Physicsaholics

DPP – 1 (Vector)

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Q 1. Sum of four nonzero vectors is zero , Then
(a) they must be coplanar
(b) they may be coplanar
(c) Sum of magnitude of any two vectors must be equal to that of other two vectors.
(d) magnitude of sum of any two vectors must be equal to that of other two vectors

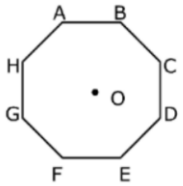
Q 2. if $\vec{A}$ has greater magnitude than $\vec{B}$ Then maximum possible angle between sum of vectors with $\vec{A}$ is
(a) $\cos^{-1}\frac{B}{A}$ (b) $\cos^{-1}\frac{B}{\sqrt{A^2+B^2}}$
(c) $\sin^{-1}\frac{B}{A}$ (d) $\text{Sin}^{-1}\frac{B}{\sqrt{A^2+B^2}}$

Q 3. If $\vec{A}\times\vec{B} = \vec{A}\times\vec{C}$ then (all three vectors are nonzero vectors)
(a) B must be equal to C.
(b) $\vec{B}$ must be equal to $\vec{C}$
(c) $\vec{B}$ and $\vec{C}$ must be coplanar
(d) $\vec{B}$ and $\vec{C}$ must be colinear.

Q 4. if A = 1 , B = 2 , C = 3 and angle between $\vec{A}$ and $\vec{B}$, $\vec{B}$ and $\vec{C}$, $\vec{C}$ and $\vec{A}$ are 60^0 each. Magnitude of resultant of $\vec{A}$, $\vec{B}$ and $\vec{C}$ is
(a) 3
(b) 4
(c) 5
(d) 6

Q 5. If $\vec{A}.\vec{B} = \vec{A}.\vec{C}$ then (all three vectors are nonzero vectors)
(a) B must be equal to C.
(b) $\vec{B}$ must be equal to $\vec{C}$
(c) $\vec{B}$ and $\vec{C}$ must be coplanar
(d) None of these

Q 6. In an octagon ABCDEFGH of equal side, what is the sum of $\overrightarrow{AB}$, $\overrightarrow{AC}$, $\overrightarrow{AD}$, $\overrightarrow{AE}$, $\overrightarrow{AF}$, $\overrightarrow{AG}$, and $\overrightarrow{AH}$



(a) $6\,\overrightarrow{AO}$
(b) $3\,\overrightarrow{AO}$
(c) $4\,\overrightarrow{AO}$
(d) $\overrightarrow{AO}$

Q 7. A particle is revolving in a circular track passing through point (3,4,5) about axis of rotation $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$. Radius of circle is

(a) 1
(b) $\sqrt{\frac{22}{7}}$
(c) $\sqrt{\frac{32}{7}}$
(d) $\sqrt{\frac{42}{7}}$

Q 8. In an equilateral DABC, AL, BM and CN are medians. Forces along BC and BA represented by them will have a resultant represented by -
(a) 2**AL**
(b) 2**BM**
(c) 2**CN**
(d) **AC**

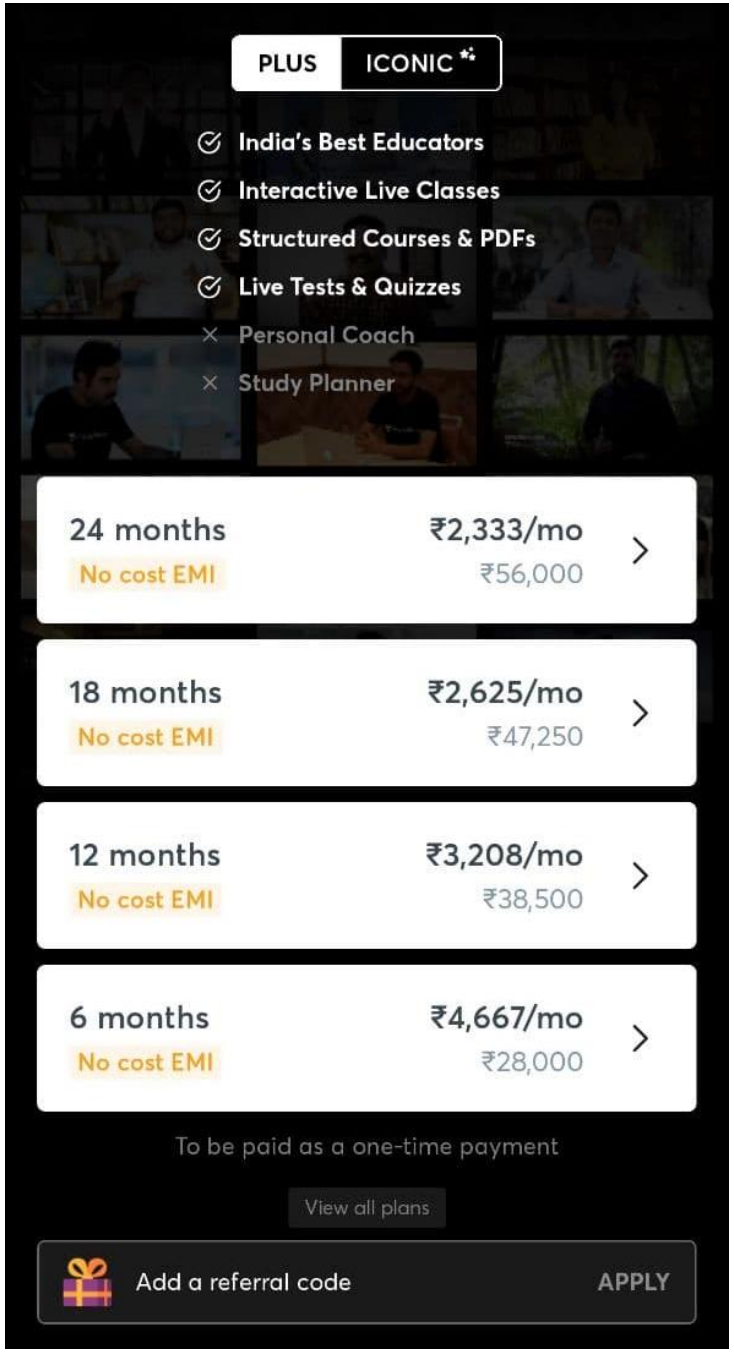
Q 9. A particle is moving with uniform velocity 10 m/sec from point (2 m,5m,6m) to (3m,7m,8m) Velocity vector of particle is
(a) $\frac{10}{3}(\hat{\imath} + 2\,\hat{\jmath} + 2\,\hat{k})$ m/sec
(b) $\frac{10}{3}(\hat{\imath} + \hat{\jmath} + 2\,\hat{k})$ m/sec
(c) $\frac{5}{3}(\hat{\imath} + 2\,\hat{\jmath} + 2\,\hat{k})$ m/sec
(d) $\frac{5}{6}(\hat{\imath} + 2\,\hat{\jmath} + 2\,\hat{k})$ m/sec

Q 10. Vector $\hat{\imath} + 2\,\hat{\jmath} + 2\,\hat{k}$ is resolved in two rectangular components. One component is along $\hat{\imath} + \hat{\jmath} + \hat{k}$. Other component is

(a) $\sqrt{\frac{5}{3}}$
(b) $\sqrt{\frac{1}{3}}$
(c) $\sqrt{\frac{2}{3}}$
(d) $\sqrt{\frac{2}{5}}$

Answer Key

Q.1) B,D	**Q.2) C**	**Q.3) C**	**Q.4) C**	**Q.5) D**
Q.6) D	**Q.7) A**	**Q.8) B**	**Q.9) A**	**Q.10) C**



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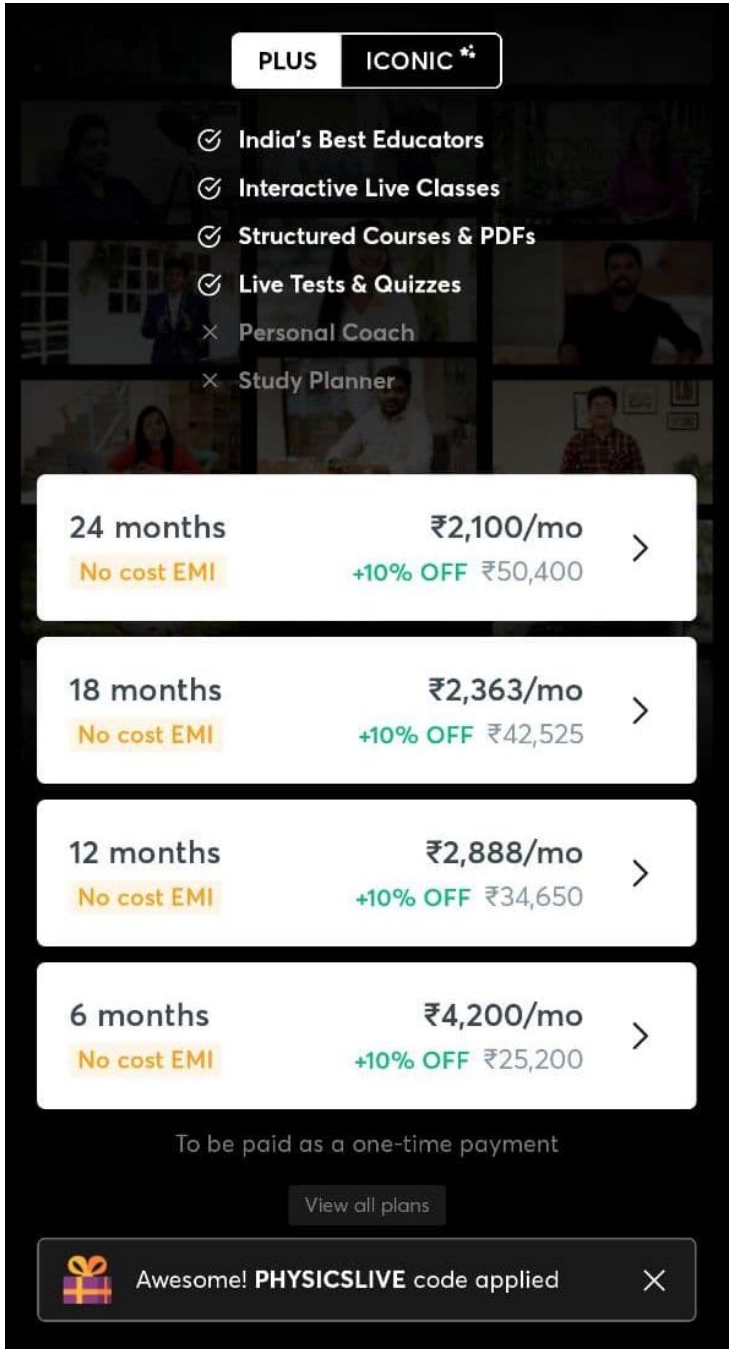


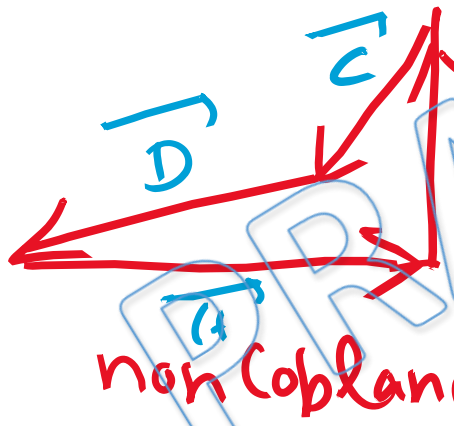
Written Solution

DPP- 1 Vector

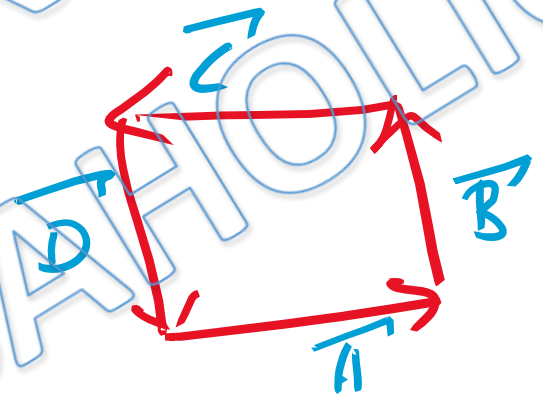
By Physicsaholics Team

1) Sum of four nonzero vectors is zero.

⇒ In head to tail arrangement they will form closed loop.



non Coplanar



Planar

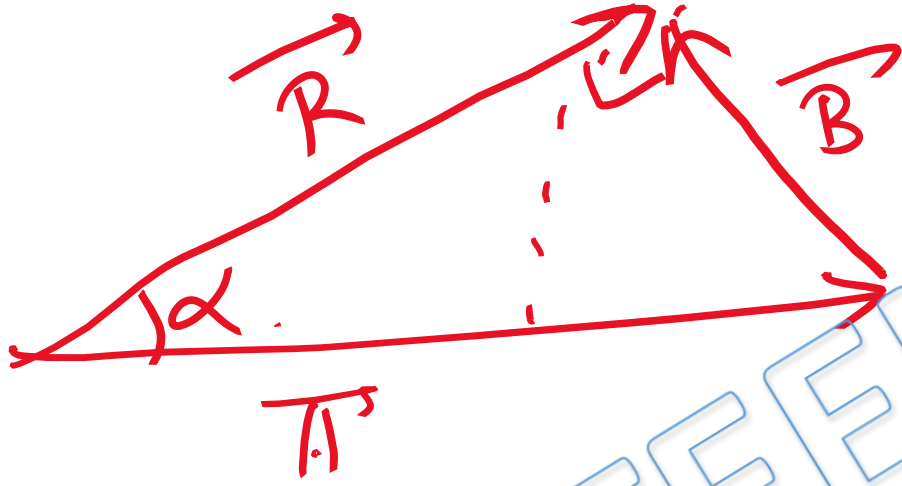
$\vec{A}+\vec{B}+\vec{C}+\vec{D}=0$

$\Rightarrow \vec{A}+\vec{B}=-(\vec{C}+\vec{D})$

$\Rightarrow |\vec{A}+\vec{B}|=|\vec{C}+\vec{D}|$

Ans (b,d)

2)



for minimum possible angle b/w $\vec{R}$ & $\vec{A}$

angle between $\vec{R}$ & $\vec{B}$ must be 90°.

$$\sin\alpha = \frac{B}{A} \Rightarrow \alpha = \sin^{-1}\left(\frac{B}{A}\right)$$

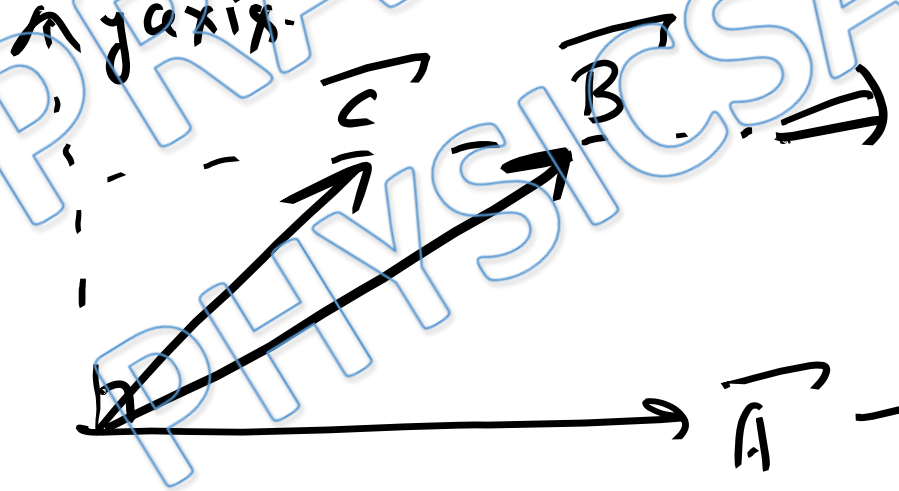
Ans (c)

3) $\vec{A} \times \vec{B} = \vec{A} \times \vec{C} = n\hat{n}$ → unit vector along cross product.

↓ magnitude

$\vec{A}, \vec{B}$ & $\vec{C}$ must be $\perp$ to $\hat{n}$.

$\Rightarrow$ $\vec{A}, \vec{B}$ & $\vec{C}$ must lie in a plane $\perp$ to $\hat{n}$.



In this example

$\vec{A} \times \vec{B} = \vec{A} \times \vec{C}$.

Ans (c)

4) $\vec{R} = \vec{A} + \vec{B} + \vec{C}$

$\Rightarrow \vec{R} \cdot \vec{R} = (\vec{A} + \vec{B} + \vec{C}) \cdot (\vec{A} + \vec{B} + \vec{C})$

$\Rightarrow R^2 = A^2 + B^2 + C^2 + 2(\vec{A}\cdot\vec{B} + \vec{B}\cdot\vec{C} + \vec{C}\cdot\vec{A})$

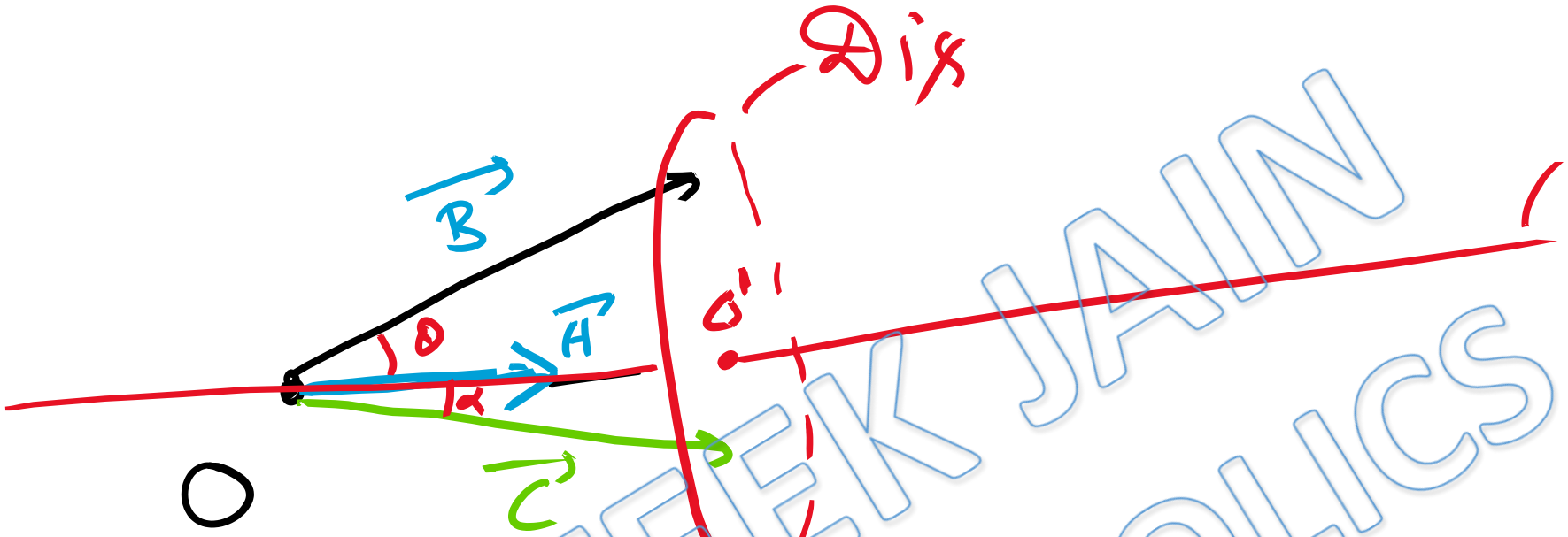
$= 1 + 4 + 9 + 2(2 + 6 + 3)\cos 60^\circ$

$= 14 + 11 = 25$

$R = 5$

Ans (c)

5)



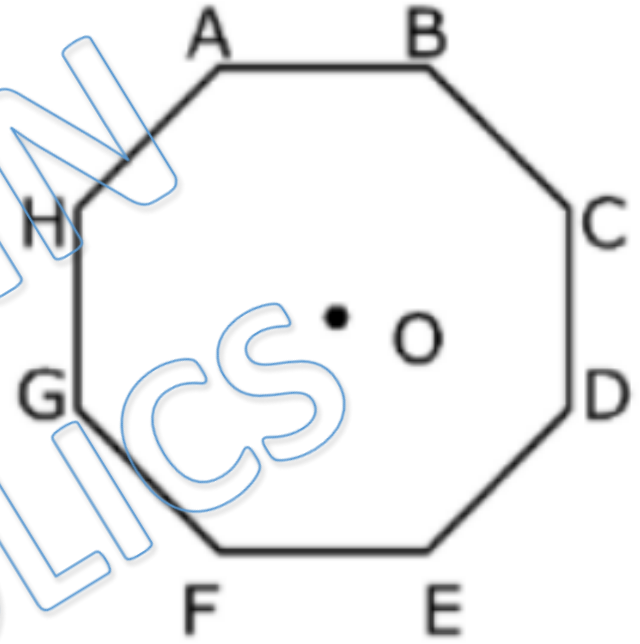
$\vec{A}$ is along axis, $\vec{B}$ & $\vec{C}$ are starting from O & ending in plane of disc.

$\vec{A}.\vec{B} = AB\cos\theta = A(OO')$

$\vec{A}.\vec{C} = AC\cos\alpha = A(OO')$

Ans (d)

6)



$$\overrightarrow{AB}+\overrightarrow{AC}+\overrightarrow{AD}+\overrightarrow{AE}+\overrightarrow{AF}+\overrightarrow{AG}+\overrightarrow{AH}$$

$$=\left(\overrightarrow{AB}+\overrightarrow{AF}\right)+\left(\overrightarrow{AC}+\overrightarrow{AG}\right)+\left(\overrightarrow{AD}+\overrightarrow{AH}\right)+\overrightarrow{AE}$$

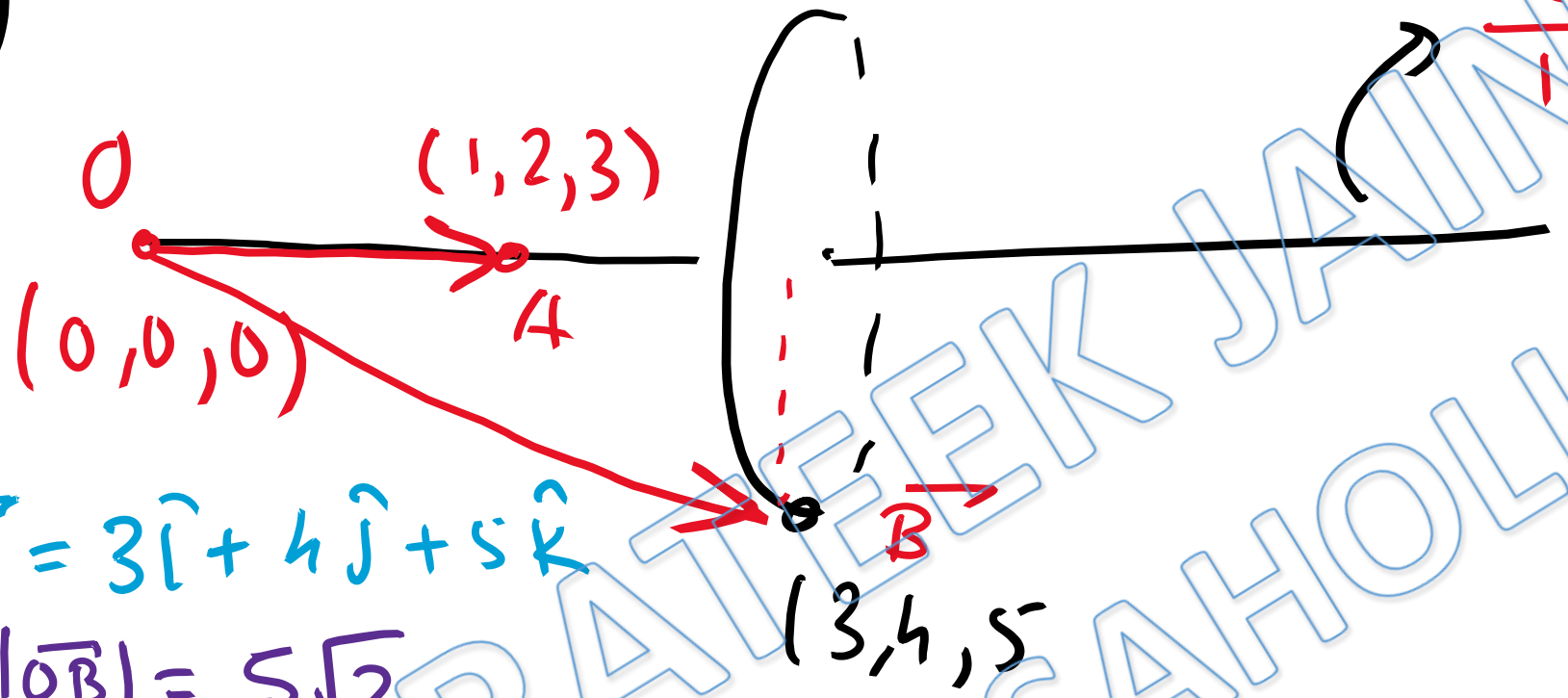
$$=\left(\overrightarrow{AF}+\overrightarrow{FE}\right)+\left(\overrightarrow{AC}+\overrightarrow{CE}\right)+\left(\overrightarrow{AD}+\overrightarrow{DE}\right)+\overrightarrow{AE}$$

$$=4\overrightarrow{AE}=8\overrightarrow{AO}$$

Ans(d)

7)

$\overrightarrow{OA} = \hat{i} + 2\hat{j} + 3\hat{k}$



$\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$

$x = 1 \Rightarrow y = 2 \Rightarrow z = 3$

$\overrightarrow{OB} = 3\hat{i} + 4\hat{j} + 5\hat{k}$

$|\overrightarrow{OB}| = 5\sqrt{2}$

Component of $\overrightarrow{OB}$ along $\overrightarrow{OA} = (3\hat{i} + 4\hat{j} + 5\hat{k}) \cdot \frac{(\hat{i} + 2\hat{j} + 3\hat{k})}{\sqrt{14}}$

$= \frac{3 + 8 + 15}{\sqrt{14}} = \frac{26}{\sqrt{14}}$

R = Component of $\overrightarrow{OB}$ perpendicular to $\vec{A} = \sqrt{(5\sqrt{2})^2 - \left(\frac{26}{\sqrt{14}}\right)^2}$

$= \sqrt{12\frac{4}{7}}$

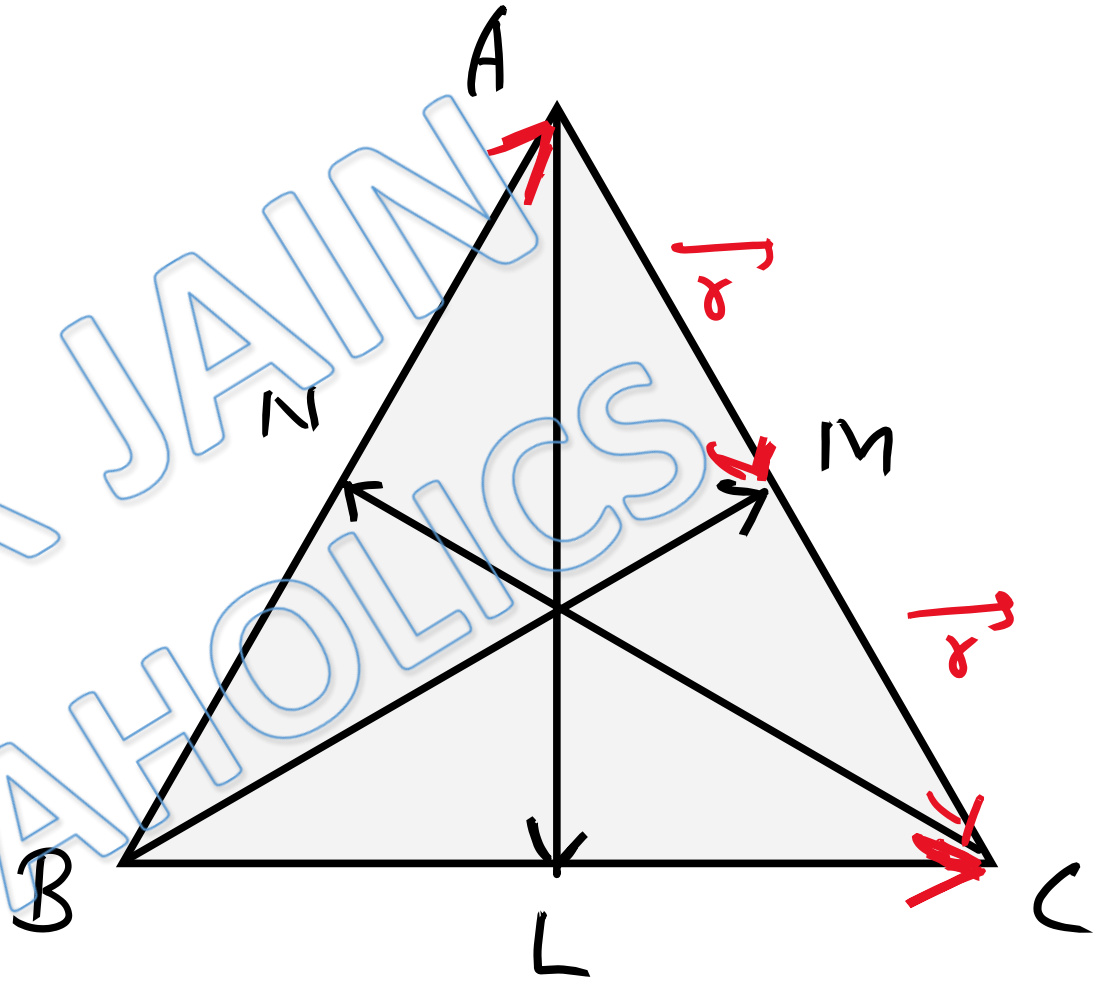
Ans (a)

8)

$$\vec{BC} + \vec{BA}$$

$$= \left(\vec{BM} + \vec{\gamma}\right) + \left(\vec{BM} - \vec{\gamma}\right)$$

$$= 2\vec{BM}$$



Ans (B)

g)

$$\overrightarrow{AB} = (3-2)\hat{i} + (7-5)\hat{j} + (8-6)\hat{k}$$

$$= \hat{i} + 2\hat{j} + 2\hat{k}$$

$$\hat{V} = \hat{AB} = \frac{\hat{i} + 2\hat{j} + 2\hat{k}}{\sqrt{1+4+4}} = \frac{1}{3}\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$$

$$\vec{V} = V\hat{V} = \frac{10}{3}\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$$

Ans (a)

10) $\vec{A} = \hat{i} + 2\hat{j} + 2\hat{k}$, $\vec{B} = \hat{i} + \hat{j} + \hat{k}$

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

Component of $\vec{A}$ along $\vec{B}$ $= \vec{A} \cdot \hat{B}$

$= (\hat{i} + 2\hat{j} + 2\hat{k}) \cdot \dfrac{(\hat{i} + \hat{j} + \hat{k})}{\sqrt{3}}$

$= 5/\sqrt{3}$

Component of $\vec{A}$ perpendicular to $\vec{B}$

$= \sqrt{3^2 - \left(\frac{5}{\sqrt{3}}\right)^2} = \sqrt{9 - \frac{25}{3}} = \sqrt{2/3}$

Ans (c)

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