - CONSTITUTIONAL BODIES	RUBY MA'AM
1:00PM	CHEMISTRY - CARBON	SHIVANGI MA'AM
5:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 1	ANURADHA MA'AM
7:00PM	MATHS - MENSURATION 2D - CLASS 2	NAVJYOTI SIR

AFCAT 1 2025 LIVE CLASSES

4:00PM	STATIC GK - POLITY - CLASS 2	DIVYANSHU SIR
5:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 1	ANURADHA MA'AM
7:00PM	MATHS - MENSURATION 2D - CLASS 2	NAVJYOTI SIR

SSBCrack EXAMS

COORDINATE AXES AND COORDINATE PLANES



Octants

OCTANTS

Octants → Coordinates ↓	I OXYZ	II OX′YZ	III OX′Y′Z	IV OXY′Z	V OXYZ′	VI OX′YZ′	VII OX′Y′Z′	VIII OXY′Z′
x	+	–	–	+	+	–	–	+
y	+	+	–	–	+	+	–	–
z	+	+	+	+	–	–	–	–

SSBCrack EXAMS

COORDINATES OF A POINT

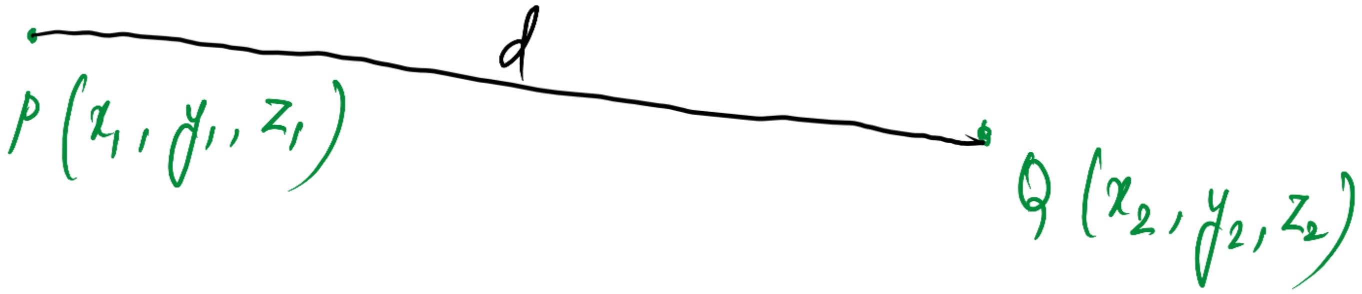
$\cdot (x, y, z)$

Any point on x-axis : $(x, 0, 0)$

" " " y- " : $(0, y, 0)$

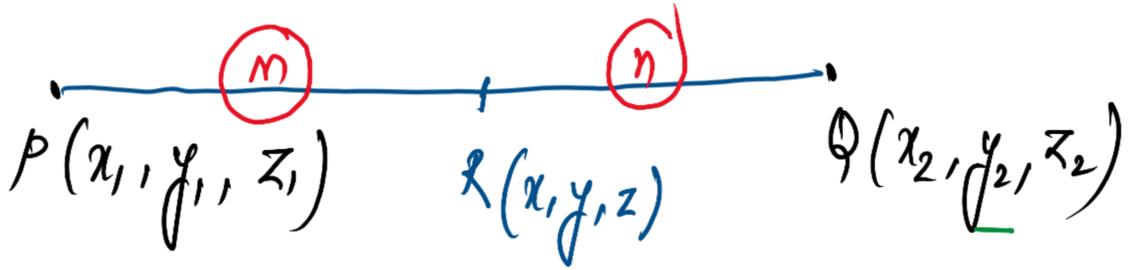
" " " z-axis : $(0, 0, z)$

DISTANCE FORMULA



$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

SECTION FORMULA



$$\frac{PR}{QR} = \frac{m}{n} = \underline{m : n}$$

(Internal Division)

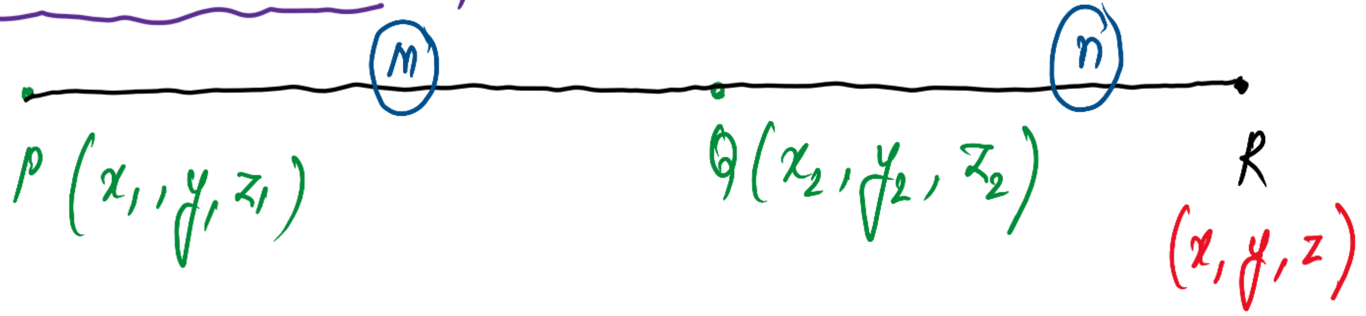
(point R in between PQ)

$$x = \frac{mx_2 + nx_1}{m+n} \qquad y = \frac{my_2 + ny_1}{m+n} \qquad z = \frac{mz_2 + nz_1}{m+n}$$

→ If coordinates of R is given, and ratio is asked, assume it $k : 1$

$k : 1 \longrightarrow$ comes +ve

External Division (point R outside PQ)



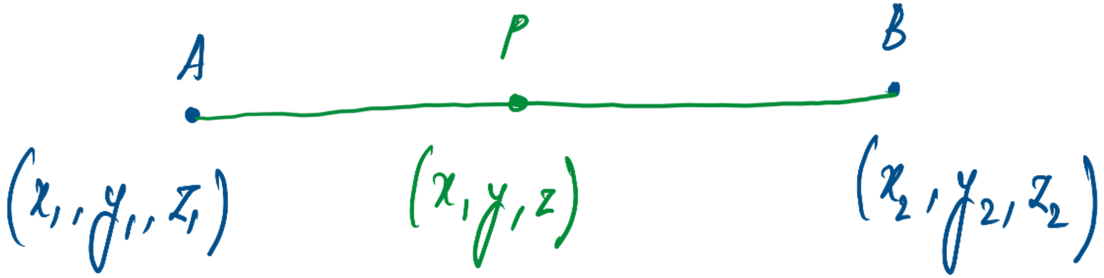
$$\frac{PQ}{QR} = \frac{m}{n}$$

$$x = \frac{mx_2 - nx_1}{m-n} \; ; \; y = \frac{my_2 - ny_1}{m-n} \; ; \; z = \frac{mz_2 - nz_1}{m-n}$$

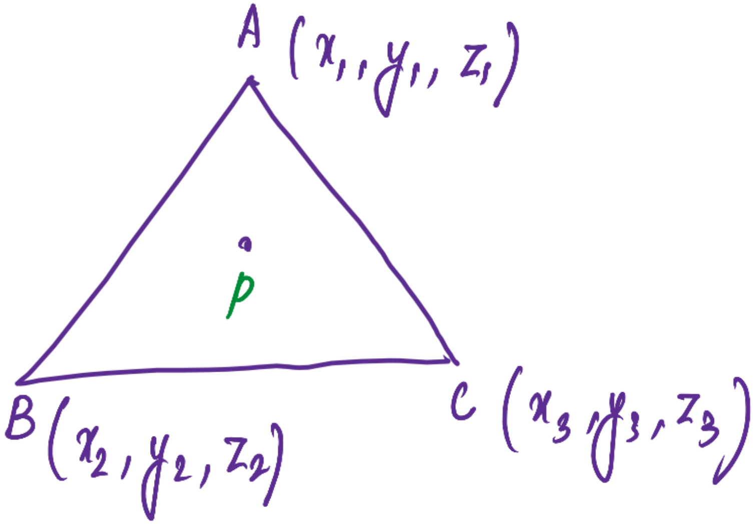
$k:1$ comes -ve when solving for ratio,

SSBCrack EXAMS

MID-POINT AND CENTROID



$$x = \frac{x_1 + x_2}{2} \; ; \; y = \frac{y_1 + y_2}{2} \; ; \; z = \frac{z_1 + z_2}{2}$$



coordinates of centroid, P

$$\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3} \right)$$

QUESTION

Find the coordinates of a point equidistant from the four points O (0, 0, 0), A (*l*, 0, 0), B (0, *m*, 0) and C (0, 0, *n*).

Let the point be $P(x, y, z)$.

$OP^2 = OA^2$

$(x-0)^2 + (y-0)^2 + (z-0)^2 = (x-l)^2 + (y-0)^2 + (z-0)^2$

$x^2 = x^2 - 2lx + l^2$

$l^2 = 2lx \Rightarrow x = \frac{l}{2}$

$OP^2 = OB^2$

$y = \frac{m}{2}$

$OP^2 = OC^2$

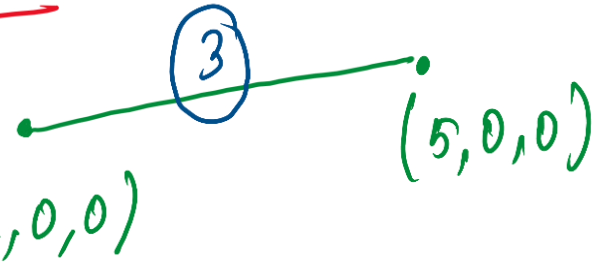
$z = \frac{n}{2}$

$\left(\frac{l}{2}, \frac{m}{2}, \frac{n}{2}\right)$

QUESTION

If a parallelopiped is formed by planes drawn through the points (2, 3, 5) and (5, 9, 7) parallel to the coordinate planes, then find the length of edges of a parallelopiped and length of the diagonal.

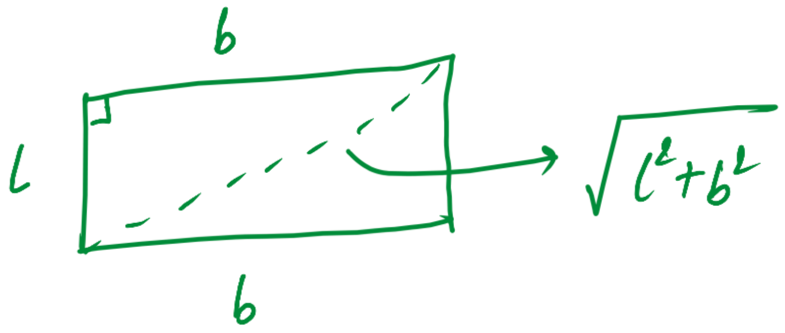
Length of edges = $\underset{(a)}{5-2}$, $\underset{(b)}{9-3}$, $\underset{(c)}{7-5}$ | $3, 6, 2$



diagonal = $\sqrt{a^2+b^2+c^2} = \sqrt{3^2+6^2+2^2}$

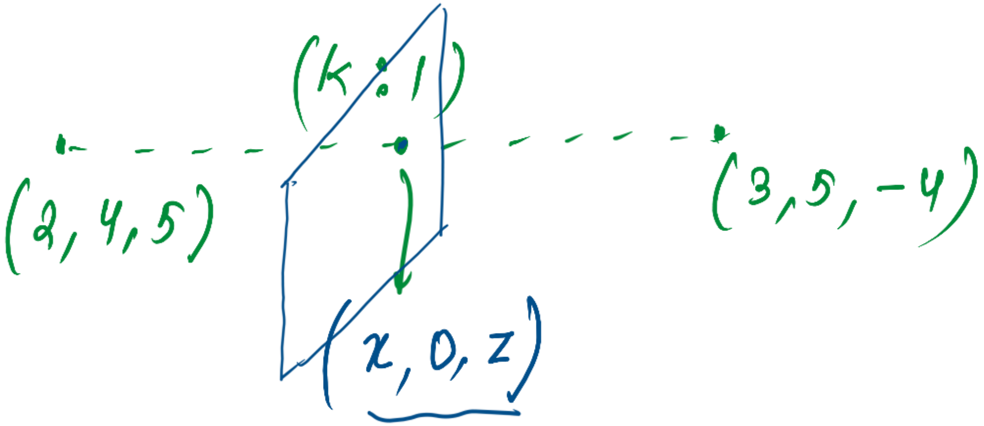
$= \sqrt{9+36+4}$

$= 7$ units



QUESTION

Find the ratio in which the line segment joining the points (2, 4, 5) and (3, 5, – 4) is divided by the *xz*-plane.

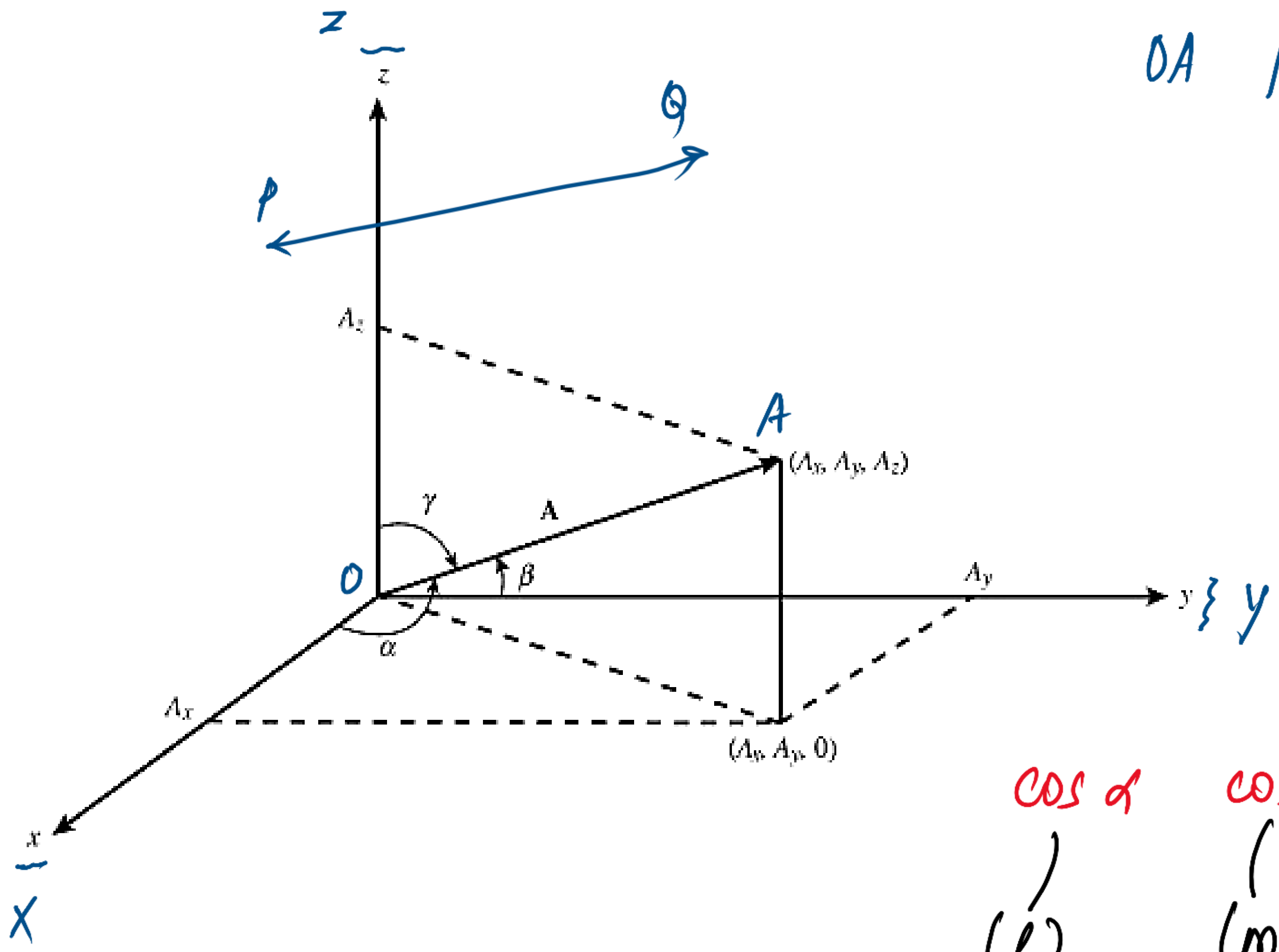


$$0 = \frac{4+5k}{k+1} \Rightarrow k = -\frac{4}{5} \quad \text{(external division)}$$

$$\boxed{4 : 5}$$

SSBCrack EXAMS

DIRECTION COSINES OF A LINE



OA ∥ PQ.

OA makes angle 'α' with x-axis.

" " " 'β' " y-axis.

" " " 'γ' " z-axis.

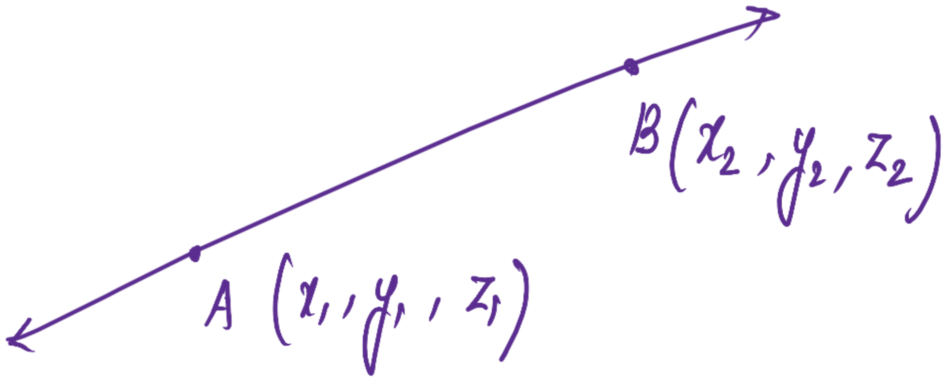
$\cos\alpha$ $\quad \cos\beta$ $\quad \cos\gamma$ ⟶ direction cosines,

(l) $\quad (m)$ $\quad (n)$

$$\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$$

$$\langle l, m, n \rangle$$

DIRECTION COSINES OF A LINE PASSING THROUGH TWO POINTS



$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

direction cosines of AB $\Rightarrow$ $l = \dfrac{x_2 - x_1}{AB}$ $\quad m = \dfrac{y_2 - y_1}{AB}$ $\quad n = \dfrac{z_2 - z_1}{AB}$

SSBCrack EXAMS

DIRECTION RATIOS OF A LINE

→ numbers proportional to direction ratios.

$\langle a, b, c \rangle$

$$l = \pm \frac{a}{\sqrt{a^2+b^2+c^2}} \qquad m = \pm \frac{b}{\sqrt{a^2+b^2+c^2}} \qquad n = \pm \frac{c}{\sqrt{a^2+b^2+c^2}}$$

(D. Rs. related to Dcs.)

EQUATION OF LINE

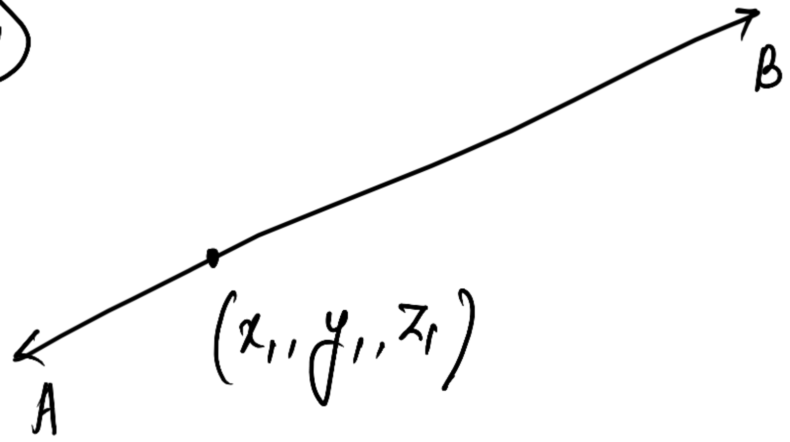
(1) one passing point

+

Dir. ratios / Dir. cosines

(2) two passing points

1



1 passing point and dir. ratios/ cosines is given.

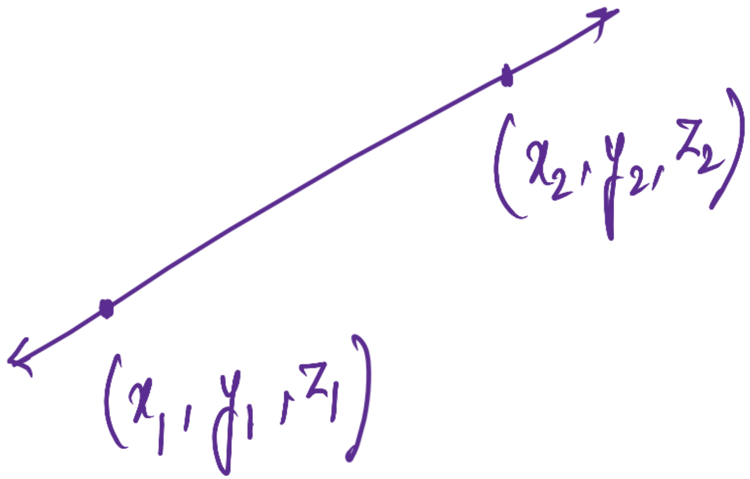
eqn of line AB $\Rightarrow$ $$\frac{x-x_1}{a} = \frac{y-y_1}{b} = \frac{z-z_1}{c}$$

(OR)

$$\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$$

② Two passing points,

dir. ratio / dir cosines $\propto$ $x_2 - x_1$ $y_2 - y_1$ $z_2 - z_1$



$$\boxed{\frac{x - x_1}{x_2 - x_1} = \frac{y - y_1}{y_2 - y_1} = \frac{z - z_1}{z_2 - z_1}}$$

ANGLE BETWEEN TWO LINES

* $l_1 \quad m_1 \quad n_1$ (Dir. cosines of line$_1$) $\qquad l_2, m_2, n_2$ (Dir. cosines of line$_2$)

$$\cos\theta = l_1 l_2 + m_1 m_2 + n_1 n_2$$

* If dir. ratios are given, $a_1 \ b_1 \ c_1$ and $a_2 \ b_2 \ c_2$

$$\cos\theta = \frac{a_1 a_2 + b_1 b_2 + c_1 c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\ \sqrt{a_2^2 + b_2^2 + c_2^2}}$$

→ When given two lines are perpendicular

$$l_1 l_2 + m_1 m_2 + n_1 n_2 = 0 \quad ; \quad a_1 a_2 + b_1 b_2 + c_1 c_2 = 0$$

→ when given two lines are parallel,

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\frac{l_1}{l_2} = \frac{m_1}{m_2} = \frac{n_1}{n_2}$$

SKEW LINES AND SHORTEST DISTANCE BETWEEN THEM

Lines not parallel and not intersecting.

Let two skew lines be,

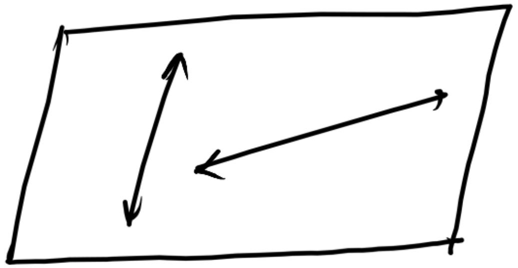
$$\frac{x-x_1}{a_1} = \frac{y-y_1}{b_1} = \frac{z-z_1}{c_1}$$

$$\frac{x-x_2}{a_2} = \frac{y-y_2}{b_2} = \frac{z-z_2}{c_2}$$

$$\frac{\begin{vmatrix} x_2-x_1 & y_2-y_1 & z_2-z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}}{\sqrt{(b_1c_2-b_2c_1)^2+(c_1a_2-c_2a_1)^2+(a_1b_2-a_2b_1)^2}}$$

COPLANARITY OF TWO LINES

Lines should be on the same plane,



$$\begin{vmatrix} x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix} = 0$$

(condition for two lines lieing on same plane)

SSBCrack EXAMS

If the direction cosines $< l, m, n >$ of a line are connected by relation $l + 2m + n = 0$, $2l - 2m + 3n = 0$, then what is the value of $l^2 + m^2 - n^2$?

(PYQ – 2024 – I)

(a) $\frac{1}{101}$

(b) $\frac{29}{101}$

(c) $\frac{41}{101}$

(d) $\frac{92}{101}$

$l + 2m + n = 0$

$2l - 2m + 3n = 0$

$\frac{p \quad q}{r \quad s}$

$(ps - qr)$

$\frac{l}{6+2} = \frac{-m}{3-2} = \frac{n}{-2-4} = k$

$l = 8k \qquad m = -k \qquad n = -6k$

$(l^2+m^2+n^2=1)$ $(8k)^2 + (-k)^2 + (-6k)^2 = 1$

$101k^2 = 1$

$k^2 = \frac{1}{101}$

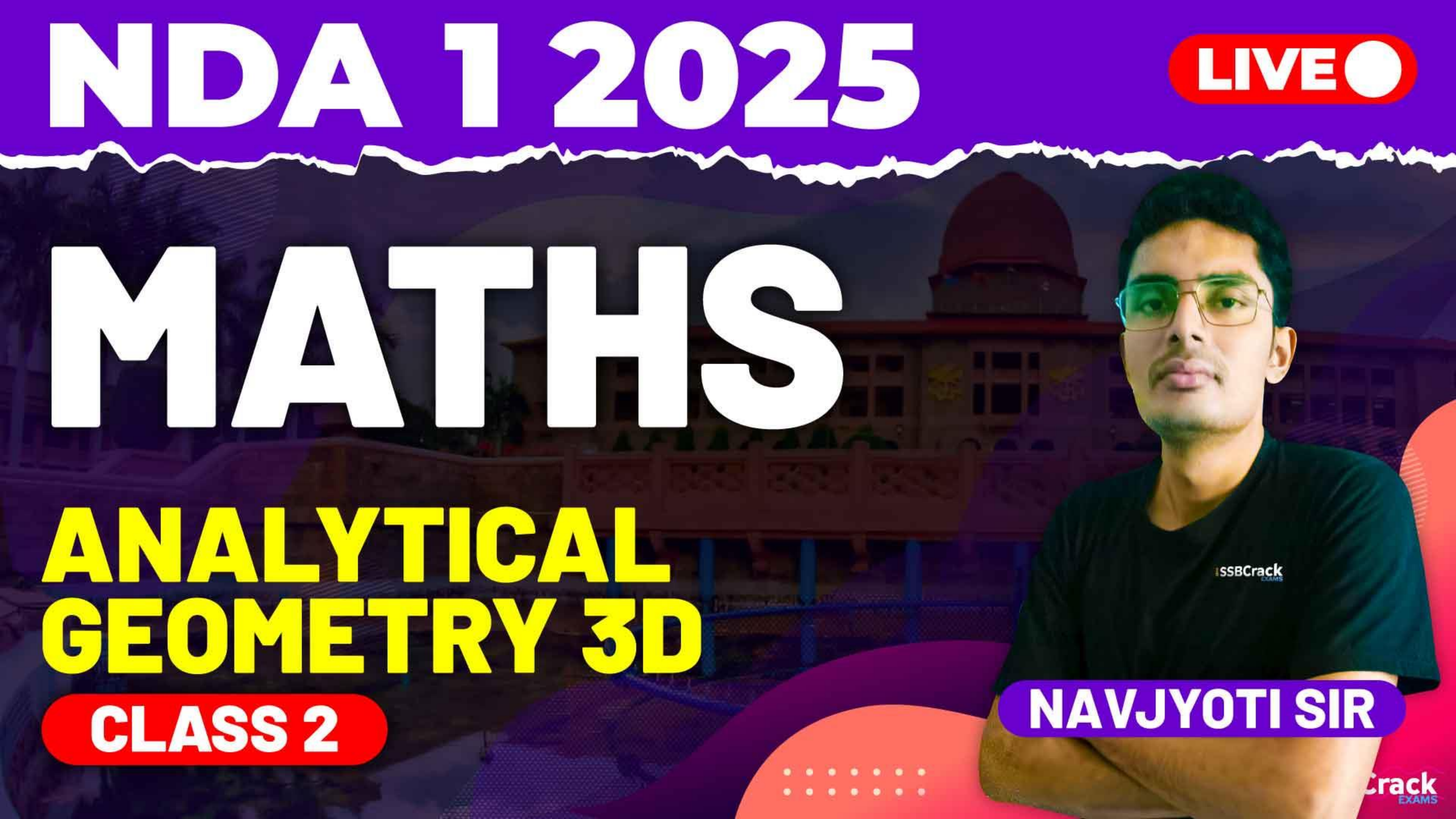
$l^2 + m^2 - n^2$

$64k^2 + k^2 - (-6k)^2$

$65k^2 - 36k^2$

$= 29k^2$

$= 29\left(\frac{1}{101}\right) = \frac{29}{101}$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