MATHS

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VECTOR ALGEBRA

Solved Examples Section I Mcq

1. In ΔABC, which of the following is not true?

A. $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \overrightarrow{0}$

B. $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{AC} = \overrightarrow{0}$

C. $\overrightarrow{AB} + \overrightarrow{BC} - \overrightarrow{CA} = \overrightarrow{0}$

D. $\overrightarrow{AB} - \overrightarrow{CB} + \overrightarrow{CA} = \overrightarrow{0}$

Answer: C

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2. If $\left|\vec{a}\right| = 1, \left|\vec{b}\right| = 2$ and $\vec{a} \cdot \vec{b} = 1$. Then the angle between $\vec{a}$ and $\vec{b}$ is :

A. 0

B. $\frac{\pi}{3}$

C. π

D. $\frac{\pi}{2}$

Answer: B

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3. If θ is the angle between two vectors $\vec{a}$, $\vec{b}$, then $\vec{a} \cdot \vec{b}$ is 0, only when :

A. $0 < \theta < \frac{\pi}{2}$

B. $0 \leq \theta \leq \frac{\pi}{2}$

C. $0 < \theta < \pi$

D. $0 \leq \theta \leq \pi$

Answer: B

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4. The value of : $\hat{i} \cdot \left(\hat{j} \times \hat{k}\right) + \hat{j} \cdot \left(\hat{k} \times \hat{i}\right) + \hat{k} \cdot \left(\hat{i} \times \hat{j}\right)$ is :

A. 0

B. -1

C. 1

D. 3

Answer: D

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5. If θ is the angle between two vectors $\vec{a}$ and $\vec{b}$, then $\left|\vec{a} \cdot \vec{b}\right| = \left|\vec{a} \times \vec{b}\right|$ when θ is equal to :

A. 0

B. $\frac{\pi}{4}$

C. $\frac{\pi}{2}$

D. π

Answer: B

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6. Let $\vec{a}$ and $\vec{b}$ be two unit vectors and θ is the angle between them. Then $\vec{a} + \vec{b}$ is a unit vector if :

A. $\theta = \frac{\pi}{4}$

B. $\theta = \frac{\pi}{3}$

C. $\theta = \frac{\pi}{2}$

D. $\theta = \frac{2\pi}{3}$

Answer: D

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Solved Examples Section Ii Short Answer Type Questions

1. Compute the magnitude of the following vectors :

$$\vec{a} = \hat{i} + \hat{j} + \hat{k},\ \vec{b} = 2\hat{i} - 7\hat{j} - 3\hat{k},\ \vec{c} = \frac{1}{\sqrt{3}}\hat{i} + \frac{1}{\sqrt{3}}\hat{j} - \frac{1}{\sqrt{3}}\hat{k}$$

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2. Find the scalar and vector components of the vector with initial point (2, 1) and terminal point (– 5, 7).

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3. Find the sum of the vectors $\vec{a} = \hat{i} - 2\hat{j} + \hat{k},\ \vec{b} = -2\hat{i} + 4\hat{j} + 5\hat{k}$ and $\vec{c} = \hat{i} - 6\hat{j} - 7\hat{k}$

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4. Find the unit vector in the direction of the vector $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$.

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5. Find the unit vector in the direction of vector $\overrightarrow{PQ}$, where P and Q are the points (1, 2, 3) and (4, 5, 6), respectively.

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6. Find a vector in the direction of $5\hat{i} - \hat{j} + 2\hat{k}$, which has magnitude 8 units.

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7. Find the value of x for which $x\left(\hat{i}+\hat{j}+\hat{k}\right)$ is a unit vector.

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8. Find the unit vector in the direction of the sum of the vectors $\vec{a}=2\hat{i}-\hat{j}+2\hat{k}$ and $\vec{b}=-\hat{i}+\hat{j}+3\hat{k}$.

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9. Find the direction cosines of the vector $\vec{i}+2\vec{j}+3\vec{k}$ I

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10. Find the direction cosines of the vector joining the points $A(1,2,-3)$ and $B(-1,-2,1)$, directed from A to B.

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11. Show that the points $A(1, 2, 7), B(2, 6, 3)$ ਅਤੇ $C(3, 10, -1)$ are collinear.

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12. Show that the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $-4\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear.

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13. Find the position vector of the mid point of the vector joining the points $P(2, 3, 4), Q(4, 1, -2)$

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14. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $P\left(\vec{i}+2\vec{j}-\vec{k}\right)$ and $Q\left(-\vec{i}+\vec{j}+\vec{k}\right)$ respectively, in the ratio 2 : 1, internally.

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15. Find the position vector of a point R which divides the line joining the points P and Q whose position vectors are $\hat{i}+2\hat{j}-\hat{k}$ and $-\hat{i}+\hat{j}+\hat{k}$ respectively, in the ratio $2:1$ internally.

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16. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are

$P\left(2\vec{a}+\vec{b}\right)$ and $Q\left(\vec{a}-3\vec{b}\right)$ externally in the ratio 1 : 2. Also, show that P is the mid point of the line segment RQ.

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Solved Examples Section Iii

1. Find $\vec{a}.\vec{b}$ If $\vec{a}=3\hat{i}-\hat{j}+2\hat{k}$ and $\vec{b}=2\hat{i}+3\hat{j}+3\hat{k}$

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2. Find $\left|\vec{x}\right|$, if for a unit vector $\vec{a}$, $\left(\vec{x}-\vec{a}\right)\cdot\left(\vec{x}+\vec{a}\right)=12$

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3. Find $\left|\vec{a}\right|$ and $\left|\vec{b}\right|$, if $\left(\vec{a}+\vec{b}\right)\cdot\left(\vec{a}-\vec{b}\right)=8$ and $\left|\vec{a}\right|=8\left|\vec{b}\right|$.

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4. Find the angle between the vectors $\vec{a}=\hat{i}-2\hat{j}+3\hat{k}$ and $\vec{b}=3\hat{i}-2\hat{j}-\hat{k}$`

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5. If $\vec{a}=5\hat{i}-\hat{j}-3\hat{k}$ and $\vec{b}=\hat{i}+3\hat{j}-5\hat{k}$ then show that the vectors $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$ are orthongal (perpendicular).

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6. Find the value of λ sach that the vectors $3\vec{a} + 4\vec{b}$ and $2\vec{a} + \vec{b}$ are perpendicular to each other when $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{b} = \hat{i} + \lambda\hat{j} + 5\hat{k}$.

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7. Show that each of the given three vectors are mutually perpendicular unit vector :

$\frac{1}{7}\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right), \frac{1}{7}\left(3\hat{i} - 6\hat{j} + 2\hat{k}\right), \frac{1}{7}\left(6\hat{i} + 2\hat{j} - 3\hat{k}\right)$.

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8. Prove that $\left(\vec{a} + \vec{b}\right) \cdot \left(\vec{a} + \vec{b}\right) = \left|\vec{a}\right|^2 + \left|\vec{b}\right|^2$, if and only if $\vec{a}$, $\vec{b}$ are perpendicular, given $\vec{a} \neq \vec{0}$, $\vec{b} \neq \vec{0}$.

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9. Show that $\left|\vec{a}\right|\vec{b}+\left|\vec{b}\right|\vec{a}$ is perpendicular to $\left|\vec{a}\right|\vec{b}-\left|\vec{b}\right|\vec{a}$ for any two non zero vectors $\vec{a}$ and $\vec{b}$

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10. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a}+\vec{b}+\vec{c}=0$, find the value of $\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a}$

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11. The projection of $\vec{a}=2\hat{i}+3\hat{j}+2\hat{k}$ on $\vec{b}=\hat{i}+2\hat{j}+\hat{k}$ is equal to:

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12. Find λ when the scalar projection of $\vec{a} = \lambda\hat{i} + \hat{j} + 4\hat{k}$ on $\vec{b} = 2\hat{i} + 6\hat{j} + 3\hat{k}$ is 4 units.

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13. Show that the points : $A\left(2\hat{i} - \hat{j} + \hat{k}\right), B\left(\hat{i} - 3\hat{j} - \hat{k}\right), C\left(3\hat{i} - 4\hat{j} - 4\hat{k}\right)$ are the vertices of a right-angled triangle.

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14. If the vertices, A, B, C of ΔABC have position vectors, $(1, 2, 3), (-1, 0, 0)$ and $(0, 1, 2)$ respectively. What is the magnitude of ΔABC?

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15. If $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$ then find a vector $\vec{d}$ (which is $\perp$ ar to both $\vec{a}$ and $\vec{b}$) and $\vec{c} . \vec{d}$ =15.

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16. Express the $\vec{a} = 5\hat{i} - 2\hat{j} + 5\hat{k}$ as sum of two vectors such that one is parallel to the vector $\vec{b} = 3\hat{i} + \hat{k}$ and other is perpendicular to $\vec{b}$.

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17. Use vectors to prove that in $\triangle ABC : a = b\cos C + c\cos B.$

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18. With the help of vector method, prove that, $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$

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19. Find $\left|\vec{a} X \vec{b}\right|$,if $\vec{a} = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$

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20. Find the work done by a force $\vec{F} = 4\hat{i} + \hat{j} - 3\hat{k}$, which displace the body from origin to $(2, 4, 3)$.

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21. Constant forces $2\hat{i} - 5\hat{j} + 6\hat{k}$ and $\hat{i} + 2\hat{j} - \hat{k}$ act on a particle. Determine the work done when the particle is displaced

from a point $A(4, -3, -2)$ to the point $B(6, 1, -3)$

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Solved Examples Section V

1. Find $\left|\vec{a} \times \vec{b}\right|$, if $\vec{a} = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$.

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2. Find a unit vector perpendicular to each of the vector $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$, where $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$.

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3. Find λ and μ if : $\left(2\hat{i}+6\hat{j}+27\hat{k}\right)\times\left(\hat{i}+\lambda\hat{j}+\mu\hat{k}\right)=\overrightarrow{0}$.

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4. Find a vector of magnitude 9, which is perpendicular to both the vectors : $4\hat{i}-\hat{j}+3\hat{k}$ and $-2\hat{i}+\hat{j}-2\hat{k}$.

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5. Find the area of parallelogram whose adjacent sides are given by vectors $\overrightarrow{a}=\hat{i}-\hat{j}+3\hat{k}$ and $\overrightarrow{b}=2\hat{i}-7\hat{j}+\hat{k}$.

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6. Find the area of the triangle with vertices $A(1, 12), B(2, 3, 5), C(1, 5, 5)$

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7. Find the sine of the angle between the vectors $\vec{a} = 2\hat{i} - 6\hat{j} - 3\hat{k}$ and $\vec{b} = 4\hat{i} + 3\hat{j} - \hat{k}$.

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8. Show that $\left(\vec{a} - \vec{b}\right) \times \left(\vec{a} + \vec{b}\right) = 2\left(\vec{a} \times \vec{b}\right)$.

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9. Given that $\vec{a} \cdot \vec{b} = 0$ and $\vec{a} \times \vec{b} = \vec{0}$. What can you conclude about the vectors $\vec{a}$ and $\vec{b}$?

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10. If $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$ then find a vector $\vec{d}$ (which is $\perp$ ar to both $\vec{a}$ and $\vec{b}$) and $\vec{c} \cdot \vec{d}$ =15.

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Solved Examples Section Vi

1. Find the moment about $(1, -1, -1)$ of the force $3\hat{i} + 4\hat{j} - 5\hat{k}$ acting at $(1, 0, -2)$.

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2. Find the magnitude of following vector $\vec{a} = \hat{i} + \hat{j} + \hat{k}$

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Solved Examples Section Vii

1. Find $\vec{a} . \left(\vec{b} \times \vec{c} \right)$, if $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$

$\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j} + 2\hat{k}$.

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2. Show that the vectors $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = -2\hat{i} + 3\hat{j} - 4\hat{k}$ and $\vec{c} = \hat{i} - 3\hat{j} + 5\hat{k}$ are coplanar.

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3. Using scalar triple product, show that the four points given by position vectors $4\hat{i}+5\hat{j}+\hat{k}$, $-\hat{j}-\hat{k}$, $3\hat{i}+9\hat{j}+4\hat{k}$ and $-4\hat{i}+4\hat{j}+4\hat{k}$ are coplanar.

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4. Find the value of λ. such that given vectors $3\hat{i}+\lambda\hat{j}+5\hat{k}$, $\hat{i}+2\hat{j}-3\hat{k}$ and $2\hat{i}-\hat{j}+\hat{k}$ are coplaner.

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5. Find the volume of the parallelopiped whose sides are given by vectors

$2\hat{i}-3\hat{j}+4\hat{k}$, $\hat{i}+2\hat{j}-\hat{k}$ and $3\hat{i}-\hat{j}+2\hat{k}$.

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Assignment Most Important Questions For Practice Section I Mcq

1. If the position vectors of points A and B are respectively $(1, 2, -3)$ and $(-1, -1, 3)$, then unit vector along $\overrightarrow{AB}$ is

A. $\hat{j}$

B. $-\frac{2}{7}\hat{i} - \frac{3}{7}\hat{j} + \frac{6}{7}\hat{k}$

C. $2\hat{i} + 3\hat{j} - 6\hat{k}$

D. none of these

Answer: B

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2. The angle between the vectors $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} - \hat{k}$ is

A. $\cos^{-1}\frac{2}{7}$

B. $\cos^{-1}\frac{5}{7}$

C. $\cos^{-1}\frac{6}{7}$

D. none of these

Answer: A

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3. If $\left|\vec{a}\right| = 1, \left|\vec{b}\right| = 2$ and $\vec{a}.\vec{b}$, then the angle between $\vec{a}$ and $\vec{b}$ is

A. $\frac{\pi}{4}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. none of these

Answer: B

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4. If $\left|\vec{a}\right| = 3, \left|\vec{b}\right| = \frac{\sqrt{2}}{3}$ and $\vec{a} . \vec{b} = 1$, then angle between $\vec{a}$ and $\vec{b}$ is

A. $\frac{\pi}{2}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{6}$

D. $\frac{\pi}{5}$

Answer: D

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5. The value of λ for which the vectors $\vec{a} = 2\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{b} = \lambda\hat{i} + \hat{j} - \hat{k}$ are perpendicular, is:

A. 1

B. 2

C. 3

D. 4

Answer: B

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6. The vector of magnitude 7 units in the direction of $\hat{i} - 2\hat{j} + 2\hat{k}$ is

A. $7\hat{i} - 14\hat{j} + 14\hat{k}$

B. $7\hat{i} + 2\hat{j} + 2\hat{k}$

C. $\frac{7}{3}\hat{i} - \frac{14}{3}\hat{j} + \frac{14}{3}\hat{k}$

D. none of these

Answer: C

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Assignment Most Important Questions For Practice Section Ii Short Answer Type Questions

1. Find the magnitude of the vector $\hat{i} - 3\hat{j} + 4\hat{k}$.

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2. Find the sum of the following vectors

$\vec{a} = \hat{i} - 3\hat{k}, \vec{b} = 2\hat{j} - \hat{k}$ and $\vec{c} = 2\hat{i} - 3\hat{j} + 2\hat{k}$

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3. Find the sum of the following vectors

$\vec{a} = \hat{i} - 2\hat{j}, \vec{b} = 2\hat{i} - 3\hat{j}, \vec{c} = 2\hat{i} + 3\hat{k}.$

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4. Find the vector joining the points P(2, 3, 0) and Q(– 1, – 2, – 4) directed from P to Q.

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5. If $\overrightarrow{PQ} = 3\hat{i} + 2\hat{j} - \hat{k}$ and the coordinate of P are $(1, -2, -2)$, find the coordinate of Q.

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6. If $\vec{a} = x\hat{i} + 2\hat{j} - z\hat{k}$ and $\vec{b} = 3\hat{i} - y\hat{j} + \hat{k}$ are equal vectors. Write the value of $x + y + z$.

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7. Find a unit vector in the direction of following vectors

$2\hat{i} - 3\hat{j} + 6\hat{k}$

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8. Find a unit vector in the direction of following vectors

$2\hat{i} - 6\hat{j} + 3\hat{k}$

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9. Find a unit vector in the direction of following vectors

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

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10. Write unit vector in the direction of the sum of vectors

$\vec{a} = 2\hat{i} + 2\hat{j} - 5\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} + 3\hat{k}$

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11. Write unit vector in the direction of the sum of vectors

$\vec{a} = 2\hat{i} + 2\hat{j} - 5\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} - 7\hat{k}$

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12. Write a vector of magnitude 9 units in the direction of vector

$-2\hat{i} + \hat{j} + 2\hat{k}$.

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13. Write a vector of magnitude 6 units in the direction of vector

$2\hat{i} - \hat{j} - 2\hat{k}$.

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14. Find a vector of magnitude 5 units, and parallel to the resultant of the vectors $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$

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15. Find the direction cosines of the vector $-2\hat{i} + \hat{j} - 5\hat{k}$.

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16. Show that the direction cosines of a vector equally inclined to the axes OX, OY and OZ are $\left(\frac{1}{\sqrt{3}}\right), \left(\frac{1}{\sqrt{3}}\right), \left(\frac{1}{\sqrt{3}}\right)$

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17. Show that the vector $\vec{i} + \vec{j} + \vec{k}$ is equally inclined to the axes OX, OY and OZ.

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18. Write the direction ratios of the vector $r = \hat{i} - \hat{j} + 2\hat{k}$ and hence calculate its direction cosines.

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19. If P = (1, 5, 4) and Q = (4, 1, -2) then find the d.r. of PQ.

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20. Find the direction cosine of the line joining the points $(1, 0, 0)$ and $(0, 1, 1)$.

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21. Find the value of 'p' for which the vector $3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\hat{i} - 2p\hat{j} + 3\hat{k}$ are parallel.

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22. Find the condition that $\vec{a} = x\hat{i} + y\hat{j}$ and $\vec{b} = y\hat{i} + x\hat{j}(\because x, y \neq 0)$ are parallel.

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23. Show that points $A(-2,1), B(-5,-1)$ and $C(1,3)$ are collinear.

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24. If $\vec{a} = -2\hat{i}+3\hat{j}+5\hat{k}$, $\vec{b} = \hat{i}+2\hat{j}+3\hat{k}$ and $\vec{c} = 7\hat{i}-\hat{k}$ are position vectors of three points A, B, C respectively, prove that A, B, C are collinear.

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25. Show that the points with position vectors $\vec{a} = 3\hat{i}-4\hat{j}-4\hat{k}$, $\vec{b} = 2\hat{i}-\hat{j}+\hat{k}$ and $\vec{c} = \hat{i}-3\hat{j}-5\hat{k}$ respectively form the vertices of a right angled triangle.

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26. Find the position vector of mid point of the line segment AB where A is $(3, 4, -2)$ and B is $(1, 2, 4)$.

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27. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $\hat{i} + 2\hat{j} - \hat{k}$ and $-\hat{i} + \hat{j} + \hat{k}$ respectively, in the ratio $2:1$ internally

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28. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $\hat{i} + 2\hat{j} - \hat{k}$ and $-\hat{i} + \hat{j} + \hat{k}$ respectively, in the ratio $2:1$ externally.

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29. Find $\vec{a} . \vec{b}$ If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{j} - \hat{k}$.

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Assignment Most Important Questions For Practice Section Iii

1. Evaluate the scalar product $\left(3\vec{a} - 5\vec{b}\right) . \left(2\vec{a} + 7\vec{b}\right)$.

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2. if $\vec{p}$ is a unit vector and $\left(\vec{x} - \vec{p}\right) . \left(\vec{x} + \vec{p}\right) = 12$ then find $\left|\vec{x}\right|$

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3. Find $\left|\vec{x}\right|$, if for a unit vector $\vec{a}$, $\left(\vec{x}-\vec{a}\right).\left(\vec{x}+\vec{a}\right)=15$

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4. Find $\left|\vec{a}\right|$ and $\left|\vec{b}\right|$, if $\left(\vec{a}+\vec{b}\right).\left(\vec{a}-\vec{b}\right)=12$ and $\left|\vec{a}\right|=2\left|\vec{b}\right|$

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5. Find the cosine of the angle between the vectors $\vec{a}=\hat{i}+2\hat{j}+3\hat{k}$, $\vec{b}=4\hat{i}-2\hat{j}+\hat{k}$

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6. Find the cosine of the angle between the vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}, \vec{b} = 4\hat{i} + 3\hat{j} + 2\hat{k}$

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7. Find the cosine of the angle between the vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}, \vec{b} = 4\hat{i} + 3\hat{j} + 2\hat{k}$

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8. Find the angles between the vectors $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}, \vec{b} = 6\hat{i} + 2\hat{j} + 3\hat{k}$

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9. If $\left|\vec{a}\right| = \sqrt{3}, \left|\vec{b}\right| = 2$ and $\vec{a}.\vec{b} = 3$, find the angle between $\vec{a}$ and $\vec{b}$.

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10. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitude 2 and 12 respectively and such that $\vec{a}.\vec{b} = \sqrt{3}$

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11. Find the angle between two vector $\vec{a}$ and $\vec{b}$ having same magnitude $\sqrt{2}$ and their scolar product is -1.

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12. If $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$, $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$, show that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular to each other.

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13. Find the value of λ if $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} - \lambda\hat{k}$ are perpendicular to each other.

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14. If $\vec{a} = 5\hat{i} - \hat{j} + 7\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \lambda\hat{k}$. Find λ such that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are orthogonal.

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15. If $\vec{a} = \hat{i} - \hat{j} + 7\hat{k}$ and $\vec{b} = 5\hat{i} - \hat{j} + \lambda\hat{k}$, Find λ such that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular to each other.

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16. If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$, then find the value of λ.

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17. If $\vec{a}$ and $\vec{b}$ are perpendicular vectors, show that $\left(\vec{a} + \vec{b}\right)^2 = \left(\vec{a} - \vec{b}\right)^2$

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18. If $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}-\vec{b}\right|$ then show that $\vec{a}$ and $\vec{b}$ are perpendicular.

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19. Find $\left|\vec{a}-\vec{b}\right|$ if $\left|\vec{a}\right|=2, \left|\vec{b}\right|=3,$ and $\vec{a}.\vec{b}=4$

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20. If $\vec{a}$ is any vector, then show that $\vec{a}=\left(\vec{a}.\hat{i}\right)\hat{j}+\left(\vec{a}.\hat{j}\right)\hat{j}+\left(\vec{a}.\hat{k}\right)\hat{j}.$

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21. If $\left|\vec{a}\right|$=3, $\left|\vec{b}\right|$=4 and $\left|\vec{c}\right|$=5 and each of them is perpendicular to the sum of other two then find the value of $\left|\vec{a}+\vec{b}+\vec{c}\right|$

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22. If $\vec{a}+\vec{b}+\vec{c}=0, \left|\vec{a}\right|=2, \left|\vec{b}\right|=4$ and $\left|\vec{c}\right|=3$, then find $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$.

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23. Find the projection of $\hat{i}-\hat{j}$ on the line represented by the vector $\hat{i}+\hat{j}$.

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24. Find the scalar projection of $7\hat{i}+\hat{j}-4\hat{k}$ on the vector $2\hat{i}+6\hat{j}+3\hat{k}$.

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25. Find the projection of $\vec{b}+\vec{c}$ on $\vec{a}$ where $\vec{a}=\hat{i}+2\hat{j}+\hat{k}$, $\vec{b}=\hat{i}+3\hat{j}+\hat{k}$ and $\vec{c}=\hat{i}+\hat{k}$.

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26. Find the sum of the vectors $\vec{a}=\hat{i}-2\hat{j}+\hat{k}$, $\vec{b}=-2\hat{i}+4\hat{j}+5\hat{k}$ and $\vec{c}=\hat{i}-6\hat{j}-7\hat{k}$

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27. Find the unit vector in the direction of the vector $\vec{a} = \hat{i} + \hat{j} + \hat{k}$

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28. Find the direction cosines of the vector $\hat{i} + 2\hat{j} + 3\hat{k}$

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29. Let $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$. Find a vector $\vec{p}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{p} \cdot \vec{c} = 18$.

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30. If $\alpha = 3\hat{i} + 4\hat{j} + 5\hat{k}$ and $\beta = 2\hat{i} + \hat{j} - 4\hat{k}$ than express $\vec{\beta}$ in the form $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2 \rightarrow$ alpha and vec(beta_(2)) $isperpendicar \rightarrow$ vecalpha`.

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31. Dot product of a vector with vectors $2\hat{i} + 3\hat{j} + \hat{k}, 4\hat{i} + \hat{j}$ and $\hat{i} - 3\hat{j} - 7\hat{k}$ are respectively 9, 7 and 6 find the vector.

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Assignment Most Important Questions For Practice Section Iv

1. Use vectors to prove that in $\triangle ABC : b = c\cos A + a\cos C.$

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2. Write two different vectors having same magnitude.

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3. With the help of vector method, prove that, $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

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4. Prove that, in any triangle ABC, $\cos B = \frac{c^2 + a^2 - b^2}{2ca}$.

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5. Given that cos (A + B) = cos A cos B-sin A sin B. Find the value of cos 105°.

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6. Find the work done by a force $\vec{F} = \hat{i} - 3\hat{j} + 4\hat{k}$, which displaces the body from origin to point $(1, 4, 2)$

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7. Forces $\vec{F} = \hat{i} + 2\hat{j} + \hat{k}$ acts on a particle and displaced from the point $(2, 1, 1)$ to point $(3, 2, 4)$ Find the work done by force $\vec{F}$.

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8. Forces $2\hat{i} + 5\hat{j} + 6\hat{k}$ and $-\hat{i} + 2\hat{j} - \hat{k}$ act on a particle. Determine the work done when the particle displaced from $A(4, -3, -2)$ to $B(6, 1, -3)$.

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Assignment Most Important Questions For Practice Section V

1. Find $\vec{a} \times \vec{b}$, if $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 5\hat{j} - 2\hat{k}$

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2. Find $\left(\vec{a} \times \vec{b}\right)$ if $\vec{a} = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$

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3. If $\vec{a} = \hat{i} + \hat{j} - 3\hat{k}$ and $\vec{b} = \hat{j} + 2\hat{k}$ find $\left|2\vec{b} + \vec{a}\right|$

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4. Find a unit vector perpendicular to both $\vec{a}$ and $\vec{b}$ if

$\vec{a} = 4\hat{i} + 3\hat{j} + 2\hat{k}$ and $\vec{b} = 2\hat{i} + 5\hat{j} - 3\hat{k}$

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5. Find a unit vector perpendicular to both $\vec{a}$ and $\vec{b}$ if

$\vec{a} = 3\hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} + 3\hat{k}$

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6. Find a unit vector perpendicular to both $\vec{a}$ and $\vec{b}$ if

$\vec{a} = 4\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} - 2\hat{k}$

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7. Find the unit vector perpendicular to $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ if $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$

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8. Find a vector of magnitude 5 units, perpendicular to both $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ where $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$

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9. Find the value of p for which $\vec{a} = 3\hat{i} + 2\hat{j} + 12\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + 4\hat{k}$ are parallel

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10. Find the value of λ if two vectors $2\hat{i}+3\hat{j}-\hat{k}$ and $4\hat{i}+6\hat{j}+\lambda\hat{k}$ are parallel.

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11. Find the area of a parallelogram whose adjacent sides are given by

$\vec{a}=\hat{i}+2\hat{j}+3\hat{k}$ and $\vec{b}=-3\hat{i}-2\hat{j}+\hat{k}$

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12. Find the area of a parallelogram whose adjacent sides are given by

$\vec{a}=\hat{i}-\hat{j}-\hat{k}$ and $\vec{b}=3\hat{i}+4\hat{j}-5\hat{k}$

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13. Find the area of a parallelogram whose adjacent sides are given by

$\vec{a} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$

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14. Find the area of a parallelogram whose adjacent sides are given by

$\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{b} = -3\hat{i} - 2\hat{j} + \hat{k}$

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15. Find the area of the triangle (using vectors) with vertices $A(3, -1, 2), B(1, -1, -3)$ and $C(4, -3, 1)$

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16. With help of vectors find the area of the triangle with vertices $A(2, 3, 5), B(3, 5, 8)$ and $C(2, 7, 8)$

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17. Find the sine of the angle between the vectors $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}, \vec{b} = 3\hat{i} + 4\hat{j} - \hat{k}$

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18. If $\vec{a}$ and $\vec{b}$ are any two vectors, prove that $\left(\vec{a} \times \vec{b}\right)^2 = \left|\vec{a}\right|^2 \left|\vec{b}\right|^2 - \left(\vec{a}.\ \vec{b}\right)^2$ It is known as Largange's indentity.

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19. If $\left|\vec{a}\right| = 5, \left|\vec{b}\right| = 4$ and $\vec{a} . \vec{b} = 16$ find $\left|\vec{a} \times \vec{b}\right|$.

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20. If $\vec{a}, \vec{b}, \vec{c}$ are any three vectors then prove that.

$$\vec{a} \times \left(\vec{b} + \vec{c}\right) + \vec{b} \times \left(\vec{c} + \vec{a}\right) + \vec{c} \times \left(\vec{a} + \vec{b}\right) = 0$$

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21. If $\vec{a} \times \vec{b} = \vec{c} \times \vec{d}$ and $\vec{a} \times \vec{c} = \vec{b} \times \vec{d}$, show that $\vec{a} - \vec{d}$ is parallel to $\vec{b} - \vec{c}$, provided $\vec{a} \neq \vec{d}$ and $\vec{b} \neq \vec{c}$

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22. Let $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$.

Find a vector $\vec{p}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{p} \cdot \vec{c} = 18$.

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Assignment Most Important Questions For Practice Section Vi

1. Find the moment of $\vec{F}$ about the point $(2, -1, 3)$ when the force $\vec{F} = 3\hat{i} + 2\hat{j} - 4\hat{k}$ is acting at the point $(1, -1, 2)$.

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2. A force $\vec{F} = 4\hat{i} + \hat{k}$ acts through point $A(0, 2, 0)$. Find the moment $\vec{m}$ of $\vec{F}$ about the point $B(4, 0, 4)$.

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3. Two unlike forces of equal magnitudes $3\hat{i}+\hat{k}$ and $-3\hat{i}-\hat{B}2\hat{i}-\hat{j}+3\hat{k}$ respectively. Find the moment of the couple formed by these forces.

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4. Find the unit vector in the direction of vector $\overrightarrow{PQ}$, where P and Q are the points (1,2,3) and (4,5,6) respectively.

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Assignment Most Important Questions For Practice Section Vii

1. If A, B and C are the vertices of a triangle ABC, prove sine formula that

$$= \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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2. Find $\left[\vec{a}, \vec{b}, \vec{c}\right]$ if

$\vec{a} = 2\hat{i} - 3\hat{j}$, $\vec{b} = \hat{i} + \hat{j} - \hat{k}$, $\vec{c} = 3\hat{i} - \hat{k}$

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3. Find $\vec{a} . \left(\vec{b} \times \vec{c}\right)$, if $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$

$\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j} + 2\hat{k}$.

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4. Show that following vectors are co-planar.

$\vec{a} = 10\hat{i} - 12\hat{j} - 4\hat{k}, \vec{b} = -16\hat{i} + 22\hat{j} - 2\hat{k}, \vec{c} = 2\hat{i} - 8\hat{j} + 16\hat{k}$

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5. Check whether the given three vectors are coplanar or non-coplanar.

$-2\hat{i} - 2\hat{j} + 4\hat{k}, -2\hat{i} + 4\hat{j} - 2\hat{k}, 4\hat{i} - 2\hat{j} - 2\hat{k}$

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6. Using scalar triple product, show that the four points given by position vectors $4\hat{i} + 5\hat{j} + \hat{k}$, $-\hat{j} - \hat{k}$, $3\hat{i} + 9\hat{j} + 4\hat{k}$ and $-4\hat{i} + 4\hat{j} + 4\hat{k}$ are coplanar.

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7. Find the direction cosines of the vector joining the points A(1,2,-3) and B(-1,-2,1) directed from A to B.

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8. For what value of 'λ' are the following vectors coplanar?

$\hat{i} - \hat{j} + \hat{k}, \hat{i} + 2\hat{j} - 3\hat{k}, 3\hat{i} + \lambda\hat{j} + 5\hat{k}$

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9. For what value of 'λ' are the following vectors coplanar?

$2\hat{i} + 2\hat{j} - \hat{k}, 3\hat{i} + \hat{j} + \hat{k}, \hat{i} + \lambda\hat{j} + 2\hat{k}$

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10. Find the volume of parallelopiped whose sides are given by $2\hat{i} - 3\hat{j} + \hat{k}, \hat{i} - \hat{j} + 2\hat{k}, 2\hat{i} + \hat{j} - \hat{k}$

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11. Using scalar triple product, find the volume of the parallelopiped whose sides are given by the vectors $7\hat{i} - 5\hat{j} - 3\hat{k}$, $\hat{i} + 2\hat{j} - \hat{k}$ and $-3\hat{i} + 7\hat{j} + 5\hat{k}$.

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12. Find the volume of parallelopiped whose sides are given by $3\hat{i} + 4\hat{j}, 2\hat{i} + 3\hat{j} + 4\hat{k}, 5\hat{k}$

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13. The value of : $\hat{i} \cdot \left(\hat{j} \times \hat{k}\right) + \hat{j} \cdot \left(\hat{i} \times \hat{k}\right) + \hat{k} \cdot \left(\hat{i} \times \hat{j}\right)$ is :

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14. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are perpendicular to each other, prove that

$$\left[\vec{a} . \left(\vec{b} \times \vec{c}\right)\right]^2 = a^2 b^2 c^2$$

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15. prove that : $\left[\vec{a} + \vec{b}, \vec{b} + \vec{c}, \vec{c} + \vec{a}\right] = 2\left[\vec{a}, \vec{b}, \vec{c}\right]$

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Previous Years Board S Questions For Practice Mcq

1. If $\vec{a} = \lambda\hat{i} + 3\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} - 3\hat{j} + 3\hat{k}$ are perpendicular to each other, the value of λ is.

A. 3

B. -3

C. 6

D. 9

Answer: B

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2. Projection of a vector $\vec{a}$ on vector $\vec{b}$ is given by

A. $\frac{\vec{a} \cdot \vec{b}}{\left|\vec{b}\right|}$

B. $\frac{\left|\vec{a}.\vec{b}\right|}{\left|\vec{a}\right|}$

C. $\frac{\left|\vec{a}\right|}{\vec{a}.\vec{b}}$

D. $\frac{\left|\vec{b}\right|}{\vec{a}.\vec{b}}$

Answer: A

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3. If $\vec{a}$ is any vector, then $\vec{a} \times \vec{a}$ is :

A. 1

B. 0

C. $\left|\vec{a}\right|^2$

D. $\vec{0}$

Answer: D

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4. If $\vec{a} \cdot \vec{a} = 0$, then $\vec{a}$ is :

A. Proper vector

B. Free vector

C. Null vector

D. none of these

Answer: C

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5. If $\vec{a}$ is any vector, then $\vec{a} \cdot \vec{a}$ is :

A. 0

B. $\overrightarrow{0}$

C. $\neq 0$

D. $\left|\overrightarrow{a}\right|^2$

Answer: D

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6. The area of the triangle having vertices : A (1, 1, 2), B (2, 3, 5) and C (1, 5, 5) is :

A. $\frac{1}{2}\sqrt{61}$

B. $\sqrt{61}$ sq units

C. 61 sq. units

D. $\frac{61}{2}$ sq units

Answer: A

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7. Area of a rectangle having vertices A, B, C and D with position vectors : $-\hat{i}+\left(\frac{1}{2}\right)\hat{j}+4\hat{k}, \hat{i}+\left(\frac{1}{2}\right)\hat{j}+4\hat{k}, \hat{i}-\left(\frac{1}{2}\right)\hat{j}+4\hat{k}$ and $-\hat{i}-\left(\frac{1}{2}\right)\hat{j}+4\hat{k}$, respectively is:

A. $\frac{1}{2}$

B. 1

C. 2

D. 4

Answer: C

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8. The projection of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ on $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$ is equal to:

A. $\frac{5\sqrt{6}}{3}$

B. $\frac{5}{\sqrt{6}}$

C. $\frac{6}{\sqrt{14}}$

D. $\frac{\sqrt{6}}{5}$

Answer: B

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9. Find the projection of $\hat{i} - \hat{j}$ on the line represented by the vector $\hat{i} + \hat{j}$.

A. 1

B. $\frac{1}{\sqrt{2}}$

C. 0

D. none of these

Answer: C

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10. For given vectors, $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = -\hat{i} + \hat{j} - \hat{k}$, find the unit vector in the direction of the vector $\vec{a} + \vec{b}$

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11. Using vectors, prove that

$\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$

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12. With the help of vector method, prove that, $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

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13. Prove that, in any triangle ABC, $\cos B = \dfrac{c^2 + a^2 - b^2}{2ca}$.

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14. Find $\vec{a} \times \vec{b}$, if $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 5\hat{j} - 2\hat{k}$

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15. Find $\left|\vec{a} \times \vec{b}\right|$, if $\vec{a} = 3\hat{i} + 4\hat{j}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$

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16. Find the unit vector perpendicular to the vector

$\vec{a} = -\hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 4\hat{j} + 5\hat{k}$

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17. Find the unit vector perpendicular to the vector

$\vec{a} = 4\hat{i} - 3\hat{j} - \hat{k}, \vec{b} = 2\hat{i} - 3\hat{j} - 3\hat{k}$

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18. Using vector, prove that

$\sin(A + B) = \sin A \cos B + \cos A \sin B$

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19. Find the area of a parallelogram whose adjacent sides are :

$3\hat{i} - 4\hat{j}$ and $\hat{i} - \hat{j} + \hat{k}$

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20. Find the area of a parallelogram whose adjacent sides are :

$3\hat{i} + \hat{j} + 4\hat{k}$ and $\hat{i} - \hat{j} + \hat{k}$

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21. Find the area of parallelogram whose adjacent sides are given by vectors $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$.

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22. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, show that $\vec{a} \times \vec{b} = \vec{c} \times \vec{a}$. Interpret the result geometrically.

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23. $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} - 5\hat{k}$ find $\vec{a} \times \vec{b}$ and verify that $\vec{a}$ and $\vec{a} \times \vec{b}$ are perpendicular.

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24. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes $\sqrt{3}$ and 2,respectively having $\vec{a} \cdot \vec{b} = \sqrt{6}$

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25. The magnitude of the vector $2\hat{i} - 6\hat{j} - 3\hat{k}$ is :

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26. Show that the three points with position vectors $-2\hat{i} + 3\hat{j} + 5\hat{k}, \hat{i} + 2\hat{j} + 3\hat{k}$ and $7\hat{i} - \hat{k}$ are collinear.

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27. The value of λ for which the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$ are perpendicular to each other is :

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28. Let $\vec{a} = 4\hat{i} + 5\hat{j} - \hat{k}$, $\vec{b} = \hat{i} - 4\hat{j} + 5\hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j} - \hat{k}$ Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{d} \cdot \vec{c} = 21$

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29. Find the scalar projection of $\vec{b}$ on $\vec{a}$ where : $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = -\hat{i} - 2\hat{j} + 4\hat{k}$

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30. If $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$, then find the projection of $\left(\vec{b} + \vec{c}\right)$ on $\vec{a}$.

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31. Find the area of the parallelogram whose diagonals are : $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} + \hat{k}$

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32. Find the position vector of a point R which divides the line joining the points $P\left(\hat{i} + 2\hat{j} - \hat{k}\right)$ and $Q\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$ internally in the ratio 2:1.

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33. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes 1 and 2 respectively and when $\vec{a} \cdot \vec{b} = 1$.

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34. Find a vector of magnitude 19, which is perpendicular to both the vectors : $4\hat{i} - \hat{j} + 8\hat{k}$ and $-\hat{j} + \hat{k}$.

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35. Find a vector of magnitude 7 , which is perpendicular to both the vectors : $2\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + \hat{j} - \hat{k}$

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36. Find the area of triangle with vertices (1,1,2),(2,3,5),(1,5,5).

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37. Find the area of triangle with vertices

$(1, 2, 4), (3, 1, -2)$ and $(4, 3, 1)$.

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38. Find $\left|\vec{a}-\vec{b}\right|$, if two vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right|=2, \left|\vec{b}\right|=3$ and $\vec{a}\cdot\vec{b}=4$.

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39. If $\left|\vec{a}\right|$=3, $\left|\vec{b}\right|$=4 and $\left|\vec{c}\right|$=5 and each of them is perpendicular to the sum of other two then find the value of $\left|\vec{a}+\vec{b}+\vec{c}\right|$

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40. Prove that $\left\{\left(\vec{b}+\vec{c}\right)\times\left(\vec{c}+\vec{a}\right)\right\}.\left(\vec{a}+\vec{b}\right)=2\left[\vec{a},\vec{b},\vec{c}\right]$

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41. If $\vec{a}$ and $\vec{b}$ are unit vectors and θ is the angle between them, show that $\left(\frac{\sin\theta}{2} = \frac{1}{2}\left|\vec{a} - \vec{b}\right|\right.$.

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42. For what value of $'\lambda'$ are the following vectors coplanar? :

$\hat{i} + \hat{j} + \hat{k}, \hat{i}$ and $\hat{i} + 2\hat{j} + \lambda\hat{k}$.

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43. For what value of $'\lambda'$ are the following vectors coplanar? :

$\hat{i} - \hat{j} + \hat{k}, 3\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} + \lambda\hat{j} - 3\hat{k}$.

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44. $\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{b} = 2\hat{i} - \hat{j} + 3\hat{k}, \vec{c} = \hat{i} - 2\hat{j} + \hat{k}$ then find a unit vectors parallel to vector $2\vec{a} - \vec{b} + \vec{c}$.

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45. Find the area of parallelogram whose adjacent sides are given by the vectors : $\vec{a} = 3\hat{i} + \hat{j} + 4\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$.

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46. Find the value of λ. such that given vectors $3\hat{i} + \lambda\hat{j} + 5\hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $2\hat{i} - \hat{j} + \hat{k}$ are coplaner.

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