MATHS

BOOKS - V PUBLICATION

VECTOR ALGEBRA

Question Bank

1. Represent graphically a displacement of $40km, 30^\circ$ west of south.

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2. Classify the following, measures as scalars and vectors.

(i) 5 seconds

(ii) $1000m^3$

(iii)$10N$

(iv) $30(km/hr)$

(v) $10(g/cm^3)$

(vi) $20(m/s)$ towards north

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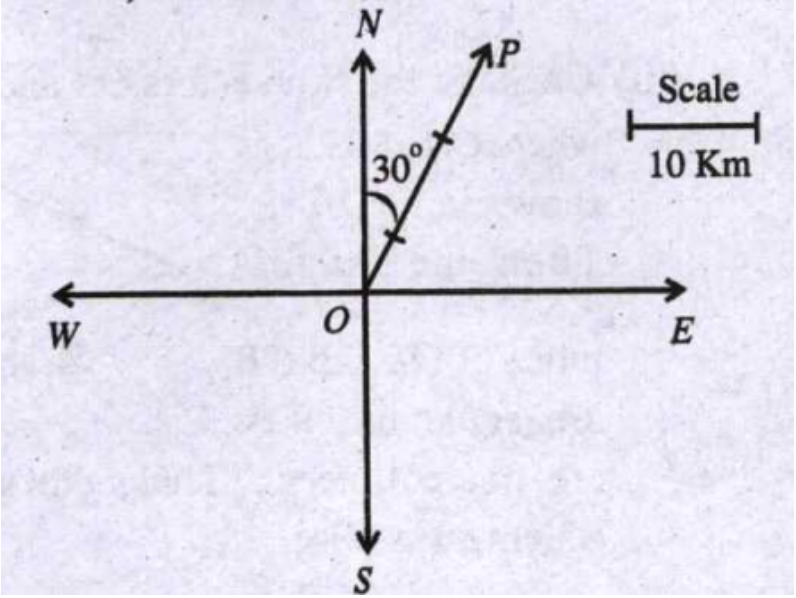
3. Represent graphically a displacement of $40km, 30^\circ$ east of north.



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4. Classify the following measures as scalars and vectors.

i) $10kg$

ii) 2 meters north-west

iii) 40°

iv) 40 watt

v) 10^{-10} coloumb

vi) $-20m/s^2$

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5. Classify the following as scalar and vector quantities.

i) time period

ii) distance.

iii) force

iv) velocity

v) workdone

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6. Answer the following as true or false.

i) $\overrightarrow{a}$ and $-\overrightarrow{a}$ 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 magnitude are equal.

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

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8. Let $\vec{a} = \hat{i} + 2\hat{j}$ and $\vec{b} = 2\hat{i} + \hat{j}$. Is $\left|\vec{a}\right| = \left|\vec{b}\right|$? Are the vectors $\vec{a}$ and $\vec{b}$ equal?

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

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

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11. Find the unit vector in the direction of the sum of the vectors,

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

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12. Write the direction ratio's of the vector, $\vec{a} = \vec{i} + \hat{j} - 2\hat{k}$ and hence calculate its direction cosines.

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

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14. Consider two points P and Q with position vectors $\overrightarrow{OP} = 3\vec{a} - 2\vec{b}$ and $\overrightarrow{OQ} = \vec{a} + \vec{b}$. 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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15. Show that the vectors '2 hati-hatj+hatk, hati-3 hatj-5 hatk' and '3 hati-4 hatj-4 hatk' form the vertices of a right-angled triangle.

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16. Compute the magnitude of the following vectors.

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

$\vec{c} = \frac{1}{\sqrt{3}}\hat{i} + \frac{1}{\sqrt{3}}\hat{j} - \frac{1}{\sqrt{3}}\hat{k}$

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17. Write two different vectors having same magnitude.

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18. Write two different vectors having same direction.

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19. 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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20. Find the scalar and vector components of the vector with initial point (2,1)

and terminal point(-5,7).

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21. Find the sum of the vectors.

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

$\vec{c} = \hat{i} - 6\hat{j} - 7\hat{k}$

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

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23. 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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24. 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 vectors $\vec{a} + \vec{b}$

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25. 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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26. 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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27. Find the direction cosines of the vector $\hat{i} + 2\hat{j} + 3\hat{k}$

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28. Find the, direction cosines of the vector joining 'A(1,2,-3)' and 'B(-1,-2,1)', directed from 'A' fò 'B'.

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

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30. 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 (li) externally.

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

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33. In triangle 'ABC', which of the following is not true.

$(\#\#VPU_HSS_MAT_XII_C10_E03_{020}\_Q01\#\#)$

A. vec(AB)+vec(BC)+vec(CA)=vec0'

B. vec(AB)+vec(BC)-vec(AC)=vec0'

C. vec(A B)+vec(B C)-vec(C A)=vec0'

D. vec(A B)-vec(C B)+vec(C A)=vec0'

Answer: C

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34. If $\vec{a}$ and $\vec{b}$ are two collinear vectors, then which of the following are incorrect: a) $\vec{b} = \vec{a}\lambda scalar\lambda$ b) $\vec{a} = \pm \vec{b}$ c)The respective components of $\vec{a}$ and $\vec{b}$ are proportional d)Both $\vec{a}$ and $\vec{b}$ have same direction, but different magnitude.

A. vecb=lambda veca', for some scalar 'lambda'.

B. veca=+- vecb'

C. the respective components of 'veca' and 'vecb' are proportional

D. Both the vectors a and 'vecb' have'same direction, but different magnitudes.

Answer: D

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

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

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

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

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

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40. 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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41. For any two vectors $\vec{a}$ and $\vec{b}$, we always have $\left|\vec{a} + \vec{b}\right| \leq \left|\vec{a}\right| + \left|\vec{b}\right|$ (triangle ineuality)

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42. 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 $C\left(7\hat{i}-\hat{k}\right)$ are collinear.

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

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

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

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46. Find the projection of a vector $i + 3j + 7k$ on the vector $7i - j + 8k$.

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47. 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 the are mutually perpendicular to each other.

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

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

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

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

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

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54. If $\vec{a}.\vec{a} = 0$ and $\vec{a}.\vec{b} = 0$, then what can be concluded about the vector $\vec{b}$?

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

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

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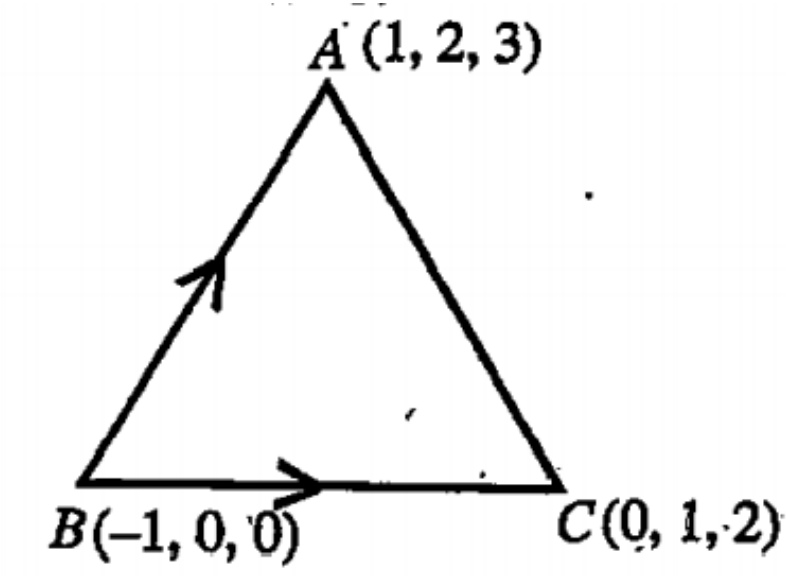
57. If the vertices A,B,C of a triangle ABC are (1,2,3),(-1,0,0), (0,1,2)respectively,then find $\angle ABC$.



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58. Using vectors, show that the points $A(1, 2, 7), B(2, 6, 3), C(3, 10, -1)$ are collinear.

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59. 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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60. If a is a non-zero vector of magnitude'a' and λ a non-zero scalar, then $\lambda\vec{a}$ is a unit vector if: a)$\lambda = 1$ b) $\lambda = -1$ c)$a = |\lambda|$ d)$a = \frac{1}{|\lambda|}$

A. lambda=1'

B. lambda=-1'

C. a=|lambda|',

D. 1/(|lambda|)'

Answer: D

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61. Show that the area of a parallelogram with diagonals $\vec{a}$ and $\vec{b}$ is $\frac{1}{2}\left|\vec{a}\times\vec{b}\right|$

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62. 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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63. 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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64. Consider the triangle ABC with vertices A(1,1,1), B(1,2,3) and C(2,3,1).Hence find the area of the triangle.

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

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

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

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

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68. Choose the correct answer from the backet. If a unit vector $\hat{a}$ makes angles $\frac{\pi}{4}$ with i and $\frac{\pi}{3}$ with j and acute angle θ with k.

then θ is

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

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70. Find $\lambda$and μ if

$$\left(2\hat{i}+6\hat{j}+27\hat{k}\right)\times\left(\hat{i}+\lambda\hat{j}+\mu\hat{k}\right)=\vec{0}.$$

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

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72. Let the vectors 'veca, vecb, vecc' be given as 'a_1 hati+a_2 hatj+a_3 hatk, b_1 hati+b_2 hatj+b_3 hatk, c_1

hati+c_2 hatj+c_3 hatk', Then show that 'veca xx(vecb+vecc)=veca xx vecb+veca xx vecc'

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

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74. 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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75. Find the area of the parallelogram whose adjacent sides are determined by the vectors 'veca=hati-hatj+3 hatk' and 'vecb=2 hati-7 hatj+hatk'

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76. Let the vectors $\vec{a}$ and $\vec{b}$ be such that $\left|\vec{a}\right| = 3 \text{and} \left|\vec{b}\right| = \frac{\sqrt{2}}{3}$,then $\vec{a} \times \vec{b}$ is a unit vector, if the angle between $\vec{a}$ and $\vec{b}$ is : a) $\frac{\pi}{6}$ b) $\frac{\pi}{4}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{2}$

A. pi/6'

B. pi/4'

C. pi/3'

D. pi/2'

Answer: B

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77. Area of a rectangle having vertices 'A, B, C' and 'D' with position vectors '-hati+1/2 hatj+4 hatk', 'hati+1/2 hatj+4 hatk, hati-1/2 hatj+4 hatk' and '-hati-1/2 hatj+4 hatk' respectively is

A. 1/2'

B. 1

C. 2

D. 4

Answer: C

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78. 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 $\overline{AB}$ and $\overline{CD}$. Deduce that $\overline{AB}$ and $\overline{CD}$ are collinear.

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79. Let $\vec{a}, \vec{b}$, and $\vec{c}$ be three vectors such that $\left|\vec{a}\right|=3, \left|\vec{b}\right|=4, \left|\vec{c}\right|=5$ and each

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

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80. Three vectors $\vec{a}, \vec{b}$, and $\vec{c}$ satisfy the condition $\vec{a}+\vec{b}+\vec{c}=\vec{0}$. Evaluate the quantity $\mu=\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$. If $\left|\vec{a}\right|=1, \left|\vec{b}\right|=4$ and $\left|\vec{c}\right|=2$.

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81. Write down a unit vector in XY plane making an angle of 30°

with the positive direction of x-axis.

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82. 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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83. If 'veca=vecb+vecc', then is it true that '|veca|=|vecb|+|vecc| ?' Justify your answer.

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84. Find the value of 'x' for which 'x(hati+hatj+hatk)' is a unit vector.

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85. 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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86. 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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87. Show that the points A(1,-2,-8),B(5,0,-2)andC(11,3,7)are collinear and find the ratio in which B divides AC.

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

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89. The two adjacent sides of a parallelogram are '2 hati-4 hatj+5 hatk' and 'hati .-2 hatj-3 hatk .' Find the unit vector parallel to its diagonal. Also find its,area.

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90. 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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91. Let ' veca=hati+4 hatj+2 hatk, vecb=3 hati-2 hatj+7 hatk' and 'vecc=2 hati-hatj+4 hatk'. Find a vector 'd' 'which is perpendicular to both 'veca' and 'vecb', and 'vecc . vecd=15'

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

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

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95. Choose the correct answer. If θ is the angle between two vectors $\vec{a}$ and $\vec{b}$, then $\vec{a}.\vec{b} \geq 0$ only when a) $0 < \theta < \frac{\pi}{2}$ b)$0 \leq \theta \leq \frac{\pi}{2}$ c)$0 < \theta < \pi$ d)$0 \leq \theta \leq \pi$

A. 0ltthetaltpi/2'

B. 0 le theta le pi/2'.

C. 0lttheta leslant pi, '

D. 0 le, theta le pi'

Answer: B

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96. Let 'veca' and 'vecb' be two unit vectors and 'theta' is the angle between them. Then 'veca,+vecb' is a unit vector if

A. theta=pi/4'

B. theta=pi/3'

C. theta=pi/2'

D. theta=2 fra.pi/3'

Answer: D

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97. The value of $\hat{i}.\left(\hat{j}\times\hat{k}\right)+\hat{j}.\left(\hat{i}\times\hat{k}\right)+\hat{k}.\left(\hat{i}\times\hat{j}\right)$ is a)0 b)-1 c)1 d)3

A. 0

B. -1

C. 1

D. 3

Answer: C

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98. If θ is the angle between any two vectors $\vec{a}$ 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

A. 0

B. pi/4'

C. pi/2'

D. pi'

Answer: B

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99. Prove that the Iine joining the midpoints of the two sides of a triangle is parallel to the third side and half of its length.

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

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101. Show that the line segment joining the midpoints of two 'sides of a triangle is parallel to. the third side and is half its length using vectors.

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102. If $P = (2, 4, 7)$ and $Q = (-4, -1, 5)$, then find $\overline{PQ}$ and $\left|\overline{PQ}\right|$

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103. i) Compute $\left|\hat{i} + \hat{j} + \hat{k}\right|$

ii) If $\vec{a} = 2\hat{i} + 3\hat{j} + 6\hat{k}$, find the unit vector along $\vec{a}$.

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104. Find a vector in the direction of the vector '-hati+2 hatj+2 hatk' that has magnitude '7 .'

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105. Find a unit vector parallel to the sum of vectors $\vec{a} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$

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106. Find the condition that the vectors $\vec{a} = k\hat{i} + 3\hat{j}$ and $\vec{b} = 4\hat{i} + k\hat{j}(k \neq 0)$ are parallel.

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107. Let 0 be the centre of the regular hexagon ABCDEF. Find the sum of the vectors 'vec(O A)+vec(O B)+vec(O C)+vec(O D)+vec(O E)+vec(O F)'

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108. Show that the diagonals of a quadrilateral bisect each other if and only if it is a parallelogram.

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109. Prove that the quadrilatral formed by joining the mid points of the sides of a quadrilateral is a parallelogram.

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110. Find the vector with initial point 'A(6,-2)' and terminal point 'B(4,8)'

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111. The vectors of magnitude a, 2a, 3a meet at a point and their directions are along the diagonals of three adjacent faces of a cube. Then, the magnitude of their resultant is a)5a b)6a c)10a d)9a

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112. Find the unit vector in the direction of vector 'vecP Q', where 'P' and 'Q' are the points '(1,2,3)' and '(4,5,6)'

respectively.

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113. Find the còndition that the vectors $\vec{a} = k\hat{i} + l\hat{j}$ and $\vec{b} = l\hat{i} + k\hat{j}(k, l \neq 0)$ are parallel.

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

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115. Find the length of the medians of the triangle formed by

$A(4, 2), B(1, -2)$ and $C(-2, 6)$ by vector method.

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116. Show that the points with position vectors '2 hati+6 hatj+3 hatk, hati+2 hatj+7 hatk' and '3 hati+10 hatj-hatk' are collinear.

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117. Show that the four points A, B, C and D with position vectors $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ respectively are coplanar if $3\vec{a} - 2\vec{b} + \vec{c} - 2\vec{d} = 0$

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