



MATHS

BOOKS - SURA MATHS (TAMIL ENGLISH)

VECTOR ALGEBRA -I



1. Represent graphically the displacement of (i) 45 km 30° north of east.

(ii) 80 km, 60° south of west

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2. Prove that the relation R defined on the set V of all vectors by $\overrightarrow{a} R \overrightarrow{b}$ if $\overrightarrow{a} = \overrightarrow{b}$, is an equivalence relation on V.

3. Let \overrightarrow{a} and \overrightarrow{b} be the position vectors of the points A and B. Prove that

the position vectors of the points which trisects the line segment AB are

$$rac{\overrightarrow{a}+2\overrightarrow{b}}{3} ext{ and } rac{\overrightarrow{b}+2\overrightarrow{a}}{3}.$$

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4. If D and E, are the midpoints of the sides AB and AC of a triangle ABC, prove that $\overrightarrow{BE} + \overrightarrow{DC} = \frac{3}{2}\overrightarrow{BC}$.

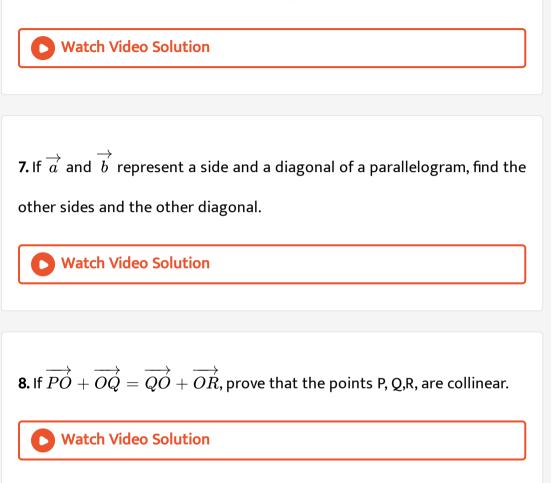
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5. Prove that line segment joining the midpoints of two sides of a triangle is parallel to the third side whose length is half of the length of the third side.



6. Prove that the line segments joining the midpoints of the adjacent

sides of a quadrilateral form a parallelogram.



9. If D is the midpoint of the side BC of a triangle ABC, prove that vec(AB)+vec(AC)=2vec(AD)

10. If G is the centroid of a triangle ABC, prove that $\overrightarrow{GA} + \overrightarrow{GB} + \overrightarrow{GC} = \overrightarrow{0}$.

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11. Let A, B, and C be the vertices of a triangle. Let D, E, and F be the midpoints of the sides BC, CA, and AB respectively. Show that $\overrightarrow{AD} + \overrightarrow{BE} + \overrightarrow{CF} = \overrightarrow{0}$.

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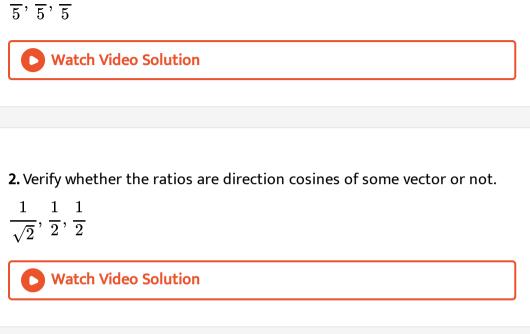
12. If ABCD is a quadrilateral and E and F are the midpoints of AC and BD

respectively, then prove that $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CB} + \overrightarrow{CD} = 4\overrightarrow{EF}$.



1. Verify whether the ratios are direction cosines of some vector or not.

 $1 \ 3 \ 4$ $\frac{1}{5}, \frac{1}{5}, \frac{1}{5}$



3. Verify whether the ratios are direction cosines of some vector or not.

 $\frac{4}{3}, 0, \frac{3}{4}$



4. Find the direction cosines of a vector whose direction ratios are (i) 1,2,3,

(ii) 3,-1,3 (iii) 0,0,7

5. Find the direction cosines and direction ratios for the following vectors.

$$3\hat{i}-4\hat{j}+8\hat{k}$$

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6. Find the direction cosines and direction ratios for the following vectors.

 $3\hat{i}+\hat{j}+\hat{k}$

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7. Find the direction cosines and direction ratios for the following vectors.

 \hat{j}

8. Find the direction cosines and direction ratios for the following vectors.

 $5\hat{i}-3\hat{j}-48\hat{k}$

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9. Find the direction cosines and direction ratios for the following vectors.

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

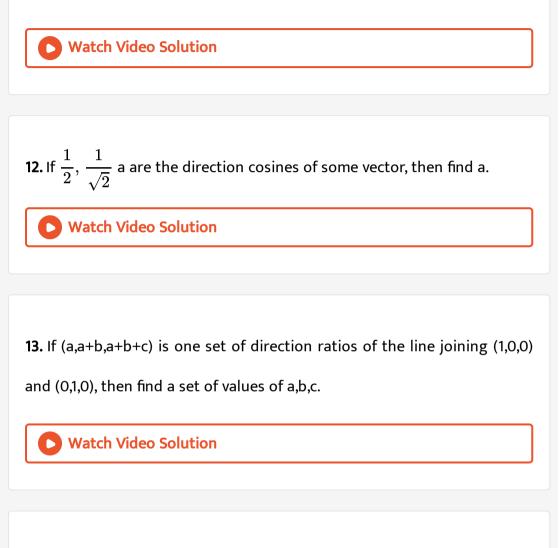
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10. Find the direction cosines and direction ratios for the following vectors.

 $\hat{i}-\hat{k}$

11. A triangle is formed by joining the points (1,0,0), (0,1,0) and (0,0,1). Find

the direction cosines of the medians.



14. Show that the vectors $2\hat{i}-\hat{j}+\hat{k},3\hat{i}-4\hat{j}-4\hat{k},\,\hat{i}-3\hat{j}-5\hat{k}$ form a

right angled triangle.

15. Find the value of λ for which the vectors $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + \lambda\hat{j} + 3\hat{k}$ are parallel.

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16. Show that the vectors are coplanar

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

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17. Show that the vectors are coplanar

 $2\hat{i}+3\hat{j}+\hat{k},\,\hat{i}-\hat{j},7\hat{i}+3\hat{j}+2\hat{k}$

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18. Show that the points whose 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.

19. If
$$\overrightarrow{a} = 2\hat{i} + 3\hat{j} - 4\hat{k}, \ \overrightarrow{b} = 3\hat{i} - 4\hat{j} - 5\hat{k},$$
 and

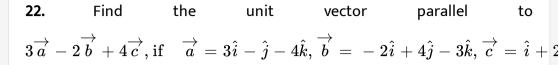
 $\overrightarrow{c} = -3\hat{i} + 2\hat{j} + 3\hat{k}$, find the magnitude and direction cosines of $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}$

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20. If
$$\overrightarrow{a} = 2\hat{i} + 3\hat{j} - 4\hat{k}$$
, $\overrightarrow{b} = 3\hat{i} - 4\hat{j} - 5\hat{k}$, and $\overrightarrow{c} = -3\hat{i} + 2\hat{j} + 3\hat{k}$, find the magnitude and direction cosines of $3\overrightarrow{a} - 2\overrightarrow{b} + 5\overrightarrow{c}$

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21. The position vectors of the vertices of a triangle are $\hat{i} + 2\hat{j} + 3\hat{k}, 3\hat{i} - 4\hat{j} + 5\hat{k}$ and $-2\hat{i} + 3\hat{j} - 7\hat{k}$. Find the perimeter of the triangle



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23. The position vectors \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} of three points satisfy the relation $2\overrightarrow{a} - 7\overrightarrow{b} + 5\overrightarrow{c} = \overrightarrow{0}$. Are these points collinear?

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24. The position vectors of the points P,Q,R,S are $\hat{i} + \hat{j} + \hat{k}, 2\hat{i} + 5\hat{j}, 3\hat{k} + 2\hat{j} - 3\hat{k}, \text{ and } \hat{i} - 6\hat{j} - \hat{k}$ respectively. Prove that the line PO and PS are perallel

that the line PQ and RS are parallel.

25. Find the value or values of m for which m $\left(\hat{i}+\hat{j}+\hat{k}
ight)$ is a unit vector.



26. Show that the points A (1,1,1), B (1,2,3) and C (2,-1,1) are vertices of an

isosceles triangle.



Exercise 83

1. Find
$$\overrightarrow{a}$$
. \overrightarrow{b} when
 $\overrightarrow{a} = \hat{i} - 2\hat{j} + \hat{k}$ and $\overrightarrow{b} = 3\hat{i} - 4\hat{j} - 2\hat{k}$
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2. Find \overrightarrow{a} . \overrightarrow{b} when $\overrightarrow{a} = 2\hat{i} + 2\hat{j} - \hat{k} \quad ext{and} \quad \overrightarrow{b} = 6\hat{i} - 3\hat{j} + 2\hat{k}$ Watch Video Solution **3.** Find the value λ for which the vectors \overrightarrow{a} and \overrightarrow{b} are perpendicular, where $\stackrel{
ightarrow}{a}=2\hat{i}+\lambda\hat{j}+\hat{k}\quad ext{and}\quad\stackrel{
ightarrow}{b}=\hat{i}-2\hat{j}+3\hat{k}$ Watch Video Solution **4.** Find the value λ for which the vectors \overrightarrow{a} and \overrightarrow{b} are perpendicular,

where

$$\overrightarrow{a} = 2 \hat{i} + 4 \hat{j} - \hat{k} \quad ext{and} \quad \overrightarrow{b} = 3 \hat{i} - 2 \hat{j} + \lambda \hat{k}$$

5. If \overrightarrow{a} and \overrightarrow{b} are two vectors such that $\left|\overrightarrow{a}\right| = 10, \left|\overrightarrow{b}\right| = 15$ and $\overrightarrow{a}. \overrightarrow{b} = 75\sqrt{2}$, find the angle between \overrightarrow{a} and \overrightarrow{b} .

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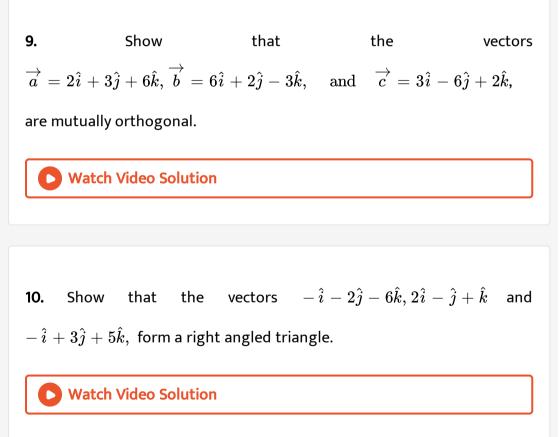
$$2\hat{i}+3\hat{j}-6\hat{k}$$
 and $6\hat{i}-3\hat{j}+2\hat{k}$

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7. Find the angle between the vectors

$$\hat{i}-\hat{j} \quad ext{and} \quad \hat{j}-\hat{k}.$$

8. If $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ are three vectors such that $\overrightarrow{a} + 2\overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$ and $\left|\overrightarrow{a}\right| = 3, \left|\overrightarrow{b}\right| = 4, \left|\overrightarrow{c}\right| = 7$, find the angle between \overrightarrow{a} and \overrightarrow{b} .



11. If
$$\left| \overrightarrow{a} \right| = 5$$
, $\left| \overrightarrow{b} \right| = 6$, $\left| \overrightarrow{c} \right| = 7$ and $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$, find
 $\overrightarrow{a} \cdot \overrightarrow{b} + \overrightarrow{b} \cdot \overrightarrow{c} + \overrightarrow{c} \cdot \overrightarrow{a}$.



12. Show that the points (2,-1,3), (4,3,1) and (3,1,2) are collinear.

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

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14. If \overrightarrow{a} , \overrightarrow{b} are unit vectors and θ is the angle between them, show that $\cos \frac{\theta}{2} = \frac{1}{2} \left| \overrightarrow{a} + \overrightarrow{b} \right|$

15. If $\overrightarrow{a}, \overrightarrow{b}$ are unit vectors and θ is the angle between them, show that

$$anrac{ heta}{2}=rac{\left|\overrightarrow{a}-\overrightarrow{b}
ight|}{\left|\overrightarrow{a}+\overrightarrow{b}
ight|}$$

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16. Let
$$\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$$
 be three vectors such that $\left|\overrightarrow{a}\right| = 3, \left|\overrightarrow{b}\right| = 4, \left|\overrightarrow{c}\right| = 5$

and each one of them being perpendicular to the sum of the other two , find $\left| \overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} \right|$.

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

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

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19. Three vectors
$$\overrightarrow{a}, \overrightarrow{b}$$
 and \overrightarrow{c} are such that $\left|\overrightarrow{a}\right| = 2, \left|\overrightarrow{b}\right| = 3, \left|\overrightarrow{c}\right| = 4, \text{ and } \overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}.$
Find $4\overrightarrow{a}, \overrightarrow{b} + 3\overrightarrow{b}, \overrightarrow{c} + 3\overrightarrow{c}, \overrightarrow{a}.$

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Exercise 8 4

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

2. Show that

$$\overrightarrow{a} \times \left(\overrightarrow{b} + \overrightarrow{c}\right) + \overrightarrow{b} \times \left(\overrightarrow{c} + \overrightarrow{a}\right) + \overrightarrow{c} \times \left(\overrightarrow{a} + \overrightarrow{b}\right) = \overrightarrow{0}$$
.
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3. Find the vectors of magnitude $10\sqrt{3}$ that are perpendicular to the plane which contains $\hat{i} + 2\hat{j} + \hat{k}$ and $\hat{i} + 3\hat{j} + 4\hat{k}$

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4. Find the unit vectors perpendicular to each of the vectors $\overrightarrow{a} + \overrightarrow{b}$

and
$$\overrightarrow{a} - \overrightarrow{b}$$
 ,where $\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}$ and $\overrightarrow{b} = \hat{i} + 2\hat{j} + 3\hat{k}.$

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5. Find the area of the parallelogram whose two adjacent sides are determined by the vectors $\hat{i} + 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$.



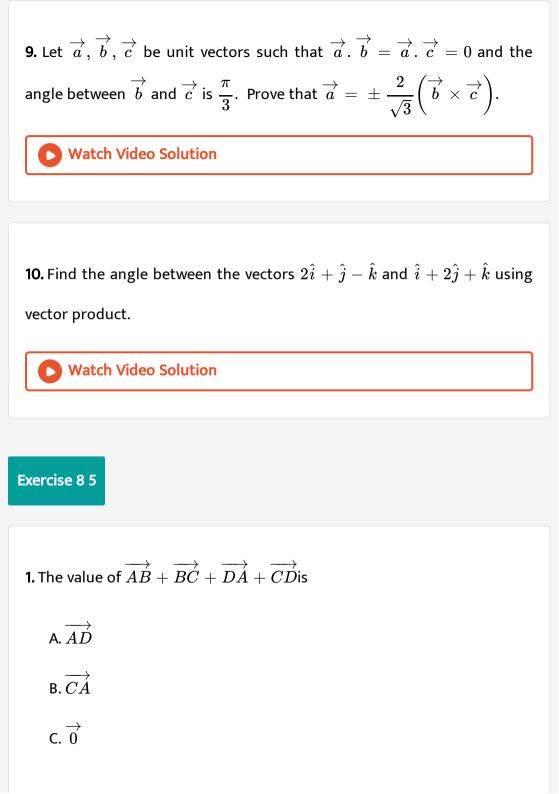
6. Find the area of the triangle whose vertices are A (3,-1,2), B(1,-1,-3) and C(4,-3,1).

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7. If \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} are position vectors of the vertices A,B,C of a triangle ABC, show that the area of the triangle ABC is $\frac{1}{2} |\overrightarrow{a} \times \overrightarrow{b} + \overrightarrow{b} \times \overrightarrow{c} + \overrightarrow{c} \times \overrightarrow{a}|$. Also deduce the condition for

collinearity of the points A,B and C.

8. For any vector
$$\overrightarrow{a}$$
 prove that $\left|\overrightarrow{a}\times \hat{i}\right|^2 + \left|\overrightarrow{a}\times \hat{j}\right|^2 + \left|\overrightarrow{a}\times \hat{k}\right|^2 = 2\left|\overrightarrow{a}\right|^2$.



D.
$$-\overrightarrow{AD}$$

Answer: C



2. If $\overrightarrow{a} + 2\overrightarrow{b}$ and $3\overrightarrow{a} + m\overrightarrow{b}$ are parallel, then the value of m is

A. 3 B. $\frac{1}{3}$ C. 6 D. $\frac{1}{6}$

Answer:

3. The unit vector parallel to the resultant of the vectors $\hat{i} + \hat{j} - \hat{k}$ and $\hat{i} - 2\hat{j} + \hat{k}$ is

A.
$$rac{i-j+k}{\sqrt{5}}$$

B. $rac{2\hat{i}+\hat{j}}{\sqrt{5}}$
C. $rac{2\hat{i}-\hat{j}+\hat{k}}{\sqrt{5}}$
D. $rac{2\hat{i}-\hat{j}}{\sqrt{5}}$

Answer: A::B

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4. A vector \overrightarrow{OP} makes 60° and 45° with the positive direction of the x and y axes respectively. Then the angle between \overrightarrow{OP} and the z-axis is

A. $45^{\,\circ}$

B. 60°

C. 90°

Answer:

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5. If $\overrightarrow{BA} = 3\hat{i} + 2\hat{j} + \hat{k}$ and the position vector of B is $\hat{i} + 3\hat{j} - \hat{k}$ then the position vector A is

A. $4\hat{i}+2\hat{j}+\hat{k}$ B. $4\hat{i}+5\hat{j}$ C. $4\hat{i}$ D. $-4\hat{i}$

Answer: A::D

6. A vector makes equal angle with the positive direction of the coordinate axes. Then each angle is equal to

A.
$$\cos^{-1}\left(\frac{1}{3}\right)$$

B. $\cos^{-1}\left(\frac{2}{3}\right)$
C. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$
D. $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$

Answer: A::C



7. The vectors
$$\overrightarrow{a} - \overrightarrow{b}, \overrightarrow{b} - \overrightarrow{c}, \overrightarrow{c} - \overrightarrow{a}$$
 are

A. parallel to each other

B. unit vectors

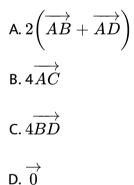
C. mutually perpendicular vectors

D. coplanar vectors.

Answer: A::C



8. If ABCD is a parallelogram, then $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CB} + \overrightarrow{CD}$ is equal to



Answer: D



9. One of the diagonals of parallelogram ABCD with \overrightarrow{a} and \overrightarrow{b} as adjacent sides is $\overrightarrow{a} + \overrightarrow{b}$. The other diagonal \overrightarrow{BD} is

A.
$$\overrightarrow{a} - \overrightarrow{b}$$

B. $\overrightarrow{b} - \overrightarrow{a}$
C. $\overrightarrow{a} + \overrightarrow{b}$
D. $\frac{\overrightarrow{a} + \overrightarrow{b}}{2}$

Answer: A::B::C



10. If \overrightarrow{a} , \overrightarrow{b} are the position vectors A and B then which one of the following points whose position vector lies on AB, is

A.
$$\overrightarrow{a} + \overrightarrow{b}$$

B. $\frac{2\overrightarrow{a} - \overrightarrow{b}}{2}$

C.
$$\frac{2\overrightarrow{a} + \overrightarrow{b}}{3}$$

D. $\frac{\overrightarrow{a} - \overrightarrow{b}}{3}$

Answer: A::B::C

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11. If \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} are the position vectors of three collinear points, then which of the following is true?

A.
$$\overrightarrow{a} = \overrightarrow{b} + \overrightarrow{c}$$

B. $2\overrightarrow{a} = \overrightarrow{b} + \overrightarrow{c}$
C. $\overrightarrow{b} = \overrightarrow{c} + \overrightarrow{a}$
D. $4\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$

Answer: A::B::C



12. If $\overrightarrow{r} = \frac{9\overrightarrow{a} + 7\overrightarrow{b}}{16}$ then the point P whose position vector \overrightarrow{r} divides the line joining the points with position vectors \overrightarrow{a} and \overrightarrow{b} in the ratio

A. 7:9 internally

B.9:7 internally

C.9:7 externally

D. 7:9 externally

Answer: A::B::C::D

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13. If $\lambda \hat{i} + 2\lambda \hat{j} + 2\lambda \hat{k}$ is a unit vector,then the value of λ is

A.
$$\frac{1}{3}$$

B. $\frac{1}{4}$
C. $\frac{1}{9}$

$$\mathsf{D}.\,\frac{1}{2}$$

Answer: A::C

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14. Two vertices of a triangle have position vectors $3\hat{i} + 4\hat{j} - 4\hat{k}$ and $2\hat{i} + 3\hat{j} + 4\hat{k}$. If the position vector of the centroid is $\hat{i} + 2\hat{j} + 3\hat{k}$, then the position vector of the third vertex is

 $\begin{array}{l} \mathsf{A}.-2\hat{I}\,-\,\hat{j}+9\hat{k}\\\\ \mathsf{B}.-2\hat{I}\,-\,\hat{j}-6\hat{k}\\\\ \mathsf{C}.\,2\hat{i}\,-\,\hat{j}+6\hat{k}\\\\\\ \mathsf{D}.-2\hat{I}\,+\,\hat{j}+6\hat{k}\end{array}$

Answer: A::B

15. If
$$\left| \overrightarrow{a} + \overrightarrow{b} \right| = 60$$
, $\left| \overrightarrow{a} - \overrightarrow{b} \right| = 40$ and $\left| \overrightarrow{b} \right| = 46$, then $\left| \overrightarrow{a} \right|$ is

A. 42

B. 12

C. 22

D. 32

Answer: C

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16. If \overrightarrow{a} and \overrightarrow{b} having same magnitude and angle between them is 60° and their scalar product is $\frac{1}{2}$ then $\left|\overrightarrow{a}\right|$ is

A. 2

B. 3

C. 7

D. 1

Answer: A



17. The value of $\theta \in \left(0, \frac{\pi}{2}\right)$ for which the vectors $\overrightarrow{a} = (\sin \theta)\hat{i} + (\cos \theta)\hat{j}$ and $\hat{b} = \hat{i} - \sqrt{3}\hat{j} + 2\hat{k}$ are perpendicular, is equal to

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

B. $\frac{\pi}{6}$
C. $\frac{\pi}{4}$
D. $\frac{\pi}{2}$

Answer: C

18. If
$$\left| \overrightarrow{a} \right| = 13$$
, $\left| \overrightarrow{b} \right| = 5$ and $\overrightarrow{a} \cdot \overrightarrow{b} = 60$ then $\left| \overrightarrow{a} \times \overrightarrow{b} \right|$ is

A. 1

B. 35

C. 45

D. 25

Answer: B

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19. Vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} are inclined at an angle $\theta = 120^{\circ}$. If $\left|\overrightarrow{a}\right| = 1, \left|\overrightarrow{b}\right| = 2, \operatorname{then}\left[\left(\overrightarrow{a} + 3\overrightarrow{b}\right) \times \left(3\overrightarrow{a} - \overrightarrow{b}\right)\right]^2$ is equal to

A. 225

B. 275

C. 325

D. 300

Answer: C

20. If \overrightarrow{a} and \overrightarrow{b} are two vectors of magnitude 2 and inclined at an angle 60° , then the angle between \overrightarrow{a} and $\overrightarrow{a} + \overrightarrow{b}$ is

A. 30°

 $B.\,60^2$

C. 45°

D. 90°

Answer: C

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21. If the projection of $5\hat{i} - \hat{j} - 3\hat{k}$ on the vector $\hat{i} + 3\hat{j} + \lambda\hat{k}$ is same as the projection of $\hat{i} + 3\hat{j} + \lambda\hat{k}$ on $5\hat{i} - \hat{j} - 3\hat{k}$ then λ is equal to. $\mathsf{B}.\pm 3$

 $\mathsf{C}.\pm 5$

D. ± 1

Answer: A::B::D

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22. If (1,2,4) and (2,-3 λ , - 3) are the initial and terminal points of the vector $\hat{i}+5\hat{j}-7\hat{k}$, then value of λ is equal to

A.
$$\frac{7}{3}$$

B. $-\frac{7}{3}$
C. $-\frac{5}{3}$
D. $\frac{5}{3}$

Answer: C

23. If the points whose position vectors $10\hat{i} + 3\hat{j}$, $12\hat{i} - 5\hat{j}$ and $a\hat{i} + 11\hat{j}$ are collinear then a is equal to

A. 6	
B. 3	
C. 5	
D. 8	

Answer:



24. If
$$\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}, \ \overrightarrow{b} = 2\hat{i} + x\hat{j} + \hat{k}, \ \overrightarrow{c} = \hat{i} - \hat{j} + 4\hat{k}$$
 and $\overrightarrow{a}. \left(\overrightarrow{b} \times \overrightarrow{c}\right) = 70$, then x is equal to

A. 5

C. 26

D. 10

Answer: B

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25. If
$$\overrightarrow{a} = \hat{i} + 2\hat{j} + 2\hat{k}$$
, $\left|\overrightarrow{b}\right|$ =5 and the angle between \overrightarrow{a} and \overrightarrow{b} is $\frac{\pi}{6}$,

then the area of the triangle formed by these two vectors as two sides is

A.
$$\frac{7}{4}$$

B. $\frac{15}{4}$
C. $\frac{3}{4}$
D. $\frac{17}{4}$

Answer: A::D

1. If m
$$\left(\overrightarrow{2} + \overrightarrow{j} + \overrightarrow{k}\right)$$
 is a unit vector then the value of m is

$$A. \pm \frac{1}{\sqrt{3}}$$
$$B. \pm \frac{1}{\sqrt{5}}$$
$$C. \pm \frac{1}{\sqrt{6}}$$
$$D. \pm \frac{1}{\sqrt{2}}$$

Answer: A



2. The vectors having initial and terminal points as (2,5,0) and (-3,7,4) respectively is

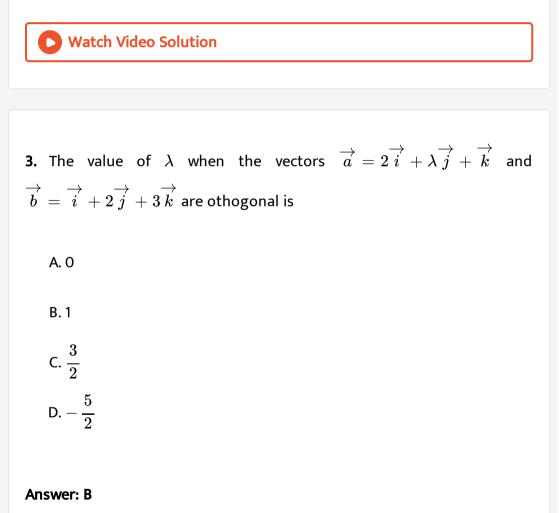
A. $-\hat{i}+12\hat{j}+4\hat{k}$

B. $5\hat{i}+2\hat{j}-4\hat{k}$

$$\mathsf{C}.-5\hat{i}+2\hat{j}+4\hat{k}$$

D. $\hat{i} + \hat{j} + \hat{k}$

Answer: A::B::D



4. The value of λ for which the vectors $3\hat{i}-6\hat{j}+\hat{k}$ and $2\hat{i}-4\hat{j}+\lambda\hat{k}$ are

parallel is

A.
$$\frac{2}{3}$$

B. $\frac{3}{2}$
C. $\frac{5}{2}$
D. $\frac{2}{5}$

Answer: B::C

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5. Match List -I with List II

ListI					ListII
i.	$\hat{i}.$	\hat{i}		(a)	0
i.	$\hat{i}.~\hat{j}$			(b)	\hat{k}
iiii.	iiii. $\hat{i} imes \hat{i}$			(c)	1
iv.	$\hat{i} imes \hat{j}$			(d)	0
A.	(i) (b)	$(\mathrm{ii}) \ (c)$	$egin{array}{c} (\mathrm{iii}) \ (d) \end{array}$	$({ m iv})\ (a)$	

В.	(i)	(ii)	(iii)	(iv)
	(c)	(a)	(d)	(b)
C.	(i)	(ii)	(iii)	(iv)
	(d)	(b)	(a)	(c)
D.	(i)	(ii)	(iii)	(iv)
	(d)	(c)	(b)	(a)

Answer: A::B::C::D

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6. Assertion (A) : If ABCD is a prallelogram, $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CB} + \overrightarrow{CD}$ then is equal to zero.

Reason (R): \overrightarrow{AB} and \overrightarrow{CD} are equal in magnitude and opposite in direction. Also \overrightarrow{AD} and \overrightarrow{CB} are equal in magnitude and opposite in direction

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A::B::C::D



7. Find the odd one out of the following

A. $\hat{i} + 2\hat{j} + 3\hat{k}$ B. $2\hat{i} + 4\hat{j} + 6\hat{k}$ C. $7\hat{i} + 14\hat{j} + 21\hat{k}$

D. $\hat{i}+3\hat{j}+2\hat{k}$

Answer: A::B::C

8. Assertion (A) : \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} are the position vector of three collinear points then $2\overrightarrow{a} = \overrightarrow{b} + \overrightarrow{c}$

Reason (R): Collinear points, have same direction

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A::B::C::D

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9. Find the odd one out of the following

A. matrix multiplication

B. vector cross product

C. Subtraction

D. Matris Addition

Answer: A::D

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Additional Problems Section B 2 Mark

1. If
$$\overrightarrow{a} = 3\hat{i} - 2\hat{j} + \hat{k}$$
 and $\overrightarrow{b} = 2\hat{i} - 4\hat{j} + \hat{k}$ then find $\left|\overrightarrow{a} - 2\overrightarrow{b}\right|$.

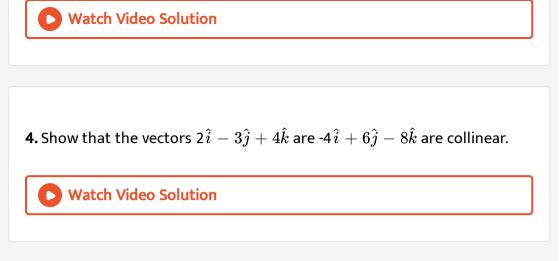
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2. Write two different vectors having same magnitude.



3. Find the scalar and vector components of the vector with initial point

(2,1) and terminal point (-5,7)



5. If
$$\overrightarrow{a} = \hat{i} + 2\hat{j} + 3\hat{k}$$
 and $\overrightarrow{b} = 2\hat{i} + 3\hat{j} - 5\hat{k}$ then find $a \times b$. Verify that \overrightarrow{a} and $\overrightarrow{a} \times \overrightarrow{b}$ are perpendicular to each other.

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Additional Problems Section C 3 Mark

1. Find the unit vector in the direction of the vector

$$\stackrel{
ightarrow}{a}-2\stackrel{
ightarrow}{b}+3\stackrel{
ightarrow}{c} \quad ext{if} \quad \stackrel{
ightarrow}{a}=\hat{i}+\hat{j}, \stackrel{
ightarrow}{b}=\hat{j}+\hat{k} \quad ext{and} \quad \stackrel{
ightarrow}{c}=\hat{i}+\hat{k}.$$

2. Find the direction cosines of the vector joining the points A (1,2,-3) and

B(-1,-2,1) directed from A to B.



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

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4. Let \overrightarrow{a} , \overrightarrow{b} and \overrightarrow{c} be non-coplanar vectors. Let A,B and C be the points whose position vectors with respect to the origin O are $\overrightarrow{a} + 2\overrightarrow{b} + 3\overrightarrow{c}$, $-2\overrightarrow{a} + 3\overrightarrow{b} + 5\overrightarrow{c}$ and $7\overrightarrow{a} - \overrightarrow{c}$ respectively. Then

prove that A, B and C are collinear.

• Watch Video Solution 5. If ABCDE is a pentagon then prove that $\overrightarrow{AB} + \overrightarrow{AE} + \overrightarrow{BC} + \overrightarrow{DC} + \overrightarrow{ED} + \overrightarrow{AC} = 3\overrightarrow{AC}$

Additional Problems Section D 5 Mark

1. Let
$$\overrightarrow{a} = 2\overrightarrow{j} + \overrightarrow{j} - 2\overrightarrow{k}$$
, $\overrightarrow{b} = \overrightarrow{i} + \overrightarrow{j}$. If \overrightarrow{c} is a vector such that $\overrightarrow{a} \cdot \overrightarrow{c} = |\overrightarrow{c}|, |\overrightarrow{c} - \overrightarrow{a}| = 2\sqrt{2}$ and the angle between $\overrightarrow{a} \times \overrightarrow{b}$ and \overrightarrow{c} is 30° . Find the value of $\left| \left(\overrightarrow{a} \times \overrightarrow{b} \right) \times \overrightarrow{c} \right|$

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2. Prove that the smaller angle between any two diagonals of a cube is $\cos^{-1}\frac{1}{3}$.

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3. If \overrightarrow{a} , \overrightarrow{b} and \overrightarrow{c} are three vectors such that $\left|\overrightarrow{a}\right| = 3$, $\left|\overrightarrow{b}\right| = 4$ and $\left|\overrightarrow{c}\right| = \sqrt{24}$ and sum of any two vectors is orthogonal to the third vector

, then find
$$\left| \overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} \right|$$

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4. If
$$\left|\overrightarrow{a}\right| = \left|\overrightarrow{b}\right| = \left|\overrightarrow{a} + \overrightarrow{b}\right| = 1$$
 then prove that $\left|\overrightarrow{a} - \overrightarrow{b}\right| = \sqrt{3}$.