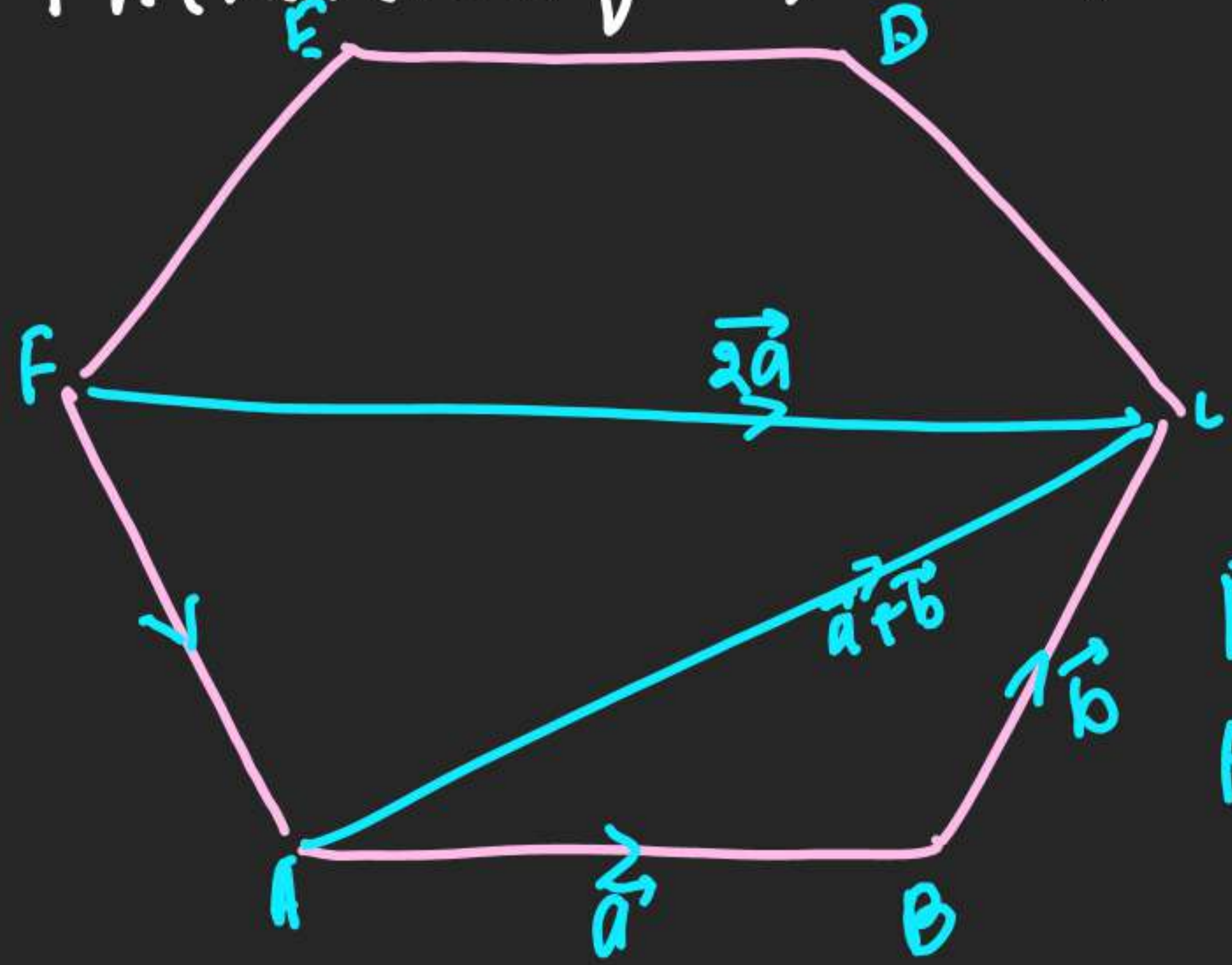
Nishant Jindal

Q If $\vec{a}$ & $\vec{b}$ rep. by Sides AB & BC of a regular hexagon ABCDEF, then vector Rep. by FA (in terms of $\vec{a}$ & $\vec{b}$) will be?

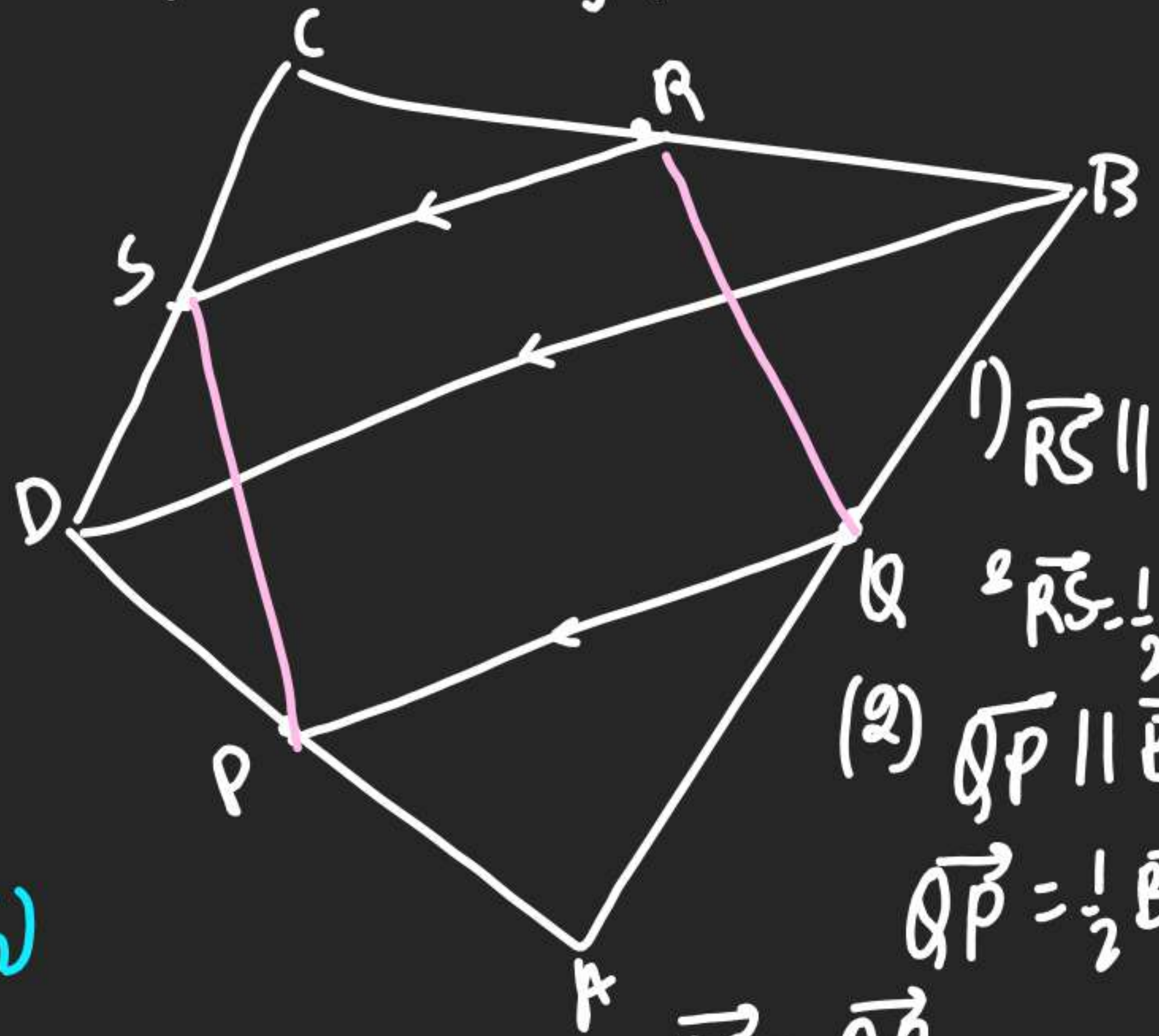


$\vec{FA}+\vec{AC}=\vec{FC}$

$\vec{FA}=2\vec{a}-(\vec{a}+\vec{b})$

$=\vec{a}-\vec{b}$

Q If Mid Pt of Consecutive Sides of a quadrilateral are joined, P.T. resulting quad. is a ||gm.



1) $\vec{RS} \parallel \vec{BD}$

& $\vec{RS}=\frac{1}{2}\vec{BD}$

(2) $\vec{QP} \parallel \vec{BD}$

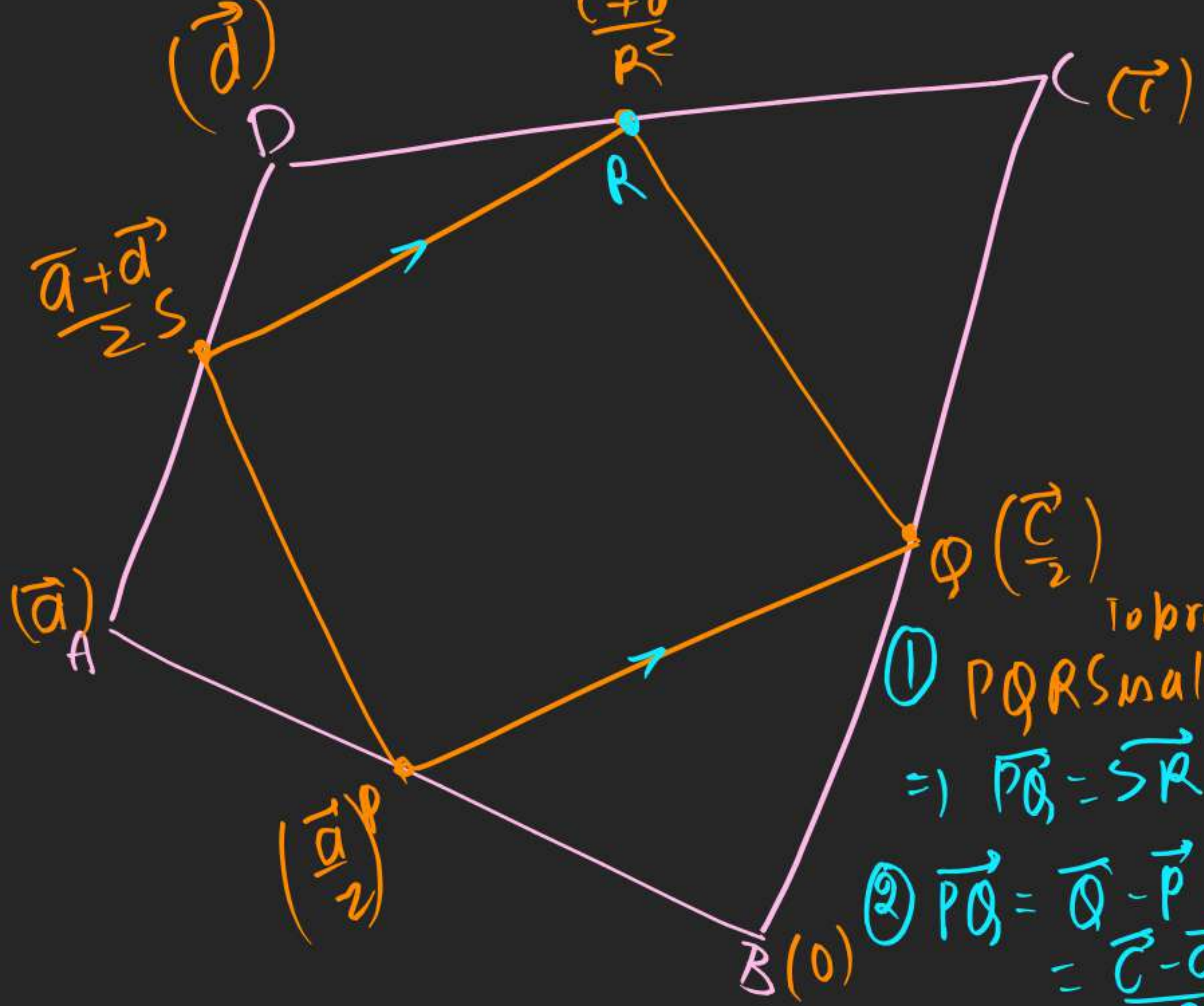
$\vec{QP}=\frac{1}{2}\vec{BD}$

$\vec{RS}=\vec{QP}$

PQRS is ||gm

Nishant Jindal

Q If Mid Pt of Consecutive Sides of a quadrilateral are joined, P.T. resulting quad. is a ||gm.



To prove

① PQRS is a ||gm

$\Rightarrow \vec{PQ} = \vec{SR}$

② $\vec{PQ} = \vec{Q} - \vec{P}$

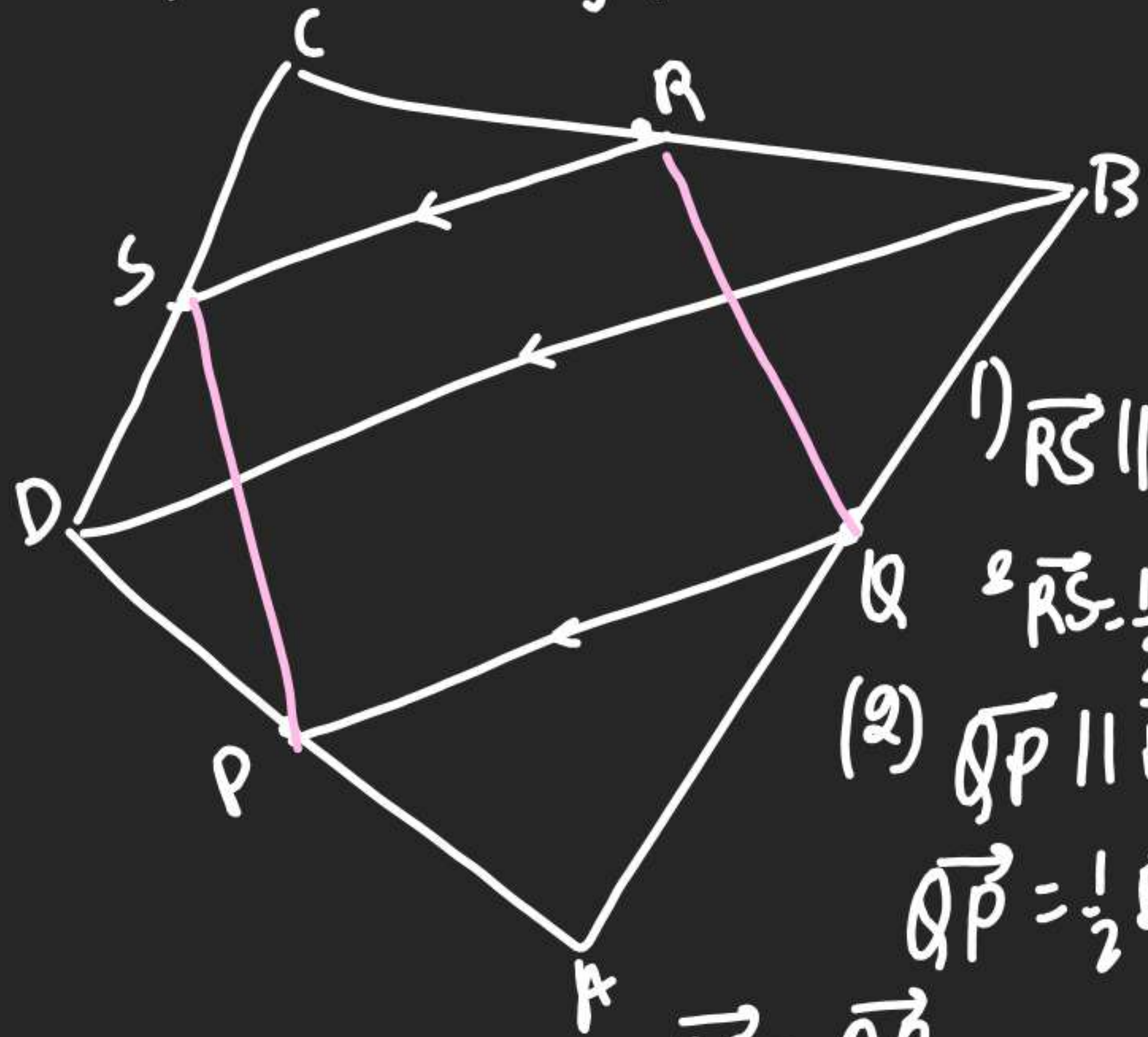
$= \frac{\vec{c} - \vec{a}}{2}$

$\vec{SR} = \vec{R} - \vec{S}$

$= \frac{\vec{c}+\vec{d}}{2} - \frac{\vec{a}+\vec{d}}{2} = \frac{\vec{c}-\vec{a}}{2}$

So $\vec{PQ} = \vec{SR}$

$\Rightarrow$ PQRS is a ||gm



1) $\vec{RS} \parallel \vec{BD}$

& $\vec{RS} = \frac{1}{2}\vec{BD}$

(2) $\vec{QP} \parallel \vec{BD}$

$\vec{QP} = \frac{1}{2}\vec{BD}$

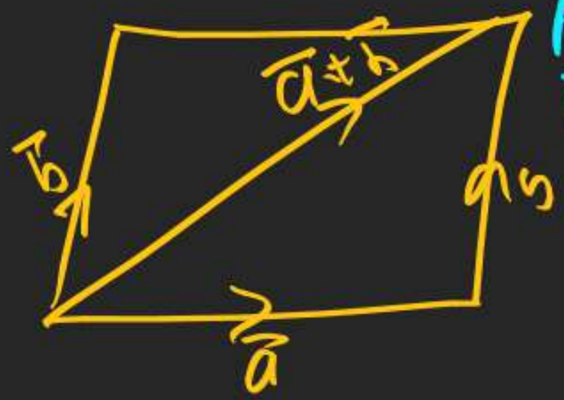
$\vec{RS} = \vec{QP}$

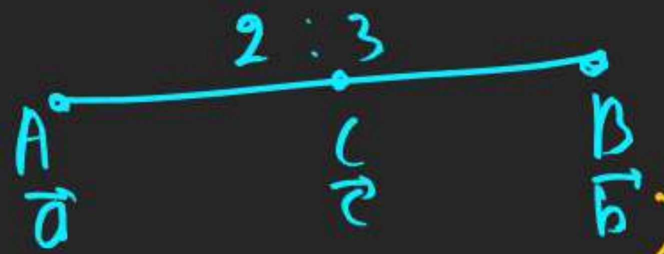
PQRS is ||gm

Nishant Jindal

Remark:-

$\vec{c}$ is dividing $\vec{a}$ & $\vec{b}$ in 2:3





$$\vec{c} = \frac{2\vec{b}+3\vec{a}}{5}$$

2) $2\vec{b}+3\vec{a} = 5\vec{c}$

$2\vec{b}+3\vec{a}-5\vec{c} = 0 \rightarrow 2+3-5=0$

★ By seeing this we can conclude to

$\underbrace{x\vec{a}+y\vec{b}+z\vec{c}}_{}=0$

Scalar Vector Combination

↳ Linear Combination

& $x+y+z=0$ then $\vec{a},\vec{b},\vec{c}$ are collinear

Q A transversal cuts Sides OL, OM, diagonal ON of a llgm at A, B, C Resp. P.T. $\frac{\overline{OL}}{\overline{OA}}+\frac{\overline{OM}}{\overline{OB}}=\frac{\overline{ON}}{\overline{OC}}$

① $\overrightarrow{OA}$ is Part of OL

$x = \frac{\overline{OL}}{\overline{OA}} \leftarrow \overrightarrow{OL} = x\overrightarrow{OA}$

$\overrightarrow{ON} = y\overrightarrow{OC}$

$\overrightarrow{OM} = z\overrightarrow{OB}$

(3) llgm law $\overrightarrow{OL}+\overrightarrow{OM}=\overrightarrow{ON}$

$x\cdot\overrightarrow{OA}+z\overrightarrow{OB}=y\overrightarrow{OC}$

L.C.=0 $\longrightarrow x\overrightarrow{OA}+z\overrightarrow{OB}-y\overrightarrow{OC}=0$

A, B, C collinear

$x+z-y=0$

$$\frac{\overline{OL}}{\overline{OA}}+\frac{\overline{OM}}{\overline{OB}}=\frac{\overline{ON}}{\overline{OC}}$$

(2) $\boxed{\begin{array}{l} \text{llgm law.} \\ \vec{ON} = \vec{OL} + \vec{OM} \end{array}}$

$$z\vec{OC} = x\cdot\vec{OA} + y\vec{OB}$$

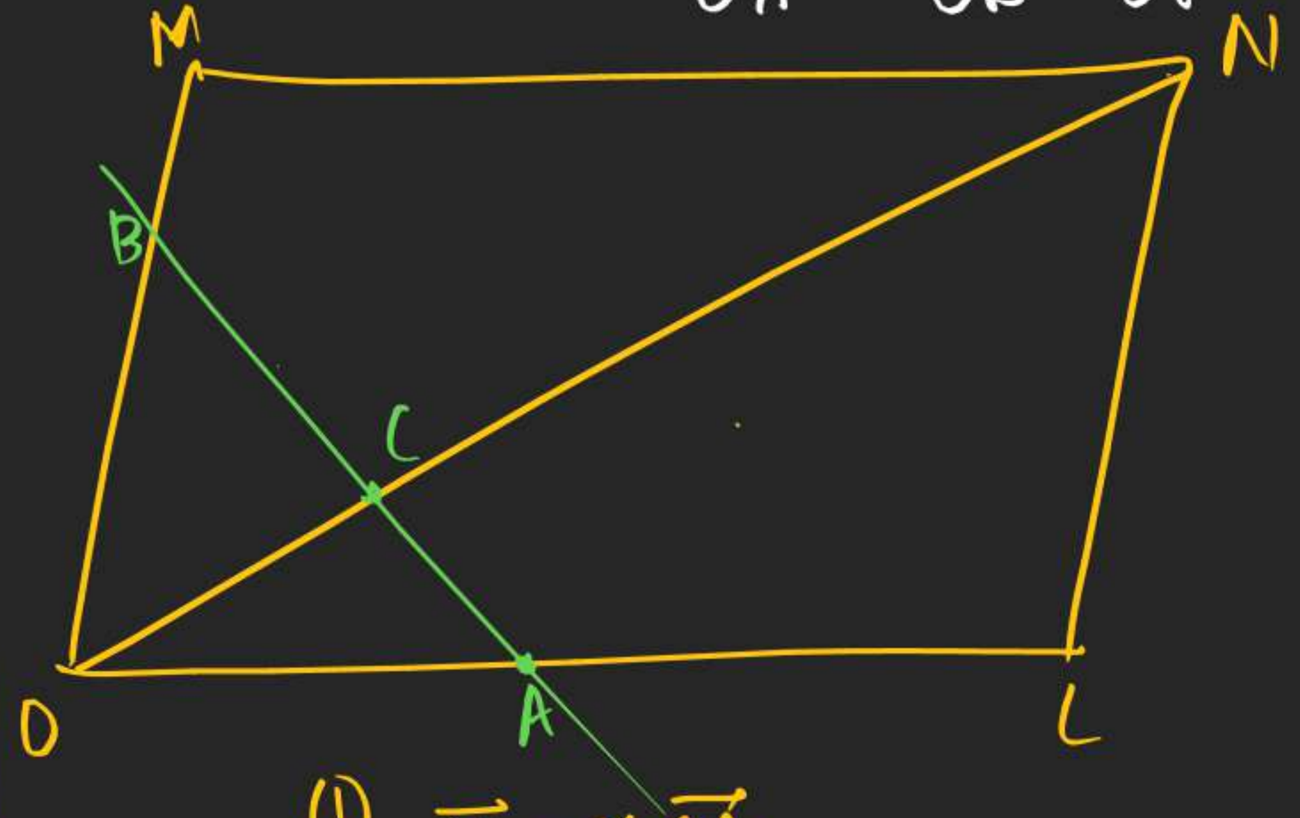
$$L.C. = 0 \rightarrow x\vec{OA} + y\vec{OB} - z\vec{OC} = 0$$

& $\vec{A}, \vec{B}, \vec{C}$ collinear

$$x + y - z = 0$$

$$\frac{\vec{OL}}{\vec{OA}} + \frac{\vec{OM}}{\vec{OB}} = \frac{\vec{ON}}{\vec{OC}}$$

Q A tansversal cuts Sides OL, OM, diagonal ON of a llgm at A, B, C Resp. P.T. $\frac{\vec{OL}}{\vec{OA}} + \frac{\vec{OM}}{\vec{OB}} = \frac{\vec{ON}}{\vec{OC}}$



(1) $\vec{OL} = x\cdot\vec{OA}$

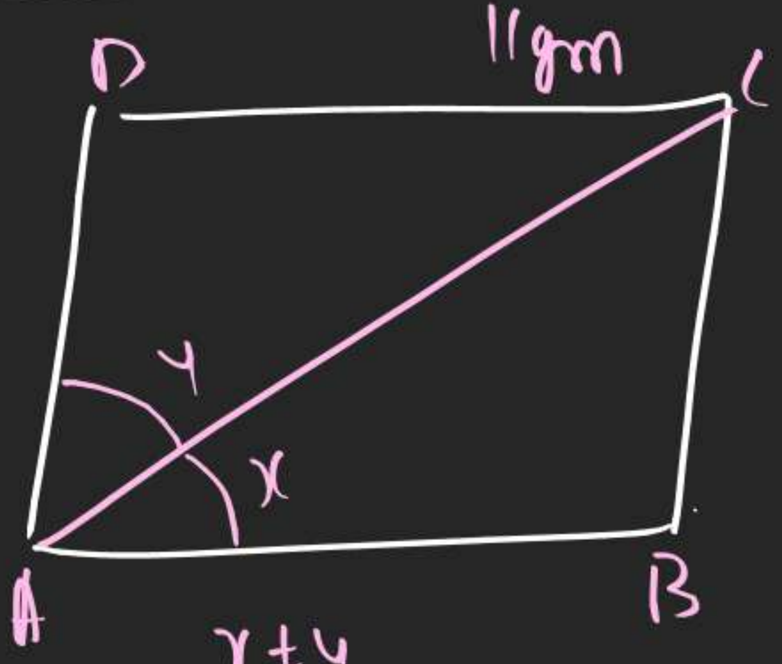
$\vec{OM} = y\vec{OB}$

$\vec{ON} = z\vec{OC}$

C

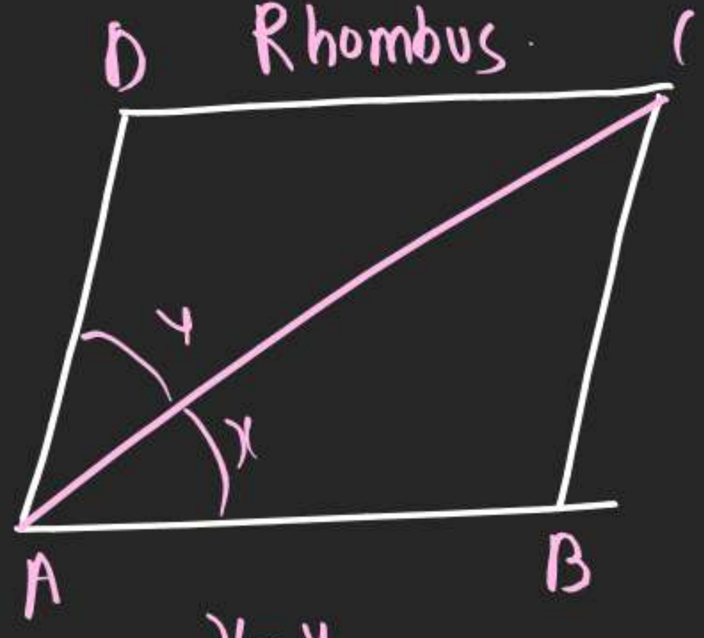
Nishant Jindal

Difference betⁿ Rhombus & ||gm.



$x \neq y$

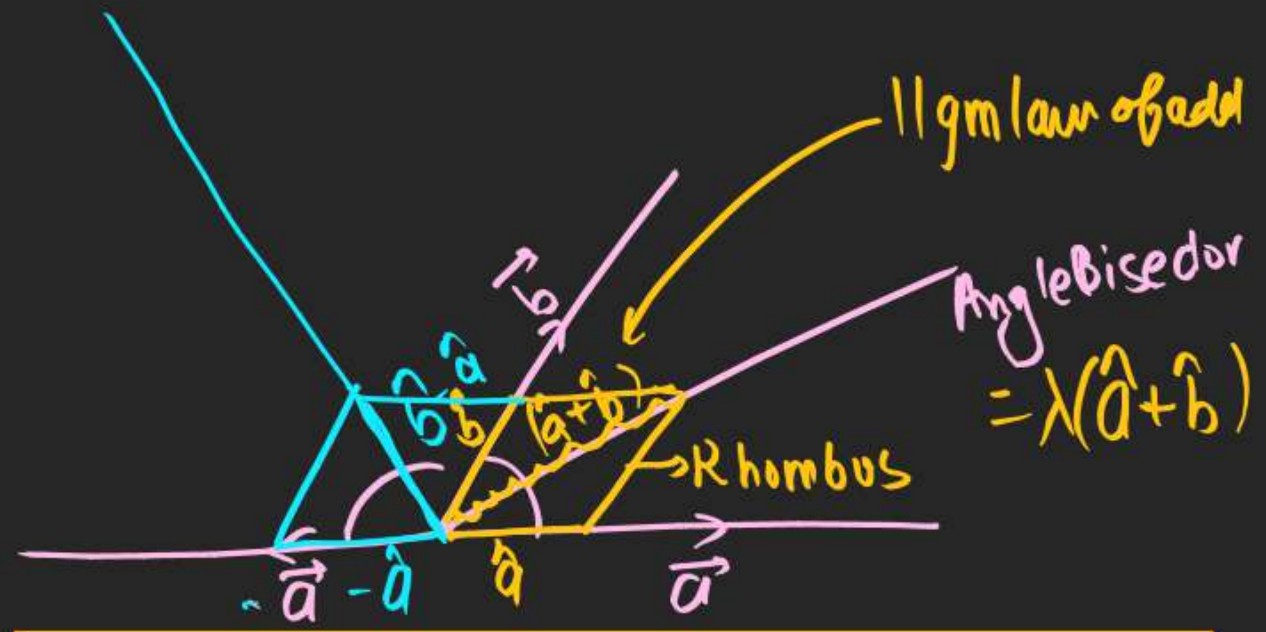
Diagonal is not Angle Bisector



$x = y$

Diagonal is Angle Bisector.

Internal / External Angle Bisector.



External Angle Bisector of $\vec{a}$ & $\vec{b}$ is $\mu(\hat{a}-\hat{b})$	Internal Angle Bisector of $\vec{a}$ & $\vec{b}$ is $\lambda(\hat{a}+\hat{b})$

$\vec a, \vec b \to$ Internal A.B $= \lambda(\hat a + \hat b)$

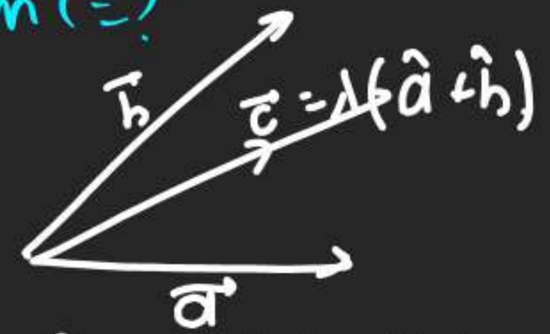
Q If $\vec a = 7\hat i + 4\hat j - 4\hat k$, $\vec b = -2\hat i - \hat j + 2\hat k$

& $\vec c$ is Internal Angle Bisector of $\vec a$ & $\vec b$

Where $|\vec c| = 5\sqrt6$ then $\vec c = ?$

$|a| = \sqrt{49+16+16} = 9$

$|b| = \sqrt{4+1+4} = 3$



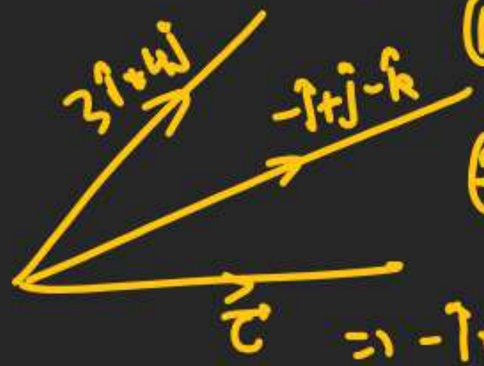
(1) $\vec c = \lambda\left(\frac{7\hat i + 4\hat i - 4\hat j}{9} + \frac{-2\hat i - \hat j + 2\hat k}{3}\right)$

$\vec c = \lambda\left(\frac{\hat i + \hat j + 2\hat k}{9}\right) = \frac{\lambda}{9}(\hat i + \hat j + 2\hat k) = \frac{\lambda}{9}\hat i + \frac{\lambda}{9}\hat j + \frac{2\lambda}{9}\hat k$

(2) $|\vec c| = 5\sqrt6 \Rightarrow |c| = \sqrt{\left(\frac{\lambda}{9}\right)^2 + \left(\frac{\lambda}{9}\right)^2 + \left(\frac{2\lambda}{9}\right)^2} = \frac{\lambda\sqrt6}{9} = 5\sqrt6 \Rightarrow \lambda = 45$

$\vec c = \frac{45}{9}(\hat i + \hat j + 2\hat k) = 5\hat i + 5\hat j + 10\hat k$

Q A Vector $-\hat i + \hat j - \hat k$ is Angle Bisector of $\vec c$ & $3\hat i + 4\hat j$. Find unit vector in direction of $\vec c$?



(1) Let $\hat c = x\hat i + y\hat j + z\hat k \to |\hat c| = 1$

$x^2 + y^2 + z^2 = 1$

(2) $-\hat i + \hat j - \hat k = \lambda\left(\hat c + \frac{3\hat i + 4\hat j}{5}\right)$

$\Rightarrow -\hat i + \hat j - \hat k = \lambda\left(x\hat i + y\hat j + z\hat k + \frac{3}{5}\hat i + \frac{4}{5}\hat j\right)$

$-1 = \lambda\left(x + \frac35\right)$ | $1 = \lambda\left(y + \frac45\right)$ | $-1 = \lambda z$

$x + \frac35 = -\frac1\lambda$ | $y + \frac45 = \frac1\lambda$ | $\Rightarrow z = \frac{-1}{\lambda}$

$x = -\frac1\lambda - \frac35$ | $y = \frac1\lambda - \frac45$ | $z = -\frac1\lambda$

$\left(-\frac1\lambda - \frac35\right)^2 + \left(\frac1\lambda - \frac45\right)^2 + \left(\frac1\lambda\right)^2 = 1$

$(-5 - 3\lambda)^2 + (5 - 4\lambda)^2 + 1 = \lambda^2 \Rightarrow \lambda = \frac{15}{2}$

$x = -\frac{2}{15} - \frac35$ | $y = \frac{2}{15} - \frac45$ | $z = -\frac{2}{15}$

$\hat c = ?$

Nishant Jindal

Ratio Based Qs.

Q In $\triangle PQR$, S & T are 2 pts on QR P

Nishant Jindal

Ratio Based Qs.

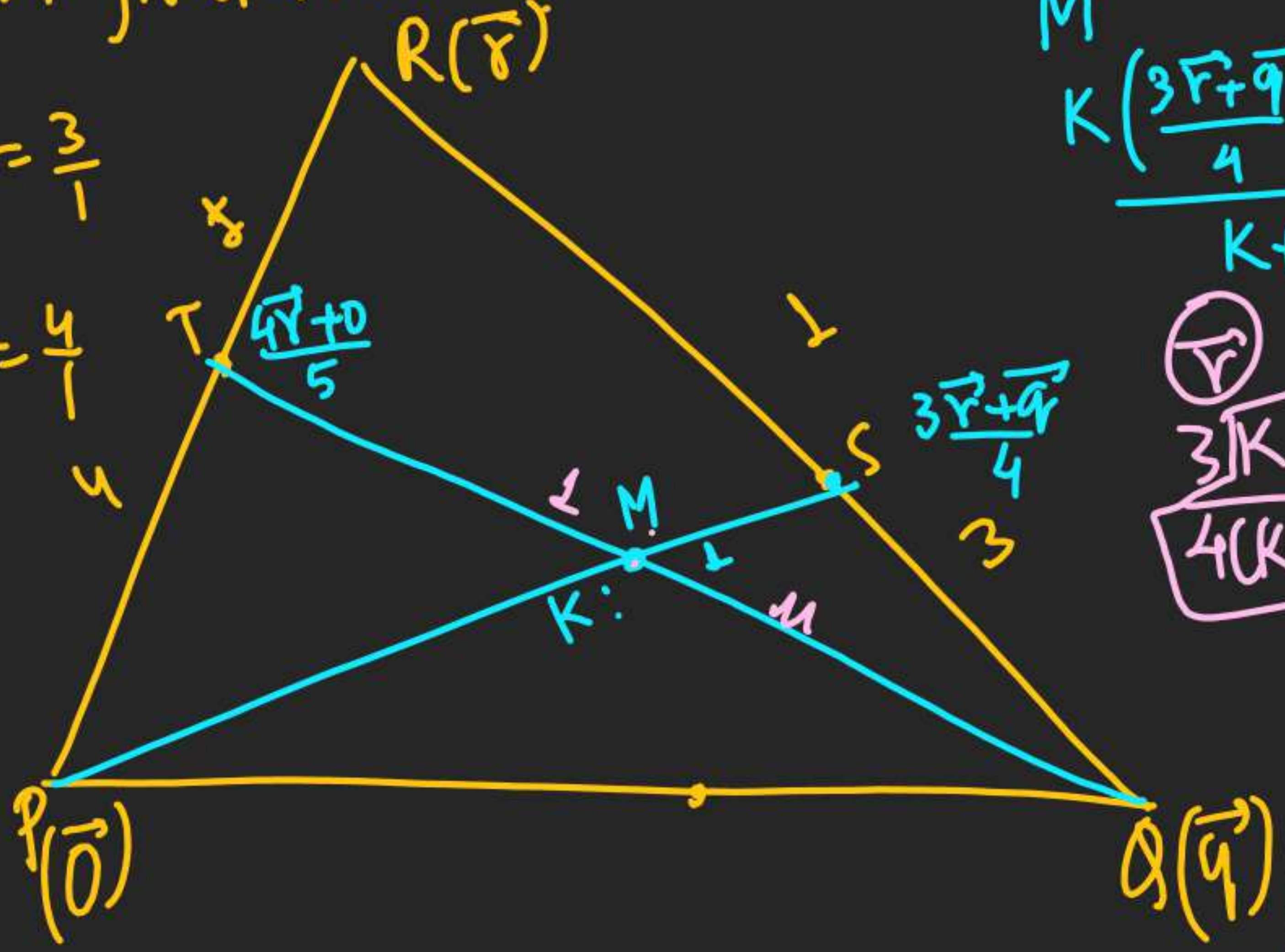
Q In $\triangle PQR$, S & T are 2 pts on QR & PR, such that $QS = 3SR$ & $PT = 4TR$. If M is PoI of PS & QT find QM : MT?

DPP-1 H.W.

Q 2 - 21 (Complete)

$$\frac{QS}{SR} = \frac{3}{1}$$

$$\frac{PT}{TR} = \frac{4}{1}$$



$\vec{M}$

$$\frac{K\left(\frac{3\vec{r}+\vec{q}}{4}\right)+0}{K+1} = \frac{u\left(\frac{4\vec{r}}{5}\right)+\vec{q}}{u+1}$$

$\vec{r}$

$$\boxed{\frac{3K}{4(K+1)}} = \frac{4u}{5(u+1)}$$

$\vec{q}$

$$\frac{K}{4(K+1)} = \frac{1}{u+1}$$

$$\frac{3}{\cancel{u+1}} = \frac{4u}{5(\cancel{u+1})}$$

$$\frac{QM}{MT} = \frac{u}{1} = \frac{15}{4} \text{ Ans}$$