

3 - 3D Geomrtry

- The angle between two straight lines whose direction cosines are (l_1, m_1, n_1) and (l_2, m_2, n_2) :

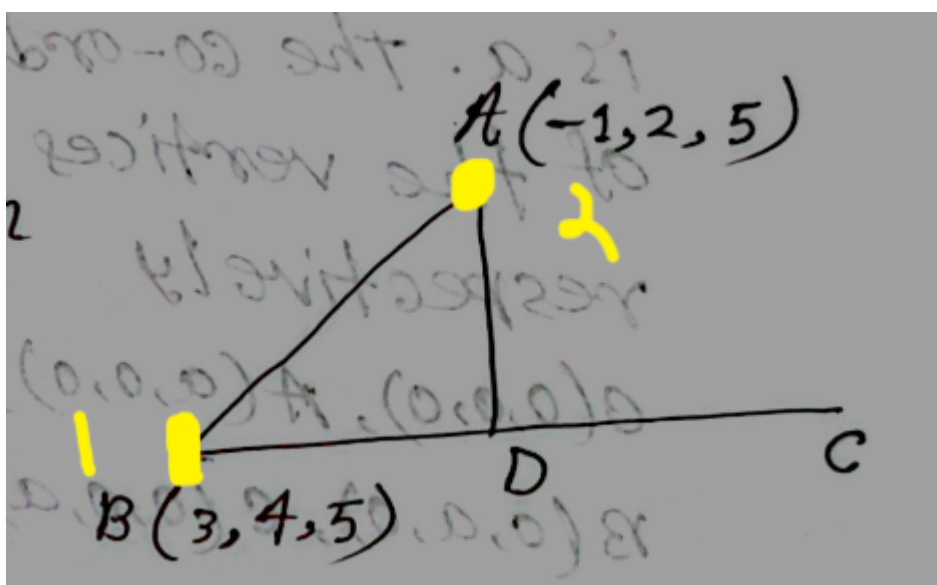
$$\begin{aligned}\cos\theta &= l_1l_2 + m_1m_2 + n_1n_2 \\ &= \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2} \cdot \sqrt{a_2^2 + b_2^2 + c_2^2}}\end{aligned}$$

- Direction cosine of a point (a, b, c) :

$$\begin{aligned}l &= \frac{a}{\sqrt{a^2 + b^2 + c^2}} \\ m &= \frac{b}{\sqrt{a^2 + b^2 + c^2}} \\ n &= \frac{c}{\sqrt{a^2 + b^2 + c^2}}\end{aligned}$$

- At the time of **direction ratio**, careful about which point is point 1 and which is point 2. According to this the direction ratio will be:

$$(x_2 - x_1), (y_2 - y_1), (z_2 - z_1)$$



- Diagonal means কর্ণ 😊
- If the direction cosines (l, m, n) of a line satisfy two given relations (i) and (ii), then:
 1. **From one relation**, express n in terms of l and m .

2. **Substitute this value of n** into the other relation. This gives a linear equation in l and m .
3. Now you have two equations:
 - the new linear equation in l and m ,
 - the condition $l^2 + m^2 + n^2 = 1$ (after substituting for n).
4. **Solve these two equations together** to find the values of l, m, n .

must do

- parallel or ta

Q. 1. If θ be the angle between the two straight lines whose direction cosines are l_1, m_1, n_1 and l_2, m_2, n_2 then show that,
 $\cos \theta = l_1 l_2 + m_1 m_2 + n_1 n_2$.
Also find the condition of parallel and perpendicular.

- dekhte sundor

Q. 3. Find the direction cosines of the line which is equally inclined to the axes.

- remind the process

Q. 4. Find the distance of $(-1, 2, 5)$ from the line through $(3, 4, 5)$ whose direction cosines are proportional to $2, -3, 6$.

- remind the process

Q. 6. A line makes angles $\alpha, \beta, \gamma, \delta$ with the four diagonals of a cube prove that,

- $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma + \cos^2 \delta = \frac{4}{3}$
- $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma + \sin^2 \delta = \frac{8}{3}$

- remind the process & must find the direction cosine again

7. If the direction cosines of two lines are connected by the relation $2l + 2m - n = 0$ and $lm + mn + nl = 0$ then find the direction cosines of the lines. show that the lines are perpendicular to each other.