MATHS

BOOKS - MBD MATHS (ODIA ENGLISH)

VECTORS

Question Bank

1. If $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} - 2\hat{j} + 2\hat{k}$ and $\vec{c} = \hat{i} + 2\hat{j} + \hat{k}$ then

A. $\vec{a}$ and $\vec{b}$ have the same direction

B. $\vec{a}$ and $\vec{c}$ have opposite directions.

C. $\vec{b}$ and $\vec{c}$ have opposite directions

D.

Answer: D

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2. If the vectors $\vec{a} = 2\hat{i} + 3\hat{j} \pm 6\hat{k}$ and $\vec{b} = \alpha\hat{i} - \hat{j} + 2\hat{k}$ are parallel, then α = _____

A. 2

B. 44257

C. -2/3

D. 44256

Answer: C

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3. If the position vectors of two points A and B are $3\hat{i}+\hat{k}$ and $2\hat{i}+\hat{j}-\hat{k}$, then the vector $\overrightarrow{BA}$ is

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

B. $\hat{i}+\hat{j}$

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

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

Answer: C

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4. If $\left|k\overrightarrow{a}\right|$ = 1`, then

A. $\overrightarrow{a}$ = 1/k

B. $\overrightarrow{a}$ = 1/|k|

C. k = $\frac{1}{\left|\overrightarrow{a}\right|}$

D. k = $\frac{+}{-\left(\frac{1}{\left|\overrightarrow{a}\right|}\right)}$

Answer: D

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5. The direction cosines of the vectors $\overrightarrow{PQ}$ where $\overrightarrow{PQ}$ = (1, 0, -2) and $\overrightarrow{OQ}$ = (3, -2, 0) are

A. 2, -2, 2

B. 4, -2, -2

C. $\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$

D. $\frac{2}{\sqrt{6}}$, -1/sqrt6, $-\frac{1}{\sqrt{6}}$

Answer: C

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6. Reactify the mistakes if any $\vec{a} - \vec{a} = 0$

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7. Reactify the mistakes if any. The vector $\vec{0}$ has unique direction.

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8. Reactify the mistakes if any. All unit vectors are equal.

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9. $\left|\overrightarrow{a}\right|$ = |vecb| = veca = vecb`.

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10. Subtraction of two vectors is not commutative.

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11. If $\overrightarrow{a}$ = (2,1), $\overrightarrow{b}$ = (-1,0), find $3\overrightarrow{a} + 2\overrightarrow{b}$.

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12. If $\vec{a}$ = (1,1,1), $\vec{b}$ = (-1,3,0) and $\vec{c}$ = (2,0,2), find $\vec{a} + 2\vec{b} - \frac{1}{2}\vec{c}$.

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13. If A, B, C and D are the vertices of a square, find $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} + \overrightarrow{DA}$.

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14. The given points A, B, C are the vertices of a triangle. Determine the vectors $\overrightarrow{AB}$, $\overrightarrow{BC}$ and $\overrightarrow{CA}$ and

the lengths of these vectors in the following case.

A(4,5,5), B(3,3,3), C(1,2,5)

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15. The given points A, B, C are the vertices of a triangle. Determine the vectors $\overrightarrow{AB}$, $\overrightarrow{BC}$ and $\overrightarrow{CA}$ and the lengths of these vectors in the following case.

A(8,6,1), B(2,0,1), C(-4,0,-5)

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16. Find the vector from origin to the mid-point of the vector $\overrightarrow{P_1P_2}$ joining the points P_1 (4,3) and P_2(8, -5).

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17. Find the vectors from the origin to the points of trisection the vector $\overrightarrow{P_1P_2}$ joining $P_1(-4, 3)$ and P_2(5, -12).

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18. Find the vectors from the origin to the intersection of the medians of the triangle whose vertices are A(5,2,1), B(-4,7,0) and C(5, -3,5)

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19. Prove that the sum of all the vectors drawn from the centre of a regular octagon to its vertices is the null vector.

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20. Prove that the sum of the vectors represented by the sides of a closed polygon taken in order is a zero vector.

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21. Prove that : $\left|\vec{a}+\vec{b}\right| \leq \left|\vec{a}\right| + \left|\vec{b}\right|$.

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22. State when the equality will hold, $\left|\vec{a}-\vec{b}\right| \geq \left|\vec{a}\right| - \left|\vec{b}\right|$

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23. What is geometrical significance of the relation $\left|\vec{a}+\vec{b}\right| = \left|\vec{a}-\vec{b}\right|$

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24. Find the magnitude of the vector $\overrightarrow{PQ}$, its scalar components and the component vectors along the co-ordinate axes, if P and Q have the co-ordinates P(-1,30, Q(1,2)

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25. Find the magnitude of the vector $\overrightarrow{PQ}$, its scalar components and the component vectors along the co-ordinate axes, if P and Q have the co-ordinates P(-1,-2), Q(-5,-6)

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26. Find the magnitude of the vector $\overrightarrow{PQ}$, its scalar components and the component vectors along the co-ordinate axes, if P and Q have the co-ordinates

P(1,4,-), Q(2,-2,-1)

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27. In each of the following find the vector `vec(PQ), its magnitude and direction cosines, if P and Q have co-ordinates.

P(2,-1,-1), Q(-1,-3,2)

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28. In each of the following find the vector `vec(PQ), its magnitude and direction cosines, if P and Q have co-ordinates.

P(3,-1,7), Q(4,-3,-1).

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29. If $\vec{a}$ = (2,-2,1), $\vec{b}$ = (2,3,6) and $\vec{c}$ = (-1,0,2), Find the magnitude and direction of $\vec{a} - \vec{b} + 2\vec{c}$.

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30. Determine the unit vector having the direction of the given vector in each of the following problems:

$5\hat{i} - 12\hat{j}$

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31. Determine the unit vector having the direction of the given vector in each of the following problems.

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

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32. Determine the unit vector having the direction of the given vector in each of the following problems.

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

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33. Determine the unit vector having the direction of the given vector in each of the following problems.

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

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34. Find the unit vector in the direction of the vector $\vec{r}_1 - \vec{r}_2$, where $\vec{r}_1 = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{r}_2 = 3\hat{i} + \hat{j} - 5\hat{k}$.

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35. Find the unit vector parallel to the sum of the vectors $\vec{a} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\vec{b}$ = `hati+2hatj+3hatk. Also find its direction cosines.

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36. If the sum of the two unit vectors, show that the magnitude of their differences is $\sqrt{3}$.

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37. The position vectors of the points A, B, C and D are $4\hat{i}+3\hat{j}-\hat{k}$, $5\hat{i}+2\hat{j}+2\hat{k}$, $2\hat{i}-2\hat{j}-3\hat{k}$ and $4\hat{i}-4\hat{j}+3\hat{k}$ respectively. Show that AB and CD are parallel.

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38. In each of the following problems, show by vector method that the given points are collinear. A(2,6,3), B(1,2,7) and C(3,10,-1)

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39. In each of the following problems, show by vector method that the given points are collinear. P(2,-1,3), Q(3,-5,1) and R(-1,11,9).

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40. Prove that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{k}$, $3\hat{i} - 4\hat{j} - 4\hat{k}$ are the sides of a right angled triangle.

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41. Prove by vector method that the medians of a triangle are concurrent.

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42. Prove by vector method that the diagonals of a parallelogram bisect each other.

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43. Prove by vector method that the line segment joining the mid points of two sides of a triangle is parallel to the third and half of it.

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44. Prove by vector method that the lines joining the mid points of consecutive sides of a quadrilateral is a parallelogram.

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45. Prove by vector method that in any triangle ABC, the point P being on the side $\overrightarrow{BC}$, if $\overrightarrow{PQ}$ is the resultant of the vectors $\overrightarrow{AP}$, $\overrightarrow{PB}$ and $\overrightarrow{PC}$, then ABQC is a parallelogram.

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46. Prove by vector method that in a parallelogram, the line joining a vertex to the midpoint of an oppositeside trisects the other diagonal.

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47. Each question given below has four possible answers, out of which only one is correct. Choose the correct one. $\left(2\hat{i}-4\hat{j}\right).\left(\hat{i}+\hat{j}+\hat{k}\right)$ = _____

A. -3

B. 2

C. -1

D. -2

Answer: D

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

then

A. $\vec{a} \perp \vec{b}$

B. $\vec{o}\, t\, \vec{c}$

C. $\vec{a} \perp \vec{c}$

D. no pair of vectors are perpendicular

Answer: C

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49. (-3, $\leq mda$, 1) $\perp$ (1,0,-3) $\Rightarrow$ $\leq mda$ = ____

A. 0

B. 1

C. impossible to find

D. any real number

Answer: C

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50. If $\vec{a} . \vec{b} = \vec{c} . \vec{a}$ for all vectors $\vec{a}$, then

A. $\vec{a} \perp \left(\vec{b} - \vec{c} \right)$

B. $\vec{b} - \vec{c} = 0$

C. $\vec{b} \neq \vec{c}$

D. $\vec{b} + \vec{c} = 0$

Answer: B

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51. Find the scalar product of the following pairs of vectors and the angle between them. $3\hat{i} - 4\hat{j}$ and $-2\hat{i} + \hat{j}$

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52. Find the scalar product of the following pairs of vectors and the angle between them. $2\hat{i} - 3\hat{j} + 6\hat{k}$ and $2\hat{i} - 3\hat{j} - 5\hat{k}$

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53. Find the scalar product of the following pairs of vectors and the angle between them. $\hat{i} - \hat{j}$ and $\hat{j} + \hat{k}$

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54. Find the scalar product of the following pairs of vectors and the angle between them. $\vec{a}$ = (2,-2,1) and

$\overrightarrow{b}$ (0,2,4)

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55. If A,B,C are the points (1,0,2), (0,3,1) and (5,2,0) respectively, find $m\angle ABC$

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56. Find the value of λ so that the vectors $\overrightarrow{a}$ and $\overrightarrow{b}$ are perpendicular to each other. $\overrightarrow{a} = 3\hat{i} + 4\hat{j}$, $\overrightarrow{b} = -5\hat{i} + \lambda\hat{j}$.

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57. Find the value of λ so that the vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other. $\vec{a} = \hat{i} + \hat{j} + \lambda\hat{k}$, $\vec{b} = 4\hat{i} - 3\hat{k}$

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58. Find the value of λ so that the vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other. $\vec{a} = 2\hat{i} - \hat{j} - \hat{k}$, $\vec{b} = \lambda\hat{i} + \hat{j} + 5\hat{k}$

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59. Find the value of λ so that the vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other. $\vec{a}$ = (6,2,-3), $\vec{b}$ = (1,-4, λ)

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60. Find the scalar and vector projection of $\vec{a}$ on $\vec{b}$. $\vec{a} = \hat{i}$, $\vec{b} = \hat{j}$

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61. Find the scalar and vector projection of $\vec{a}$ on $\vec{b}$. $\vec{a} = \hat{i} + \hat{j}$, $\vec{b} = \hat{j} + \hat{k}$

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62. Find the scalar and vector projection of $\vec{a}$ on $\vec{b}$.

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

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63. In each of the problems given below, find the work done by a force $\vec{F}$ acting on a particle, such that the particle is displaced from a point A to a point B. $\vec{F} = 4\hat{i} + 2\hat{j} + 3\hat{k}$

A(1,2,0), B(2,-1,3).

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64. In each of the problems given below, find the work done by a force $\vec{F}$ acting on a particle, such that the particle is displaced from a point A to a point B. $\vec{F}$ = $2\hat{i} + \hat{j} - \widehat{K}$

A(0,1,2), B(-2,3,0)

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65. In each of the problems given below, find the work done by a force $\vec{F}$ acting on a particle, such that the particle is displaced from a point A to a point B. $\vec{F}$ =

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

A(1,2,0), B(0,2,3).

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66. In each of the problems given below, find the work done by a force $\overrightarrow{F}$ acting on a particle, such that the particle is displaced from a point A to a point B. $\overrightarrow{F}$ = $3\hat{i} - \hat{j} - 2\hat{k}$

A(-3,-4,1), B(-1,-1,-2).

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67. If $\left(\vec{a}+\vec{b}\right).\left(\vec{a}-\vec{b}\right)=0$ show that $\left|\vec{a}\right|=\left|\vec{b}\right|$.

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

$\left[\left(\vec{a}+\vec{b}\right)^2 means$(veca+vecb).(veca+vecb), $sodoes$ (veca-vecb)^2`.]

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69. Prove that two vactors are perpendicular iff

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

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70. If $\vec{a}, \vec{b}, \vec{c}$ are mutually perpendicular vectors of equal magnitude, show that $\vec{a}+\vec{b}+\vec{c}$ is equally inclined to $\vec{a}.\ \vec{b}.\ \vec{c}$.

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71. Prove the following by vector method. Altitudes of a triangle are concurrent.

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72. Prove the following by vector method. Median to the base of an isosceles triangle is perpendicular to the base.

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73. Prove the following by vector method. The parallelogram whose diagonals are equal is a rectangle.

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74. Prove the following by vector method. The diagonals of a rhombus are at right angles.

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75. Prove the following by vector method. An angle inscribed in a semi-circle is a right angle.

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76. Prove the following by vector method. in any triangle ABC,

$a = b\cos C + c\cos B$.

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77. Prove the following by vector method. In a triangle AOB, $m\angle AOB = 90^\circ$. If P and Q are the points of trisection of AB, prove that

$OP^2 + OQ^2 = \frac{5}{9}AB^2$

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78. Prove the following by vector method. Measure of the angle between two diagonals of a cube is

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

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79. Each question given below has four possible answers, out of which only one is correct. Choose the correct one. $\left(\hat{i}+\hat{k}\right)\times\left(\hat{i}+\hat{j}+\hat{k}\right)$ = ___

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

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

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

D. 2

Answer: B

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80. A vector perpendicular to the vectors $\hat{i} + \hat{j}$ and $\hat{i} + \hat{k}$ is ____

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

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

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

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

Answer: A

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81. The area of the triangle with vertices (1,0,0), (0,1,0) and (0,0,1) is ____

A. 44228

B. 1

C. `sqrt3/2

D. 2

Answer: C

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82. If $\vec{a}$ and $\vec{b}$ are unit vectors such that $\vec{a} \times \vec{b}$ is a unit vector, then the angle between $\vec{a}$ and $\vec{b}$ is ____

A. of any measure

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

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

D. π

Answer: C

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83. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are non-zero vectors, then $\vec{a} \times \vec{b}$ = `vecaxxvecc

A. $\vec{b} = \vec{c}$

B. `veca||(vecb-vecc)

C. $\vec{b} \mid \mid \vec{c}$

D. $\vec{\mathbf{o}} t \vec{c}$

Answer: B

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84. Let $\vec{a} = 2\hat{i} + \hat{j}, \vec{b} = -\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{c} = \hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find $\vec{c} \times \vec{a}$

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85. Let $\vec{a} = 2\hat{i} + \hat{j}, \vec{b} = -\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{c} = \hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find $\vec{a} \times \left(-\vec{b}\right)$

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86. Let $\vec{a} = 2\hat{i} + \hat{j}, \vec{b} = -\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{c} = \hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find

$\left(\vec{a} - 2\vec{b}\right) \times \vec{c}$

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87. Let $\vec{a} = 2\hat{i} + \hat{j}$, $\vec{b} = -\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{c} = -\hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find $\left(\vec{a} - \vec{c}\right) \times \vec{c}$

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88. Let $\vec{a} = 2\hat{i} + \hat{j}$, $\vec{b} = -\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{c} = \hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find $\left(\vec{a} - \vec{b}\right) \times \left(\vec{c} - \vec{a}\right)$

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89. Find the unit vectors perpendicular to the vectors.

$\hat{i}, \hat{k}$

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90. Find the unit vectors perpendicular to the vectors.

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

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91. Find the unit vectors perpendicular to the vectors.

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

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92. Find the unit vectors perpendicular to the vectors.

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

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93. Determine the area of parallelogram whose adjacent sides are the vector $2\hat{i}, \hat{j}$

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94. Determine the area of parallelogram whose adjacent sides are the vector $\hat{i} + \hat{j}, -\hat{i} + 2\hat{j}$

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95. Determine the area of parallelogram whose adjacent sides are the vector $2\hat{i} + \hat{j} + 3\hat{k}, \hat{i} - \hat{j}$

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96. Determine the area of parallelogram whose adjacent sides are the vector (1, -3, 1), (1,1,1)

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97. Calculate the area of the triangle ABC (by vector method) where A(1,2,4), B(3,1,-2), C(4,3,1)

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98. Calculate the area of the triangle ABC (by vector method) where A(1,1,2), B(2,2,3), C(3,-1,-1)

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99. Determine the sine of the angle between the vectors $5\hat{i} - 3\hat{j}, 3\hat{i} - 2\hat{k}$

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100. Determine the sine of the angle between the vectors $\widehat{-} 3\hat{j} + \hat{k}, \hat{i} + \hat{j} + \hat{k}$

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

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102. If $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} \neq \vec{0}$, prove that $\vec{a} + \vec{c} = m\vec{b}$, where m is a scalar.

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103. if $\vec{=} 2\hat{i} + \hat{j} - \hat{k}, \vec{b} = -\hat{i} + 2\hat{j} - 4\hat{k}, \vec{c} = \hat{i} + \hat{j} + \hat{k}$, find $\left(\vec{a} \times \vec{b}\right).\left(\vec{a} \times \vec{c}\right)$.

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104. If $\vec{a} = 3\hat{i} + \hat{j} - 2\hat{k}, \vec{b} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ then verify that $\vec{a} \times \vec{b}$ is perpendicular to both $\vec{a}$ and

$\vec{b}$.

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105. Find the area of the parallelogram whose diagonals are vectors $3\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$.

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106. Show that $\left(\vec{a} - \vec{b}\right) \times \left(\vec{a} + \vec{b}\right) = 2\left(\vec{a} \times \vec{b}\right)$. Interpret this result geometrically.

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107. Each question given below has four possible answers out of which only one is correct. Choose the correct one. $\vec{a} . \vec{b} \times \vec{a}$ =

A. $\vec{0}$

B. 0

C. 1

D. $\vec{a}^2 \vec{b}$

Answer: B

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108. $\left(-\vec{a}\right).\vec{b}\times\left(-\vec{c}\right)\Big)$ =

A. $\vec{a}\times\vec{b}.\vec{c}$

B. $-\vec{a}.\left(\vec{b}\times\vec{c}\right)$

C. $\vec{a}\times\vec{c}.\vec{b}$

D. $\vec{a}.\left(\vec{c}\times\vec{b}\right)$

Answer: B

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109. For the non-zero vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$, $\vec{a}.\left(\vec{b}\times\vec{c}\right)$ = 0 if

A. $\vec{o}\, t\, \vec{c}$

B. $\vec{a} \perp \vec{b}$

C. $\vec{a} \mid \mid \vec{c}$

D. $\vec{a} \perp \vec{c}$

Answer: B

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110. Find the scalar triple product $\vec{b}.\left(\vec{c} \times \vec{a}\right)$ where $\vec{a}, \vec{b}$ and $\vec{c}$ are respectively $\hat{i}+\hat{j}, \hat{i}-\hat{j}, 5\hat{i}+2\hat{j}+3\hat{k}.$

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111. Find the scalar triple product $\vec{b}.\left(\vec{c}\times\vec{a}\right)$ where $\vec{a}$, $\vec{b}$ and $\vec{c}$ are respectively $5\hat{i}-\hat{j}+4\hat{k}, 2\hat{i}+3\hat{j}+5\hat{k}, 5\hat{i}-2\hat{j}+6\hat{k}$

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

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113. Find the volume of the Parallelepiped whose sides are given by the vectors. (1,0,0), (0,1,0), (0,0,1)

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114. Show that the following vector are co-planar. $\hat{i} - 2\hat{j} + 2\hat{k}, 3\hat{i} + 4\hat{j} + 5\hat{k}, -2\hat{i} + 4\hat{j} - 4\hat{k}.$

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115. Show that the following vector are co-planar. $\hat{i} + 2\hat{j} + 3\hat{k}, -2\hat{i} - 4\hat{j} + 5\hat{k}, 3\hat{i} + 6\hat{j} + \hat{k}$

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116. Find the value of λ so that the three vectors are co-planar. $\hat{i}+2\hat{j}+3\hat{k}, 4\hat{i}+\hat{j}+\lambda\hat{k}$ and $\lambda\hat{i}-4\hat{j}+\hat{k}$

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117. Find the value of λ so that the three vectors are co-planar. (2,-1,1), (1,2,-3) and (3,λ,5)

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118. If $\vec{a}, \vec{b}$ and $\vec{c}$ mutually perpendiculars, show that $\left[\vec{a}.\left(\vec{b}\times\vec{c}\right)\right]^2 = a^2b^2c^2$

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119. Show 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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120. Prove that $\left[\vec{a}\times\vec{b}\,\vec{b}\times\vec{c}\,\vec{c}\times\vec{a}\right] = \left[\vec{a}\,\vec{b}\,\vec{c}\right]^2$

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121. For $\vec{a} = \hat{i} + \hat{j}$, $\vec{b} = -\hat{i} + 2\hat{k}$, $\vec{c} = \hat{j} + \hat{k}$, obtain $\vec{a} \times \left(\vec{b} \times \vec{c}\right)$ and also verify the formula $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \left(\vec{a} . \vec{c}\right)\vec{b} - \left(\vec{a} . \vec{b}\right)\vec{c}$.

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122. Prove that $\vec{a} \times \left(\vec{b} \times \vec{c}\right) + \vec{b} \times \left(\vec{c} \times \vec{a}\right) + \vec{c} \times \left(\vec{a} \times \vec{b}\right) = 0$ and hence prove that $\vec{a} \times \left(\vec{b} \times \vec{c}\right), \vec{b} \times \left(\vec{c} \times \vec{a}\right), \vec{c} \times \left(\vec{a} \times \vec{b}\right)$ are coplanar.

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123. If $\vec{a}$, $\vec{b}$, $\vec{c}$ be unit vectors and $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \frac{1}{2}\hat{b}$, find the angles that $\vec{a}$ makes with $\hat{b}$ and $\hat{c}$, where $\hat{b}, \hat{c}$ are not parallel.

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124. Prove that the sum of the vectors directed from the vertices to the mid points of opposite sides of a triangle is zero

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125. Prove by vector method that the diagonals of a quadrilateral bisect each other iff is a parallelogram.

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

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127. If M is the midpoint of the side $\overrightarrow{BC}$ of a triangle ABC, prove that $\overrightarrow{AB} + \overrightarrow{AC} = 2\overrightarrow{AM}$

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128. If $\overrightarrow{a}$ and $\overrightarrow{b}$ are unit vectors represented by the adjacent sides of a regular hexagon, taken in order, what are the vectors represented by the other sides taken in order?

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129. If the points with position vectors $10\hat{i}+3\hat{j}, 12\hat{i}-5\hat{j}$ and $a\hat{i}+11\hat{j}$ are collinear, find the value of a.

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130. Prove that the four points with position vectors $2\vec{a} + 3\vec{b} - \vec{c}$, $\vec{a} - 2\vec{b} + 3\vec{c}$, $3\vec{a} + 4\vec{b} - 2\vec{c}$ and $\vec{a} - 6\vec{b} + 6\vec{c}$ are coplanar.

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131. For any vector $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, prove that $\vec{r} = \left(\vec{r} \cdot \hat{i}\right)\hat{i} + \left(\vec{r} \cdot \hat{j}\right)\hat{j} + \left(\vec{r} \cdot \hat{k}\right)\hat{k}$.

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132. If two vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right| = 3$, $\left|\vec{b}\right| = 2$ and $\vec{a} \cdot \vec{b} = 6$, find $\left|\vec{a} + \vec{b}\right|$ and $\left|\vec{a} - \vec{b}\right|$.

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133. If $\vec{a}$ makes equal angles with $\hat{i}$, $\hat{j}$ and $\hat{k}$ and has magnitude 3, prove that the angle between $\vec{a}$ and each of $\hat{i}$, $\hat{j}$ and $\hat{k}$ is $\cos^{-}\left(\frac{1}{\sqrt{3}}\right)$.

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134. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are such that $\vec{a}.\vec{b} = \vec{a}.\vec{c}$ then show that $\vec{a} = \vec{0}$ or $\vec{b} = \vec{c}$ or $\vec{a}$ is perpendicular to $\vec{b}.\vec{c}$.

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135. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, $|\vec{a}| = 3$, $|\vec{b}| = 5$ and $|\vec{c}| = 7$, find the angle between $\vec{a}$ and $\vec{b}$.

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

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137. Find the angles which the vector $\vec{a} = \hat{i} - \hat{j} + \sqrt{2}\hat{k}$ makes with the coordinates axes.

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138. Find the angle between $\vec{a}$ and $\vec{b}$ if $\left|\vec{a} \times \vec{b}\right| = \vec{a} . \vec{b}$

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