MATHS

BOOKS - ACCURATE PUBLICATION

VECTOR ALGEBRA

Questions Carrying 1 Mark Type I Multiple Choice Questions

1. In triangle ABC, which of the following is not true:

A. $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \overrightarrow{0}$

B. $\overrightarrow{AB} + \overrightarrow{BC} - \overrightarrow{AC} = \overrightarrow{0}$

C. $\overrightarrow{AB} + \overrightarrow{BC} - \overrightarrow{CA} = \overrightarrow{0}$

D. $\overrightarrow{AB} - \overrightarrow{CB} + \overrightarrow{CA} = \overrightarrow{0}$

Answer: c

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2. If $\overrightarrow{a}$ and $\overrightarrow{b}$ are two collinear vectors, then which of the following are incorrect:

A. $\overrightarrow{b} = \lambda \overrightarrow{a}$, for some scalar λ

B. $\overrightarrow{a} = \pm \overrightarrow{b}$

C. the respective components of $\overrightarrow{a}$ and $\overrightarrow{b}$ are proportional

D. both the vectors $\overrightarrow{a}$ and $\overrightarrow{b}$ have same direction, but different magnitudes

Answer: d

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3. The magnitude of the vector $2\hat{i} - 6\hat{j} - 3\hat{k}$ is :

A. 7

B. 2

C. 8

D. None of these

Answer: a

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4. Magnitude of the vectors $\frac{1}{\sqrt{3}}\hat{i}+\frac{1}{\sqrt{3}}\hat{j}+\frac{1}{\sqrt{3}}\hat{k}$ is equal to

A. -1

B. 1

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

D. 0

Answer: b

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5. Magnitude of the vectors $\frac{2}{\sqrt{3}}\hat{i}+\frac{2}{\sqrt{3}}\hat{j}+\frac{2}{\sqrt{3}}\hat{k}$ is equal to

A. -1

B. 2

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

D. 0

Answer: b

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6. Direction ratios of vector $1\hat{i}+3\hat{j}+4\hat{k}$ are

A. $<1,3,4>$

B. $<3,4,2>$

C. $<4,3,2>$

D. $< 3, 2, 4 >$

Answer: a

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7. If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} + 2\hat{k}$, then vector in the direction of $\vec{a} + \vec{b}$ with magnitude 9 is :

A. $9\hat{k}$

B. $3\hat{k}$

C. $\hat{k}$

D. $6\hat{k}$

Answer: a

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8. If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} + 5\hat{k}$ then vector in the direction of $\vec{a} + \vec{b}$ with magnitude 7 is:

A. a) $6\hat{k}$

B. b) $3\hat{k}$

C. c) $7\hat{k}$

D. d) $14\hat{k}$

Answer: c

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9. If $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} + 2\hat{k}$ then the unit vector in the direction of $\vec{a} - \vec{b}$ is :

A. $9\hat{k}$

B. $3\hat{k}$

C. $\hat{k}$

D. $6\hat{k}$

Answer: c

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10. If $\vec{a} = 2\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} + \hat{k}$ then the unit vector in the direction of $\vec{a} - \vec{b}$ is:

A. $\hat{i}$

B. $\hat{k}$

C. $\hat{j}$

D. $6\hat{k}$

Answer: c

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11. If position vector of mid point of vector joining the point $P(8, 3, 4)$ and Q(4,7,-2) is

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

B. $6\hat{i} + 5\hat{j} - \hat{k}$

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

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

Answer: b

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12. Position vector of mid point of vector joining the points P(2,3,6) and Q(4,5,-2) is : $\overrightarrow{a}$. $\overrightarrow{b}$

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

B. $6\hat{i}-\hat{j}-3\hat{k}$

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

D. $3\hat{i}+4\hat{j}+2\hat{k}$

Answer: d

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13. If $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 3$ and $\vec{a} \cdot \vec{b} = 3$, then the angle between $\vec{a}$ and $\vec{b}$ equals :

A. 0

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

C. $\frac{\pi}{6}$

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

Answer: b

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14. If $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 7$ and $\vec{a} . \vec{b}$ = 7, then angle between $\vec{a}$ and $\vec{b}$ equals to ,

A. 0

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

C. $\frac{\pi}{6}$

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

Answer: b

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15. If $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 5$ and $\vec{a} . \vec{b}$ = 5, then angle between $\vec{a}$ and $\vec{b}$ equals to ,

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

B. $\frac{\pi}{6}$

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

D. 0

Answer: a

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16. If $\left|\vec{a}\right| = 1, \left|\vec{b}\right| = 2$ and $\vec{a} \cdot \vec{b} = 1$. Then the angle between $\vec{a}$ and $\vec{b}$ is :

A. 0

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

C. π

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

Answer: b

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17. If $\sqrt{2}\left(\vec{a}.\ \vec{b}\right) = \left|\vec{a}\right|\left|\vec{b}\right|$ then angle between $\vec{a}$ and $\vec{b}$ equals to ,

A. 30°

B. 45°

C. 60°

D. 90°

Answer: b

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18. The projection of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ on $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$ is equal to:

A. $\frac{5\sqrt{6}}{3}$

B. $\frac{5}{\sqrt{6}}$

C. $\frac{6}{\sqrt{14}}$

D. $\frac{\sqrt{6}}{5}$

Answer: b

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19. The projection of $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$ is equal to:

A. $\frac{\sqrt{6}}{14}$

B. $\frac{5\sqrt{6}}{3}$

C. $\frac{5}{\sqrt{6}}$

D. $\frac{6}{\sqrt{14}}$

Answer: b

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20. If $\vec{a} = \lambda\hat{i} + 3\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + 3\hat{k}$ are per[endicular to each other, the value of λ is :

A. 3

B. -3

C. 6

D. 9

Answer: b

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21. If $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 8\hat{k}$ are per[endicular to each other, the value of λ is :

A. 6

B. 7

C. 8

D. 16

Answer: b

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22. If $\vec{a} = \hat{i} + \hat{j} - \lambda\hat{k}$ and $\vec{b} = 2\hat{i} + \lambda\hat{k}$ are per[endicular to each other, the value of λ is :

A. $+1$

B. $\pm\sqrt{2}$

C. $\pm\sqrt{3}$

D. None of these

Answer: b

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23. For which value of λ the vector $\vec{a} = 2\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} - 3\hat{j} + \lambda\hat{k}$ are perpendicular to each other :

A. $\frac{1}{2}$

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

C. $-\frac{1}{2}$

D. 0

Answer: c

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24. If $\vec{a} = \hat{i} + \hat{j} - \lambda\hat{k}$ and $\vec{b} = 2\hat{i} + \lambda\hat{k}$ are per[endicular to each other, the value of λ is :

A. ± 1

B. $\pm\sqrt{2}$

C. $\pm\sqrt{3}$

D. None of these

Answer: b

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25. If $\vec{a}$ is any vector, then $\vec{a} \cdot \vec{a}$ is :

A. 0

B. $\overrightarrow{0}$

C. $\neq 0$

D. $\left|\overrightarrow{a}\right|^2$

Answer: d

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26. If $\overrightarrow{a} \cdot \overrightarrow{a} = 0$, then $\overrightarrow{a}$ is :

A. Proper vector

B. Free vector

C. Null vector

D. None of these

Answer: c

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27. If $\vec{a} = 3\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} + 3\hat{k}$ then $\vec{a} . \vec{b}$ is equal to :

A. 3

B. 9

C. -9

D. -3

Answer: b

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28. If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{j} - \hat{k}$ then $\vec{a} . \vec{b}$ is equal to :

A. 3

B. 4

C. -3

D. -1

Answer: a

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29. If $\vec{a} = 2\hat{i} + 3\hat{j} - 5\hat{k}$ and $\vec{b} = \hat{i} + \hat{j} - \hat{k}$, then $\vec{a} \cdot \vec{b}$ is :

A. 10

B. 0

C. 5

D. 2

Answer: a

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30. If $\vec{a}$ is any vector, then $\vec{a} \times \vec{a}$ is :

A. 1

B. 0

C. $\left|\vec{a}\right|^2$

D. $\overrightarrow{0}$

Answer: d

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31. If $\left|\overrightarrow{a}\cdot\overrightarrow{b}\right| = \left|\overrightarrow{a}\times\overrightarrow{b}\right|$,then angle between $\overrightarrow{a}$ and $\overrightarrow{b}$ is :

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

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

C. π

D. $\frac{\pi}{6}$

Answer: a

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32. If $\sqrt{3}\left|\vec{a}.\ \vec{b}\right| = \left|\vec{a} \times \vec{b}\right|$, then angle between $\vec{a}$ and $\vec{b}$ is:

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

B. $\frac{\pi}{6}$

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

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

Answer: a

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33. If $\vec{a} \cdot \vec{b} = \sqrt{3}\left|\vec{a} \times \vec{b}\right|$, then angle between vector $\vec{a}$ and vector $\vec{b}$ is :

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

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

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

D. $\frac{\pi}{6}$

Answer: d

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34. The value of : $\hat{i} \cdot \left(\hat{j} \times \hat{k}\right) + \hat{j} \cdot \left(\hat{i} \times \hat{k}\right) + \hat{k} \cdot \left(\hat{i} \times \hat{j}\right)$ is :

A. 1

B. -1

C. 3

D. 0

Answer: a

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35. 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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36. Let $\vec{a}$ and $\vec{b}$ be two unit vectors and θ is the angle between them. Then $\vec{a} + \vec{b}$ is a unit vector if :

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

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

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

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

Answer: d

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37. Let the vectors $\vec{a}$ and $\vec{b}$ be such that $\left|\vec{a}\right| = 3$ 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. $\pi/6$

B. $\pi/4$

C. $\pi/3$

D. $\pi/2$

Answer: b

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38. Let the vectors $\vec{a}$ and $\vec{b}$ be such that $\left|\vec{a}\right| = 3$ 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. $\pi/6$

B. $\pi/4$

C. $\pi/3$

D. $\pi/2$

Answer: b

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39. This ineqality $\left|\vec{a}.\ \vec{b}\right| \leq \left|\vec{a}\right|\left|\vec{b}\right|$ is called

A. Cauchy Schwartz inequality

B. Triangle inequality

C. Rolle's Theorem

D. Lagrange's Mean Value theorem.

Answer: a

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40. The magnitude of the vector $6\hat{i} + 2\hat{j} + 3\hat{k}$ is :

A. 5

B. 7

C. 12

D. 1

Answer: b

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41. The position vector of the point which divides the join of points with position vectors $\vec{a} + \vec{b}$ and $2\vec{a} - \vec{b}$ in the ratio 1:2 is

A. $\frac{3\vec{a} + 2\vec{b}}{3}$

B. $\vec{a}$

C. $\frac{5\vec{a} - \vec{b}}{3}$

D. $\frac{4\vec{a} + \vec{b}}{3}$

Answer: d

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42. The vector with initial point P(2,-3,5) and terminal point Q(3,-4,7) is :

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

B. $5\hat{i} - 7\hat{j} + 12\hat{k}$

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

D. None of these

Answer: a

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43. The angle between the vectors $\hat{i} - \hat{j}$ and $\hat{j} - \hat{k}$ is :

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

B. $\frac{2\pi}{3}$

C. $-\frac{\pi}{3}$

D. $\frac{5\pi}{6}$

Answer: b

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44. The value of $'\lambda'$ for which the two vectors : $2\hat{i} - \hat{j} + 2\hat{k}$ and $3\hat{i} + \lambda\hat{j} + \hat{k}$ are perpendicular is :

A. 2

B. 4

C. 6

D. 8

Answer: d

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45. The area of the parallelogram whose adjacent sides are $\hat{i} + \hat{k}$ and $2\hat{i} + \hat{j} + \hat{k}$ is :

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 3

D. 4

Answer: b

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46. If $\left|\vec{a}\right| = 8, \left|\vec{b}\right| = 3$ and $\left|\vec{a} \times \vec{b}\right| = 12$, then value of $\vec{a} \cdot \vec{b}$ is :

A. $6\sqrt{3}$

B. $8\sqrt{3}$

C. $12\sqrt{3}$

D. None of these

Answer: c

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47. The two vectors $\hat{j}+\hat{k}$ and $3\hat{i}-\hat{j}+4\hat{k}$ represent the two sides AB and AC respectively of a $\triangle ABC$. Find the lengthof the median through A

A. $\frac{\sqrt{34}}{2}$

B. $\frac{\sqrt{48}}{2}$

C. $\sqrt{18}$

D. None of these

Answer: a

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48. The projection of vector $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ along $\vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$ is

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

B. b) $\frac{1}{2}$

C. c) 2

D. d) $\sqrt{6}$

Answer: a

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49. If $\vec{a}$ and $\vec{b}$ are unit vectors then what is the angle between $\vec{a}$ and $\vec{b}$ for $\sqrt{3}\vec{a} - \vec{b}$ to be a unit vector?

A. a) 30°

B. b) 45°

C. c) 60°

D. d) 90°

Answer: a

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50. The unit vector perpendicular to the vectors $\hat{i} - \hat{j}$ and $\hat{i} + \hat{j}$ forming a right handed system is

A. a) $\hat{k}$

B. b) $-\hat{k}$

C. c) $\frac{\hat{i} - \hat{j}}{\sqrt{2}}$

D. d) $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$

Answer: a

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51. If $\left|\overrightarrow{a}\right| = 3$ and $-1 \leq k \leq 2$, then $\left|k\overrightarrow{a}\right|$ lies in the interval

A. $[0, 6]$

B. $[-3, 6]$

C. $[3, 6]$

D. $[1, 2]$

Answer: a

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52. The vector in the direction of the vector $\hat{i} - 2\hat{j} + 2\hat{k}$ that has magnitude 9 is

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

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

C. $3\left(\hat{i} - 2\hat{j} + 2\hat{k}\right)$

D. $\left(\hat{i} - 2\hat{k} + 2\hat{k}\right)$

Answer: c

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53. The position vector of the point which divides the join of points $2\vec{a} - 3\vec{b}$ and $\vec{a} + \vec{b}$ in the ratio 3:1 is

A. $\frac{3\vec{a} - 2\vec{b}}{2}$

B. $\frac{7\vec{a} - 8\vec{b}}{4}$

C. $\frac{3\vec{a}}{4}$

D. $\frac{5\vec{a}}{4}$

Answer: d

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54. The vector 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. $5\hat{i}+2\hat{j}-4\hat{k}$

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

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

Answer: c

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55. The angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes $\sqrt{3}$ and 4, respectively and $\vec{a}.\vec{b}=2\sqrt{3}$ is

A. $\frac{\pi}{6}$

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

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

D. $\frac{5\pi}{2}$

Answer: b

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56. Find the value of λ such that the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ are orthogonal

A. 0

B. 1

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

D. $-\frac{5}{2}$

Answer: d

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57. The value of λ for which the vector $3\hat{i} - \hat{j} + \hat{k}$ 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: a

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58. The vectors from origin to the points A and B are $\vec{a} = 2\hat{i} - 3\hat{j} + 2\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} + \hat{k}$, respectively then the area of triagnle OAB is

A. 340

B. $\sqrt{25}$

C. $\sqrt{229}$

D. $\frac{1}{2}\sqrt{229}$

Answer: d

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59. For any vector $\vec{a}$ the value of $\left(\vec{a} \times \hat{i}\right)^2 + \left(\vec{a} \times \hat{j}\right)^2 + \left(\vec{a} \times \hat{k}\right)^2$ is equal to

A. $\vec{a}^2$

B. $3\vec{a}^2$

C. $4\vec{a}^2$

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

Answer: d

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60. If $\left|\vec{a}\right| = 10, \left|\vec{b}\right| = 2$ and $\vec{a} . \vec{b} = 12$, then value of $\left|\vec{a} \times \vec{b}\right|$ is

A. 5

B. 10

C. 14

D. 16

Answer: d

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61. The vectors $\lambda\hat{i} + \hat{j} + 2\hat{k}$, $\hat{i} + \lambda\hat{j} - \hat{k}$ and $2\hat{i} - \hat{j} + \lambda\hat{k}$ are coplanar if

A. $\lambda = -2$

B. $\lambda = 0$

C. $\lambda = 1$

D. $\lambda = -1$

Answer: a

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

A. 1

B. 3

C. $-\frac{3}{2}$

D. None of these

Answer: c

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63. Projection of a vector $\vec{a}$ on vector $\vec{b}$ is given by

A. $\left(\frac{\vec{a}.\vec{b}}{\left|\vec{b}\right|^2}\right)\vec{b}$

B. $\frac{\vec{a}.\vec{b}}{\left|\vec{b}\right|}$

C. $\frac{\vec{a}.\vec{b}}{\left|\vec{a}\right|}$

D. $\left(\frac{\vec{a}.\vec{b}}{\left|\vec{a}\right|^2}\right)\hat{b}$

Answer: a

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64. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 3, \left|\vec{c}\right| = 5$ the value of $\vec{a}.\ \vec{b} + \vec{b}.\ \vec{c} + \vec{c}.\ \vec{a}$ is

A. 0

B. 1

C. -19

D. 38

Answer: c

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65. If $\left|\overrightarrow{a}\right| = 4$ and $-3 \leq \lambda \leq 2$ then the range of $\left|\lambda\overrightarrow{a}\right|$ is

A. 1) [0,8]

B. 2) [-12,8]

C. 3) [0,12]

D. 4) [8,12]

Answer: c

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66. The number of vectors of unit length perpendicular to the vectors $\overrightarrow{a} = 2\hat{i} + \hat{j} + 2\hat{k}$ and $\overrightarrow{b} = \hat{j} + \hat{k}$ is

A. one

B. two

C. three

D. infinite

Answer: b

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Questions Carrying 1 Mark Type Ii Fill In The Blanks Questions

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

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2. Magnitude of the vectors $\frac{2}{\sqrt{3}}\hat{i}+\frac{2}{\sqrt{3}}\hat{j}+\frac{2}{\sqrt{3}}\hat{k}$ is equal to

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3. Direction ratio's of vectors $3\hat{i}+2\hat{j}+4\hat{k}$ are :

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4. If $\vec{a}=2\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=-2\hat{i}+\hat{j}+2\hat{k}$, then vector in the direction of $\vec{a}+\vec{b}$ with magnitude 5 is :

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5. If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$ then the unit vector in the direction of $\vec{a} - \vec{b}$ is equal to .....

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6. Position vector of mid-point of vector joining the points P (2,3,4)andQ(4, l,-2) is:

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7. If $\left|\vec{a}\right| = \sqrt{3}, \left|\vec{b}\right| = 2$ and $\vec{a} \cdot \vec{b} = \sqrt{6}$. Then the angle between $\vec{a}$ and $\vec{b}$ is :

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8. If $\left|\vec{a}\right| = 1, \left|\vec{b}\right| = 2$ and $\vec{a} \cdot \vec{b} = 1$. Then the angle between $\vec{a}$ and $\vec{b}$ is :

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9. If $2\left(\vec{a} . \vec{b}\right) = \left|\vec{a}\right|\left|\vec{b}\right|$ then angle between $\vec{a}$ and $\vec{b}$ equals to ,

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10. The projection of $\vec{a} = 2\hat{i} - 2\hat{j} - \hat{k}$ on $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$ is equal to:

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11. If $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 8\hat{k}$ are per[endicular to each other, the value of λ is :

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12. The value of λ for which the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$ are perpendicular to each other is :

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13. If $\vec{a} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 5\hat{i} - \hat{j} + 2\hat{k}$, then $\vec{a} \cdot \vec{b}$ is :

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14. If $\vec{a} = 2\hat{i} + \hat{j} + 7\hat{k}$ and $\vec{b} = 5\hat{i} - 3\hat{j} + 10\hat{k}$, then $\vec{a} \cdot \vec{b}$ is :

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15. If $\vec{a} \cdot \vec{b} = \left|\vec{a} \times \vec{b}\right|$, then angle between vector $\vec{a}$ and vector $\vec{b}$ is :

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16. If $\sqrt{3}\vec{a} . \vec{b} = \left|\vec{a} \times \vec{b}\right|$ then angle between vector $\vec{a}$ and vector $\vec{b}$ is .....

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17. If $\vec{a} . \vec{b} = \left| \vec{a} \times \vec{b} \right|$ then angle between vector $\vec{a}$ and vector $\vec{b}$ is .....

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18. The value of : $\hat{i} \cdot \left(\hat{j} \times \hat{k} \right) + \hat{j} \cdot \left(\hat{k} \times \hat{i} \right) + \hat{k} \cdot \left(\hat{i} \times \hat{j} \right)$ is :

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19. If θ is the angle between two vectors $\vec{a}$ and $\vec{b}$, then $\left| \vec{a} \cdot \vec{b} \right| = \left| \vec{a} \times \vec{b} \right|$ when θ is equal to :

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20. If θ is the angle between two vectors $\vec{a}$ and $\vec{b}$, then $\left|\vec{a} \cdot \vec{b}\right| = \left|\vec{a} \times \vec{b}\right|$ when θ is equal to :

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21. The vector $\vec{a} + \vec{b}$ bisects the angle between the non collinear vectors $\vec{a}$ and $\vec{b}$ if .....

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22. If $\vec{r} . \vec{a} = 0, \vec{r} . \vec{b} = 0$ and $\vec{r} . \vec{c} = 0$ for some non zero vector $\vec{r}$ then the value of $\vec{a} . \left(\vec{b} \times \vec{c}\right)$ is .....

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23. The vector $\vec{a} = 3\hat{i} - 2\hat{j} + 2\hat{k}$ and $\vec{b} = -\hat{i} - 2\hat{k}$ are the adjacent sides of a parallelogram. The acute angle between its diagonals is .....

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24. The value of k for which $\left|k\vec{a}\right| < \left|\vec{a}\right|$ and $k\vec{a} + \frac{1}{2}\vec{a}$ is parallel to $\vec{a}$ holds true are.....

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25. The value of the expression $\left|\vec{a} \times \vec{b}\right|^2 + \left(\vec{a} . \vec{b}\right)^2$ is .....

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26. If $\left|\vec{a} \times \vec{b}\right|^2 + \left|\vec{a} . \vec{b}\right|^2 = 144$ and $\left|\vec{a}\right| = 3$ then $\left|\vec{b}\right|$ is equal to

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27. If $\vec{a}$ is any vector, then show that $\vec{a} = \left(\vec{a} . \hat{i}\right)\hat{j} + \left(\vec{a} . \hat{j}\right)\hat{j} + \left(\vec{a} . \hat{k}\right)\hat{j}.$

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Questions Carrying 1 Mark Type Iii True Ro False Questions

1. If $\left|\vec{a}\right| = \left|\vec{b}\right|$ then necessarily it impulies $\vec{a} = \pm \vec{b}$.

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2. Position vector of a point P is vectors whose initial point is origin.

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3. If $\vec{a} \cdot \vec{b} = -\left|\vec{a}\right|\left|\vec{b}\right|$, then $\theta =$

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4. The formula $\left(\vec{a} + \vec{b}\right)^2 = \vec{a}^2 + \vec{b}^2 + 2\vec{a} \times \vec{b}$ is valid for non zero vectors $\vec{a}$ and $\vec{b}$.

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5. If $\vec{a}$ and $\vec{b}$ are adjacent sides of a rhombus, then $\vec{a} . \vec{b} = 0$

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6. A vector has both magnitude and direction. Does it mean that anything that has magnitude and direction is necessarily a vector ?The rotation of a body can be specified by the direction of the axis of rotation, and the angle of rotation about the axis. Does that make any rotation a vector ?

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7. Answer the following ad true or false : Two vectors having same magnitude are collinear.

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8. The sum of the vectors $\vec{a} = \hat{i} - 3\hat{k}, \vec{b} = 2\hat{j} - \hat{k}, \vec{c} = 2\hat{i} - 3\hat{j} + 2\hat{k}$ is $3\hat{i} - \hat{j} - 2\hat{k}$.

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

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10. A vector of magnitude 15 units in the direction of vector $\hat{i} - 2\hat{j} + 2\hat{k}$ is $5\hat{i} + 10\hat{j} + 10\hat{k}$.

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11. If θ is the angle between two vectors $\vec{a}$ and $\vec{b}$, then $\vec{a} \cdot \vec{b} \geq 0$ only when:

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12. If $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 8\hat{k}$ are perpendicular to each other the value of λ is 6.

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13. The projection of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ on $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$ is equal to $\frac{5}{\sqrt{6}}$

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14. The value of : $\hat{i} \cdot \left(\hat{j} \times \hat{k}\right) + \hat{j} \cdot \left(\hat{k} \times \hat{i}\right) + \hat{k} \cdot \left(\hat{i} \times \hat{j}\right)$ is :

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15. If $\left|\vec{a} \cdot \vec{b}\right| = \sqrt{3}\left|\vec{a} \times \vec{b}\right|$,then angle between $\vec{a}$ and $\vec{b}$ is :

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Questions Carrying 2 Marks

1. Prove that the figure formed by joining the mid-points of the pairs of consecutive sides of a quadrilateral is a parallelogram.

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

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3. If $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$, $\vec{b} = \hat{i} + \hat{j} - \hat{k}$, $\vec{c} = 3\hat{i} + 4\hat{j} - 5\hat{k}$, then find a unit vector parallel to the vector $3\vec{a} + \vec{b} - \vec{c}$.

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4. If $\vec{a} = 5\hat{i} + \hat{j} - 4\hat{k}$, $\vec{b} = 2\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{c} = \hat{i} + 3\hat{j} - 2\hat{k}$ then find a unit vector parallel to the vector $2\vec{a} + \vec{b} + 3\vec{c}$.

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

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6. Show that the three points with position vectors $2\hat{i}+6\hat{j}+3\hat{k}, \hat{i}+2\hat{j}+7\hat{k}$ and $3\hat{i}+10\hat{j}-\hat{k}$ are collinear.

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7. 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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8. Show that . the points (2. 6, 3), (1, 2, 7) and (3, 10, -1) are collinear. (by vector method only)

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9. Find the position vector of a point R which divides the line joining the points $P\left(\hat{i}+2\hat{j}-\hat{k}\right)$ and $Q\left(\hat{i}+2\hat{j}+2\hat{k}\right)$ internally in the ratio 2:1.

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10. Find the position vector of a point R which divides the line joining the points $P\left(\hat{i}+2\hat{j}-2\hat{k}\right)$ and $Q\left(\hat{i}+2\hat{j}+2\hat{k}\right)$ internally in the ratio 1:2.

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

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12. For any two vectors $\vec{a}$ and $\vec{b}$, prove that $\left|\vec{a} . \vec{b}\right| \leq \left|\vec{a}\right|\left|\vec{b}\right|$ Also write the name of this inequality.

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13. For any two vectors $\vec{a}$ and $\vec{b}$, prove that : $\left|\vec{a} + \vec{b}\right| \leq \left|\vec{a}\right| + \left|\vec{b}\right|$. Also, write the name of this inequality

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14. If $\left|\vec{a}\right|=3$, $\left|\vec{b}\right|=4$ and $\left|\vec{c}\right|=5$ and each of them is perpendicular to the sum of other two then find the value of $\left|\vec{a}+\vec{b}+\vec{c}\right|$

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15. If $\left|\vec{a}\right|=2$, $\left|\vec{b}\right|=3$ and $\left|\vec{c}\right|=4$ and each of them is perpendicularto the sum of other two then find the value of $\left|\vec{a}+\vec{b}+\vec{c}\right|$

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16. If $\left|\vec{a}\right|=7$, $\left|\vec{b}\right|=1$ and $\left|\vec{c}\right|=5$ and each of them is perpendicular to the sum of other two then find the value of $\left|\vec{a}+\vec{b}+\vec{c}\right|$

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17. Let $\vec{a}$, $\vec{b}$, $\vec{c}$ be the three vectors of magnitude 5, 3, I respectively. If each one is perpendicular to the sum of other two vectors, prove that $\left|\vec{a}+\vec{b}+\vec{c}\right|=\sqrt{35}$.

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18. Find the scalar projection of : $\vec{a}=2\hat{i}-\hat{j}-3\hat{k}$ on $\vec{b}=3\hat{i}-5\hat{j}+\hat{k}$.

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19. Find the scalar projection of : $\vec{a} = 7\hat{i} + 3\hat{j} + 6\hat{k}$ on $\vec{b} = 5\hat{i} - 2\hat{j} + 3\hat{k}$.

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20. Find the scalar projection of $\vec{b}$ on $\vec{a}$ where : $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = -\hat{i} - 2\hat{j} + 4\hat{k}$

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21. Find the scalar projection of $\vec{b}$ on $\vec{a}$ where : $\vec{a} = 2\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - \hat{j} + 4\hat{k}$

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22. Find the scalar projection of $\vec{b}$ on $\vec{a}$ where : $\vec{a} = 2\hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = 2\hat{i} - \hat{j} - 4\hat{k}$

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23. The projection of the vector $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on the vector $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$ is :

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24. If $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$, then find the projection of $\left(\vec{b} + \vec{c}\right)$

on $\vec{a}$.

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25. If $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$, then find the projection of $\left(\vec{b} + \vec{c}\right)$ on $\vec{a}$.

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26. If $\vec{a}$ =$2\hat{i} - 2\hat{j} + \hat{k}$, $\vec{b}$ =$2\hat{i} - \hat{j} + 4\hat{k}$, and $\vec{c}$ =$\hat{i} + 2\hat{j} - 2\hat{k}$ then find the projection of $\vec{b} + \vec{c}$ on $\vec{a}$.

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27. 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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28. With the help of vector method, prove that, $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$

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29. With the help of vector method, prove that, $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

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30. Prove that, in any triangle ABC, $\cos B = \frac{c^2 + a^2 - b^2}{2ca}$.

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31. Using vector method, prove that in a triangle, $a = b\cos C + c\cos B$ (projection formula)

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32. Use vectors to prove that in $\triangle ABC$: $b = c\cos A + a\cos C$.

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33. Prove that in any triangle ABC, $c = a\cos B + b\cos A$

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34. Using vector method, prove that the angle in a semi-circle is a right angle.

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35. Show that the diagonals of a rhombus bisect each other at right angles.

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

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37. If $\left|\vec{a}\right| = 5, \left|\vec{b}\right| = 8$ and $\vec{a} . \vec{b} = 24$, then find $\left|\vec{a} \times \vec{b}\right|$

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38. If $\left|\vec{a}\right| = 3, \left|\vec{b}\right| = 4$ and $\vec{a} . \vec{b} = 9$ then find $\left|\vec{a} \times \vec{b}\right|$

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39. Find a vector of magnitude 9, which is perpendicular to both the vectors : $4\hat{i} - \hat{j} + 3\hat{k}$ and $-2\hat{i} + \hat{j} - 2\hat{k}$.

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40. Find a vector of magnitude 19, which is perpendicular to both the vectors : $4\hat{i} - \hat{j} + 8\hat{k}$ and $-\hat{j} + \hat{k}$.

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41. Find a vector of magnitude 7 , which is perpendicular to both the vectors : $2\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + \hat{j} - \hat{k}$

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42. Determine the area of a parallelogram whose adjacent sides are represented 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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43. Find the area of a parallelogram whose adjacent sides are :

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

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44. Find the area of a parallelogram whose adjacent sides are $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$

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45. Find the area of the parallelogram whose adjacent sides are given by the vectors $\vec{a} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} - 2\hat{k}$

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46. Find the area of parallelogram whose adjacent sidesa are given by the vector $\vec{a} = 2\hat{i} + 4\hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$.

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

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48. Find the area of the parallelogram whose diagonals are $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{b} = -3\hat{i} - \hat{j} + \hat{k}$

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49. Find the area of the parallelogram whose diagonals are $\vec{a} = 3\hat{i} - \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} + 4\hat{k}$.

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50. Find the area of the parallelogram whose diagonals are : $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} + \hat{k}$

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51. If $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ and $\vec{b} = 5\hat{i} + \hat{j} - \hat{k}$ represents sides of a parallelogram then find both diagonals and a unit vector perpendicular to both diagonals of parallelogram.

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52. Find the value of a+b, if the points (2,a,3),(3,-5,b) and (-1,11,9) are collinear.

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53. Find the area of the triangle formed by the points A(1,1,1),B(1,2,3) and C(2,3,1) with reference to a rectangular system of axes.

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54. Find the area of triangle with vertices (1,1,2),(2,3,5),(1,5,5).

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55. Using vectors find the area of the triangle ABC with vertices A(1,0,3),B(2,1,4) and C(4,3,1).

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56. Find the area of the triangle fonned by the points A (1,2,4), B(3,1,-2) and C(4,3,1) as its vartices (using vector).

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57. Using vectors, find the area of the triangle having vertices A (2, 5, 6), B (3, 3, 1) and C (4, 6, 3)

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58. Using vectors, find the area of the triangle having vertices A (3, 2, 6), B (1, 3, 5) and C (5, 3, 1).

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59. Using vectors find the area of the triangle whose vertices arc (0, 1 , 2), (2, 1, 5) and (1 , 5, 2).

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60. Using vectors, find the area of triangle whose vertices are (2,1,1),(2,3,1) and (1,3,4).

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61. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ show that $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$. Interpret the result geometrically.

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62. If A, B and C are the vertices of a triangle ABC, prove sine formula that

$$= \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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63. In a triangle OAC, if B is the mid point of side AC and $\overrightarrow{OA} = \vec{a}, \overrightarrow{OB} = \vec{b}$, then what is $\overrightarrow{OC}$.

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

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65. 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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66. If the sum of two unit vectors is a unit vector, show that the magnitude of their difference is $\sqrt{3}$.

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67. Show that the points (-2,3,5), (1,2,3) and (7,0,-1) are collinear.

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68. If a unit vector $\vec{a}$, makes angles $\frac{\pi}{3}$ with $\hat{i}$, $\frac{\pi}{4}$ wih $\hat{j}$ and an acute angle θ with $\hat{k}$, then find θ and hence, the components of $\vec{a}$.

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69. Find a vector of magnitude $5\sqrt{2}$ units which makes an angle of $\frac{\pi}{4}$ and $\frac{\pi}{2}$ which y and z-axis respectively.

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70. Write the value of the cosine of the angle which the vector $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ makes with y-axis. Also find angle between $\hat{i} + \hat{j} + \hat{k}$ and x-axis

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71. 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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72. The vectors $\vec{a} = 3\hat{i} + x\hat{j}$ and $\vec{b} = 2\hat{i} + \hat{j} + y\hat{k}$ are mutually perpendicular. If $\left|\vec{a}\right| = \left|\vec{b}\right|$ then find the value of y.

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73. Find the values of λ for which the angle between the vectors $\vec{a} = 2\lambda^2\hat{i} + 4\lambda\hat{j} + \hat{k}$ and $\vec{b} = 7\hat{i} - 2\hat{j} + \lambda\hat{k}$ is obtuse.

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74. If $\vec{a}$ and $\vec{b}$ are two unit vectors such that $\vec{a} + \vec{b}$ is also a unit vector, then find the angle between $\vec{a}$ and $\vec{b}$.

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75. If $\vec{a}$ and $\vec{b}$ are two vectors such that $\left|\vec{a} + \vec{b}\right| = \left|\vec{a}\right|$, then prove that the vector $2\vec{a} + \vec{b}$ is perpendicular to vector $\vec{b}$.

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76. Write the projection of the vector $7\hat{i} + \hat{j} + 4\hat{k}$ on the vector $2\hat{i} + 6\hat{j} + 3\hat{k}$.

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77. If $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{c} = 5\hat{i} - 4\hat{j} + 3\hat{k}$ then find the value of $\left(\vec{a} + \vec{b}\right).\vec{c}$.

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78. Express the $\vec{a} = 5\hat{i} - 2\hat{j} + 5\hat{k}$ as sum of two vectors such that one is parallel to the vector $\vec{b} = 3\hat{i} + \hat{k}$ and other is perpendicular to $\vec{b}$.

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79. Show that the point whose position vectors are $\vec{a} = 4\hat{i} - 3\hat{j} + \hat{k}, \vec{b} = 2\hat{i} - 4\hat{j} + 5\hat{k}, \vec{c} = \hat{i} - \hat{j}$ form a right angled triangle.

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80. 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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81. If a unit vector $\vec{a}$ makes angle $\frac{\pi}{4}$ with $\hat{i}$, $\frac{\pi}{3}$ with $\hat{j}$ and acute angle θ with $\hat{k}$ then find the component of $\vec{a}$ ang the

angle θ.

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82. 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 $\vec{p}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{p} . \vec{c} = 18$.

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83. Dot product of a vector with vectors $\hat{i} - \hat{j} + \hat{k}, 2\hat{k} + \hat{j} + 3\hat{k}$ and $\hat{i} + \hat{j} + \hat{k}$ are respectively 4,0 and 2. Find the vector.

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84. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $\left|\vec{a}\right| = 3, \left|\vec{b}\right| = 5, \left|\vec{c}\right| = 7,$ show that the angle between $\vec{a}$ and $\vec{b}$ is 60°

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85. 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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86. 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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87. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that : $\left|\vec{a}\right| = 5, \left|\vec{b}\right| = 12$ and $\left|\vec{c}\right| = 13$ and $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, find the value of $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$.

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88. If with reference to the right handed system of mutually perpendicular unit vectors $\hat{i}, \hat{j}, \hat{k}$, $\vec{\alpha} = 3\hat{i} - \hat{j}, \vec{\beta} = 2\hat{i} + \hat{j} - 3\hat{k}$, then express $\vec{\beta}$ in the form $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2$ where $\vec{\beta}_1$ is parallel to $\vec{\alpha}$ and $\vec{\beta}_2$ is perpendicular to $\vec{\alpha}$.

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89. Using vectors, prove that a parallelogram whose diagonals are equal is a rectangle.

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90. For any vector $\vec{a}$ the value of $\left(\vec{a} \times \hat{i}\right)^2 + \left(\vec{a} \times \hat{j}\right)^2 + \left(\vec{a} \times \hat{k}\right)^2$ is equal to

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91. Find a unit vector perpendicular to the plane of triangle ABC where the coordinates of its vertices are

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

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

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93. Find a vector of magnitude $\sqrt{171}$, which is perpendicular to both of the vectors $\vec{a}=\hat{i}+2\hat{j}-3\hat{k}$ and $\vec{b}=3\hat{i}-\hat{j}+2\hat{k}$

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94. Find a vector of magnitude 5 units, perpendicular to each of the vectors $\left(\vec{a}+\vec{b}\right)$ and $\left(\vec{a}-\vec{b}\right)$ where $\vec{a}=\hat{i}+\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}+2\hat{j}+3\hat{k}$

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95. Find the area of a parallelogram whose adjacent sides are represented by the vectors $2\hat{i}-3\hat{k}$ and $4\hat{j}+2\hat{k}$.

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96. If $\vec{a}=2\hat{i}-3\hat{j}+\hat{k}$, $\vec{b}=\hat{i}+\hat{k}$, $\vec{c}=2\hat{j}-\hat{k}$ are three vectors find the area fo the parallelogram having diagonals $\left(\vec{a}+\vec{b}\right)$ and $\left(\vec{b}+\vec{c}\right)$

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97. With help of vectors find the area of the triangle with vertices $A(2, 3, 5), B(3, 5, 8)$ and $C(2, 7, 8)$

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98. Using vectors find the area of the triange ABC with vertices A(1,2,3),B(2,-1,4) and C(4,5,-1).

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99. If $\vec{a} \times \vec{b} = \vec{c} \times \vec{d}$ and $\vec{a} \times \vec{c} = \vec{b} \times \vec{d}$, show that $\vec{a} - \vec{d}$ is parallel to $\vec{b} - \vec{c}$, provided $\vec{a} \neq \vec{d}$ and

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

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100. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{j} - \hat{k}$, find a vector $\vec{c}$ such that $\vec{a} \times \vec{c} = \vec{b}$ and $\vec{a} \cdot \vec{c} = 3$.

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101. 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 $\vec{c} \cdot \vec{d} = 18$.

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102. If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, find :

$\left(\vec{r} \times \hat{i}\right) \cdot \left(\vec{r} \times \hat{j}\right) + xy.$

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