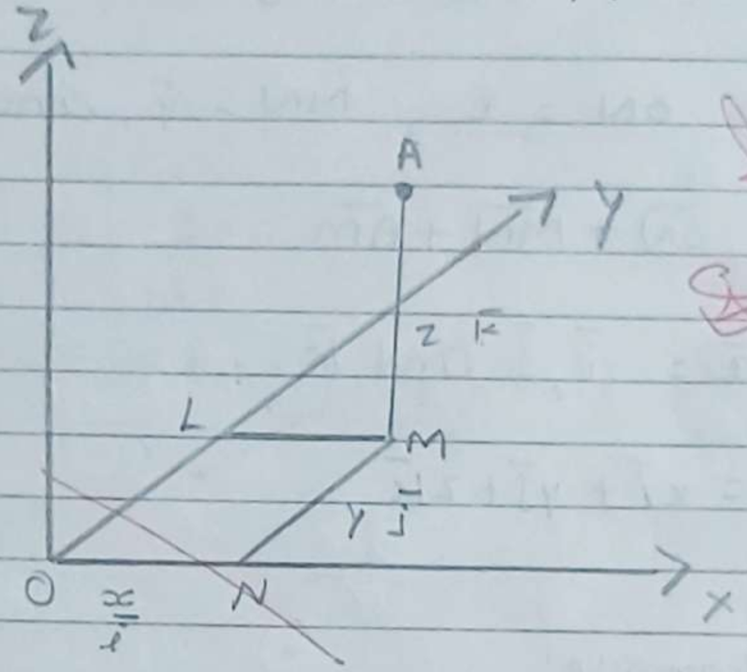
Que: 1 Position vector in space (10).



30/30 good

→ Position of vector in space is the origin where,

Let A is a one point in space
A = co: adinator of space.

Draw A point in space and take one line and indicate Name 'm'.

m, draw is perpendicular on x and y exises.

Draw MN and ML where MN is perpendicular on x axises and ML is perpendicular on $\bar{y}$ axises.

We want to find magnitude of $\overline{OA}$.

where, $ON = \bar{x}$, $MN = \bar{y}$, and $\overline{AM} = \bar{z}$.

$\overline{OA} = \overline{ON} + \overline{MN} + \overline{AM}$

$\overline{OA} = \bar{a} = \bar{i}, \bar{j}$, and $\bar{k}$.

$\overline{OA} = x\bar{i} + y\bar{j} + z\bar{k}$

For example:

$A = (2, 1, 3)$

$\cancel{\bar{a} = (2\bar{i} + 2}$

$\bar{a} = 2\bar{i} + 1\bar{j} + 3\bar{k}$

ue:2 $\bar{a}$ = ~~xe~~ $(3,-1,-2)$ $\bar{b}=(7,1,-1)$ $\bar{c}=(-2,3,5)$

$\bar{a} = 3\bar{i} - 1\bar{j} - 2\bar{k}$
$\bar{b} = 7\bar{i} + 1\bar{j} - 1\bar{k}$
$\bar{c} = -2\bar{i} + 3\bar{j} + 5\bar{k}$

1) $\dfrac{\bar{b}}{|\bar{a}\times\bar{c}|}$

$$\therefore \bar{a}\times\bar{c} \quad \begin{vmatrix} \bar{i} & \bar{j} & \bar{k} \\ 3 & -1 & -2 \\ -2 & 3 & 5 \end{vmatrix}$$

$= ((-1)(5)-(-2)(3))\bar{i} + ((-2)(-2)-(5)(3))\bar{j} + ((3)(3)-(-1)(-2))\bar{k}$

$= (-5+6)\bar{i} + (+4-15)\bar{j} + (9-2)\bar{k}$

$= \bar{i} - 11\bar{j} + 7\bar{k}$

$\therefore |\bar{a}\times\bar{c}|$

$= \sqrt{(1)^2+(-11)^2+(7)^2}$

$= \sqrt{1+121+49}$

$= \sqrt{171}$

$= 3\sqrt{19}$

$= \dfrac{\bar{b}}{|\bar{a} \times \bar{c}|}$

$= \dfrac{7\bar{i} + 1\bar{j} - 1\bar{k}}{3\sqrt{19}}$

2 $\dfrac{\cos\theta}{\sin\theta}$ (AC)

$\bar{a} = 3\bar{i} - \bar{j} - 2\bar{k}$
$\bar{c} = -2\bar{i} + 3\bar{j} + 5\bar{k}$

$\therefore \cos\theta \cdot \cancel{\dfrac{\bar{a}\cdot\bar{b}}{ab}} \quad \dfrac{\bar{a}\cdot\bar{c}}{ac}$

- $\bar{a}\cdot\bar{c}$

$= ((3)(-2) + (-1)(3) + (-2)(5))$
$= -6 - 3 - 10$
$= -9 - 10$
$= -19$

- ac

$= \sqrt{(3)^2 + (-1)^2 + (-2)^2} \sqrt{(-2)^2 + (3)^2 + (5)^2}$

$= \sqrt{9+1+4} \quad \sqrt{4+9+25}$

$= \sqrt{14}\sqrt{38}$
$= \sqrt{532}$

$$\cos\theta = \frac{-19}{\sqrt{532}}$$

$$\therefore \quad \sin\theta = \frac{|\bar{a} \times \bar{c}|}{ac}$$

$$\begin{vmatrix} \bar{i} & \bar{j} & \bar{k} \\ 3 & -1 & -2 \\ -2 & 3 & 5 \end{vmatrix}$$

- $\bar{a} \times \bar{c}$

$= ((-1)(5) - (-2)(3))\bar{i} + ((-2)(-2) - (5)(3))\bar{j} + ((3)(3) - (-1)(-2))\bar{k}$

$= (-5+6)\bar{i} + (4-15)\bar{j} + (9-2)\bar{k}$

$= 1\bar{i} - 11\bar{j} + 7\bar{k}$

- $|\bar{a} \times \bar{c}|$

$= \sqrt{(1)^2 + (-11)^2 + (7)^2}$

$= \sqrt{1 + 121 + 49}$

$= \sqrt{171}$

$= 3\sqrt{19}$

- ac

$= \sqrt{(3)^2 + (-1)^2 + (-2)^2}\ \sqrt{(-2)^2 + (3)^2 + (5)^2}$

$= \sqrt{9+1+4}\ \sqrt{4+9+25}$

$\sqrt{14}\sqrt{38}$.

$$\frac{\cos\theta}{\sin\theta} = \frac{\frac{-19}{\sqrt{532}}}{\frac{3\sqrt{19}}{\sqrt{532}}}$$

$$= \frac{-19}{3\sqrt{19}}$$

Good

3 $\bar{A}\cdot(\bar{b}-\bar{c})$

$\therefore\ \bar{b}-\bar{c}$

$= (7-(-2))\bar{i}+(1-3)\bar{j}+(-1-5)\bar{k}$

$= (7+2)\bar{i}+(-2)\bar{j}+(-6)\bar{k}$

$= 9\bar{i}-2\bar{j}-6\bar{k}$

$\therefore\ \bar{a}\cdot(\bar{b}-\bar{c})$

$= (3\bar{i}-1\bar{j}-2\bar{k})(9\bar{i}-2\bar{j}-6\bar{k})$.

$= (3)(9)+(-1)(-2)+(-2)(-6)$

$= 27+2+12 = 41$.

unit vector of cross product

[illegible] $\bar{b} \times \bar{c}$

$= ((1)(5) - (-1)(3))\bar{i} + ((-1)(-2) - (7)(5))\bar{j} + ((7)(3) - (1)(-2))\bar{k}$

$= (5+3)\bar{i} + (2-35)\bar{j} + (21+2)\bar{k}$

$= 8\bar{i} - 33\bar{j} + 23\bar{k}$

$\therefore |\bar{b} \times \bar{c}|$

$= \sqrt{(8)^2 + (-33)^2 + (23)^2}$

$= \sqrt{64 + 1089 + 529}$

$= \sqrt{1682}$ 4

$= 29\sqrt{2}$

$\dfrac{\bar{b} \times \bar{c}}{|\bar{b} \times \bar{c}|} = \dfrac{8\bar{i} - 33\bar{j} + 23\bar{k}}{29\sqrt{2}}$

(6) $3\bar{a} \cdot (4\bar{b} - 2\bar{c})$

$\bar{a} = (3, -1, -2)$
$\bar{b} = (7, 1, -1)$
$\bar{c} = (-2, 3, 5)$

→ $\bar{a}$ is 3 is scalar multiple with $\bar{a}$.
$= \bar{a} = 9\bar{i} - 3\bar{j} - 6\bar{k}$

→ b is scalar multiple with 4.
$= \bar{b} = 28\bar{i} + 4\bar{j} - 4\bar{k}$

→ c is scalar multiple with 2
$= \bar{c} = -4\bar{i} + 6\bar{j} + 10\bar{k}$

$\therefore 4\bar{b} - 2\bar{c}$

$= (28 - (-4))\bar{i} + (4 - 6)\bar{j} + (-4 - 10)\bar{k}$
$= (28 + 4)\bar{i} + (-2)\bar{j} + (-14)\bar{k}$
$= 32\bar{i} - 2\bar{j} - 14\bar{k}$ (2)

$\therefore 3\bar{a}(4\bar{b} - 2\bar{c})$

$= (9\bar{i} - 3\bar{j} - 6\bar{k})(32\bar{i} - 2\bar{j} - 14\bar{k})$
$= (9)(32) + (-3)(-2) + (-6)(-14)$
$= 288 + 6 + 84$
$= \boxed{378}$.