MATHS

BOOKS - JMD MATHS (PUNJABI ENGLISH)

VECTOR ALGEBRA

Example

1. If $\vec{a} = 2\hat{i} - 6\hat{j} - 3\hat{k}$ then $\left|\vec{a}\right|$ =

A. $\sqrt{7}$

B. 7

C. 6

D. 5

Answer: B

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2. Find x, y and z if vectors $x\hat{i} - 2\hat{j} + z\hat{k} = 2\hat{i} - y\hat{j} + \hat{k}$

A. $2, 1, 2$

B. $1, 2, 2$

C. $1, 1, 2$

D. $2, 2, 1$

Answer: D

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3. If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{b} = 3\hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{c} = \hat{i} + 2\hat{j} + \hat{k}$ then $2\vec{a} + \vec{b} - \vec{c} =$

A. $6\hat{i} - 2\hat{j} - 2\hat{k}$

B. $6\hat{i} + 2\hat{j} - 2\hat{k}$

C. $6\hat{i} - 2\hat{j} + 2\hat{k}$

D. $6\hat{i} + 2\hat{j} + 2\hat{k}$

Answer: A

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4. Find a if the vectors $\overrightarrow{x} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ and $\overrightarrow{y} = a\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear?

A. 4

B. -4

C. 2

D. -2

Answer: B

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5. Find p if vectors $\overrightarrow{a} = 2\hat{i} - \hat{j} + p\hat{k}$ and $\overrightarrow{b} = \hat{i} - 2\hat{j} + \hat{k}$ are perpendicular.

A. 4

B. 2

C. -4

D. 3

Answer: C

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6. If $\vec{a}$ is a unit vector and $\left(\vec{x}-\vec{a}\right).\left(\vec{x}+\vec{a}\right)=255$ then find $\left|\vec{x}\right|$

A. 81

B. 16

C. 1

D. 0

Answer: B

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7. If $\vec{a} = 2\hat{i} + \hat{j} + 4\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + \hat{k}$ then $\vec{a} . \vec{b} =$

A. 6

B. 3

C. 8

D. 5

Answer: C

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

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

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

C. 0

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

Answer: D

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9. 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 :

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

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

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

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

Answer: D

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10. 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 $\vec{a} \cdot \vec{b} = 4.$

A. $\sqrt{5}$

B. 5

C. 3

D. $\sqrt{3}$

Answer: A

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11. Fill in the blanks :

If $\vec{a} = x\hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{b} = 3\hat{i} + b\hat{j} - 9\hat{k}$

are parallel then $x =$ ... ...

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12. Fill in the blanks :

Unit vector in direction of $2\hat{i} - 3\hat{j} + 6\hat{k} =$ ... ...

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13. Fill in the blanks :

If $\vec{a} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} + \lambda\hat{j} - 3\hat{k}$ are perpendicular then $\lambda =$ ... ...

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

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15. Fill in the blanks :

If $\left|\vec{a} \times \vec{b}\right|^2 + \left(\vec{a} . \vec{b}\right)^2 = 400$ and $\left|\vec{a}\right| = 5$ then $\left|\vec{b}\right| = \ldots\ldots\ldots\ldots$

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16. State True/False

The value of $\vec{a} . \vec{a}$ is $\left|\vec{a}\right|^2$.

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17. State True/False

If $\vec{a}$ is unit vector and $\left(2\vec{x} - 3\vec{a}\right) . \left(2\vec{x} + 3\vec{a}\right) = 9,$ then $\left|\vec{x}\right| = \frac{9}{2}.$

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18. State True/False

Then magnitude of $2\hat{i} - 3\hat{j} + 6\hat{k}$ is 7 units.

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19. Write the value of $\left(\hat{i} \times \hat{j}\right).k + \left(\hat{j} \times \hat{k}\right).\hat{i}$

.

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20. Write the value of p for which $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are parallel vectors.

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21. Prove that :

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

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22. If $\vec{a} = 4\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{k}$, find $\left|2\vec{b} \times \vec{a}\right|$.

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23. 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:

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24. Find unit vector in the direction of veca+vecb, where $\vec{a} = -\hat{i} + \hat{j} + \hat{k}$ and 'vecb=2hati+hatj-3hatk'

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25. 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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26. If $\left|\vec{a}\right| = \sqrt{3}, \left|\vec{b}\right| = 2$ and angle between $\vec{a}$ and $\vec{b}$ is 60^o. Find $\vec{a} . \vec{b}$.

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27. If $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = \sqrt{3}$ and $\vec{a} . \vec{b} = \sqrt{3}$, find the angle between $\vec{a}$ and $\vec{b}$.

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28. For what value of λ are 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?

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29. Find the projection of $\vec{a}$ on $\vec{b}$ if $\vec{a} . \vec{b} = 8$ and $\vec{b} = 2\hat{i} + 6\hat{j} + 3\hat{k}$.

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30. 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 :

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31. Let $\vec{a}$ and $\vec{b}$ be two vectors such that $\left|\vec{a}\right| = 3$ and $\left|\vec{b}\right| = \frac{\sqrt{2}}{3}$ and $\vec{a} \times \vec{b}$ is a unit vector. Then what is the angle between vectors $\vec{a}$ and $\vec{b}$?

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32. What is the cosine of the angle which the vector $\sqrt{2\hat{i}} + \hat{j} + \hat{k}$ makes with y-axis ?

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33. If $\vec{p}$ is a unit vector and $\left(\vec{x} - \vec{p}\right).\left(\vec{x} + \vec{p}\right) = 80$, then find $\left|\vec{x}\right|$.

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34. Write a vector of magnitude 15 units in the direction of vector $\hat{i} - 2\hat{j} + 2\hat{k}$.

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35. If $\vec{a}$ and $\vec{b}$ are two vectors such that $\left|\vec{a} . \vec{b}\right| = \left|\vec{a} \times \vec{b}\right|$, then what is the angle between $\vec{a}$ and $\vec{b}$?

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36. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes 1 and 2 respectively and when $\left|\vec{a} \times \vec{b}\right| = \sqrt{3}$.

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37. Find the value of p if

$$\left(2\hat{i} + 6\hat{j} + 27\hat{k}\right) \times \left(\hat{i} + 3\hat{j} + p\hat{k}\right) = \vec{0}.$$

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38. For what value of 'a' the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $a\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear?

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

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40. Determine the area of the parallelogram whose adjacent sides are $2\hat{i}$ and $3\hat{j}$.

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41. P and Q are two points with position vectors $3\vec{a} - 3\vec{b}$ and $\vec{a} + \vec{b}$ respectively. Write the position vector of a point R which divides the line segment PQ in the ratio $2:1$ externally.

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42. Find a unit vector perpendicular to both the vectors $\left(3\hat{i}+2\hat{j}-\hat{k}\right)$ and $\left(\hat{i}+2\hat{j}+\hat{k}\right)$.

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43. Find a vector of magnitude 8, which is perpendicular to both the vectors $2\hat{i}-\hat{j}+3\hat{k}$ and $-\hat{i}+2\hat{j}-\hat{k}$.

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44. If $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$, then find a unit vector which is perpendicular to both the vectors $\left(\vec{a} - \vec{b}\right)$ and $\left(\vec{a} + \vec{b}\right)$.

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45. Find the area of parallelogram whose adjacent sides are given 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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46. Find the area of parallelogram whose diagnolas are $2\hat{i} + 3\hat{j} + 6\hat{k}$ and $3\hat{i} - 6\hat{j} + 2\hat{k}$

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47. 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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48. If two vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right| = 3, \left|\vec{b}\right| = 2$ and $\vec{a} . \vec{b} = 4$ then find the value of $\left(3\vec{a} - 4\vec{b}\right) . \left(2\vec{a} + 5\vec{b}\right)$.

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49. If veca and vecb are perpendicular vectors, $\left|\vec{a} + \vec{b}\right| = 13, \left|\vec{a}\right| = 5$ then find |vecb|`.

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

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51. Find $\vec{a}.\left(\vec{b} \times \vec{c}\right)$, if $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j} + 2\hat{k}$.

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52. 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 vectors $\vec{a}$ and $\vec{b}$.

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53. If $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 5\hat{j} - 2\hat{k}$, then find $\left|\vec{a} \times \vec{b}\right|$.

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54. Find λ, if the vectors $\vec{a} = \hat{i} + 3\hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} - \hat{k}$ and $\vec{c} = \lambda\hat{j} + 3\hat{k}$ are coplanar.

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