FREE NCERT SOLUTIONS

CLASS - 12

VECTOR ALGEBRA

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EXERCISE 10.1 - Question No. 1

Represent graphically a displacement of 40 km, 30*o* east of north.

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EXERCISE 10.1 - Question No. 2

Classify the following measures as scalars and vectors. (i) 10 kg (ii) 2 meters north-west (iii) 40 (iv) 40 watt (v) 10^19 coulomb (vi)20 m/s^2

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EXERCISE 10.1 - Question No. 3

Classify the following as scalar and vector quantities. (i) time period (ii) distance (iii) force (iv) velocity (v) work done

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EXERCISE 10.1 - Question No. 4

In Figure (a square), identify the following vectors. (i) Coinitial (ii) Equal (iii) Collinear but not equal

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EXERCISE 10.1 - Question No. 5

Answer the following as true or false. (i) $\rightarrow a$ and - $\rightarrow a$ are collinear. (ii) Two collinear vectors are always equal in magnitude. (iii) Two vectors having same magnitude are collinear. (iv) Two collinear vectors having the same magni

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EXERCISE 10.2 - Question No. 1

Compute the magnitude of the following vectors: $\rightarrow a = \hat{i} + \hat{j} + \hat{k}$;

$\rightarrow b = 2\hat{i} - 7\hat{j} - 3\hat{k}$; $\rightarrow c = \frac{1}{\sqrt{3}}\hat{i} + \frac{1}{\sqrt{3}}\hat{j} - \frac{1}{\sqrt{3}}\hat{k}$

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EXERCISE 10.2 - Question No. 2

Write two different vectors having same magnitude.

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EXERCISE 10.2 - Question No. 3

Write two different vectors having same direction.

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EXERCISE 10.2 - Question No. 4

Find the values of x and y so that the vectors $2\hat{i} + 3\hat{j}$ and $x\hat{i} + y\hat{j}$ are equal.

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EXERCISE 10.2 - Question No. 5

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

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EXERCISE 10.2 - Question No. 6

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

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EXERCISE 10.2 - Question No. 7

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

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EXERCISE 10.2 - Question No. 8

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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EXERCISE 10.2 - Question No. 9

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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EXERCISE 10.2 - Question No. 10

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

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EXERCISE 10.2 - Question No. 11

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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EXERCISE 10.2 - Question No. 12

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

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EXERCISE 10.2 - Question No. 13

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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EXERCISE 10.2 - Question No. 14

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

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EXERCISE 10.2 - Question No. 15

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 (i) internally (ii) externally

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EXERCISE 10.2 - Question No. 16

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

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EXERCISE 10.2 - Question No. 17

Show that the points A, B and C 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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EXERCISE 10.2 - Question No. 18

In triangle ABC (Figure), which of the following is not true: (A)

$\rightarrow AB + \rightarrow BC + \rightarrow CA = \rightarrow 0$ (B) $\rightarrow AB + \rightarrow BC - \rightarrow AC = \rightarrow 0$ (C)

$\rightarrow AB + \rightarrow BC - \rightarrow CA = \rightarrow 0$ (D) $\rightarrow AB - \rightarrow CB + \rightarrow CA = \rightarrow 0$

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EXERCISE 10.2 - Question No. 19

If $\rightarrow a$ and $\rightarrow b$ are two collinear vectors, then which of the following are incorrect:

(A) $\rightarrow b = \lambda \rightarrow a$, for some scalar l (B) $\rightarrow a = \pm \rightarrow b$ (C) the respective components of $\rightarrow a$ and $\rightarrow b$ are proportional (D) both

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EXERCISE 10.3 - Question No. 1

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

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EXERCISE 10.3 - Question No. 2

Find the angle between the vectors $\hat{i} - 2\hat{j} + 3k$ and $3\hat{i} - 2\hat{j} + k$

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EXERCISE 10.3 - Question No. 3

Find the projection of the vector $\hat{i} - \hat{j}$ on the vector $\hat{i} + \hat{j}$

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EXERCISE 10.3 - Question No. 4

Find the projection of the vector $\hat{i} + 3\hat{j} + 7\hat{k}$ on the vector $7\hat{i} - \hat{j} + 8\hat{k}$

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EXERCISE 10.3 - Question No. 5

Show that each of the given three vectors is a unit vector:

$\frac{1}{7}\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right), \frac{1}{7}\left(3\hat{i} - 6\hat{j} + 2\hat{k}\right), \frac{1}{7}\left(6\hat{i} + 2\hat{j} - 3\hat{k}\right)$ Also, show that they are mutually perpendicular to each other.

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EXERCISE 10.3 - Question No. 6

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

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EXERCISE 10.3 - Question No. 7

Evaluate the product $(3 \rightarrow a - 5 \rightarrow b) 2 \rightarrow a \cdot + 7 \rightarrow b$

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EXERCISE 10.3 - Question No. 8

Find the magnitude of two vectors $\rightarrow a$ and $\rightarrow b$ having the same magnitude and such that the angle between them is $60o$ and their scalar product is $\frac{1}{2}$.

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EXERCISE 10.3 - Question No. 9

Find $|\rightarrow x|$, if for a unit vector $\rightarrow a, (\rightarrow x - \rightarrow a) \rightarrow x \cdot + \rightarrow a = 12$.

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EXERCISE 10.3 - Question No. 10

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

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EXERCISE 10.3 - Question No. 11

Show that $|\rightarrow a| \rightarrow b + |\rightarrow b| \rightarrow a$ is perpendicular to $|\rightarrow a| \rightarrow b - |\rightarrow b| \rightarrow a$, for any two nonzero vectors $\rightarrow a$ and $\rightarrow b$.

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EXERCISE 10.3 - Question No. 12

If $\rightarrow a \cdot \rightarrow a = 0$ and $\rightarrow a \cdot \rightarrow b = 0$, then what can be concluded about the vector $\rightarrow b$.

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EXERCISE 10.3 - Question No. 13

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

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EXERCISE 10.3 - Question No. 14

If either $\vec{a} = \vec{0}$ or $\vec{b} = \vec{0}$, then $\vec{a} \cdot \vec{b} = 0$ But the converse need not be true. Justify your answer with an example.

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EXERCISE 10.3 - Question No. 15

If the vertices A, B, C of a triangle ABC are (1, 2, 3), (1, 0, 0), (0, 1, 2), respectively, then find $\angle ABC$. [$\angle ABC$ is the angle between the vectors $\overrightarrow{BA}$ and $\overrightarrow{BC}$.

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EXERCISE 10.3 - Question No. 16

Show that the points A(1, 2, 7), B(2, 6, 3) and C(3, 10, 1) are collinear.

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EXERCISE 10.3 - Question No. 17

Show that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{k}$ and $3\hat{i} - 4\hat{j} - 4\hat{k}$ form the vertices of a right angled triangle.

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EXERCISE 10.3 - Question No. 18

If $\vec{a}$ is a nonzero vector of magnitude a and λ a nonzero scalar, then $\lambda\,\vec{a}$ is unit vector if

(A) $\lambda = 1$ (B) $\lambda = -1$ (C) $a = |\lambda|$ (D) $a = \frac{1}{|\lambda|}$

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EXERCISE 10.4 - Question No. 1

Find $|\rightarrow a \times \rightarrow b|$, if $\rightarrow a = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\rightarrow b = 3\hat{i} - 2\hat{j} + 2\hat{k}$

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EXERCISE 10.4 - Question No. 2

Find a unit vector perpendicular to each of the vector $\rightarrow a + \rightarrow b$ and $\rightarrow a - \rightarrow b$

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

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EXERCISE 10.4 - Question No. 5

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

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EXERCISE 10.4 - Question No. 6

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

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EXERCISE 10.4 - Question No. 7

Let the vectors $\vec{a}, \vec{b}, \vec{c}$ be given as $a_1\hat{i} + a_2\hat{j} + a_3\hat{k}, b_1\hat{i} + b_2\hat{j} + b_3\hat{k}, c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$.

Then show that $\vec{a} \times \left(\vec{b} + \vec{c}\right) = \vec{a} \times \vec{b} + \vec{a} \times \vec{c}$

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EXERCISE 10.4 - Question No. 8

If either $\vec{a} = 0$ and $\vec{b} = 0$ then $\vec{a} \times \vec{b} = 0$. Is Is the converse true? Justify your answer with an example.

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EXERCISE 10.4 - Question No. 9

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

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EXERCISE 10.4 - Question No. 10

Find the area of the parallelogram whose adjacent sides are determined by the 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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EXERCISE 10.4 - Question No. 11

Let the vectors $\vec{a}$ and $\vec{b}$ be such that $|\vec{a}| = 3$ and $|\vec{b}| = \frac{\sqrt{2}}{3}$, then $\vec{a} \times \vec{b}$ is a unit vector,

if the angle between $\vec{a}$ and $\vec{b}$ (A) $\pi/6$ (B) $\pi/4$ (C) $\pi/3$ (D) $\pi/2$

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EXERCISE 10.4 - Question No. 12

Area of a rectangle having vertices A, B, C and D with position vectors

$-\hat{i} + \frac{1}{2}\hat{j} + 4\hat{k}$, $\hat{i} + \frac{1}{2}\hat{j} + 4\hat{k}$, $\hat{i} - \frac{1}{2}\hat{j} + 4\hat{k}$ and $-\hat{i} - \frac{1}{2}\hat{j} + 4\hat{k}$ respectively is (A) 1/2 (B) 1 (C)

2 (D) 4

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EXERCISE 10.5 - Question No. 1

Find $\left[\vec{a}\vec{b}\vec{c}\right]$ if $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}, \vec{b} = 2i - 3j + k, \vec{c} = 3\hat{i} + \hat{j} - 2\hat{k}$

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EXERCISE 10.5 - Question No. 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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EXERCISE 10.5 - Question No. 3

Find λ if the vectors $\hat{i} - \hat{j} + \hat{k}, 3\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} + \lambda\hat{j} + 3\hat{k}$ are coplanar

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EXERCISE 10.5 - Question No. 4

Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = i$ and $\vec{c} = c_1\hat{i} + \hat{c}_2 j + c_3\hat{k}$ Then (a) if $c_1 = 1$ and $c_2 = 2$, find c_3 which makes $\vec{a}, \vec{b}, \vec{c}$ coplanar (b) if $c_2 = -1$ and $c_3 = 1$, show that no value of c_3 can makes $\vec{a}, \vec{b}, \vec{c}$ coplanar.

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EXERCISE 10.5 - Question No. 5

Show that the four points with position vectors

$4\hat{i} + 8\hat{j} + 12\hat{k},\ 2\hat{i} + 4\hat{j} + 6\hat{k}, 3\hat{i} + 5\hat{j} + 4\hat{k}$ *and* $5\hat{i} + 8\hat{j} + 5\hat{k}$ are coplanar.

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EXERCISE 10.5 - Question No. 6

Find x such that the four points $A\ (3,\ 2,\ 1)$, $B(4, x,\ 5)$, $C\ (4,\ 2,\ 2)$ and $D\ (6,\ 5,\ 1)$ are coplanar

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EXERCISE 10.5 - Question No. 7

Show that the vectors $\rightarrow a$, $\rightarrow b$ and $\rightarrow c$ coplanar if $\rightarrow a + \rightarrow b$, $\rightarrow b + \rightarrow c$ and $\rightarrow c + \rightarrow a$ are coplanar

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MISCELLANEOUS EXERCISE - Question No. 1

Write down a unit vector in XY-plane, making an angle of 30 with the positive direction of x-axis.

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MISCELLANEOUS EXERCISE - Question No. 2

Find the scalar components and magnitude of the vector joining the points $P\left(x_1, y_1, z_1\right)$ and $Q\left(x_2, y_2, z_2\right)$

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MISCELLANEOUS EXERCISE - Question No. 3

A girl walks 4 km towards west, then she walks 3 km in a direction 30*o* east of north and stops. Determine the girls displacement from her initial point of departure.

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MISCELLANEOUS EXERCISE - Question No. 4

If $\rightarrow a = \rightarrow b + \rightarrow c$, then is it true that $|\rightarrow a| = |\rightarrow b| + |\rightarrow c|$? Justify your answer.

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MISCELLANEOUS EXERCISE - Question No. 5

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

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MISCELLANEOUS EXERCISE - Question No. 6

Find a vector of magnitude 5 units, and parallel to the resultant of the vectors

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

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MISCELLANEOUS EXERCISE - Question No. 7

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

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MISCELLANEOUS EXERCISE - Question No. 8

Show that the points A(1,2,8) , B(5,0,2) and C(11,3,7) are collinear, and find the ratio in which B divides AC.

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MISCELLANEOUS EXERCISE - Question No. 9

Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $2(\rightarrow a + \rightarrow b)$ and $(\rightarrow a - 3 \rightarrow b)$ externally in the ratio 1 : 2. Also, show that P is the mid point of the line segment RQ

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MISCELLANEOUS EXERCISE - Question No. 10

The two adjacent sides of a parallelogram are $2\hat{i} - 4\hat{j} + 5\hat{k}$ and $\hat{i} - 2\hat{j} - 3\hat{k}$. Find the unit vector parallel to its diagonal. Also, find its area.

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MISCELLANEOUS EXERCISE - Question No. 11

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

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MISCELLANEOUS EXERCISE - Question No. 12

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 $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{c} \cdot \vec{d} = 15$.

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MISCELLANEOUS EXERCISE - Question No. 13

The scalar product of the vector $\hat{i} + \hat{j} + \hat{k}$ with a unit vector along the sum of vector $2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\lambda\hat{i} + 2\hat{j} + 3\hat{k}$ is equal to one. Find the value of λ .

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MISCELLANEOUS EXERCISE - Question No. 14

If $\rightarrow a$, $\rightarrow b$, $\rightarrow c$ are mutually perpendicular vectors of equal magnitudes, show that the vector $\rightarrow a + \rightarrow b + \rightarrow c$ is equally inclined to $\rightarrow a$, $\rightarrow b$ and $\rightarrow c$.

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MISCELLANEOUS EXERCISE - Question No. 15

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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MISCELLANEOUS EXERCISE - Question No. 16

If θ is the angle between two vectors $\rightarrow a$ and $\rightarrow b$, then $\rightarrow a \cdot \rightarrow b \geq 0$ only when

(A) $0<\theta<\frac{\pi}{2}$ (B) $0\leq\theta\leq\frac{\pi}{2}$ (C) $0<\theta<\pi$ (D) 0

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MISCELLANEOUS EXERCISE - Question No. 17

Let $\rightarrow a$ and $\rightarrow b$ be two unit vectors and is the angle between them. Then

$\rightarrow a + \rightarrow b$ is a unit vector if (A) $\theta=\frac{\pi}{4}$ (B) $\theta=\frac{\pi}{3}$ (C) $\theta=\frac{\pi}{2}$ (D) $\theta=\frac{2\pi}{3}$

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MISCELLANEOUS EXERCISE - Question No. 18

The value of $\hat{i}\hat{j} \times \hat{k} + \hat{j}\hat{i} + \hat{k} + \hat{k}\hat{i} \times \hat{j}$ is (A) 0 (B) 1 (C) 1 (D) 3

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MISCELLANEOUS EXERCISE - Question No. 19

If is the angle between any two vectors $\vec{a}a$ and $\vec{b}$, then $\left|\vec{a}.\vec{b}\right| = \left|\vec{a} \times \vec{b}\right|$ when θ is equal to (A) 0 (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) π

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SOLVED EXAMPLES - Question No. 1

Represent graphically a displacement of 40 km, 30o west of south.

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SOLVED EXAMPLES - Question No. 2

Classify the following measures as scalars and vectors. (i) 5 seconds (ii) 1000 cm^3

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SOLVED EXAMPLES - Question No. 3

In Figure, which of the vectors are: (i) Collinear (ii) Equal (iii) Coinitial

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SOLVED EXAMPLES - Question No. 4

Find the values of x, y and z so that the vectors $\vec{a} = x\hat{i} + 2\hat{j} + z\hat{k}$ and $\vec{b} = 2\hat{i} + y\hat{j} + \hat{k}$ are equal.

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SOLVED EXAMPLES - Question No. 5

Let $\rightarrow a = \hat{i} + 2\hat{j}$ and $\rightarrow b = 2\hat{i} + \hat{j}$. Is $|\rightarrow a| = |\rightarrow b|$? Are the vector $\rightarrow a$ and $\rightarrow b$ equal?

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SOLVED EXAMPLES - Question No. 6

Find unit vector in the direction of vector $\rightarrow a = 2\hat{i} + 3\hat{j} + \hat{k}$.

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SOLVED EXAMPLES - Question No. 7

Find a vector in the direction of vector - and $>$; $a = \hat{i} - 2\hat{j}$ that has magnitude 7 units.

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SOLVED EXAMPLES - Question No. 8

Find the unit vector in the direction of the sum of the vectors, $\rightarrow a = 2\hat{i} + 2\hat{j} - 5\hat{k}$ and $\rightarrow b = 2\hat{i} + \hat{j} + 3\hat{k}$.

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SOLVED EXAMPLES - Question No. 9

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

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SOLVED EXAMPLES - Question No. 10

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

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SOLVED EXAMPLES - Question No. 11

Consider two points P and Q with position vectors $\rightarrow OP = 3 \rightarrow a - 2 \rightarrow b$ and $\rightarrow OQ = \rightarrow a + \rightarrow b$ Find the position vector of a point R which divides the line joining P and Q in the ratio 2:1, (i) internally, and (ii) externally.

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SOLVED EXAMPLES - Question No. 12

Show that the points $A\left(2\hat{i} - \hat{j} + \hat{k}\right), B\left(\hat{i} - 3\hat{j} - 5\hat{k}\right), C\left(3\hat{i} - 4\hat{j} - 4\hat{k}\right)$ are the vertices of a right angled triangle.

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SOLVED EXAMPLES - Question No. 13

Find the angle between two vectors $\rightarrow a$ and $\rightarrow b$ with magnitudes 1 and 2 respectively and when $\rightarrow a \rightarrow b = 1$.

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SOLVED EXAMPLES - Question No. 14

Find angle θ between the vectors $\rightarrow a = \hat{i} + \hat{j} - \hat{k}$ and $\rightarrow b = \hat{i} - \hat{j} + \hat{k}$.

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SOLVED EXAMPLES - Question No. 15

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 perpendicular.

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SOLVED EXAMPLES - Question No. 16

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

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SOLVED EXAMPLES - Question No. 17

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

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SOLVED EXAMPLES - Question No. 18

If $\vec{a}$ is a unit vector and $\left(\vec{x} - \vec{a}\right).\left(\vec{x} + \vec{a}\right) = 8$, then find $\left|\vec{x}\right|$

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SOLVED EXAMPLES - Question No. 19

For any two vectors $\rightarrow a$ and $\rightarrow b$ we always have $\left|\rightarrow a \rightarrow b\right| \leq |\rightarrow a||\rightarrow b|$

(Cauchy-Schwartz inequality).

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SOLVED EXAMPLES - Question No. 20

For any two vectors $\vec{a}$ and $\vec{b}$, we always have $\left|\vec{a} + \vec{b}\right| \leq \left|\vec{a}\right| + \left|\vec{b}\right|$

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SOLVED EXAMPLES - Question No. 21

Show that the points $A\left(- 2\hat{i} + 3\hat{j} + 5\hat{k} \right), B\left(\hat{i} + 2\hat{j} + 3\hat{k} \right)$ and $C\left(7\hat{i} - 3\hat{k} \right)$ are collinear.

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SOLVED EXAMPLES - Question No. 22

Find $\left| \vec{a} \times \vec{b} \right|$, 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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SOLVED EXAMPLES - Question No. 23

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

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SOLVED EXAMPLES - Question No. 24

Find the area of a triangle having the points $A(1, 1, 1)$, $B(1, 2, 3)$ and $C(2, 3, 1)$ as its vertices.

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SOLVED EXAMPLES - Question No. 25

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

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SOLVED EXAMPLES - Question No. 26

Write all the unit vectors in XY-plane.

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SOLVED EXAMPLES - Question No. 27

If $\hat{i}+\hat{j}+\hat{k}, 2\hat{i}+5\hat{j}, 3\hat{i}+2\hat{j}-3\hat{k}$ and $\hat{i}-6\hat{j}-\hat{k}$ are the position vectors of points A, B, C and D respectively, then find the angle between $\overrightarrow{AB}$ and $\overrightarrow{CD}$. Deduce that $\overrightarrow{AB}$ and $\overrightarrow{CD}$

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SOLVED EXAMPLES - Question No. 28

Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three vectors such that $|\vec{a}| = 3, |\vec{b}| = 4, |\vec{c}| = 5$ and each one of them being perpendicular to the sum of the other two, find $|\vec{a}+\vec{b}+\vec{c}|$.

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SOLVED EXAMPLES - Question No. 29

Three vectors $\rightarrow a$, $\rightarrow b$ and $\rightarrow c$ satisfy the condition

$\rightarrow a + \rightarrow b + \rightarrow c = \rightarrow 0$. Evaluate the quantity

$\mu = \rightarrow a \cdot \rightarrow b + \rightarrow b \cdot \rightarrow c + \rightarrow c \cdot \rightarrow a$, if $|\rightarrow a| = 1, |\rightarrow b| = 4$ and $|\rightarrow c| = 2$.

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SOLVED EXAMPLES - Question No. 30

If with reference to the right handed system of mutually perpendicular unit vectors $\hat{i}, \hat{j}$ and $\hat{k}$, $\rightarrow \alpha = 3\hat{i} - \hat{j}$, $\rightarrow \beta = 2\hat{i} + \hat{j} - 3\hat{k}$, then express $\rightarrow \beta$ in the from $\rightarrow \beta = \rightarrow \beta_1 + \rightarrow \beta_2$, where ` -

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SOLVED EXAMPLES - Question No. 31

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

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SOLVED EXAMPLES - Question No. 32

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

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SOLVED EXAMPLES - Question No. 33

Find λ if the vectors

- and $> ; a = \hat{i} + 3\hat{j} + \hat{k}$, - and $> ; b = 2\hat{i} - \hat{j} - \hat{k}$ and - and $> ; c = \lambda\hat{i} + 7\hat{j} + 3\hat{k}$

are coplanar.

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SOLVED EXAMPLES - Question No. 34

Show that the four points A, B, C and D with position vectors

$4\hat{i} + 5\hat{j} + \hat{k}$, $-\left(\hat{j} + \hat{k}\right), 3\hat{j} + 9\hat{j} + 4\hat{k}$ *and* $4\left(\hat{i} + \hat{j} + \hat{k}\right)$, respectively are coplanar.

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SOLVED EXAMPLES - Question No. 35

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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SOLVED EXAMPLES - Question No. 36

Prove that $[\rightarrow a, \rightarrow b, \rightarrow c + \rightarrow d] = [\rightarrow a, \rightarrow b, \rightarrow c] + [\rightarrow a, \rightarrow b, \rightarrow d]$

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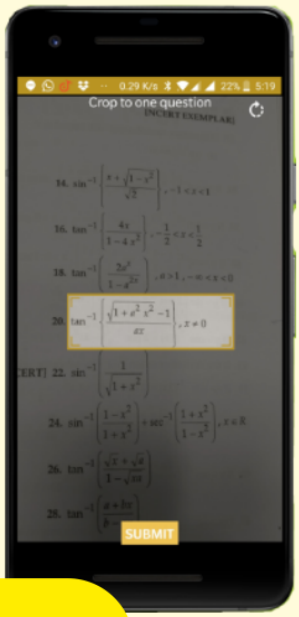

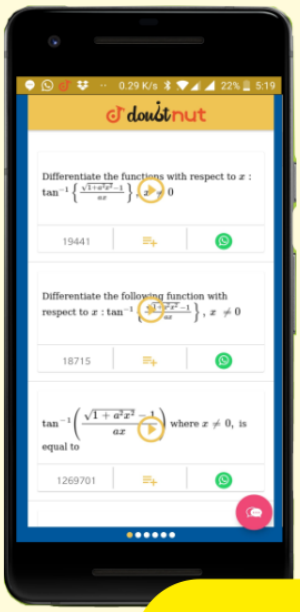

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