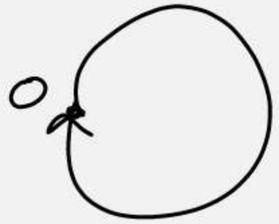
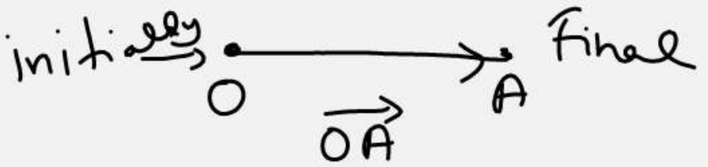
Types of vectors:-





(1) zero (null vector) → a vector in which starting & end point are same.

(2) unit vector :- a vector which has mag. = 1

↳ unit vector in the direction of $\vec{a}$ is given by:-

$$\hat{a}$$

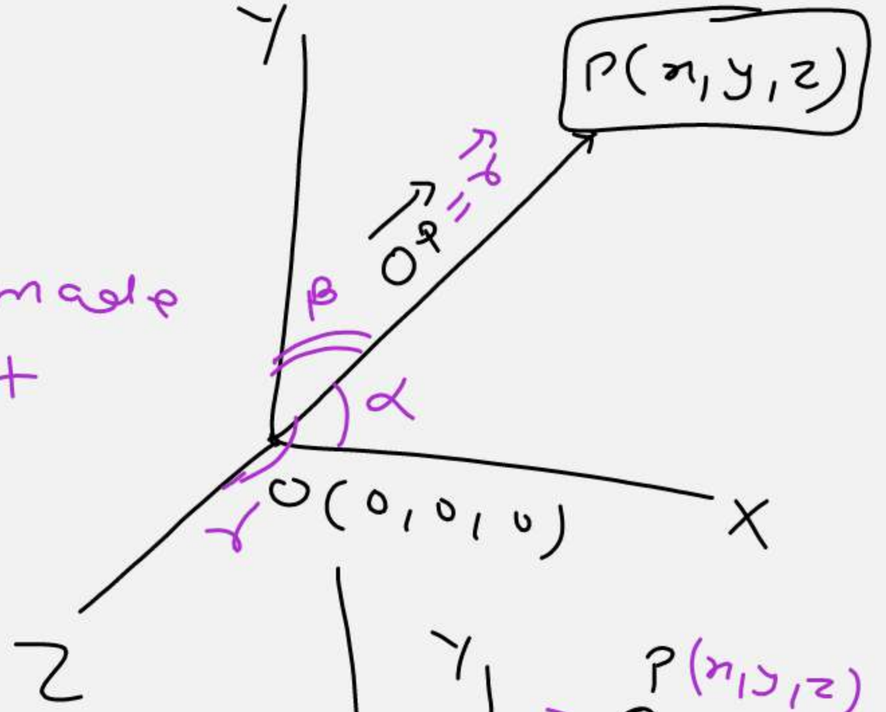
Similarly:- x axis → $\hat{i}$

y axis → $\hat{j}$

z axis → $\hat{k}$

Direction Cosine :-

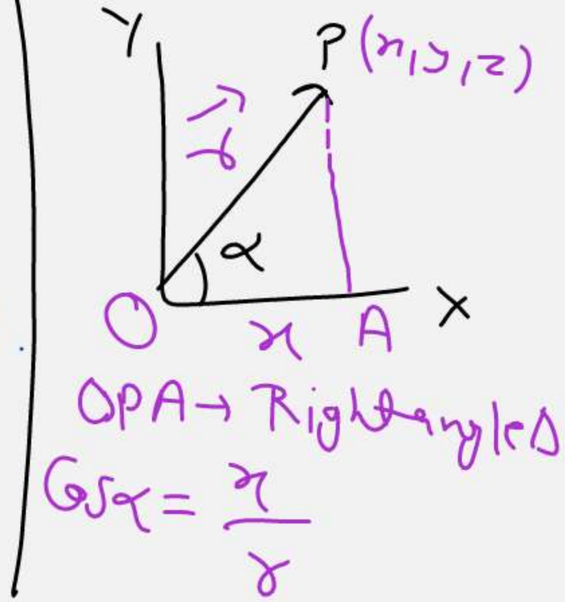
Direction angle :→ angle which is made by point P wrt x, y & z axis (i.e. α, β & γ.)



⇒ The Cosine of the Direction angle is called Direction Cosine.

(i.e.) → $\cos\alpha, \cos\beta, \cos\gamma$ → Direction Cosine.

also :- $\left[l = \cos\alpha,\ m = \cos\beta,\ n = \cos\gamma\right]$



OPA → Right angled Δ.

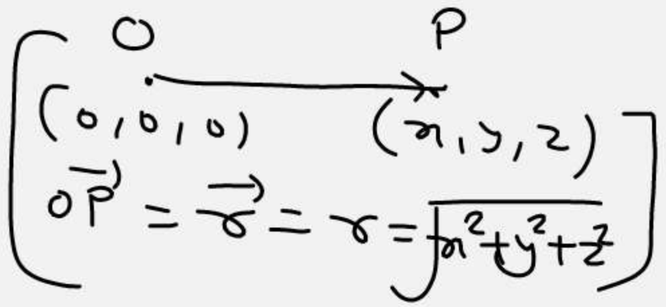
$\cos\alpha = \frac{x}{\gamma}$

$\cos\alpha = x/r = l \Rightarrow [x = lr]$

Similarly :- $\cos\beta = \frac{y}{r} = m \Rightarrow [y = mr]$

$\cos\gamma = \frac{z}{r} = n \Rightarrow [z = nr]$

So $P(x, y, z) = P(lr, mr, nr)$



Now :- $\boxed{l^2 + m^2 + n^2 = 1}$

$$\rightarrow \frac{x^2}{r^2} + \frac{y^2}{r^2} + \frac{z^2}{r^2} = \frac{x^2+y^2+z^2}{r^2} = \frac{r^2}{r^2} = 1$$

Q. magnitude of following vector

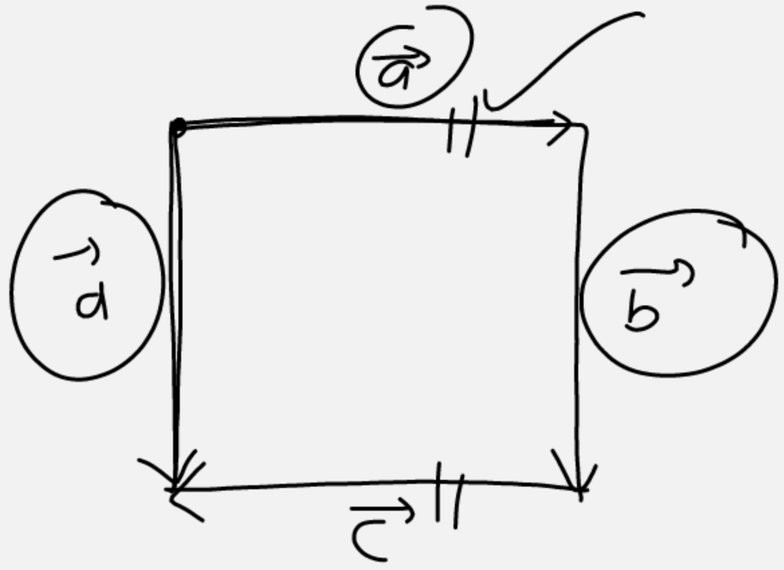
$$\underline{b'} = \underline{2\hat{i} - 7\hat{j} - 3\hat{k}} \quad [x\hat{i} + y\hat{j} + z\hat{k}]$$

$$|\vec{b'}| = \sqrt{(2)^2 + (-7)^2 + (-3)^2} = \sqrt{4 + 49 + 9} = \sqrt{62}$$]

$$\underline{\vec{c'}} = \frac{1}{\sqrt{3}}\hat{i} + \frac{1}{\sqrt{3}}\hat{j} - \frac{1}{\sqrt{3}}\hat{k} = \boxed{+1}$$

Q. write 2 Diff vec. having same mag.

Q.



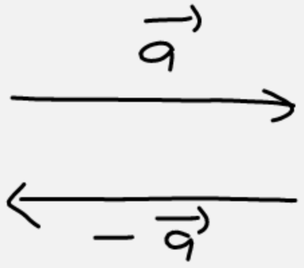
(1) Coinitial → $\vec{a}$, $\vec{d}$

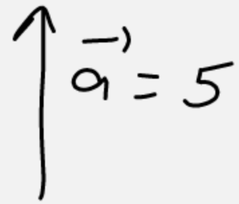
(2) Equal. → $\vec{b}$, $\vec{d}$

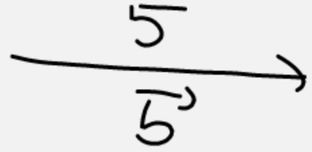
(3) Collinear but no equal - $\vec{a}$ & $\vec{c}$

Q.

$\vec{a}$, $-\vec{a}$ → Collinear







(2) 2 vec having same mag.

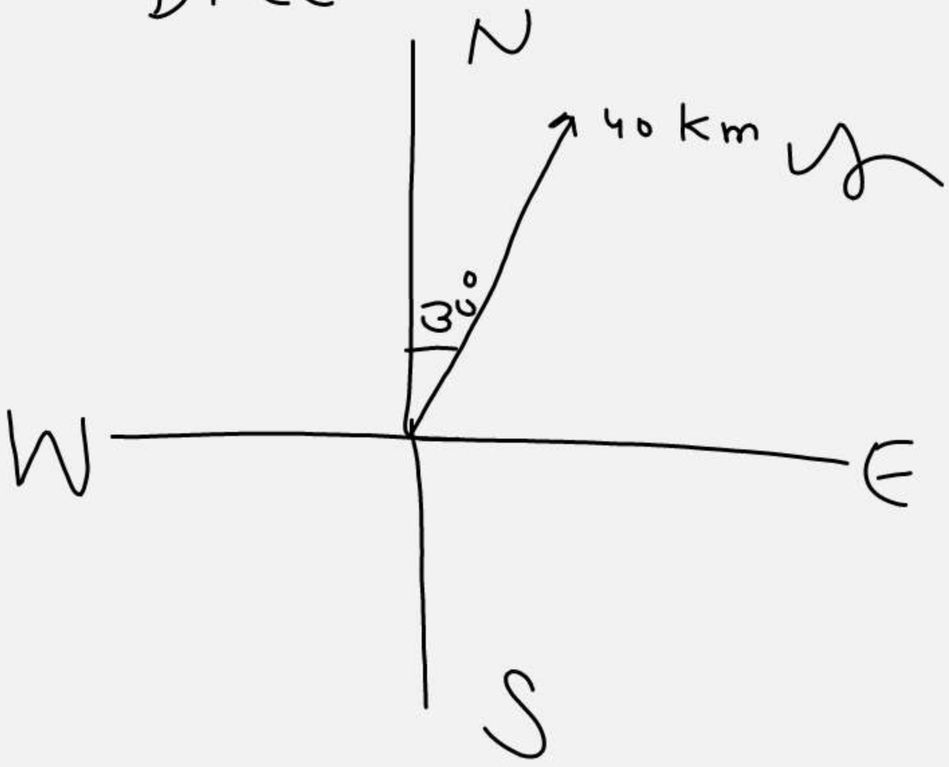
↕

Collinear.

(3) 2 collinear → same mg → eq.

Q. Displacement → 40 km, 30° east of North

Mag. Direc.



Q ① 10 kg.

② 2 meter north-east

20 m/sec²

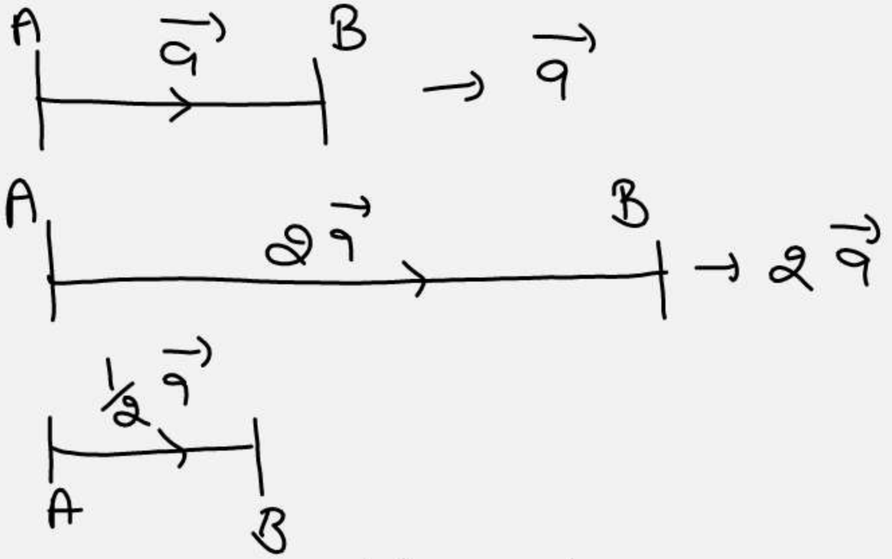
force →

work done

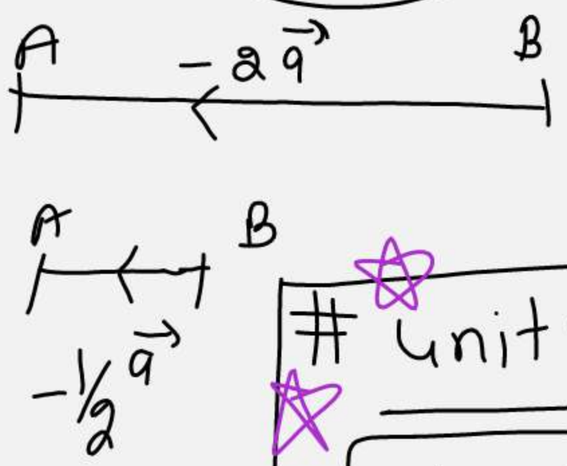
associative :-

$$\left[\vec{a}+(\vec{b}+\vec{c}) = (\vec{a}+\vec{b})+\vec{c}\right] = \left[\vec{a}+\vec{b}+\vec{c}\right]$$

Multiplication of vector by scaler :



(magnitude change)



$\vec{x} = \hat{i} + 2\hat{j}$

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

$\vec{x}+\vec{y} = 3\hat{i} + 5\hat{j}$

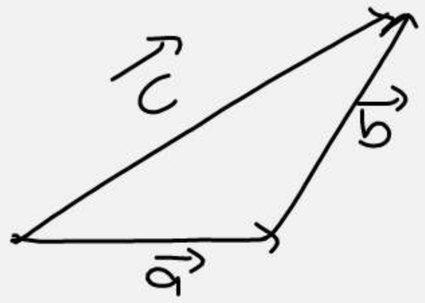
Unit vector :- $\vec{a} \rightarrow \hat{a}$

$$\hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

Addition of vector :- △ law of Addition.

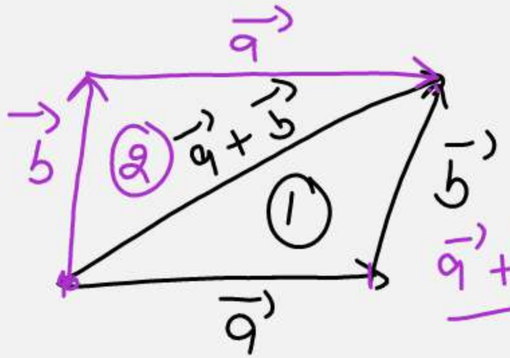
$$\vec{a} + \vec{b} = \vec{c}$$

$$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$$

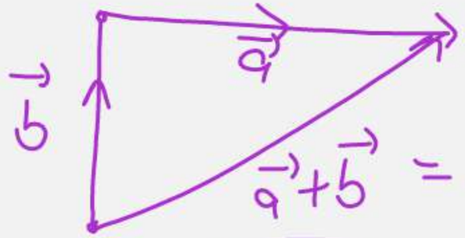


$$\vec{a} + \vec{b} = \vec{b} + \vec{a}$$

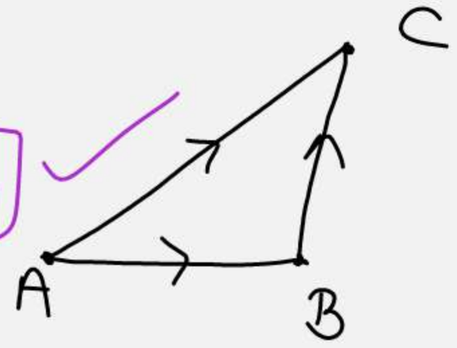
Commutative property



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

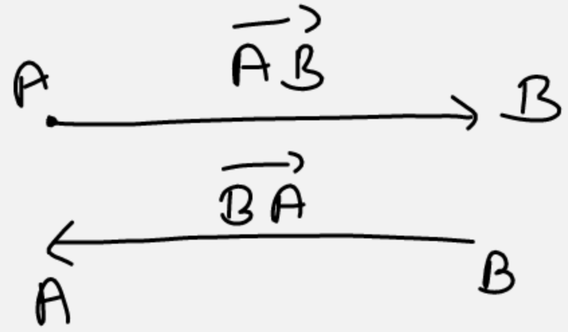


$= \vec{b} + \vec{a}$



Free vector :- Chapter

negetive of a vector:-



$|\overrightarrow{AB}| = |\overrightarrow{BA}|$ ✓

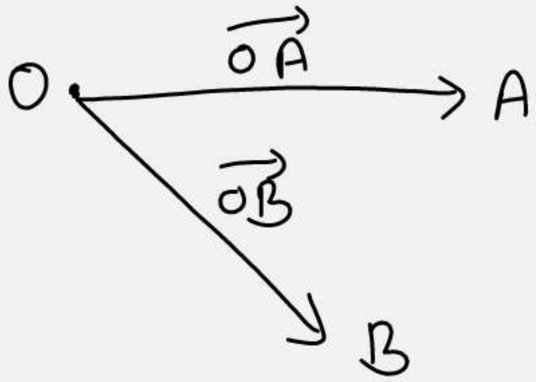
$\overrightarrow{AB} \neq \overrightarrow{BA}$

$\overrightarrow{AB} = (-)\overrightarrow{BA}$

↓

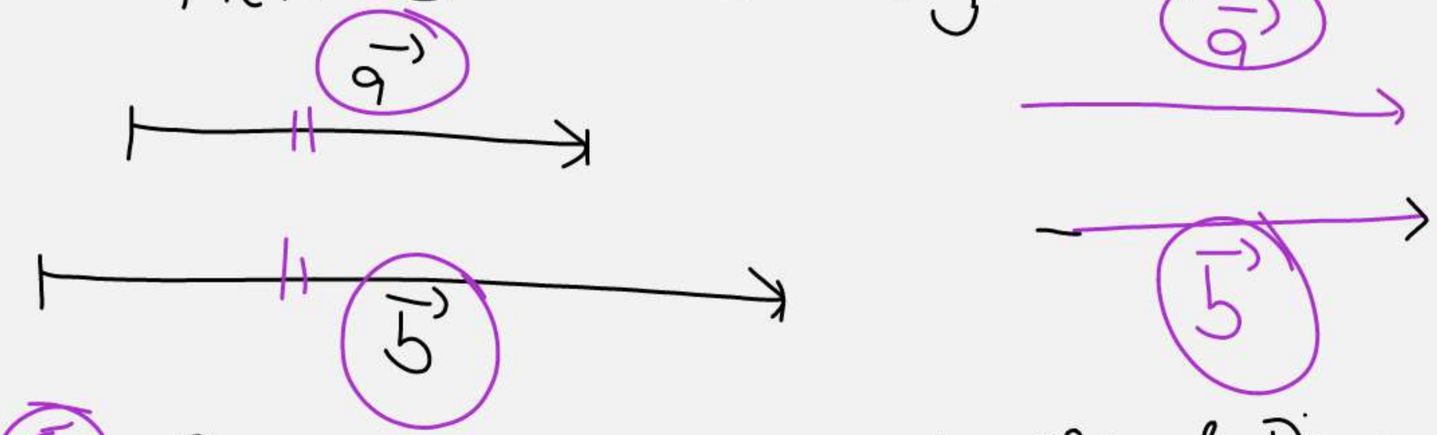
opposite Direction

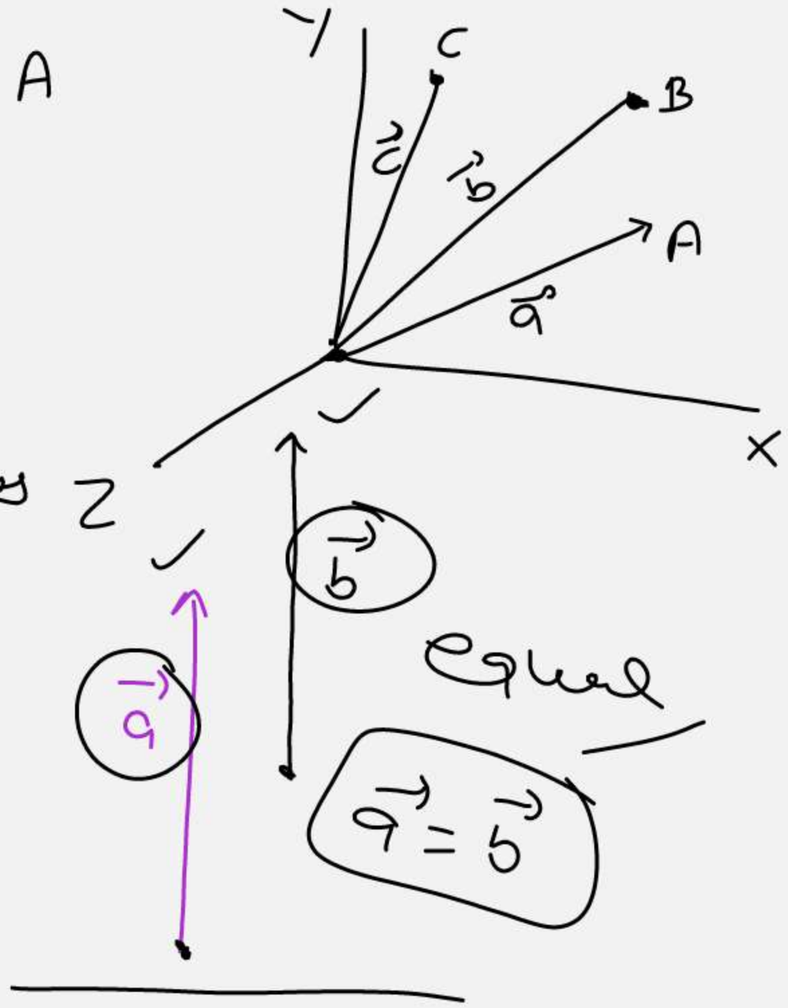
③ Co-Initial vector :-



④ Co-linear vector :-

if 2 vector are parallel regardless their Direct & magnitude.





⑤ Equal vector :- When both Mag & Dire. are same.