



MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

VECTORS

Miscellaneous Exercise

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



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3. A girl walks 4 km towards west, and then she walks 3 km in a direction 30^0 east of north and

stops. Determine the girls displacement from her initial point of departure.



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4. If $\vec{a} = \vec{b} + \vec{c}$, then is it true that

$|\vec{a}| = |\vec{b}| + |\vec{c}|$? Justify your

answer.



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



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



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



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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.

A. $13\sqrt{5}$ sq. units

B. $6\sqrt{5}$ sq. units

C. $11\sqrt{2}$ sq. units

D. $11\sqrt{5}$ sq. units

Answer: D



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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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12.

Let

$$\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}, \quad \vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$$

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} . $\vec{d} =$ 15.



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13. The scalar product of the vector $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ with a unit vector along the sum of the vectors $\vec{b} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\vec{c} = \lambda\hat{i} + 2\hat{j} + 3\hat{k}$ is equal to 1. Find the value of λ and hence find the unit vector along $\vec{b} + \vec{c}$.



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



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15. Prove that

$$|\vec{a} + \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2$$

, 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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16. If θ is the angle between two vectors

\vec{a} and \vec{b} , then $\vec{a} \cdot \vec{b} \geq 0$ only when

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

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

C. $0 < \theta < \pi$

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

Answer: B



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17. Let \vec{a} and \vec{b} be two unit vectors and α be the angle between them, then $\vec{a} + \vec{b}$ is a unit vector, if

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

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

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

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

Answer: D



18. The value of

$$\hat{i} \cdot (\hat{j} \times \hat{k}) + \hat{j} \cdot (\hat{i} \times \hat{k}) + \hat{k} \cdot (\hat{i} \times \hat{j})$$

A. 0

B. -1

C. 1

D. 3

Answer: C



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

A. 0

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

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

D. π

Answer: b



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