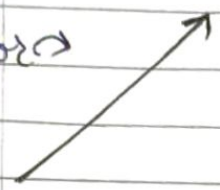
☆ VECTOR

Part = II

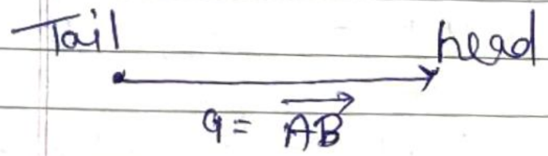
Vector→



~~The length~~

- The ~~log~~ length shows the magnitude.

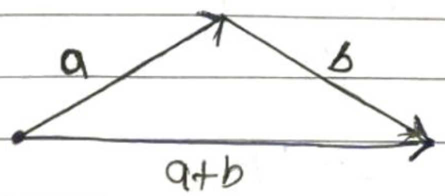
- The Arrow shows the direction.



→ The length of the line shows its magnitude (size) and the arrowhead point is the Direction.

→ force and velocity both are vector with a magnitude and a Direction.

→ Addition of vector -:

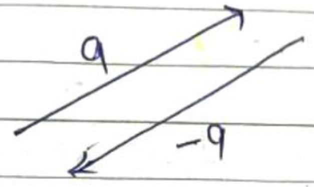


The line from the tail of a to the head of b is the vector a+b.

$a+b = b+a$ doesn't matter which order we add them.

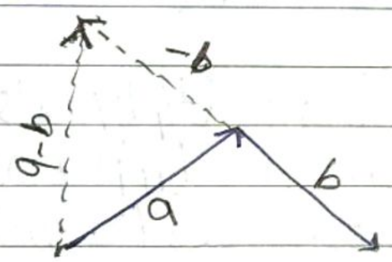
→ Subtraction of Vector :- Vector '$-a$' is the opposite of '$+a$'.

- This means that vector a and vector $-a$ has the same magnitude in the opposite directions.



→ So first we reverse the direction of the vector from another.

→ Then add them as usual:



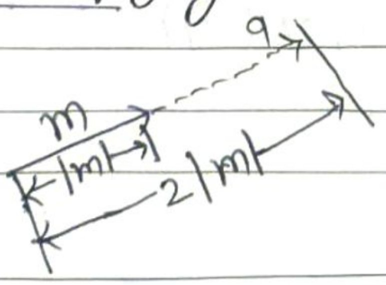
$a-b$

$= a + (-b) = a - b$

* Magnitude of a Vector :- $|a|$

$$|a| = \sqrt{(x^2 + y^2)}$$

* Multiplying a Vector by a Scalar Value :-



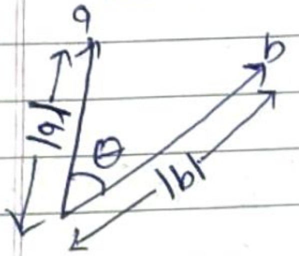
$m = 2|m|$

* Multiplying Vector by Vector / Dot Product / Cross product :-

There ~~is~~ are two ways :-

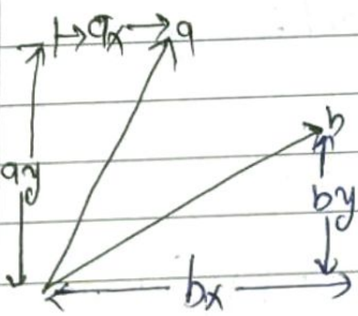
(1) Dot Product :- $a \cdot b$

(i) $a \cdot b = |a| \times |b| \times \cos(\theta)$



Where → Length
$|a|$ = Magnitude of vector a
$|b|$ = Magnitude of vector b
θ = Angle between a and b

(ii)



$a \cdot b = a_x \times b_x + a_y \times b_y$

first multiply x's and than multiply y's and then add both.

[Ex. - SS]

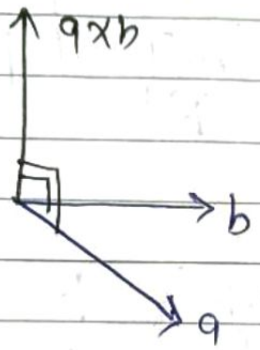
$A = 2i - 3j + 7K$
$B = -4i + 2j - 4K$

Sol. →

$A \cdot B = (2i - 3j + 7K) \cdot (-4i + 2j - 4K)$
$= 2(-4) + (-3)2 + 7(-4)$
$= -8 - 6 - 28$
$= -42$ Ans

$a \times b$

(2) **Cross Product** :- The cross product $a \times b$ of two vectors is another vector, that is at right angles to both.



$A = ai + bj + ck$
$B = xi + yj + zk$
Then,

$$A \times B = \begin{array}{ccc} + & - & + \\ \end{array}$$
$$A \times B = \begin{vmatrix} i & j & k \\ a & b & c \\ x & y & z \end{vmatrix}$$

Solv same as Determinant

$$A \times B = i(bz - cy) - j(az - cx) + k(ay - bx)$$

Ex. $\vec{x} = 5\vec{i} + 6\vec{j} + 2\vec{k}$

$\vec{y} = i + j + k$

$$\vec{x} \times \vec{y} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 5 & 6 & 2 \\ 1 & 1 & 1 \end{vmatrix}$$

$$\vec{x} \times \vec{y} = \vec{i}(6-2) - \vec{j}(5-2) + \vec{k}(5-6)$$

$$\vec{x} \times \vec{y} = 4i - 3j - \vec{k}$$

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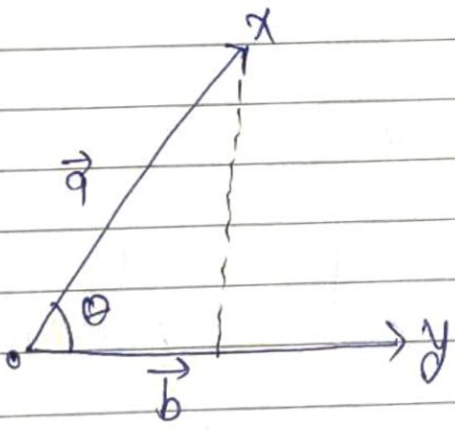
Vector Projection :-

Projection of $\vec{b}$ on $\vec{a}$ = $\frac{\vec{a}\cdot\vec{b}}{|\vec{a}|}$

Projection of $\vec{a}$ on $\vec{b}$ = $\frac{\vec{b}\cdot\vec{a}}{|\vec{b}|}$

$\Big\}$ for Scalar Projection

Projection of $\vec{b}$ on $\vec{a}$ = $\left(\frac{a\cdot b}{|b|}\right)\frac{b}{|b|}$



Projection is shadow or $\vec{a}$ on $\vec{b}$. ~~in simple~~