YAKEEN NEET 2.0

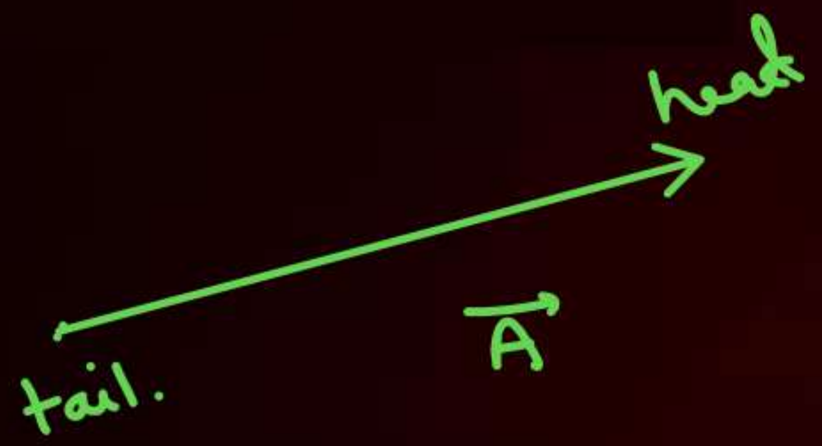
2026

Vectors

(One Shot)

PHYSICS | Summary Lecture

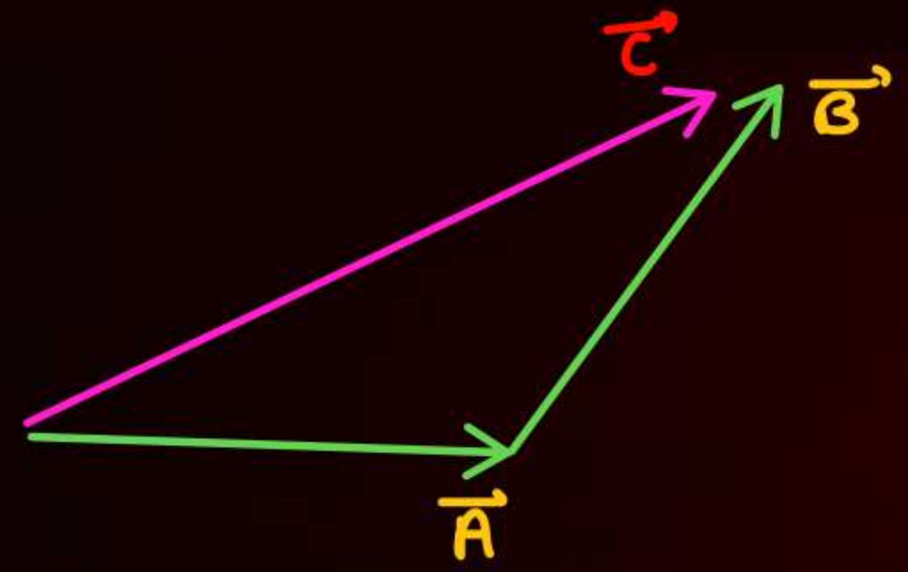
By - Saleem Ahmed Sir



$\vec{A}$

$\vec{A}$ $\vec{F}$

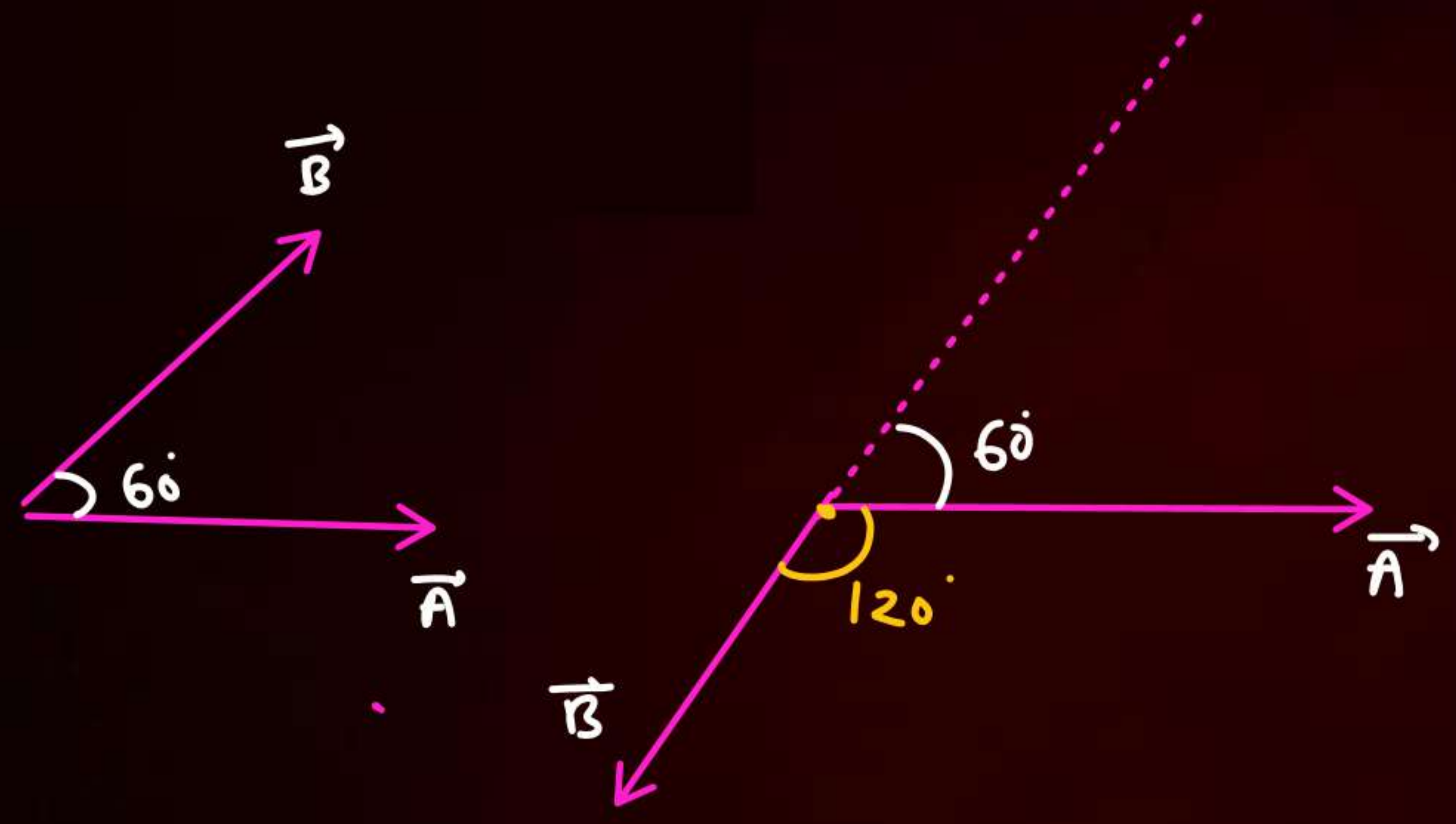
$\vec{v}$



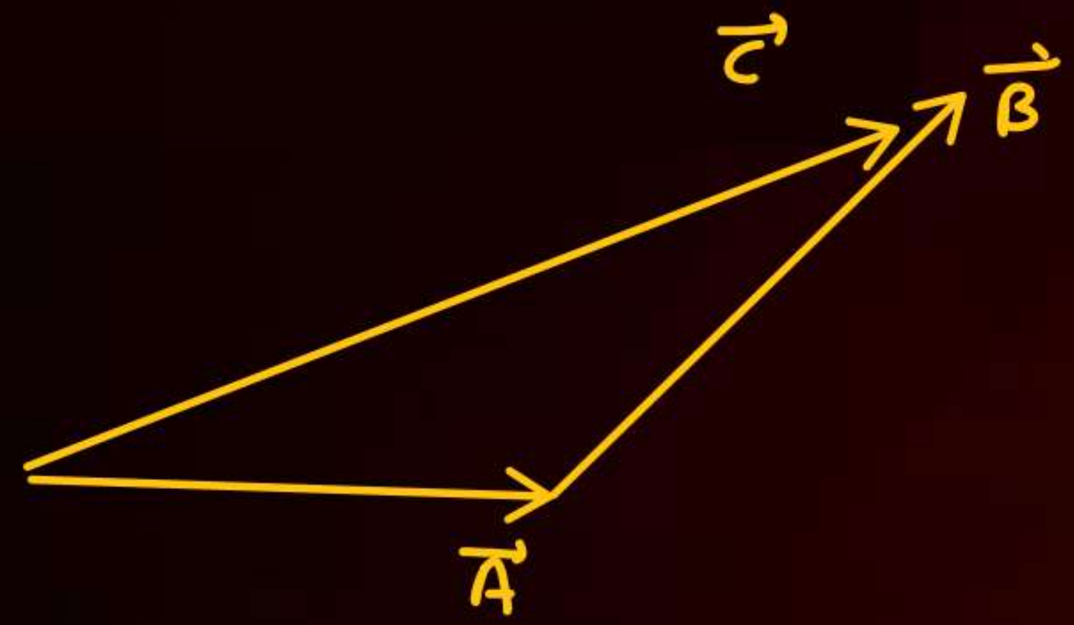
$$\vec{A} + \vec{B} = \vec{C}$$

$$|\vec{A}| \qquad |\vec{B}| \qquad |\vec{C}|$$

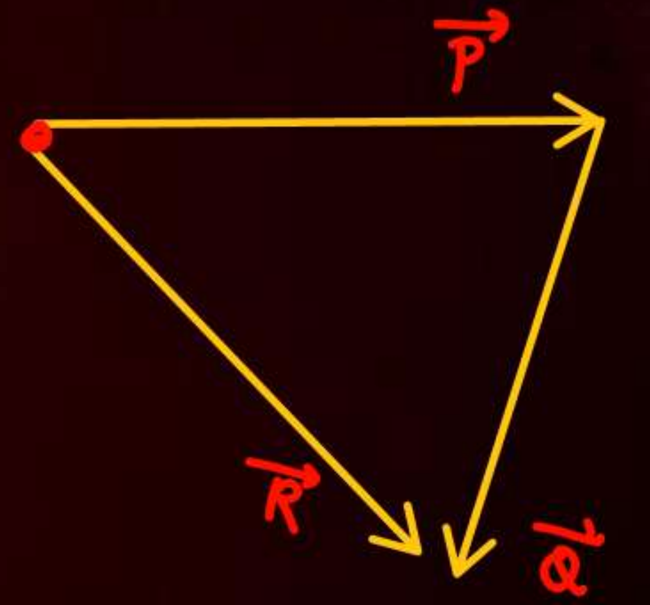
$$C = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$



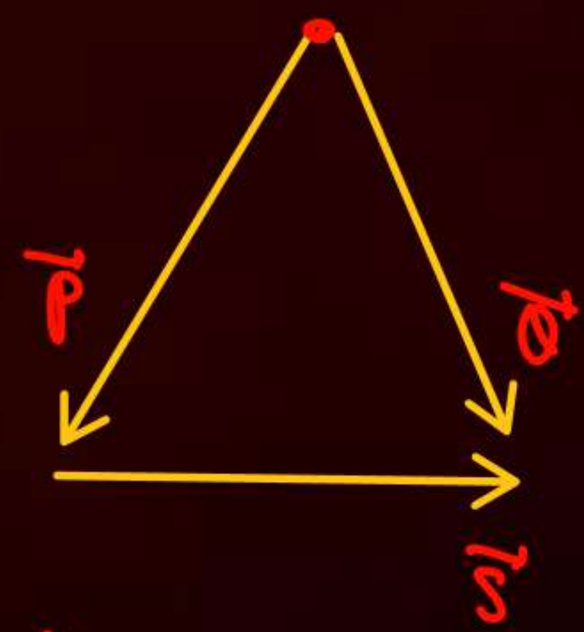
$\vec{B}$
$60°$
$\vec{A}$
$60°$
$120°$
$\vec{A}$
$\vec{B}$



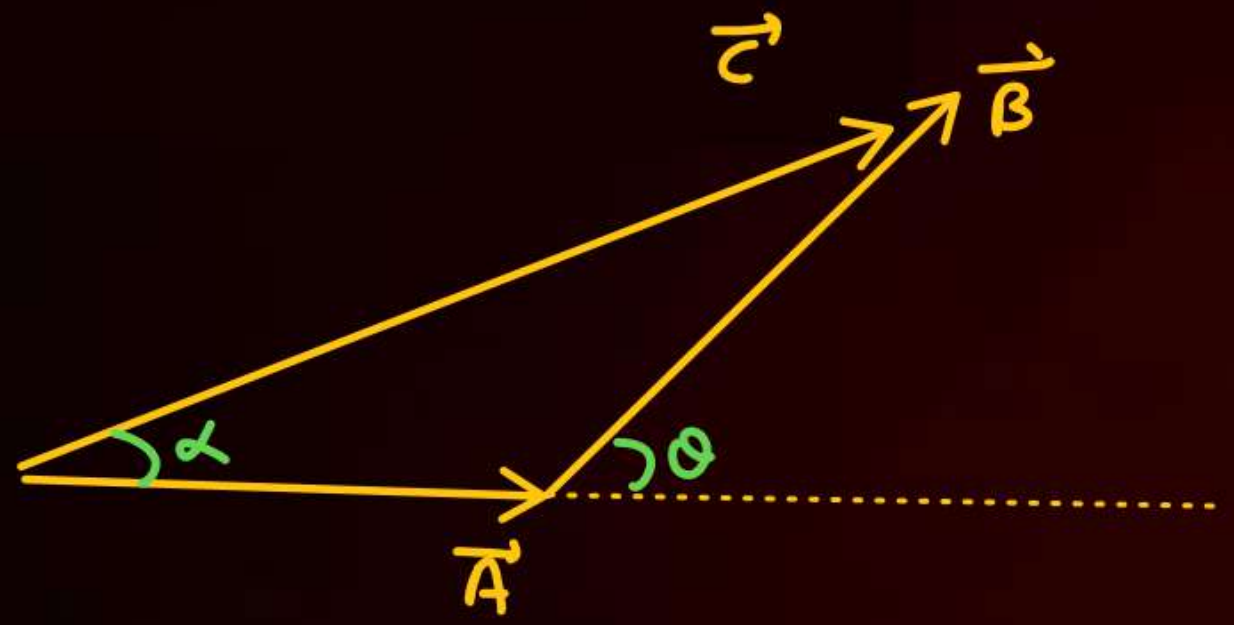
$$\vec{C} = \vec{A} + \vec{B}$$



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



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



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

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

$$\tan\alpha = \frac{B\sin\theta}{A + B\cos\theta}$$

$*\ |\vec{A}| = |\vec{B}| = x$

$\theta = 60^\circ \Rightarrow x\sqrt{3}$

$\theta = 90 \Rightarrow x\sqrt{2}$

$\theta = 120 \Rightarrow x$

$C_{max} = A + B \quad (\theta = 0)$

$C_{min} = |A - B| \quad \theta = 180^\circ$

$A = 17$
$B = 7$

r

$C_{max} = 17 + 7 = 24$
$C_{min} = 17 - 7 = 10$

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

Q 50 (max)
20 (min)

$A + B = 50$
$A - B = 20$

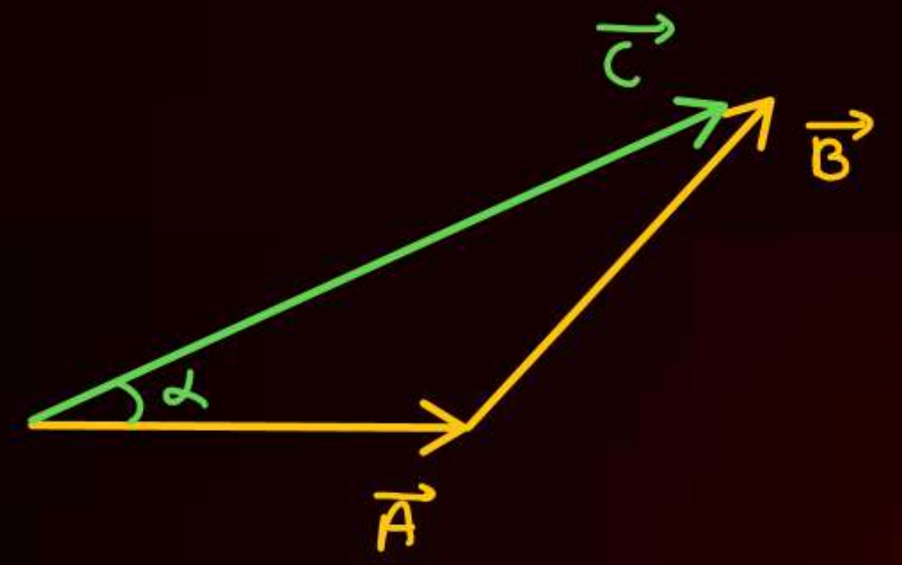
$2A = 70$

$A = 35$
$B = 15$

$\sqrt{(35)^2 + (15)^2}$

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

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



$C_{max} = A+B$

$C_{min} = |A-B| = $ (बड़ा - छोटा)

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

$\tan\alpha = \frac{B\sin\theta}{A - B\cos\theta}$

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

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

Q maximum and minimum value of resultant of $\vec{A}$ & $\vec{B}$ are 17N and 7N. Find

$$A+B=17$$
$$A-B=7$$

① $\frac{A}{B}$

$$A=12$$
$$B=5$$

② Resultant of $\vec{A}$ & $\vec{B}$ when both vector are orthogonal to each other.

$$\sqrt{A^2+B^2}=\sqrt{12^2+5^2}=13$$

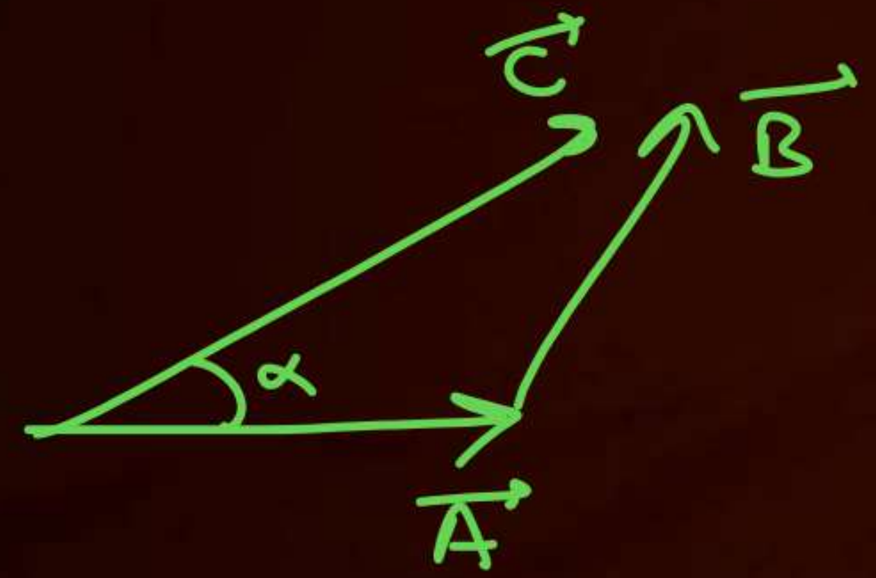
$3x, 5x$

Q Two forces have their magnitude in ratio 3:5 & their resultant is 28 N. Find magnitude of each force if angle between them is 60°.

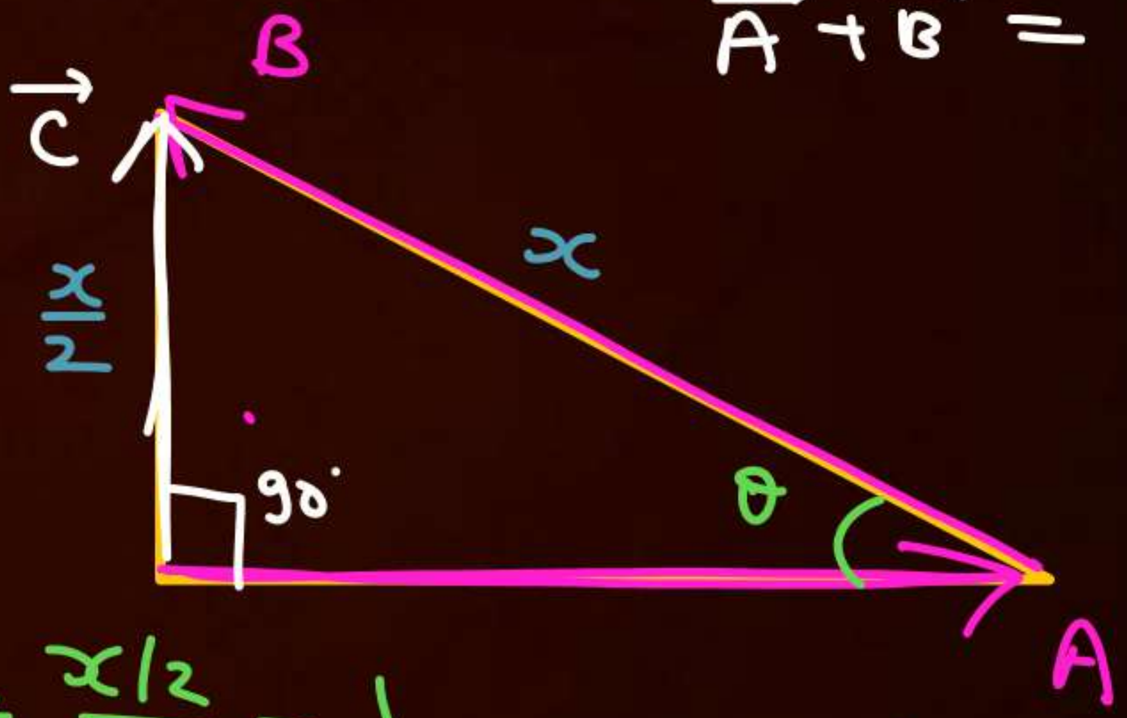
$$28 = \sqrt{(3x)^2 + (5x)^2 + 2 \times 3x \times 5x \cos 60}$$

$\alpha = 90^\circ$

Q Resultant of $\vec{A}$ & $\vec{B}$ is perpendicular to $\vec{A}$. If magnitude of resultant is half of the magnitude of $\vec{B}$. Find angle between $\vec{A}$ & $\vec{B}$

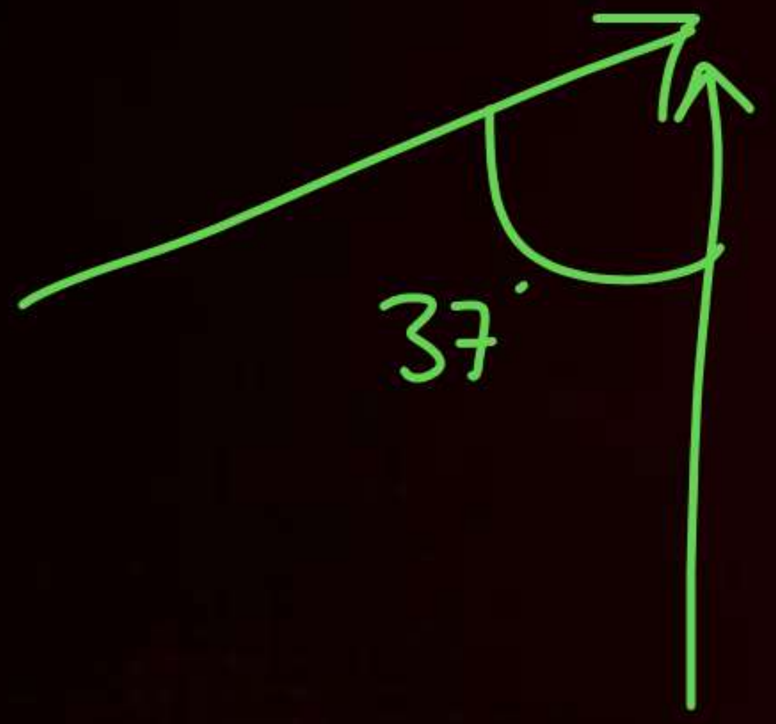


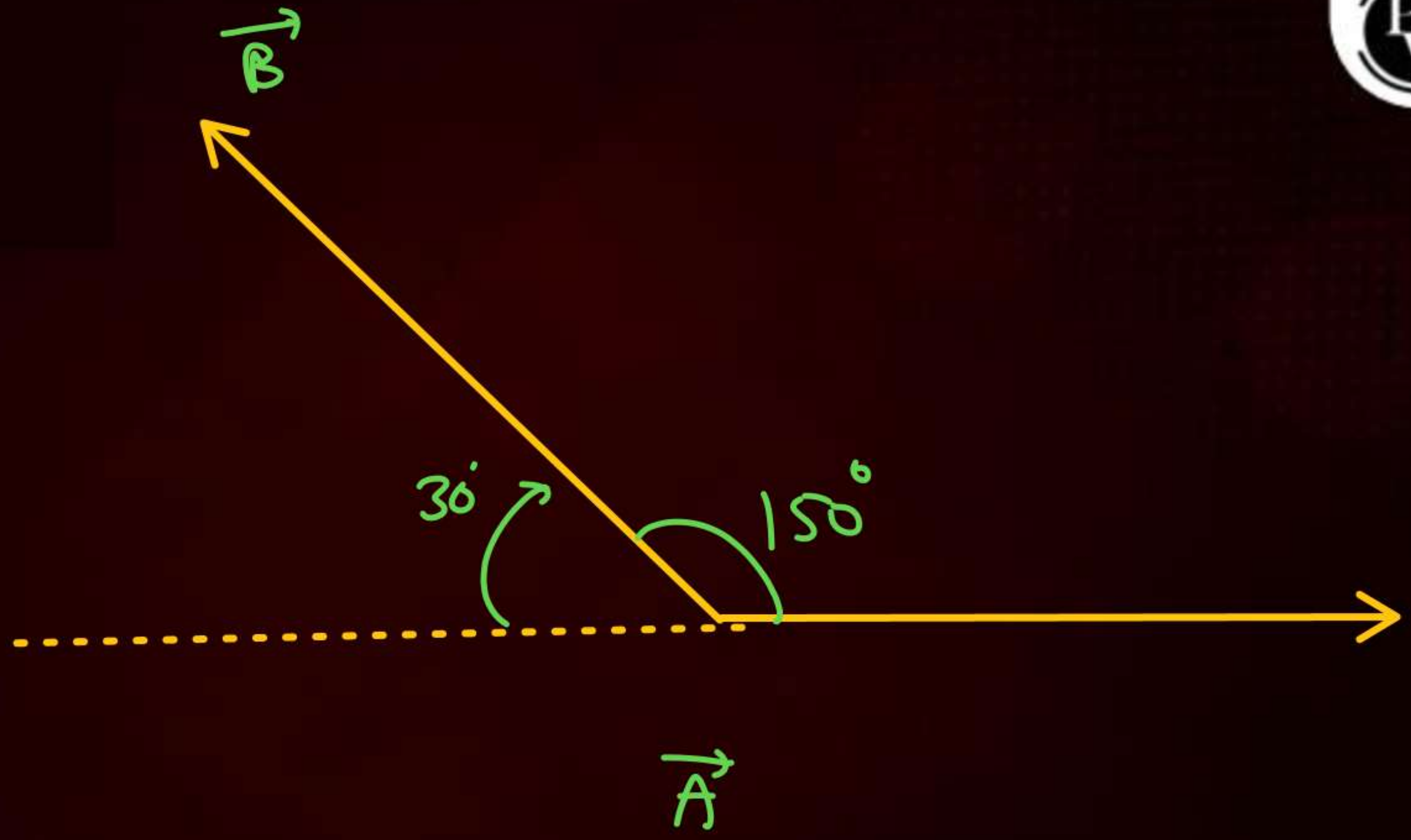
$\vec{A} + \vec{B} = \vec{C}$



$$\sin\theta = \frac{x/2}{x} = \frac{1}{2}$$

$$\theta = 30^\circ$$


37°

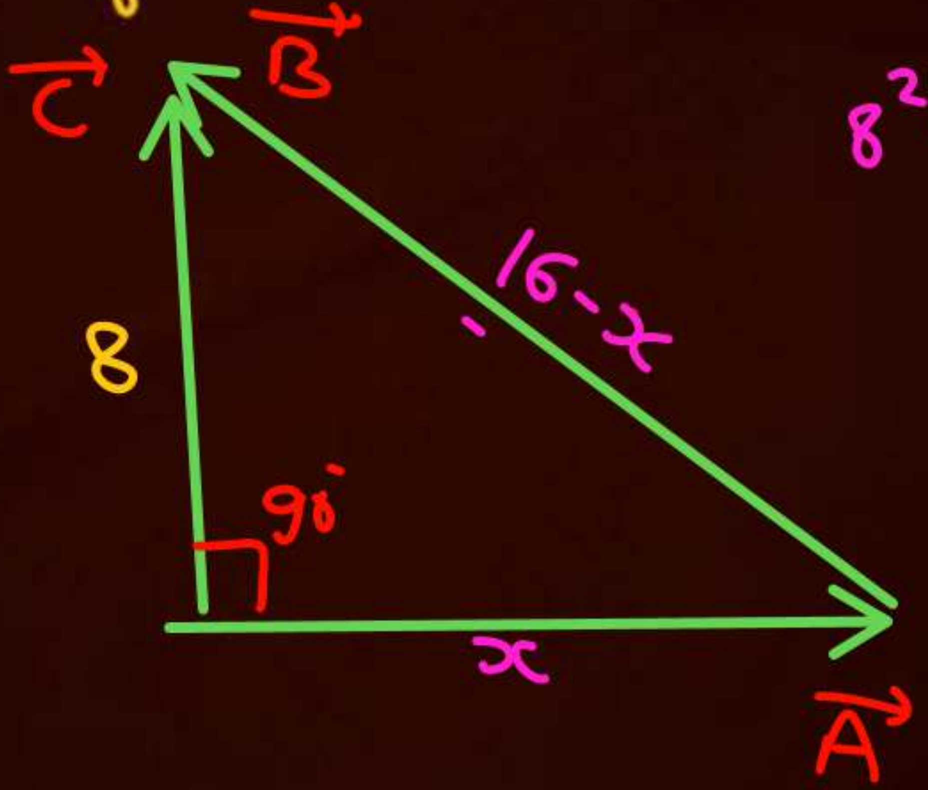

$\vec{B}$
30°
150°
$\vec{A}$

Q. If sum of magnitude of $\vec{A}$ & $\vec{B}$ is 16N. Magnitude of resultant of $\vec{A}$ & $\vec{B}$ is 8N when resultant is perpendicular to the $\vec{A}$. Find magnitude of $\vec{A}$ & $\vec{B}$.

$$A + B = 16$$

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

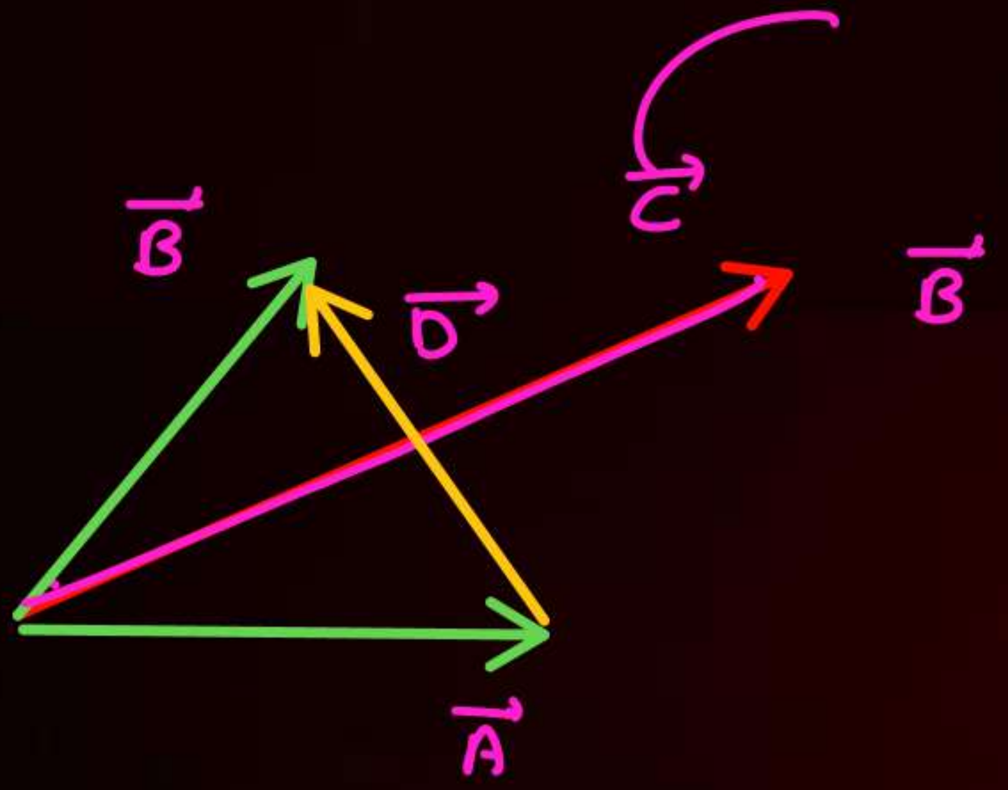
$$|\vec{C}| = 8$$



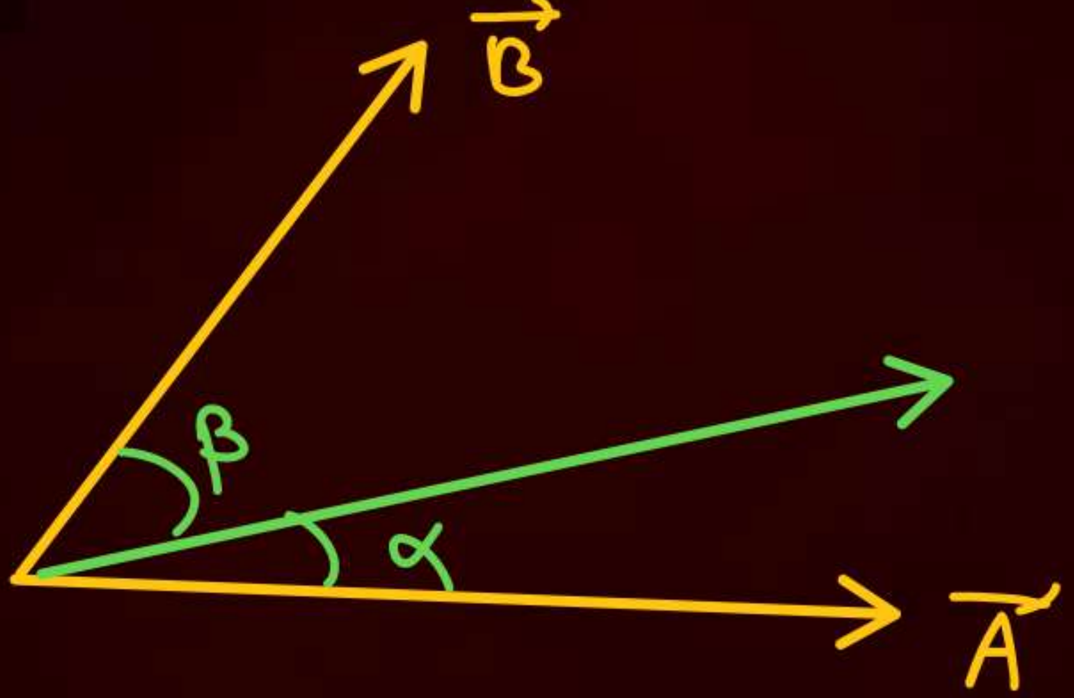
$$8^2 + x^2 = (16-x)^2$$

$$x = 6$$

6N, 10N

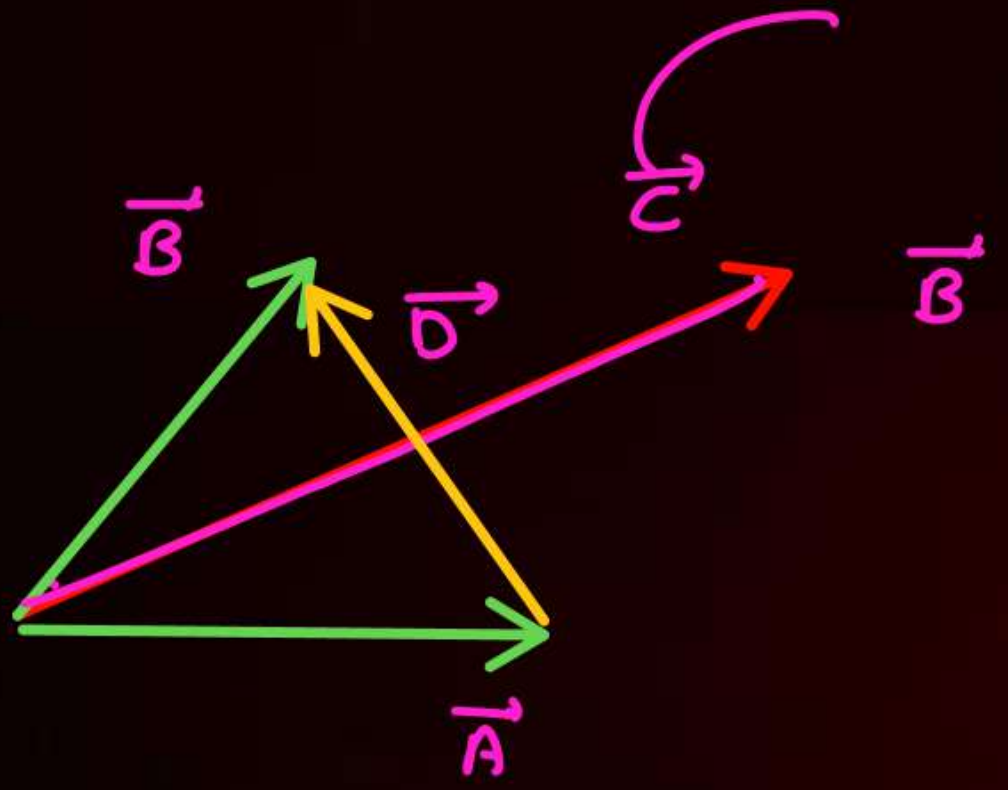


$\vec{C} = \vec{A} + \vec{B}$



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

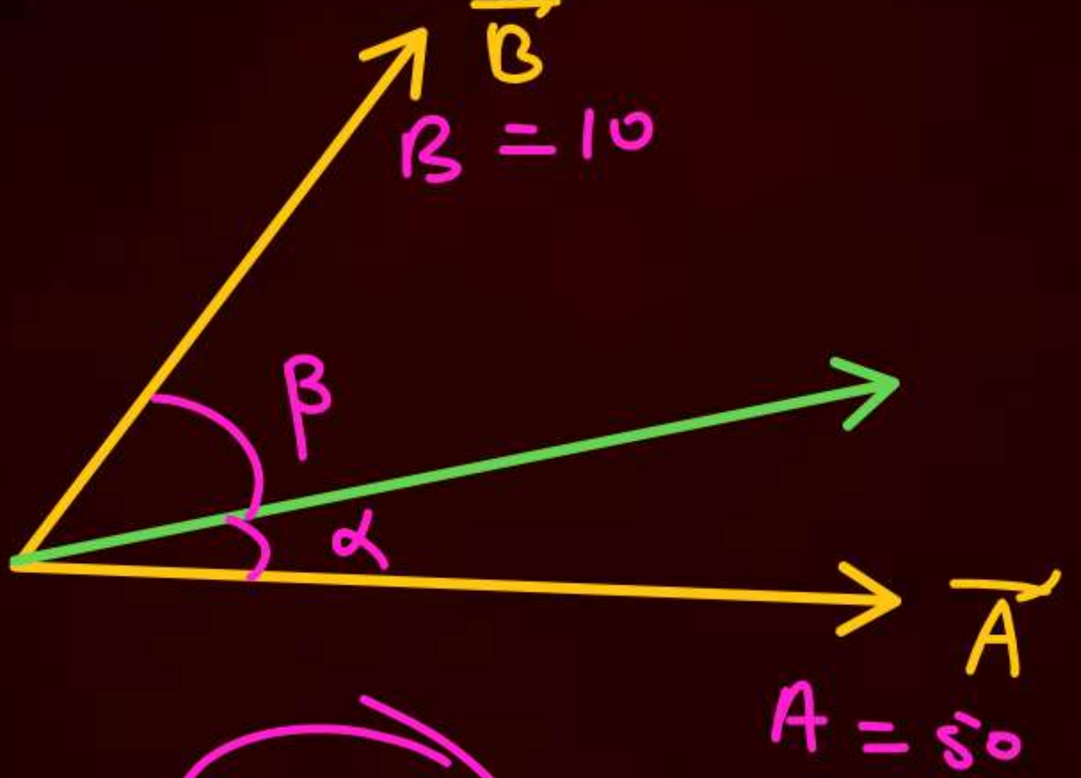
$\vec{D} = \vec{B} - \vec{A}$



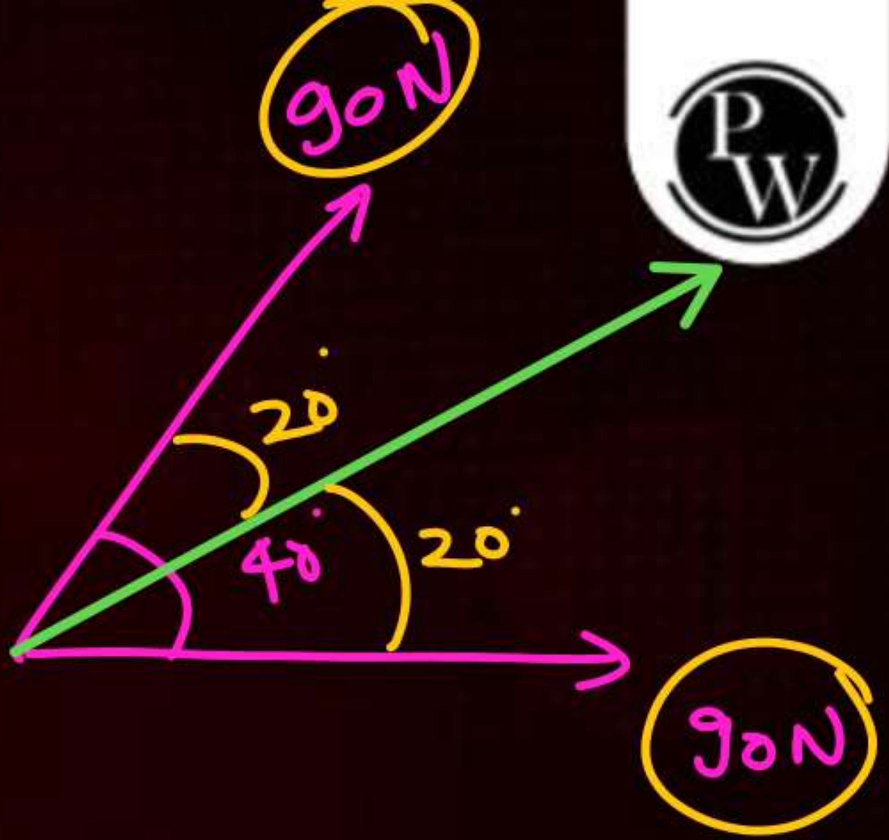
$\vec{A}+\vec{D}=\vec{B}$

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

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

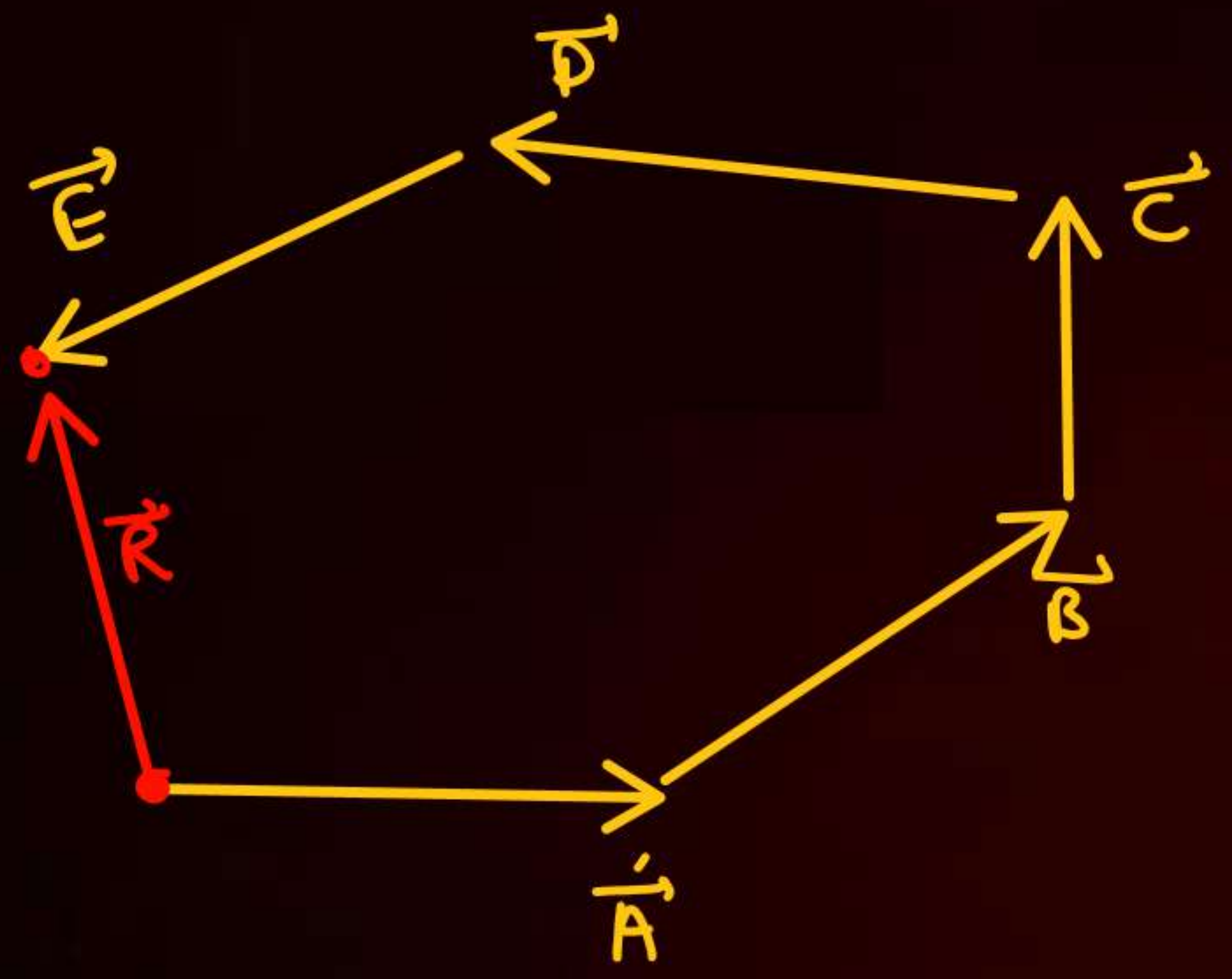


$\alpha<\beta$



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

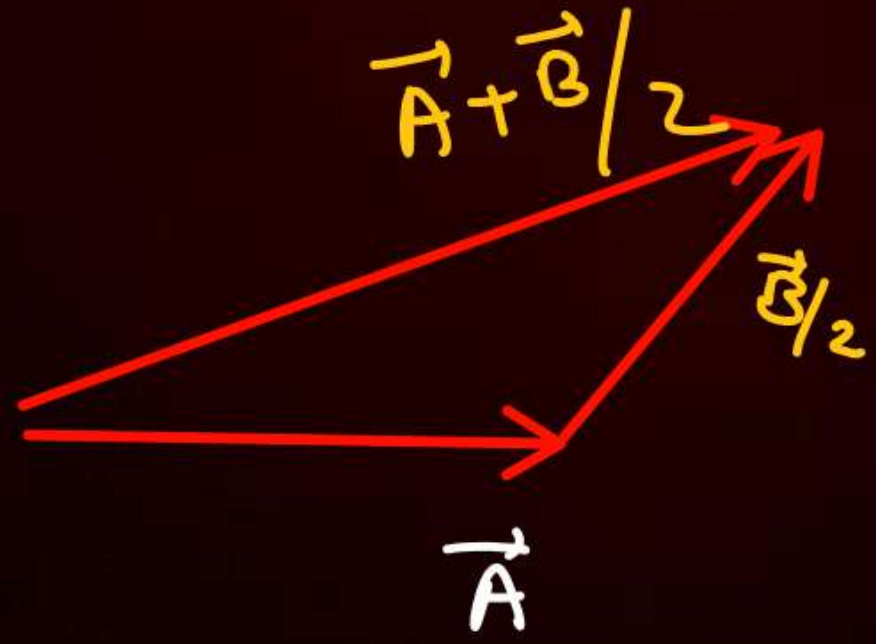
$\cancel{2}x \times \frac{\sqrt{3}}{\cancel{2}}$

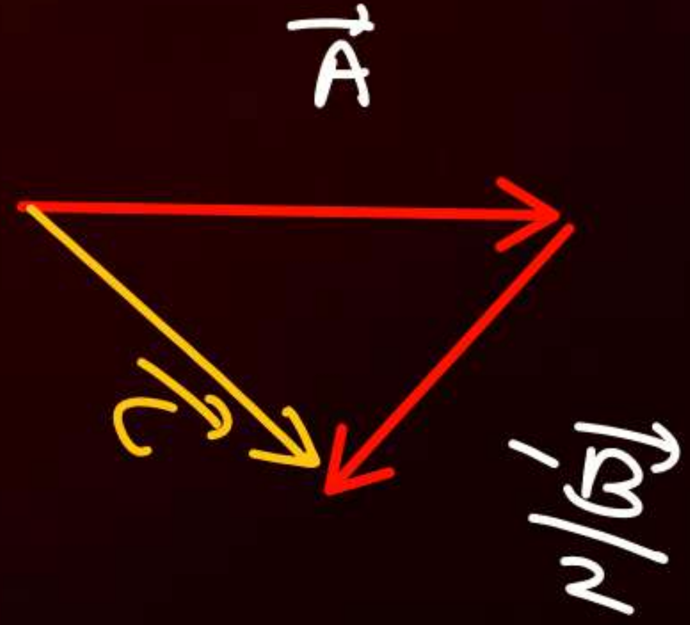


$$\vec{A}+\vec{B}+\vec{C}+\vec{D}+\vec{E}=\vec{R}$$

Q $\vec{A} - \frac{\vec{B}}{2} = \vec{C}$

$\vec{A} + \frac{\vec{B}}{2} \Rightarrow$





If angle between $\vec{A}$ & $\vec{B}$ is θ

$$\left\{\begin{aligned} |\vec{A}+\vec{B}| &= \sqrt{A^2+B^2+2AB\cos\theta} \\ |\vec{A}-\vec{B}| &= \sqrt{A^2+B^2-2AB\cos\theta} \end{aligned}\right.$$

Q If $|\vec{A}| = 2$, $|\vec{B}| = 3$

$|\vec{A}+\vec{B}| = \sqrt{3}\,|\vec{A}-\vec{B}|$

Find angle between $\vec{A}$ & $\vec{B}$.

Sol^n $\sqrt{A^2+B^2+2AB\cos\theta} = \sqrt{3}\sqrt{A^2+B^2-2AB\cos\theta}$

$2^2+3^2+2\times2\times3\cos\theta$

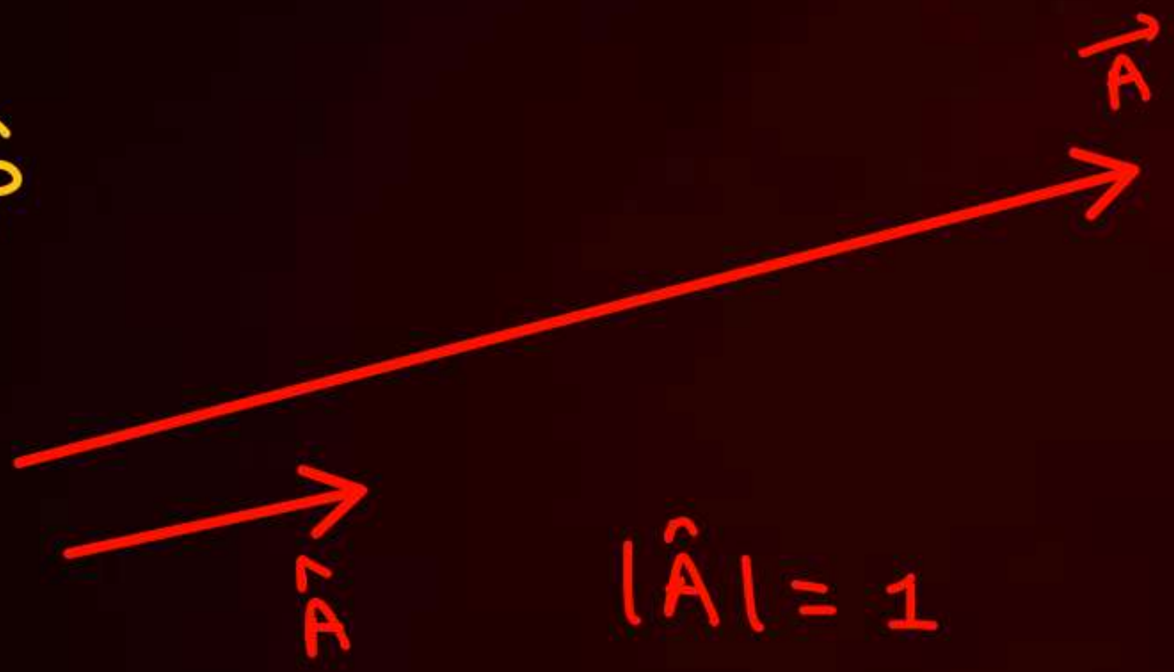
$= 3\left(2^2+3^2-2\times2\times3\times\cos\theta\right)$

$4+9+12\cos\theta = 12+27-36\cos\theta$

$\cos\theta =$

Unit vector

$\hat{A}$ $\hat{P}$



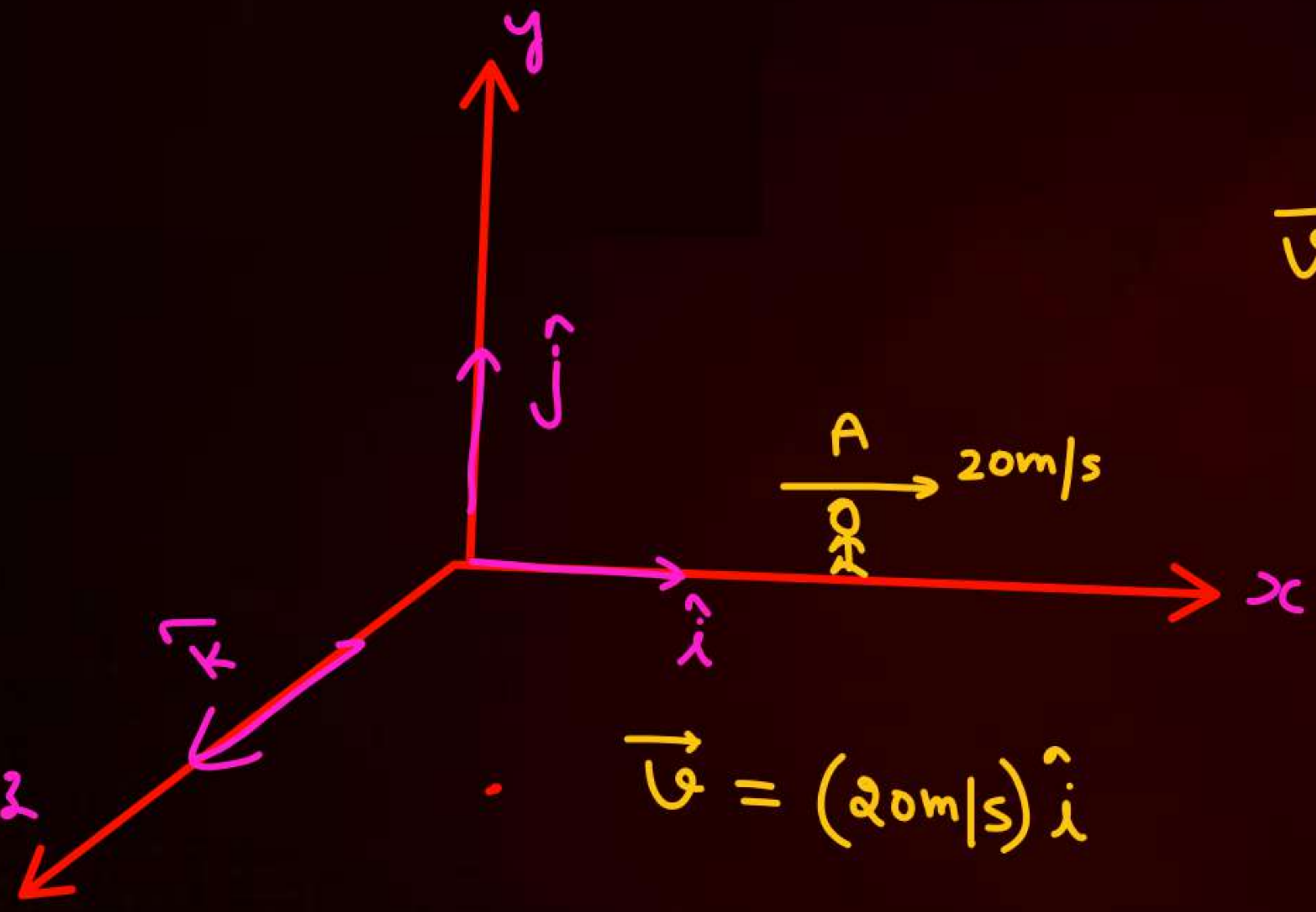
$|\hat{A}| = 1$

$\vec{A} = (\text{magnitude})(\hat{\text{dir}})$

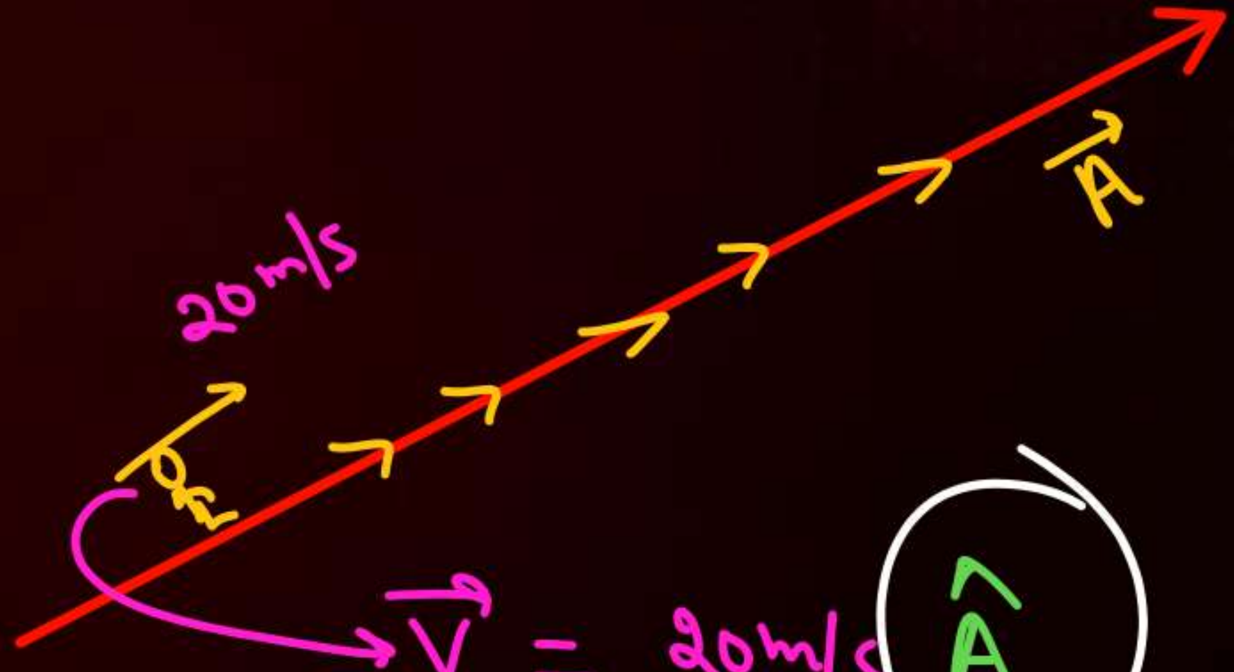
$\vec{A} = |\vec{A}|\,\hat{A}$

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

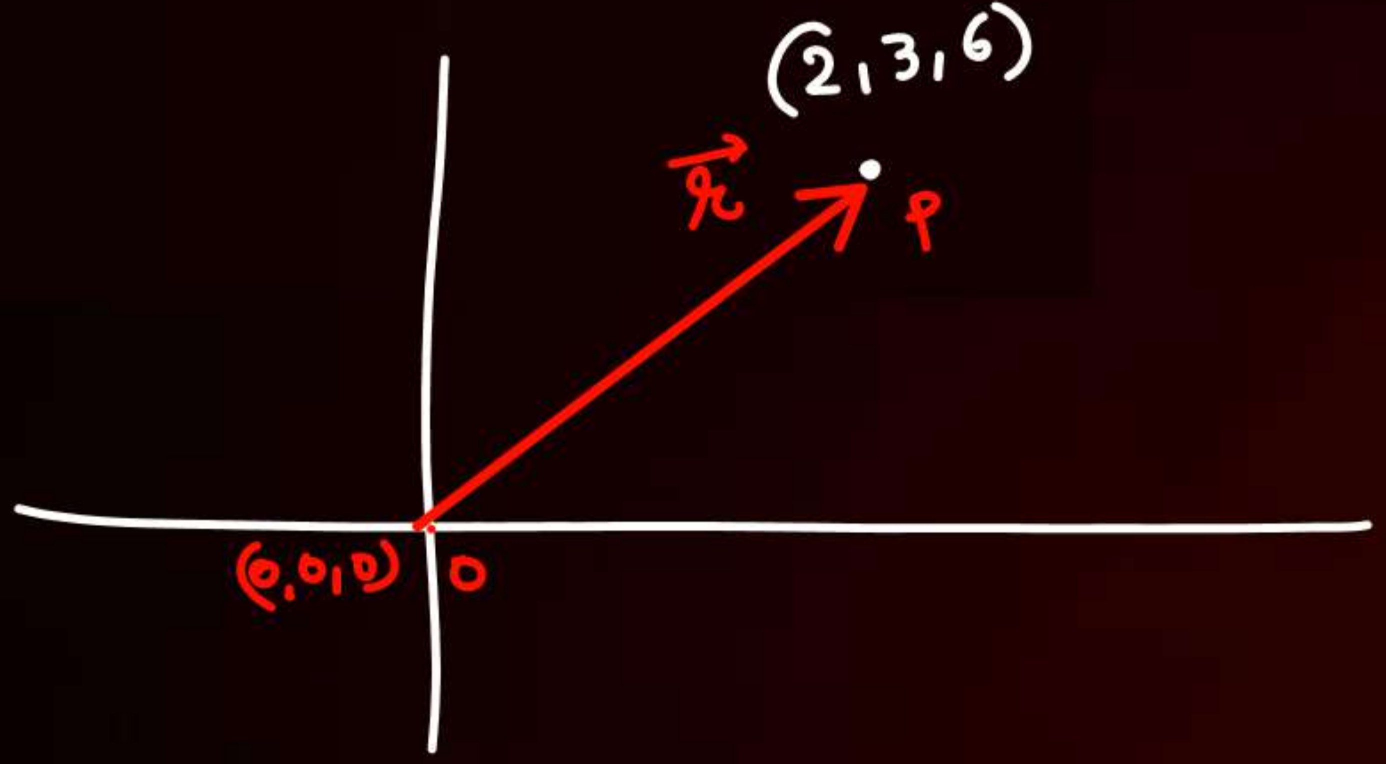
$$\vec{v} = (20\,m/s)\,\hat{i}$$



$$\vec{v} = (20\,m/s)\,\hat{i}$$



$$\vec{V} = 20\,m/s\;\hat{A}$$



position vector $= \vec{r} = 2\hat{i}+3\hat{j}+6\hat{k}$

$$|\vec{r}| = \sqrt{2^2+3^2+6^2}$$

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

$$|\vec{r}| = \sqrt{5^2+5^2+2^2}$$

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

$$\vec{A} = 2\hat{i} + 3\hat{j} + 6\hat{k}$$

$$|\vec{A}| = \sqrt{2^2 + 3^2 + 6^2} = 7$$

$$\hat{A} = \frac{\vec{A}}{|\vec{A}|} = \frac{2\hat{i} + 3\hat{j} + 6\hat{k}}{7}$$

$$\vec{A} = 2\hat{i} - 3\hat{j} - 6\hat{k}$$

$$|\vec{A}| = \sqrt{2^2 + 3^2 + 6^2} = 7$$

$$\hat{A} = \frac{2\hat{i} - 3\hat{j} - 6\hat{k}}{7}$$

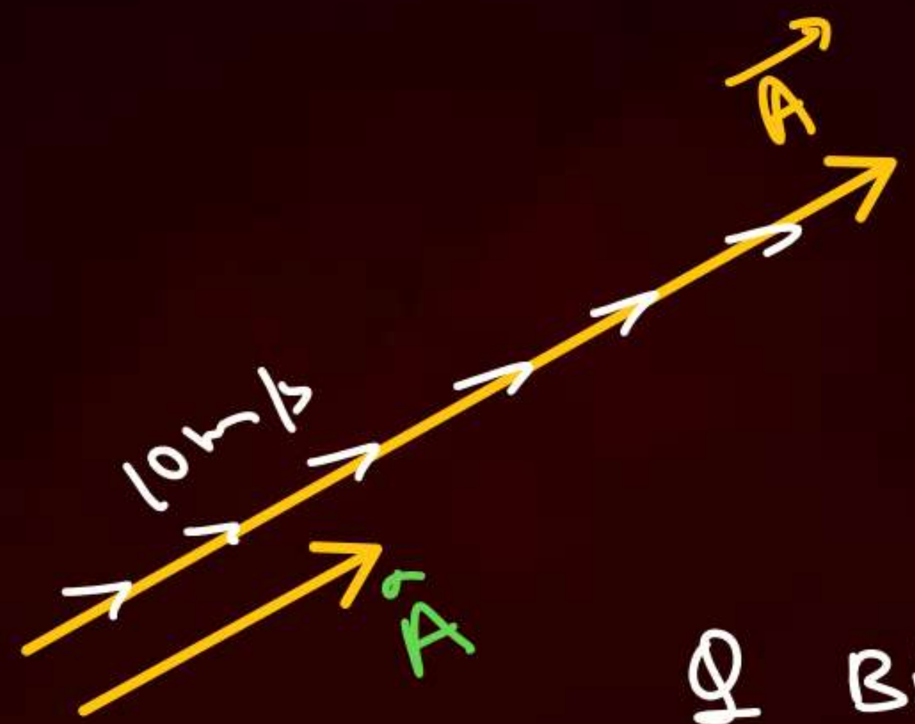
$$\vec{A} = 3\hat{i} + 4\hat{j}$$

$$|\vec{A}| = \sqrt{3^2+4^2} = 5$$

$$\hat{A} = \frac{3\hat{i}+4\hat{j}}{5}$$

$$= \frac{3}{5}\hat{i} + \frac{4}{5}\hat{j}$$

Unit vector Along $\vec{A}$.



Q Bird speed = 10m/s along $\vec{A}$

$$\text{Velocity} = 10\,\text{m/s}\ (\text{Along } \vec{A})$$

$$= 10\,\text{m/s}.\ \hat{A}$$

$$= 10\,\text{m/s}\left(\frac{3}{5}\hat{i} + \frac{4}{5}\hat{j}\right)$$

$$= 6\hat{i} + 8\hat{j}$$

(2, 23)

$2\vec{A} = 16\hat{i} + 6\hat{j} + 10\hat{k}$

$3\vec{B} = 9\hat{i} + 18\hat{j} + 9\hat{k}$

$\vec{A} = 8\hat{i} + 3\hat{j} + 5\hat{k}$

$\vec{B} = 3\hat{i} + 6\hat{j} + 3\hat{k}$

$\vec{A} + \vec{B} = 11\hat{i} + 9\hat{j} + 8\hat{k}$

$\vec{A} - \vec{B} = 5\hat{i} - 3\hat{j} + 2\hat{k}$

$2\vec{A} + 3\vec{B} = 25\hat{i} + 24\hat{j} + 19\hat{k}$

Unit vector along $(\vec{A} + \vec{B})$

$$= \frac{11\hat{i} + 9\hat{j} + 8\hat{k}}{\sqrt{11^2 + 9^2 + 8^2}}$$

Find the unit vector along $2\vec{A} - 3\vec{B}$

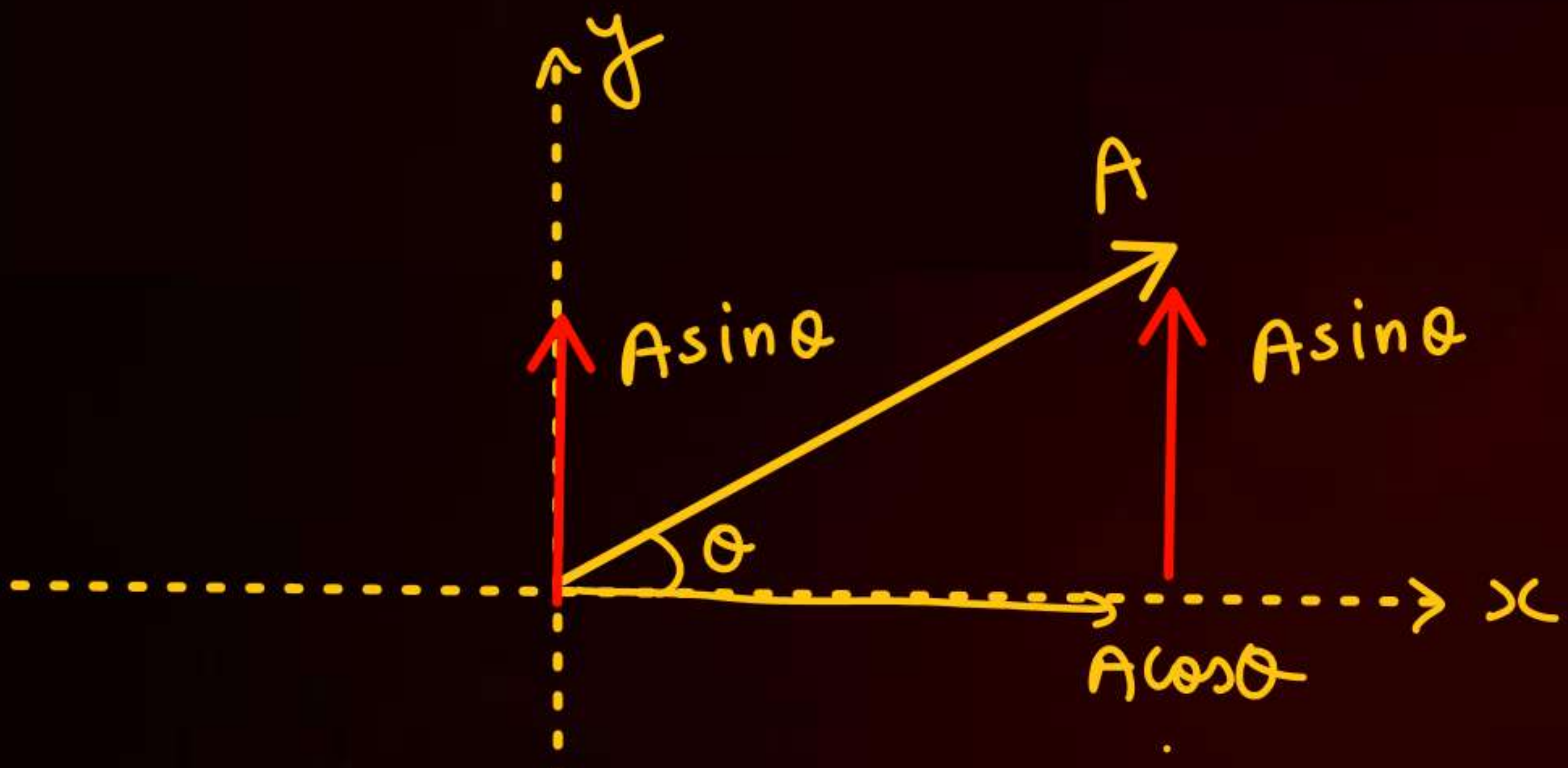
$$= \frac{7\hat{i} - 12\hat{j} + \hat{k}}{\sqrt{7^2 + 12^2 + 1^2}}$$

Q bird. 10 m/s along $2\vec{A} - 3\vec{B}$

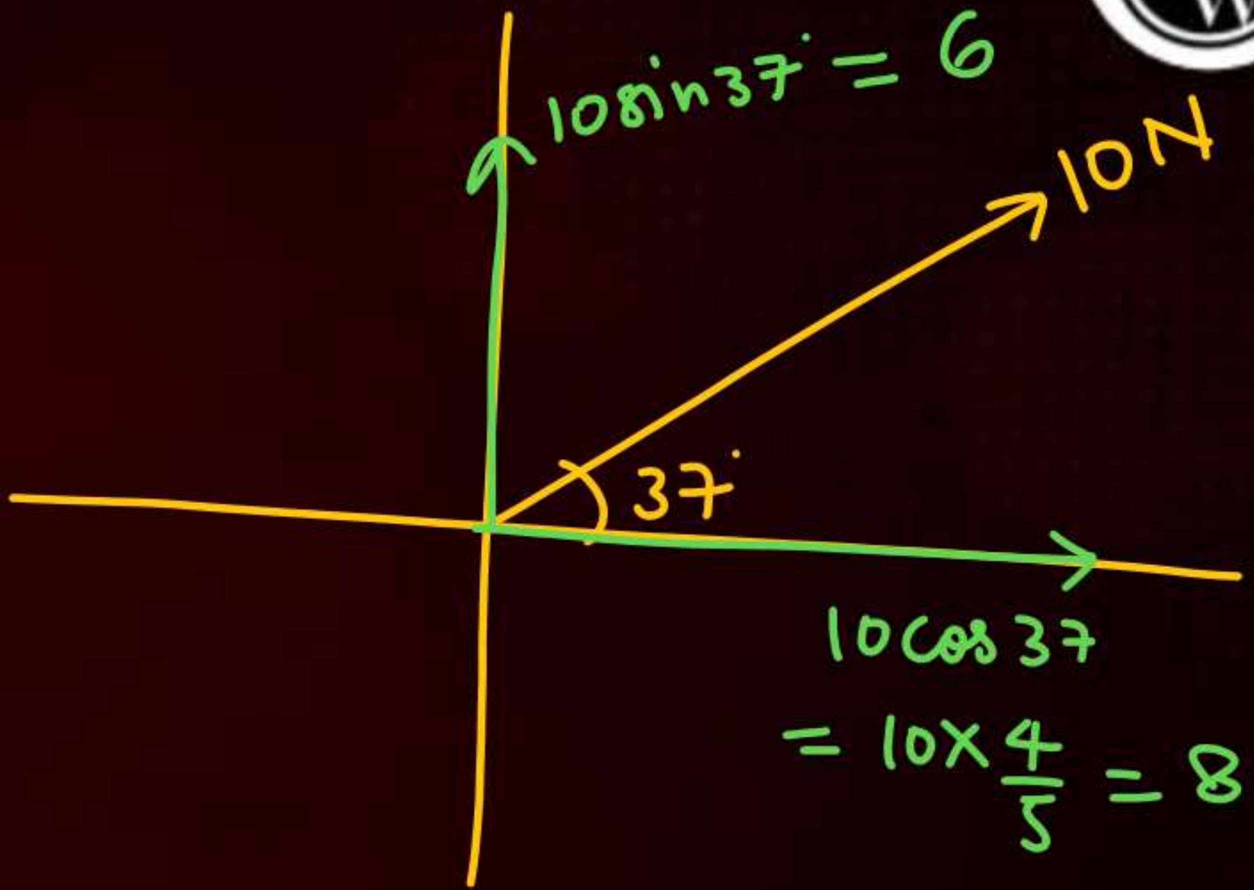
$$= (10\ m/s) \times \frac{7\hat{i} - 12\hat{j} + \hat{k}}{\sqrt{7^2 + 12^2 + 1^2}}$$

$$\vec{A} = 3\hat{i} - 4\hat{j}$$

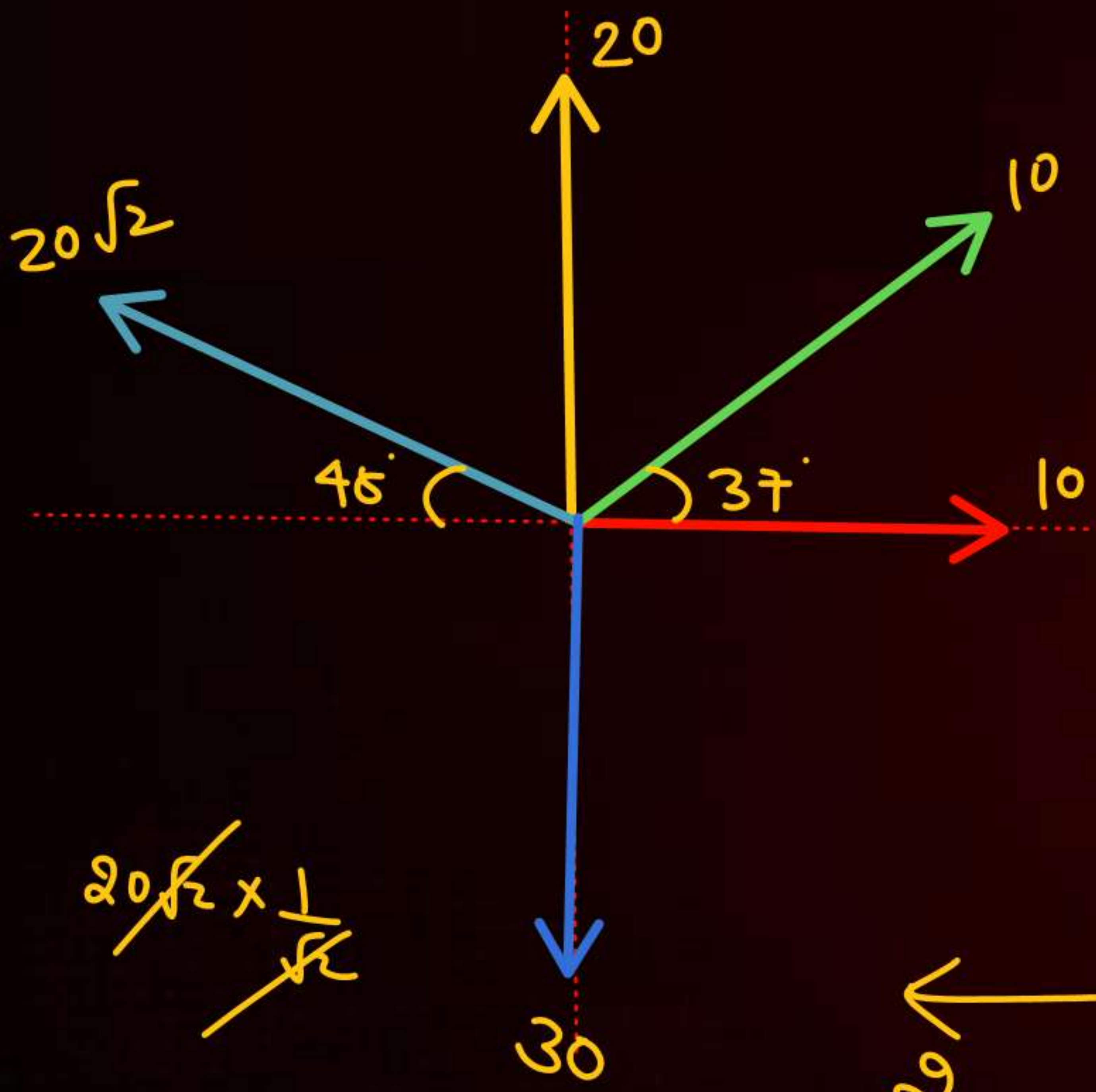
$$20\hat{A} = 20\left(\frac{3\hat{i} - 4\hat{j}}{5}\right)$$



$$\vec{A} = A\cos\theta\,\hat{i} + A\sin\theta\,\hat{j}$$

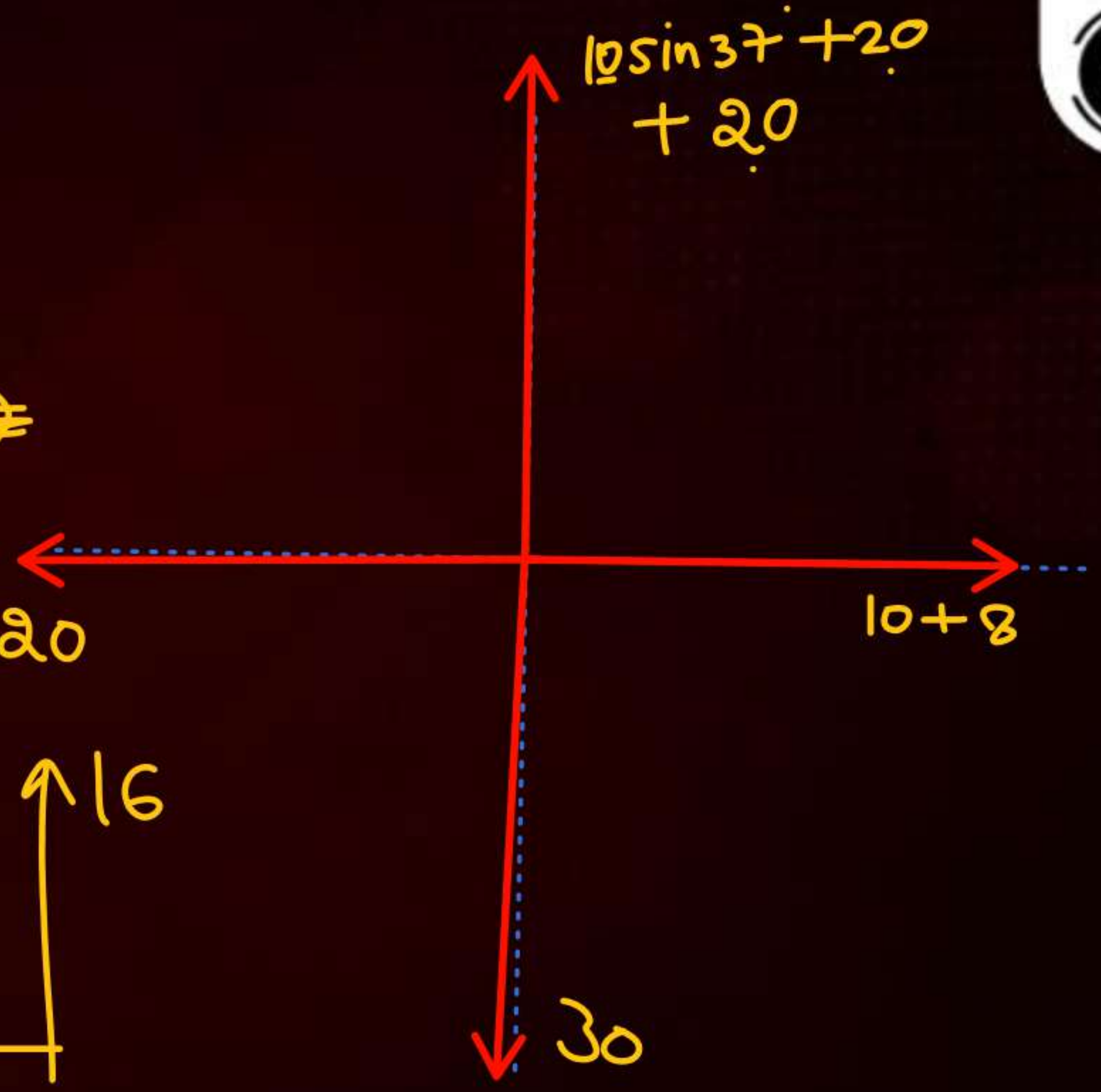


$$\vec{F} = 8\hat{i} + 6\hat{j}$$



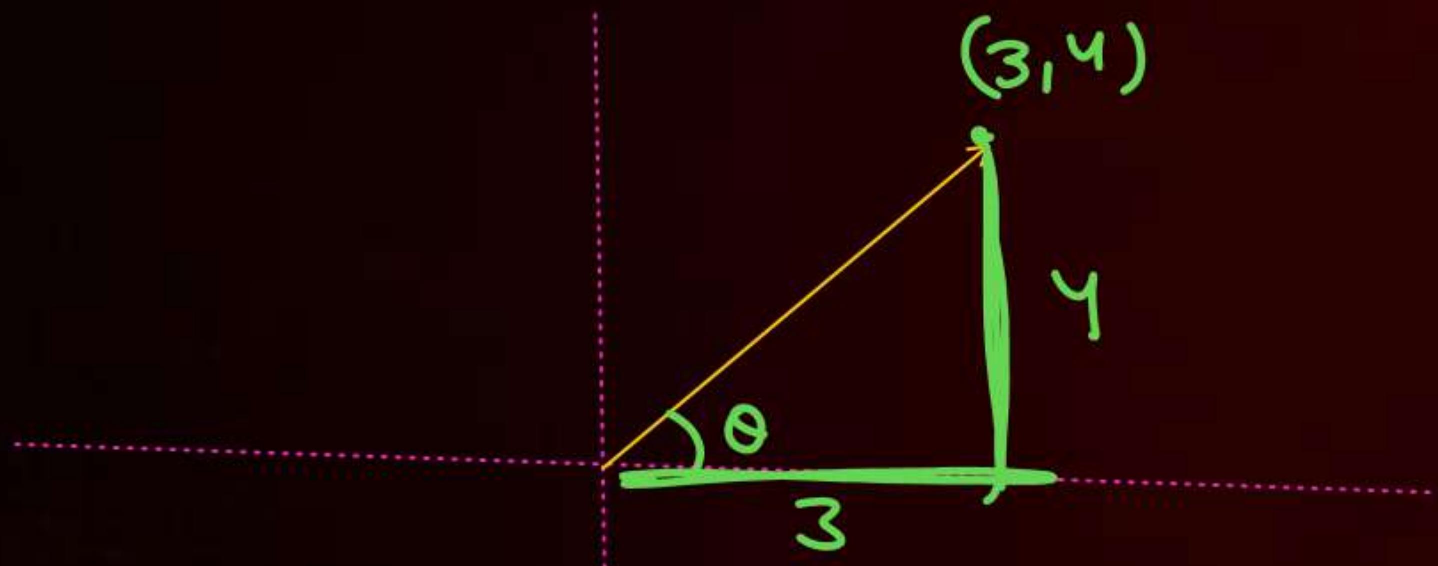
$\cancel{20\sqrt{2}} \times \frac{1}{\cancel{\sqrt{2}}}$

$\not\equiv$



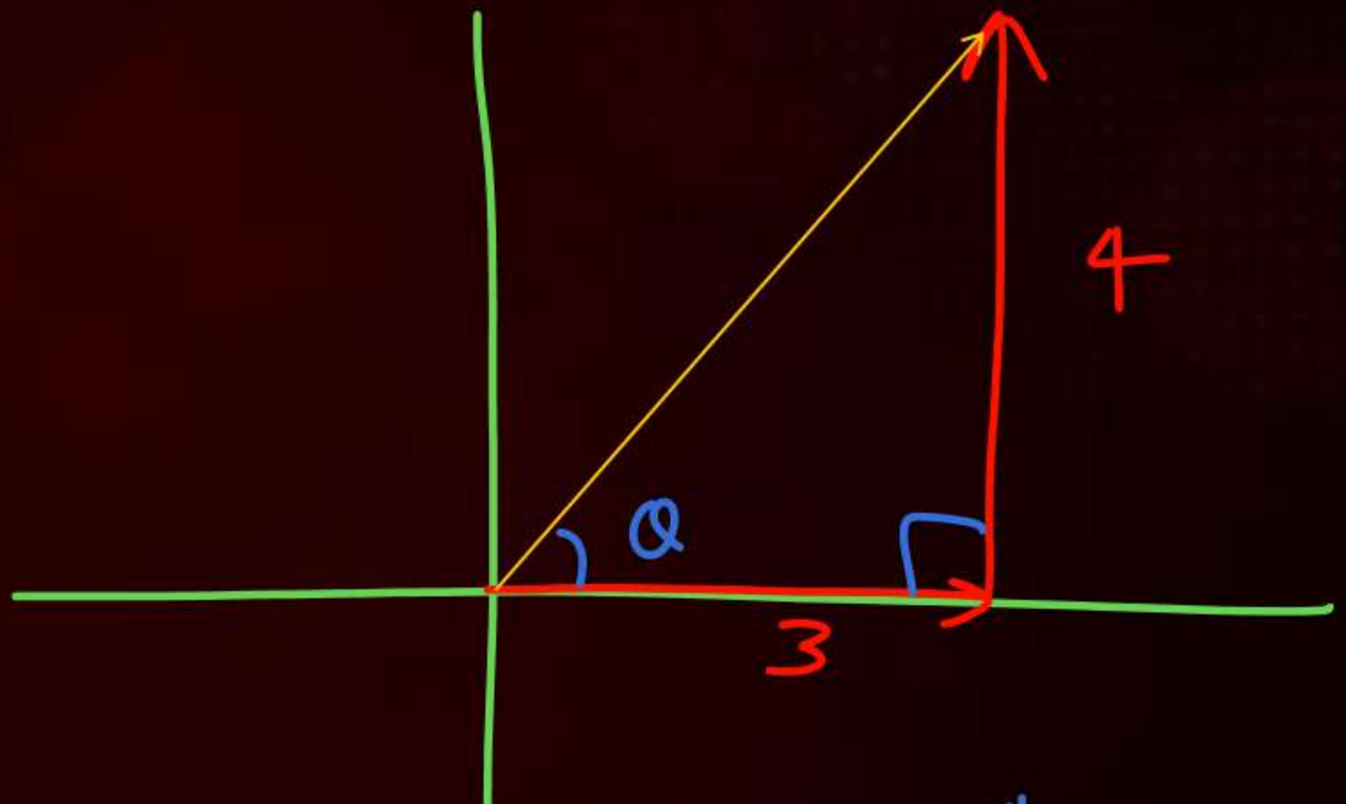
$$\vec{F}_{net} = -2\hat{i} + 16\hat{j}$$

$\vec{A} = 3\hat{i} + 4\hat{j}$



$\tan\theta = 4/3$

$\theta = 53^\circ$



$\tan\theta = \frac{4}{3}$

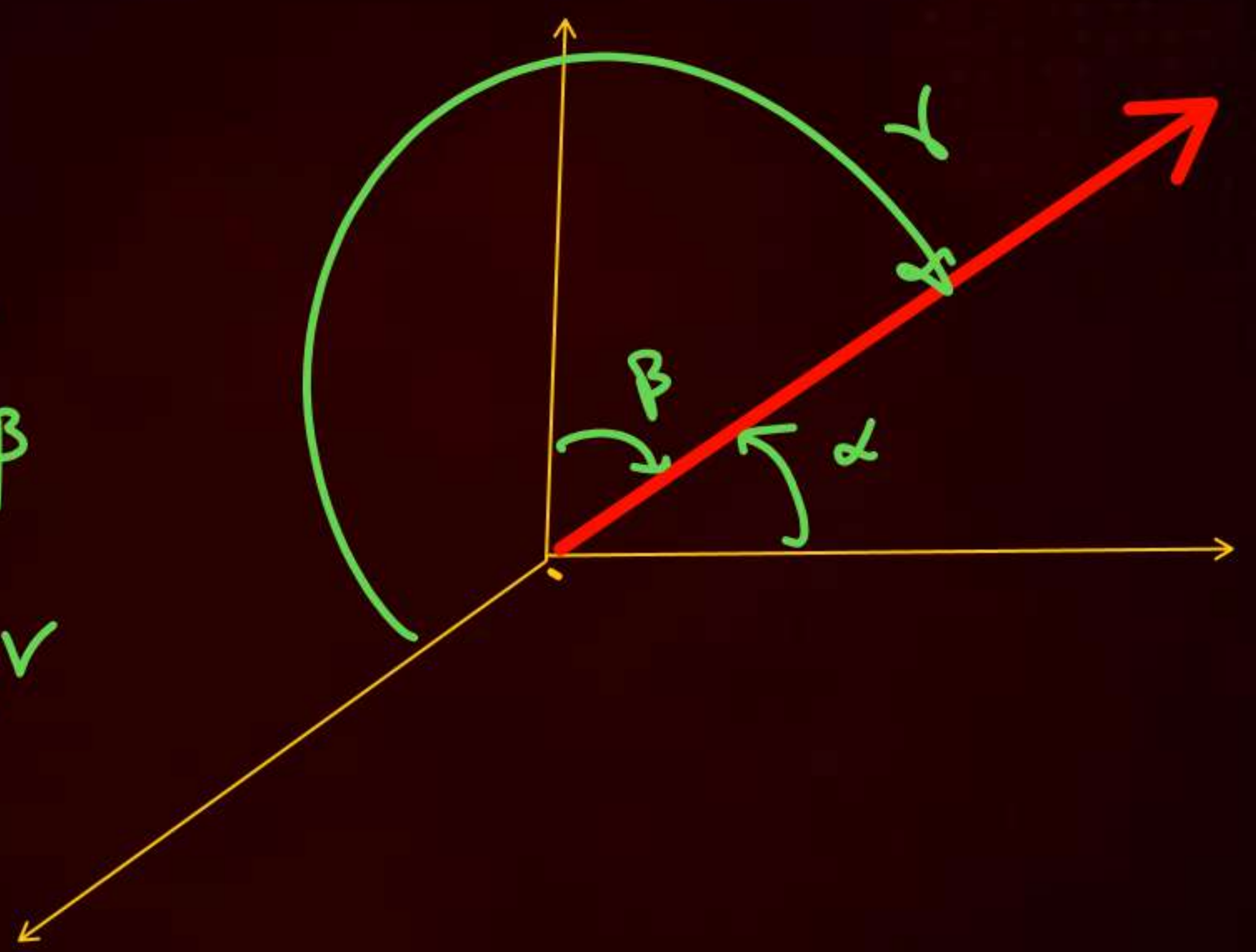
$$\vec{A} = A_x\hat{i} + A_y\hat{j} + A_z\hat{k}$$

$$\left\{\begin{aligned} \cos\alpha &= \frac{A_x}{A} \\ \cos\beta &= \frac{A_y}{A} \\ \cos\gamma &= \frac{A_z}{A} \end{aligned}\right\}$$

$A_x = A\cos\alpha$

$A_y = A\cos\beta$

$A_z = A\cos\gamma$



Direction cosin

Q $\vec{A} = 3\hat{i} - 2\hat{j} + 6\hat{k}$

$A = \sqrt{3^2 + 2^2 + 6^2} = 7$

$+x$- Axis के साथ Angle $\Rightarrow \alpha \Rightarrow \cos\alpha = \frac{A_x}{A} = \frac{3}{7}$

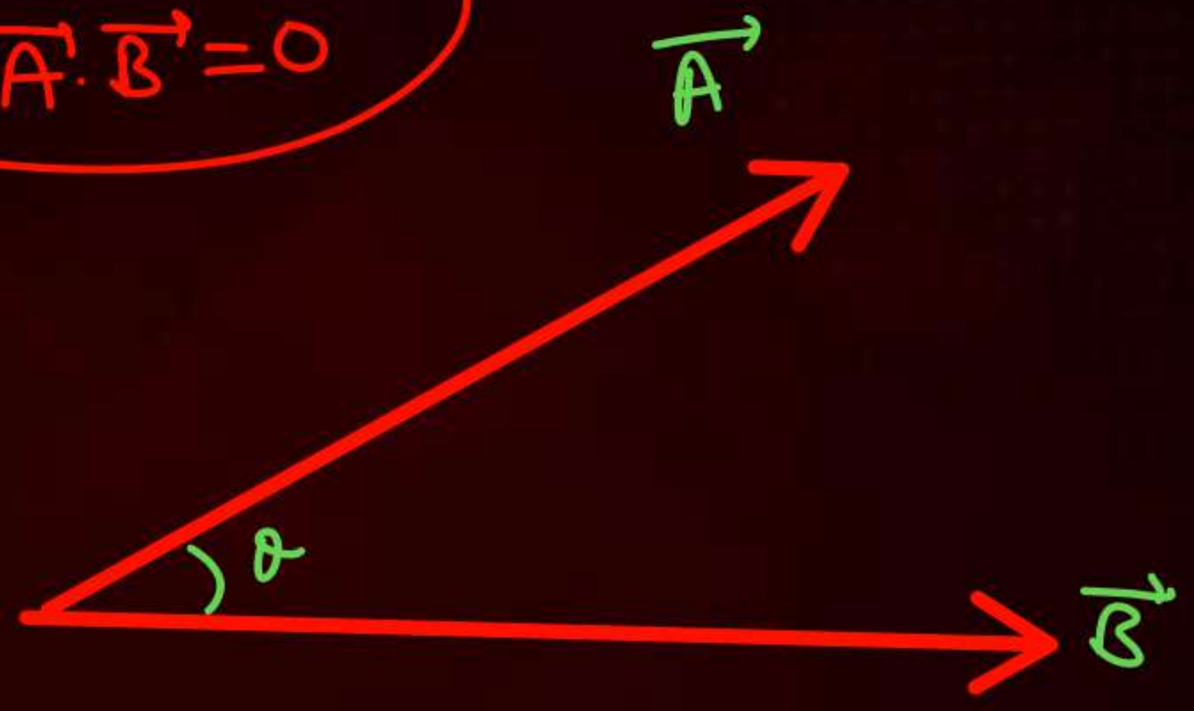
$\cos\beta = \frac{-2}{7}$

$\cos\gamma = \frac{6}{7}$

$\vec{A}\cdot\vec{B} = AB\cos\theta$

$\theta = 90^\circ \Rightarrow \vec{A} \perp \vec{B}$

$\vec{A}\cdot\vec{B} = 0$



Q $\vec{A} = 3\hat{i} + 4\hat{j} + 5\hat{k}$

$\vec{B} = 2\hat{i} + 3\hat{j} + \hat{k}$

$\vec{A}\cdot\vec{B} = 6 + 12 + 5$

$= 23$

$\hat{i}\cdot\hat{i} = \hat{j}\cdot\hat{j} = \hat{k}\cdot\hat{k} = 1$

$\hat{i}\cdot\hat{j} = 0 = \hat{j}\cdot\hat{k} = \hat{k}\cdot\hat{i}$

$23 = 5\sqrt{2}\sqrt{14}\cos\theta$

$\cos\theta = \dfrac{23}{5\sqrt{28}}$

Q $\vec{A} = 3\hat{i} + 4\hat{j} + \alpha\hat{k}$

$\vec{B} = 2\hat{i} + 5\hat{j} + 2\hat{k}$

$\vec{A} \perp \vec{B}$ find α

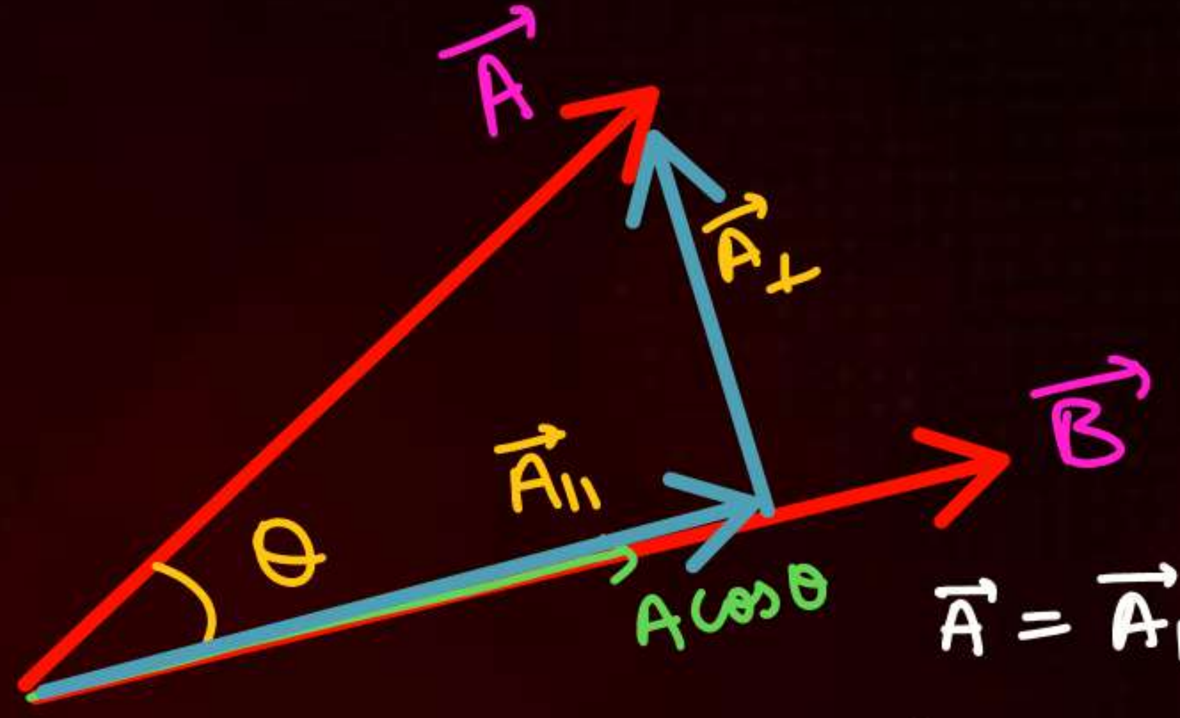
$6 + 20 + 2\alpha = 0$

$\alpha = -13$

$\vec{A} = 3\hat{i} + 4\hat{j}$

$\vec{B} = \hat{i} + \hat{j}$

$\vec{A} \cdot \vec{B} = AB\cos\theta$



$\vec{A} = \vec{A}_{\parallel} + \vec{A}_{\perp}$

$\vec{A}_{\perp} = \vec{A} - \vec{A}_{\parallel}$

Compoment of $\vec{A}$ parallel (Along) to $\vec{B}$ = $A\cos\theta = \dfrac{\vec{A} \cdot \vec{B}}{B} = \dfrac{7}{\sqrt{2}}$ (magnitude)

" " (Along) " Vector $= \dfrac{7}{\sqrt{2}} \hat{B} = \dfrac{7}{\sqrt{2}} \cdot \dfrac{\hat{i} + \hat{j}}{\sqrt{2}} = \dfrac{7}{2}\hat{i} + \dfrac{7}{2}\hat{j}$

Compont of $\vec{A}$ $\perp^{r}$ to $\vec{B}$ $= \vec{A} - \vec{A}_{\parallel} = (3\hat{i} + 4\hat{j}) - \left(\dfrac{7}{2}\hat{i} + \dfrac{7}{2}\hat{j}\right)$

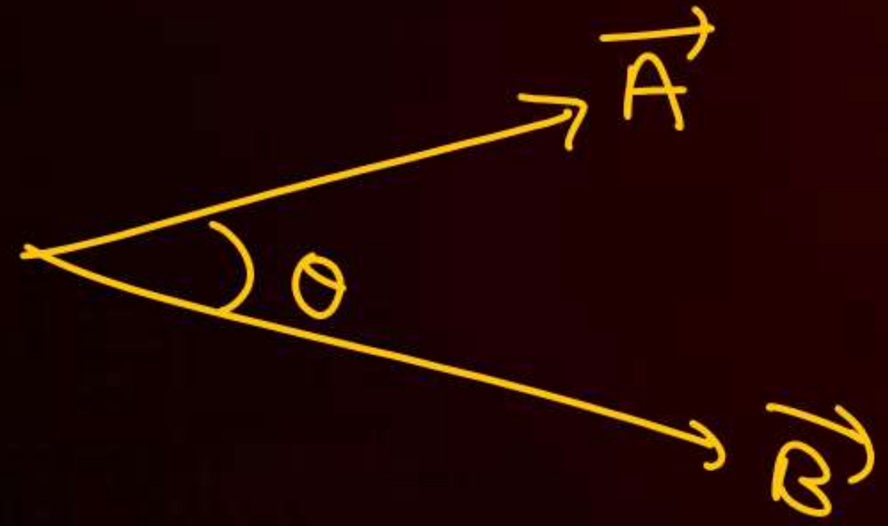
$= \checkmark$

Cross Product

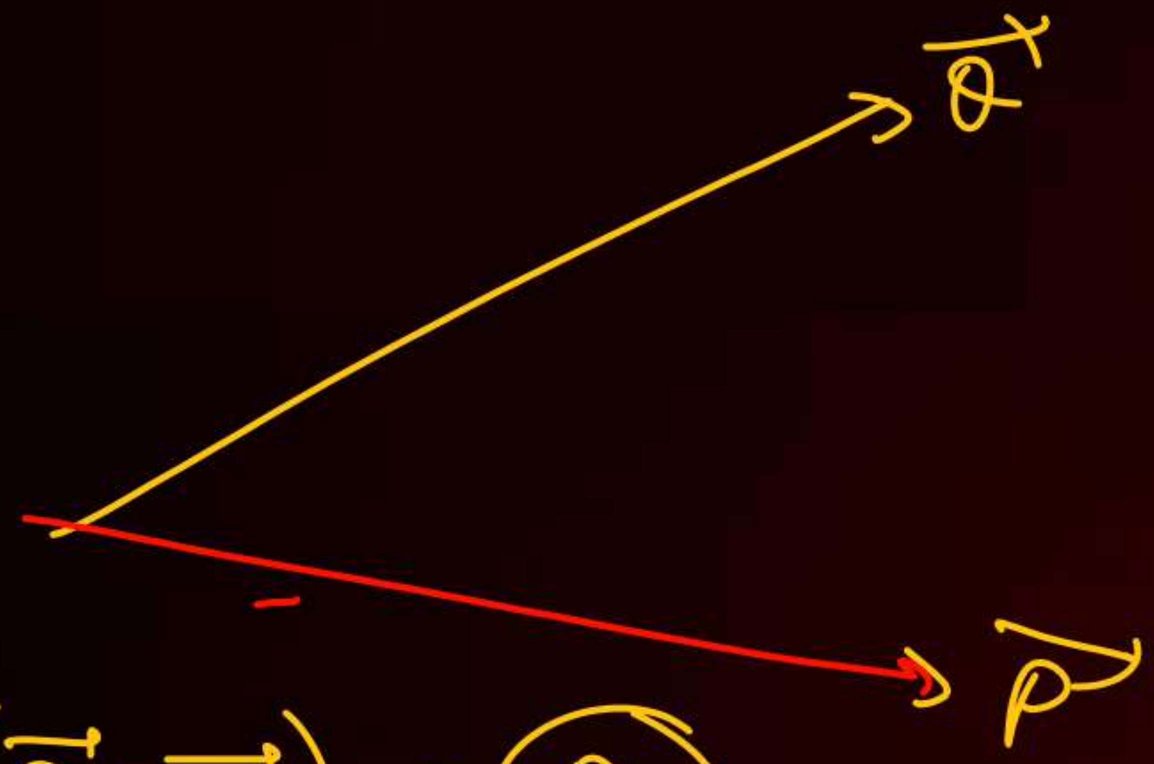
$$\vec{A}\times\vec{B} = \vec{C} = (AB\sin\theta)\,\hat{C}$$

$\vec{A}\cdot\vec{B} = AB\cos\theta$ → num scalar

$\vec{C}\perp\vec{A}$, $\vec{C}\perp\vec{B}$, $\vec{C}\cdot\vec{A}=0$, $\vec{C}\cdot\vec{B}=0$



Dir^n of $\vec{A}\times\vec{B} = \perp^{r}$ inside

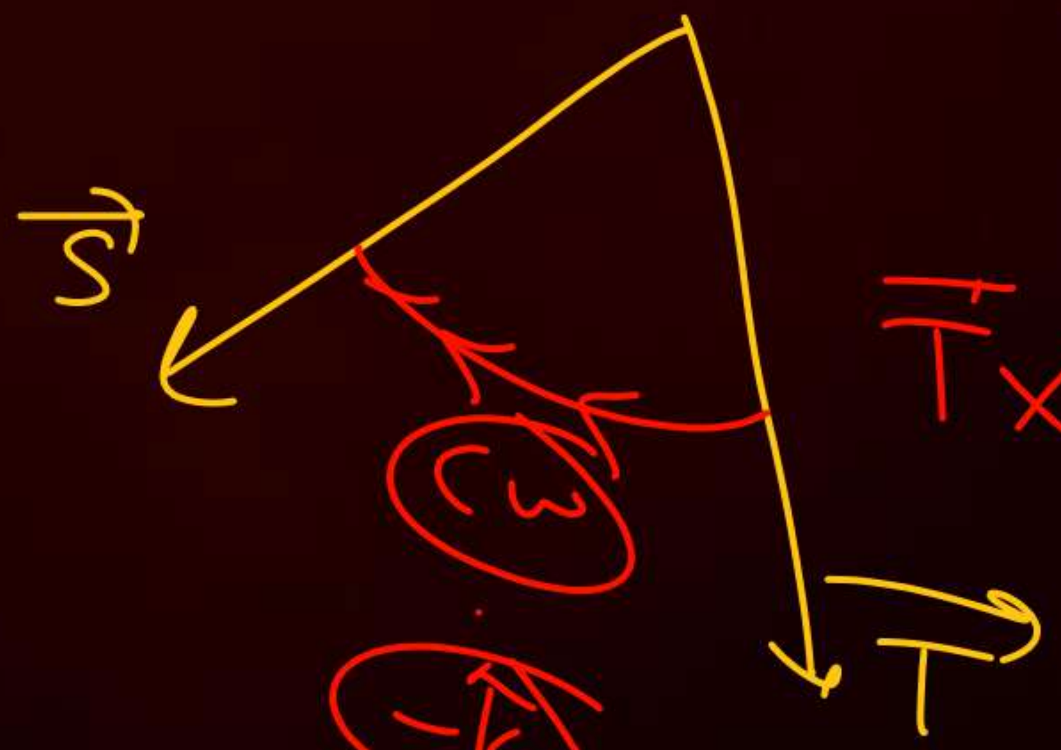


$(\vec{P}\times\vec{Q}) \Rightarrow \hat{k}$

ACW

$\vec{S}\times\vec{R}$

ACW $\hat{k}$



$\vec{T}\times\vec{S}$.

$-\hat{k}$

$\hat{j} \times \hat{i} = -\hat{k}$

$\hat{i} \times \hat{i} = 0 = \hat{j} \times \hat{j} = 0 = \hat{k} \times \hat{k} = 0 = \vec{A} \times \vec{A}$ $\quad \hat{i} \times \hat{k} = -\hat{j}$

* $\hat{i} \times \hat{j} = \hat{k}$ $\quad \hat{j} \times \hat{i} = -\hat{k}$ $\quad \hat{i}\,\hat{j}\,\hat{k}\,\hat{i}\,\hat{j}\,\hat{k}\,\hat{i}\,\hat{j}\,\hat{k}$

$\hat{j} \times \hat{k} = \hat{i}$ $\quad \hat{k} \times \hat{j} = -\hat{i}$

$\hat{k} \times \hat{i} = \hat{j}$ $\quad \hat{i} \times \hat{k} = -\hat{j}$

$\hat{i} \times \hat{j} = \hat{k}$

$\hat{j} \times \hat{k} = \hat{i}$

$\hat{k} \times \hat{i} = \hat{j}$

$(a+b)(c+d)$

$= ac + ad + bc + bd$

Q $\vec{A} = 2\hat{i} + 3\hat{j}$

$\vec{B} = 5\hat{i} + 6\hat{j}$

$\vec{A} \times \vec{B} = (2\hat{i} + 3\hat{j}) \times (5\hat{i} + 6\hat{j})$

$=$

$12K - 15(K) = -3\hat{k}$

$$\vec{A} = A_x\hat{i} + A_y\hat{j} + A_z\hat{k}$$

$$\vec{B} = B_x\hat{i} + B_y\hat{j} + B_z\hat{k}$$

$$\frac{A_x}{B_x} = \frac{A_y}{B_y} = \frac{A_z}{B_z} = n \begin{cases} \rightarrow n > 0 \quad \uparrow\uparrow \\ \rightarrow n < 0 \quad \uparrow\downarrow \end{cases}$$

$\vec{A} = 10\hat{i} + 20\hat{j} + x\hat{k}$

$\vec{B} = 5\hat{i} + y\hat{j} + 15\hat{k}$

$\vec{A} \uparrow\uparrow \vec{B}$

$\frac{10}{5} = \frac{20}{y}$

$y = 10$

$\frac{10}{5} = \frac{x}{15}$

$x = 30$

ACW $\Rightarrow$ बाहर $\perp$ outside $\equiv \hat{k}$

CW $\Rightarrow$ $\perp$ inside $\equiv -\hat{k}$

THANK
YOU