



MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

SCALAR OR DOT PRODUCT



1. If the median to the base of a triangle is perpendicular to the base,

then triangle is isosceles.

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2. If AD is the median of ABC, using vectors, prove that $AB^2 + AC^2 = 2(AD^2 + CD^2).$

3. In a triangle OAB, $\angle AOB = 90^0$. If P and Q are points of trisection of AB, prove that $OP^2 + OQ^2 = \frac{5}{9}AB^2$



4. If \hat{a} and \hat{b} are unit vectors inclined at an angle θ , then prove that $\frac{\cos\theta}{2} = \frac{1}{2} \left| \hat{a} + \hat{b} \right| \frac{\tan\theta}{2} = \frac{1}{2} \left| \frac{\hat{a} - \hat{b}}{\hat{a} + \hat{b}} \right|$

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5. (Pythagoras's Theorem) Prove by vector method that in a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.



6. Prove that; If the diagonals of a quadrilateral bisect each other at right

angles, then it is a rhombus.

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7. prove using vectors: The quadrilateral obtained by joining mid-points of adjacent sides a rectangle is a rhombus.

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8. prove by vector method that the sum of the squares of the diagonals

of a parallelogram is equal to the sum of the squares of its sides.



9. prove that the diagonals of a rectangle are perpendicular if and only if

the rectangle is a square.



10. Using analytical geometry, prove that the diagonals of a rhombus are

perpendicular to each other.

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11. If
$$\left|\overrightarrow{a}\right| = a$$
 and $\left|\overrightarrow{b}\right| = b$, prove that $\left(\frac{\overrightarrow{a}}{a^2} - \frac{\overrightarrow{b}}{b^2}\right)^2 = \left(\frac{\overrightarrow{a} - \overrightarrow{b}}{ab}\right)^2$

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12. If
$$\overrightarrow{a} = \hat{i} - \hat{j}$$
 and $\overrightarrow{b} = -\hat{j} + 2\hat{k}$, find $\left(\overrightarrow{a} - 2\overrightarrow{b}\right)\overrightarrow{a} + \overrightarrow{b}$.

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13. Find the angles which the vector $\overrightarrow{a}=\hat{i}-\hat{j}+\sqrt{2}\hat{k}$ makes with the

coordinate axes.

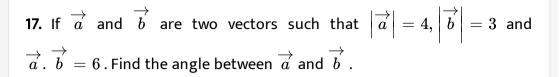
14. Dot product of a vector with $\hat{i} + \hat{j} - 3\hat{k}$, $\hat{i} + 3\hat{j} - 2\hat{k}$ and $2\hat{i} + \hat{j} + 4\hat{k}$ are 0, 5 and 8 respectively. Find the vector.

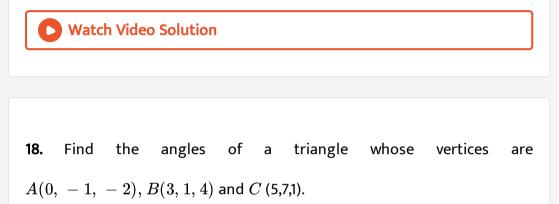
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15. Find
$$\overrightarrow{a}$$
, when (i) $\overrightarrow{a} = \hat{i} - 2\hat{j} + \hat{k}$ and $\overrightarrow{b} = 4\hat{i} - 4\hat{j} + 7\hat{k}$ (ii) $\overrightarrow{a} = \hat{j}$
+2 \hat{k} and $\overrightarrow{b} = 2\hat{i} + \hat{k}$ (iii) $\overrightarrow{a} = \hat{j} - \hat{k}$ and $\overrightarrow{b} = 2\hat{i} + 3\hat{j} - 2\hat{k}$

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16. For what value of λ are the vector \overrightarrow{a} and \overrightarrow{b} perpendicular to each other? where: $\mathbf{i}, \overrightarrow{a} = \lambda \hat{i} + 2\hat{j} + \hat{k}$ and $\overrightarrow{b} = 4\hat{i} - 9\hat{j} + 2\hat{k}$ ii, $\overrightarrow{a} = \lambda \hat{i} + 2\hat{j} + \hat{k}$ and $\overrightarrow{b} = 4\hat{i} - 9\hat{j} + 2\hat{k}$ iii, $\overrightarrow{a} = \lambda \hat{i} + 2\hat{j} + \hat{k}$ and $\overrightarrow{b} = 5\hat{i} - 9\hat{j} + 2\hat{k}$ iii, $\overrightarrow{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\overrightarrow{b} = 3\hat{i} + 2\hat{j} - \lambda\hat{k}$ iv, $\overrightarrow{a} = \lambda\hat{i} + 3\hat{j} + 2\hat{k}$ and $\overrightarrow{b} = \hat{i} - \hat{j} + 3\hat{k}$





19. Find the projection of $\overrightarrow{b} + \overrightarrow{c}$ on \overrightarrow{a} , where $\overrightarrow{a} = 2\hat{i} - 2\hat{j} + \hat{k}$, $\overrightarrow{b} = \hat{i} + 2\hat{j} - 2\hat{k}$ and $\overrightarrow{c} = 2\hat{i} - \hat{j} + 4\hat{k}$.

20. Find the values of x and y if the vectors $\vec{a} = 3\hat{i} + x\hat{j} - \hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} + y\hat{k}$ are mutually perpendicular vectors of equal magnitude.

21. In a quadrilateral ABCD, prove that $AB^2 + BC^2 + CD^2 + DA^2 = AC^2 + BD^2 + 4PQ^2$, where P and Q are middle points of diagonals AC and BD.

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22. If \overrightarrow{a} and \overrightarrow{b} are two non-collinear unit vectors such that $\left|\overrightarrow{a} + \overrightarrow{b}\right| = \sqrt{3}$, find $\left(2\overrightarrow{a} - 5\overrightarrow{b}\right)$. $\left(3\overrightarrow{a} + \overrightarrow{b}\right)$.

23. If \overrightarrow{a} , \overrightarrow{b} are two vectors such that $\left|\overrightarrow{a} + \overrightarrow{b}\right| = \left|\overrightarrow{b}\right|$, then prove that $\overrightarrow{a} + 2\overrightarrow{b}$ is perpendicular to \overrightarrow{a} .

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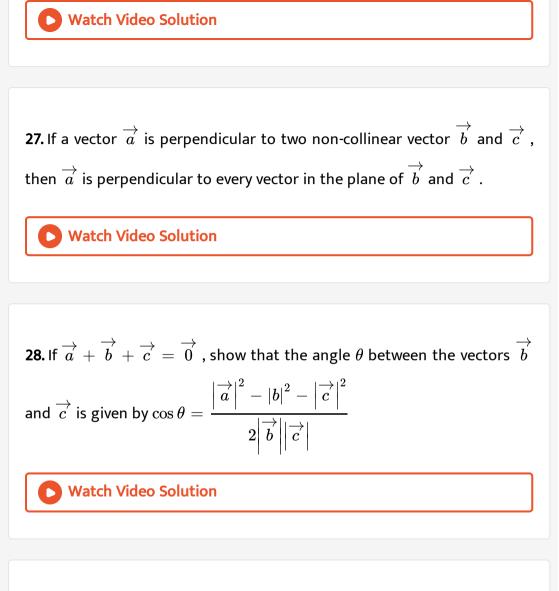
24. If \overrightarrow{c} is perpendicular to both \overrightarrow{a} and \overrightarrow{b} , then prove that it is perpendicular to both $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$.

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25. If $\overrightarrow{a} \cdot \overrightarrow{a} = 0$ and $\overrightarrow{a} \cdot \overrightarrow{b} = 0$, what can you conclude about the vector \overrightarrow{b} ?

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26. If $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ are three non coplanar vectors such that $\overrightarrow{a}, \overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c} = 0$, then show that \overrightarrow{d} is the null vector.



29. Let
$$\overrightarrow{u}, \overrightarrow{v}$$
 and \overrightarrow{w} be vector such $\overrightarrow{u} + \overrightarrow{v} + \overrightarrow{w} = \overrightarrow{0}$. If $\left|\overrightarrow{u}\right| = 3, \left|\overrightarrow{v}\right| = 4$ and $\left|\overrightarrow{w}\right| = 5$, then find $\overrightarrow{u} \cdot \overrightarrow{v} + \overrightarrow{v} \cdot \overrightarrow{w} + \overrightarrow{w} \cdot \overrightarrow{u}$.

30. Let $\overrightarrow{a} = x^2\hat{i} + 2\hat{j} - 2\hat{k}$, $\overrightarrow{b} = \hat{i} - \hat{j} + \hat{k}$ and $\overrightarrow{c} = x^2\hat{i} + 5\hat{j} - 4\hat{k}$ be three vectors. Find the values of x for which the angle between \overrightarrow{a} and \overrightarrow{b} is acute and the angle between \overrightarrow{b} and \overrightarrow{c} is obtuse.

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31. 12). Show that the vector $\hat{i} + \hat{j} + \hat{k}$ is equally inclined with the coordinate axes. (13)show that the vectors $\vec{a} = \frac{1}{7} \left(2\hat{i} + 3\hat{j} + 6\hat{k} \right), \vec{b} = \frac{1}{7} \left(3\hat{i} - 6\hat{j} + 2\hat{k} \right), \vec{c} = \frac{1}{7} \left(6\hat{i} + 2\hat{j} - 3\hat{k} \right)$

are mutually perpendicular unit vectors.

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32. If
$$\overrightarrow{\alpha} = 3\hat{i} + 4\hat{j} + 5\hat{k}$$
 and $\overrightarrow{\beta} = 2\hat{i} + \hat{j} - 4\hat{k}$, then express $\overrightarrow{\beta}$ in the form of $\overrightarrow{\beta} = \overrightarrow{\beta}_1 + \overrightarrow{\beta}_2$, where $\overrightarrow{\beta}_1$ is parallel to $\overrightarrow{\alpha}$ and $\overrightarrow{\beta}_2$ is perpendicular to $\overrightarrow{\alpha}$.

33. If $\overrightarrow{p} = 5\hat{i} + \lambda\hat{j} - 3\hat{k}$ and $\overrightarrow{q} = \hat{i} + 3\hat{j} - 5\hat{k}$, then find the value of λ , so that $\overrightarrow{p} + \overrightarrow{q}$ and $\overrightarrow{p} - \overrightarrow{q}$ are perpendicular vectors.

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34. For any two vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} , show that :
 $\left(\overrightarrow{a} + \overrightarrow{b}\right)\overrightarrow{a} - \overrightarrow{b} = 0, when \left|\overrightarrow{a}\right| = \left|\overrightarrow{b}\right|$.
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35. Show that the vectors
$$\overrightarrow{a} = \frac{1}{7} \Big(2\hat{i} + 3\hat{j} + 6\hat{k} \Big), \quad \overrightarrow{b} = \frac{1}{7} \Big(3\hat{i} - 6\hat{j} + 2\hat{k} \Big), \quad \overrightarrow{c} = \frac{1}{7} \Big(6\hat{i} + 2\hat{j} - 3\hat{k} \Big)$$

are mutually perpendicular unit vectors.

36. Let $\overrightarrow{a} = 5\hat{i} - \hat{j} + 7\hat{k}$ and $\overrightarrow{b} = \hat{i} - \hat{j} + \lambda\hat{k}$. Find λ such that $\overrightarrow{a} + \overrightarrow{b}$ is orthogonal to $\overrightarrow{a} - \overrightarrow{b}$.

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37. If \overrightarrow{a} and \overrightarrow{b} are two vectors of the same magnitude inclined at an angle of 30^0 such that $\overrightarrow{a} \overrightarrow{b} = 3$, find $|\overrightarrow{a}|, |\overrightarrow{b}|$.

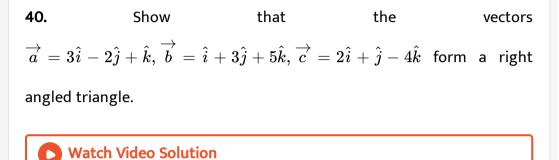
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38. Decompose the vector $6\hat{i} - 3\hat{j} - 6\hat{k}$ into vectors which are parallel

and perpendicular to the vector . $\hat{i}+\hat{j}+\hat{k}$ Then the vectors are .

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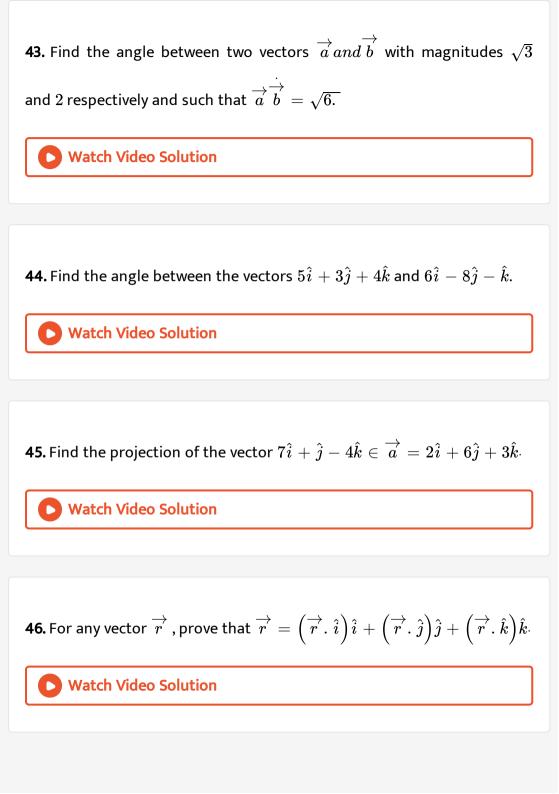
39. Express $2\hat{i} - \hat{j} + 3\hat{k}$ as the sum of vector parallel and a vector perpendicular to $2\hat{i} + 4\hat{j} - 2\hat{k}$.



41. (Projection Formulae) if a, b, c are the lengths of the sides opposite respectively to the angles A, B, C of a triangle ABC, show that $a = b \cos C + \cos B$ (ii) $b = \cos A + a \cos C$ (iii) $c = a \cos B + b \cos A$

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42. Prove using vectors: If two medians of a triangle are equal, then it is isosceles.



47. Find
$$\overrightarrow{a} \cdot \overrightarrow{b}$$
 when $\overrightarrow{a} = 2\hat{i} + 2\hat{j} - \hat{k}and \overrightarrow{b} = 6\hat{i} - 3\hat{j} + 2\hat{k}$,
 $\overrightarrow{a} = (1, 1, 2)and \overrightarrow{b} = (3, 2, -1)$

48. Find the value of λ so 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 perpendicular to each other.

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49. Find the value of p for which the vectors $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are (i) perpendicular (ii) parallel

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50. Find the values of 'a' which the vector $ec{r}=ig(a^2-4ig)\hat{i}+2\hat{j}-ig(a^2-9ig)\hat{k}$ makes acute angle with the

coordinate axes.



51. If
$$\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$$
 are unit vector, prove that
 $\left|\overrightarrow{a} - \overrightarrow{b}\right|^2 + \left|\overrightarrow{b} - \overrightarrow{c}\right|^2 + \left|\overrightarrow{c} - \overrightarrow{a}\right|^2 \le 9.$
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52. If $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ are mutually perpendicular unit vectors, find
 $\left|2\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}\right|.$

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53. Find the value of c for which the vectors $\overrightarrow{a} = (c \log_2 x)\hat{i} - 6\hat{j} + 3\hat{k}$ and $\overrightarrow{b} = ((\log)_2 x)\hat{i} + 2\hat{j} + (2c(\log)_2 x)\hat{k}$ make an obtuse angle for any $x \in (0, \infty)$.

54. Let $\overrightarrow{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\overrightarrow{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ and $\overrightarrow{c} = 2\hat{i} - \hat{j} + 4\hat{k}$. Find a vector \overrightarrow{d} which is perpendicular to both \overrightarrow{a} and \overrightarrow{b} and \overrightarrow{c} . \overrightarrow{d} =15.

55. Dot products of a vector with vectors $3\hat{i} - 5\hat{k}, 2\hat{i} + 7\hat{j}and\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}$ are respectively -1, 6 and 5. Find the vector.

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56. Let $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ be three vectors such that $\left|\overrightarrow{a}\right| = 1, \left|\overrightarrow{b}\right| = 2and\left|\overrightarrow{c}\right| = 3$. If the projection of \overrightarrow{b} along a is equal to the projection of \overrightarrow{c} along \overrightarrow{a} and $\overrightarrow{b}, \overrightarrow{c}$ are perpendicular to each other, find $\left|3\overrightarrow{a}-2\overrightarrow{b}+2\overrightarrow{c}\right|$.

57. (Cosine Formulae) if a, b, c are the lengths of the sides opposite respectively to the angles A, B, C of a triangle ABC, show that $\cos A \frac{b^2 + c^2 - a^2}{2bc}$ (ii) $\cos B \frac{c^2 + a^2 - b^2}{2ac}$ (iii) (i) $\cos C \frac{a^2 + b^2 - c^2}{2ab}$ Watch Video Solution

58. Prove that the altitudes of a triangle are concurrent.

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59. Find the components of a unit vector which is perpendicular to the

vectors $\hat{i}+2\hat{j}-\hat{k}and2\hat{i}-\hat{j}+2\hat{k}\cdot$

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60. If a unit vector \overrightarrow{a} makes angle $\pi/3$ with $\hat{i}, \pi/4$ with \hat{j} and an acute angle θ with \hat{k} , then find the components of \overrightarrow{a} and the angle θ .

61. If $\hat{a}and\hat{b}$ are unit vectors inclined at an angle θ , then prove that $\frac{\sin\theta}{2} = \frac{1}{2} |\hat{a} - \hat{b}|.$

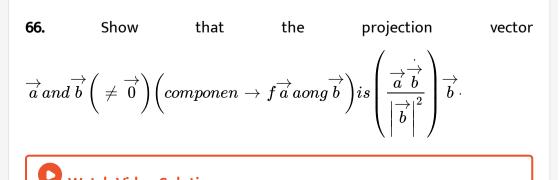
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62. If two vectors
$$\overrightarrow{a} and \overrightarrow{b}$$
 are such that $|\overrightarrow{a}| = 3$, $|\overrightarrow{b}| = 2$ and $\overrightarrow{a} \cdot \overrightarrow{b} = 6$, ., Find $|\overrightarrow{a} + \overrightarrow{b}| and |\overrightarrow{a} - \overrightarrow{b}|$.
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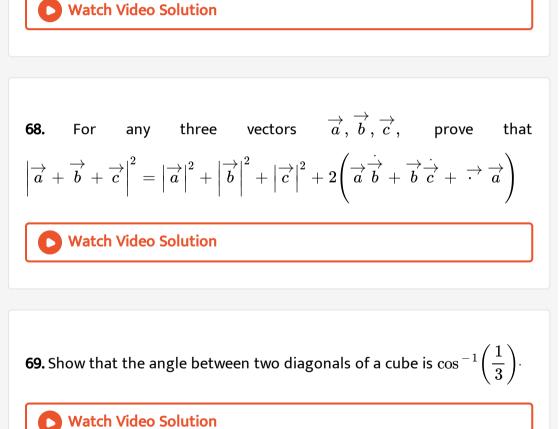
63. Find
$$\left| \overrightarrow{a} \right| and \left| \overrightarrow{b} \right|$$
, if $\left(\overrightarrow{a} - \overrightarrow{b} \right) \overrightarrow{a} + \overrightarrow{b} = 27$ and $\left| \overrightarrow{a} \right| = 2 \left| \overrightarrow{b} \right|$.

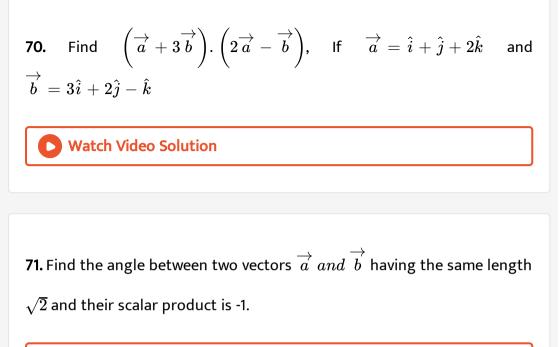
64. If two vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} are such that $|\overrightarrow{a}| = 2$, $|\overrightarrow{b}| = 1$ and $\overrightarrow{a} \overrightarrow{b} = 1$, find $(3\overrightarrow{a} - 5\overrightarrow{b})2\overrightarrow{a} + 7\overrightarrow{b}$.
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65. For any two vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} , prove that:
 $\left|\overrightarrow{a} + \overrightarrow{b}\right|^2 = \left|\overrightarrow{a}\right|^2 + \left|\overrightarrow{b}\right|^2 + 2\overrightarrow{a}\overrightarrow{b}$,
 $\left|\overrightarrow{a} - \overrightarrow{b}\right|^2 = \left|\overrightarrow{a}\right|^2 + \left|\overrightarrow{b}\right|^2 - 2\overrightarrow{a}\overrightarrow{b}$,
 $\left|\overrightarrow{a} + \overrightarrow{b}\right|^2 + \left|\overrightarrow{a} - \overrightarrow{b}\right|^2 = 2\left(\left|\overrightarrow{a}\right|^2 + \left|\overrightarrow{b}\right|^2\right)$ and
 $\left|\overrightarrow{a} + \overrightarrow{b}\right|^2 = \left|\overrightarrow{a} - \overrightarrow{b}\right|^2 \Leftrightarrow \overrightarrow{a} \perp \overrightarrow{b}$. Interpret the result geometrically.



67. Using dot product of vectors, prove that a parallelogram, whose diagonals are equal, is a rectangle





72. If $\hat{i} + \hat{j} + \hat{k}$, $2\hat{i} + 5\hat{j}$, $3\hat{i} + 2\hat{j} - 3\hat{k}$ and $\hat{i} - 6\hat{j} - \hat{k}$ espectively are the position vectors of points A, B, C and D then find the angle between the straight lines AB and CD. Deduce that AB and CD are collinear.

73. Let \overrightarrow{a} and \overrightarrow{b} be two vectors of the same magnitude such that the

angle between then is
$$60^0$$
 and $\overrightarrow{a} \overrightarrow{b} = 8$. Find $\left| \overrightarrow{a} \right| and \left| \overrightarrow{b} \right|$.

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74. Find
$$\left| \overrightarrow{x} \right|$$
 if for a unit vector \overrightarrow{a} , $\left(\overrightarrow{x} - \overrightarrow{a} \right) \cdot \left(\overrightarrow{x} + \overrightarrow{a} \right) = 15.$

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

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76. If
$$\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$$
, $|\overrightarrow{a}| = 3$, $|\overrightarrow{b}| = 5$ and $|\overrightarrow{c}| = 7$ find the anglebetweeen \overrightarrow{a} and \overrightarrow{b}

77. For any vector
$$\overrightarrow{a}$$
 and \overrightarrow{b} prove that $\left|\overrightarrow{a} + \overrightarrow{b}\right| \leq \left|\overrightarrow{a}\right| + \left|\overrightarrow{b}\right|$.

78. For any two vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} prove that $\left(\overrightarrow{a}, \overrightarrow{b}\right)^2 \leq \left|\overrightarrow{a}\right|^2 \left|\overrightarrow{b}\right|^2$ and hence show that $(a_1b_2 + a_2b_2 + a_3b_3)^2 \leq (a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2)$

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79. If \overrightarrow{a} , \overrightarrow{b} , are two vectors such that $\left|\overrightarrow{a} + \overrightarrow{b}\right| = \left|\overrightarrow{a}\right|$, then prove that $2\overrightarrow{a} + \overrightarrow{b}$ is perpendicular to \overrightarrow{b} .

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80. The scalar product of the vector $\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}$ with a unit vector

along the sum of the vectors

 $\overrightarrow{b}=2\hat{i}+4\hat{j}-5\hat{k}$ and $\overrightarrow{c}=\lambda\hat{i}+2\hat{j}+3\hat{k}$ is equal to 1. Find the value

of λ and hence find the unit vector along \overrightarrow{b} + $\overrightarrow{\cdot}$

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81. If \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} are three vectors such that \overrightarrow{a} , \overrightarrow{b} = \overrightarrow{a} , \overrightarrow{c} then show that \overrightarrow{a} = 0 or , \overrightarrow{b} = c or $\overrightarrow{a} \perp (\overrightarrow{b} - \overrightarrow{c})$.

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82. Show that the vector $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{k}$, $3\hat{i} - 4\hat{j} - 4\hat{k}$ form the sides of a rights angled triangle.

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83. Show that the points A, B, C with position vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{k}$ and $3\hat{i} - 4\hat{j} - 4\hat{k}$ respectively, are the vertices of a right angled triangle. Also, find the remaining angles of the triangle.

84. If with reference to a right handed system of mutually perpendicular unit vectors \hat{i} , \hat{j} , \hat{k} we have $\overrightarrow{\alpha} = 3\hat{i} - \hat{j}$, and $\overrightarrow{\beta} = 2\hat{i} + \hat{j} - 3\hat{k}$. Express $\overrightarrow{\beta}$ in the form $\overrightarrow{\beta} = \overrightarrow{\beta}_1 + \overrightarrow{\beta}_2$, where $\overrightarrow{\beta}_1$ is parallel to $\overrightarrow{\alpha}$ and $\overrightarrow{\beta}_2$ is perpendicular to $\overrightarrow{\alpha}$.

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85. Find the value of 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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86. If l, m, n are scalars and $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ are vectors, prove that $\left| l\overrightarrow{a} + m\overrightarrow{b} + n\overrightarrow{c} \right|^2 = l^2 \left| \overrightarrow{a} \right|^2 + m^2 \left| \overrightarrow{b} \right|^2 + n^2 \left| \overrightarrow{c} \right|^2 + 2 \left\{ lm\left(\overrightarrow{a}, \overrightarrow{b} \right) + m \right\}$

deduce

that

$$\left| l \overrightarrow{a} + m \overrightarrow{b} + n \overrightarrow{c} \right|^2 = l^2 \left| \overrightarrow{a} \right|^2 + m^2 \left| \overrightarrow{b} \right|^2 + n^2 \left| \overrightarrow{c} \right|^2$$
 if $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ are

mutually perpendicular vectors.

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87. If \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} are three mutually perpendicular vectors of equal magniltgude, prove that $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}$ is equally inclined with vectors \overrightarrow{a} , \overrightarrow{b} , and $\overrightarrow{\cdot}$ also find the angle.

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88. Let \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} be three vectors of magnitudes 3, 4 and 5 respectively. If each one is perpendicular to the sum of the other two vectors, prove

that
$$\left| \overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} \right| = 5\sqrt{2}$$
 .

89. If \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} are unit vectors such that $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$ find the

value of `vec adot vec b+ vec bdot vec c+ vec cdot vec adot'

90. Three vectors
$$\overrightarrow{a}$$
, \overrightarrow{b} , \overrightarrow{c} satisfy the condition $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$.
Evaluate the quantity
 $\mu = \overrightarrow{a} \overrightarrow{b} + \overrightarrow{b} \overrightarrow{c} + \overrightarrow{\cdot} \overrightarrow{a}$, if $|\overrightarrow{a}| = 1$, $|\overrightarrow{b}| = 4$ and $|\overrightarrow{c}| = 2$.
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91. Find $\overrightarrow{a} \overrightarrow{b}$ when: $\overrightarrow{a} = \hat{i} - 2\hat{j} + \hat{k}$ and $\overrightarrow{b} = 4\hat{i} - 4\hat{j} + 7\hat{k}$
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92. Find
$$\overrightarrow{a} \overrightarrow{b}$$
 when: $\overrightarrow{a} = \hat{j} + 2\hat{k}$ and $\overrightarrow{b} = 2\hat{i} + \hat{k}$

93. Find
$$\overrightarrow{a}$$
 \overrightarrow{b} when: $\overrightarrow{a} = \hat{j} - \hat{k}$ and $\overrightarrow{b} = 2\hat{i} + 3\hat{j} - 2\hat{k}$

94. For what value of λ are the vector \overrightarrow{a} and \overrightarrow{b} perpendicular to each other? Where; $\overrightarrow{a} = \lambda \hat{i} + 2\hat{j} + \hat{k}$ and $\overrightarrow{b} = 4\hat{i} - 9\hat{j} + 2\hat{k}$

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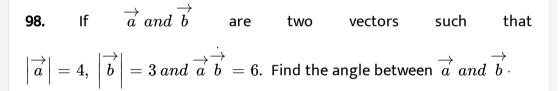
95. For what value of λ are the vector \overrightarrow{a} and \overrightarrow{b} perpendicular to each other? Where; $\overrightarrow{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\overrightarrow{b} = 3\hat{i} + 2\hat{j} - \lambda\hat{k}$

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96. For what value of λ are the vector \overrightarrow{a} and \overrightarrow{b} perpendicular to each other? Where; $\overrightarrow{a} = \lambda \hat{i} + 2\hat{j} + \hat{k}$ and $\overrightarrow{b} = 5\hat{i} - 9\hat{j} + 2\hat{k}$

97. For what value of λ are the vector \overrightarrow{a} and \overrightarrow{b} perpendicular to each other? Where; $\overrightarrow{a} = \lambda \hat{i} + 3\hat{j} + 2\hat{k}$ and $\overrightarrow{b} = \hat{i} - \hat{j} + 3\hat{k}$

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99. If `vec a= i- j and vec b=- j+2k ,find (vec a-2 vec b)dot(vec a+ vec b)

100. Find the angle between the vectors
$$\vec{a}$$
 and \vec{b} where:
 $\vec{a} = \hat{i} - \hat{j}$ and $\vec{b} = \hat{j} + \hat{k}$
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101. Find the angle between the vectors \vec{a} and \vec{b} where:
 $\vec{a} = 3\hat{i} - 2\hat{j} - 6\hat{k}$ and $\vec{b} = 4\hat{i} - \hat{j} + 8\hat{k}$
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102. Find the angle between the vectors \vec{a} and \vec{b} where:
 $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = 4i + 4\hat{j} - 2\hat{k}$
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103. Find the angle between the vectors \vec{a} and \vec{b} where:
 $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = 4\hat{i} + 4\hat{j} - 2\hat{k}$

104. Find the angle between the vectors \overrightarrow{a} and \overrightarrow{b} where: $\overrightarrow{a} = 2\hat{i} - 3\hat{j} + \hat{k}$ and $\overrightarrow{b} = \hat{i} + \hat{j} - 2\hat{k}$

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105. Find the angle between the vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} where:
 $\overrightarrow{a} = \hat{i} + 2\hat{j} - \hat{k}, \ \overrightarrow{b} = \hat{i} - \hat{j} + \hat{k}$

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106. Find the angles which the vector $\overrightarrow{a}=\hat{i}-\hat{j}+\sqrt{2}\hat{k}$ makes with the coordinate axes.



107. Dot product of a vector with $\hat{i} + \hat{j} - 3\hat{k}$, $\hat{i} + 3\hat{j} - 2\hat{k}$ and $2\hat{i} + \hat{j} + 4\hat{k}$ are 0, 5 and 8 respectively. Find the vector.

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

the vector.

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109. If \hat{a} and \hat{b} are unit vectors inclined at an angle θ then prove that $\frac{\tan \theta}{2} = \frac{\left|\hat{a} - \hat{b}\right|}{\left|\hat{a} + \hat{b}\right|}$

110. If the sum of two unit vectors is a unit vector prove that the magnitude of their difference is $\sqrt{3}$.



111. If \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} are three mutually perpendicular unit vectors, then prove that $\left|\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}\right| = \sqrt{3}$

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112. If
$$\left|\overrightarrow{a} + \overrightarrow{b}\right| = 60, \ \left|\overrightarrow{a} - \overrightarrow{b}\right| = 40 \left|\overrightarrow{b}\right| = 46$$
, `Then find | vec a|

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113. Show that the vector $\hat{i}+\hat{j}+\hat{k}$ is equally inclined with the coordinate axes.

114. Show that the vector

$$\vec{a} = \frac{1}{7} \left(2\hat{i} + 3\hat{j} + 6\hat{k} \right), \quad \vec{b} = \frac{1}{7} \left(3\hat{i} - 6\hat{j} + 2\hat{k} \right), \quad \vec{c} = \frac{1}{7} \left(6\hat{i} + 2\hat{j} - 3\hat{k} \right)$$
are mutually perpendicular unit vectors.
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115. For any tow vectors *a* and *b* show that
 $\left(\vec{a} + \vec{b} \right) \left(\vec{a} - \vec{b} \right) = 0$ if $|\vec{a}| = |\vec{b}|$.
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If

 $\overrightarrow{a}=2\hat{i}-\hat{j}+\hat{k},\ \overrightarrow{b}=\hat{i}+\hat{j}-2\hat{k}\ and\ \overrightarrow{c}=\hat{i}+3\hat{j}-\hat{k},\ f\in d\ \lambda$ such

that \overrightarrow{a} is perpendicular to λ vec b+ \overrightarrow{c}

117. If $\overrightarrow{p} = 5\hat{i} + \lambda\hat{j} - 3\hat{k}$ and $\overrightarrow{q} = \hat{i} + 3\hat{j} - 5\hat{k}$, then find the value of λ such that $\overrightarrow{p} + \overrightarrow{q}$ and $\overrightarrow{p} - \overrightarrow{q}$ are perpendicular vectors.

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118. If
$$\overrightarrow{\alpha} = 3\hat{i} + 4\hat{j} + 5\hat{k}$$
 and $\overrightarrow{\beta} = 2\hat{i} + \hat{j} - 4\hat{k}$, then express $\overrightarrow{\beta}$ in the form of $\overrightarrow{\beta} = \overrightarrow{\beta}_1 + \overrightarrow{\beta}_2$ where $\overrightarrow{\beta}_1$ is parallel to $\overrightarrow{\alpha}$ and $\overrightarrow{\beta}_2$ is perpendicular to $\overrightarrow{\alpha}$.

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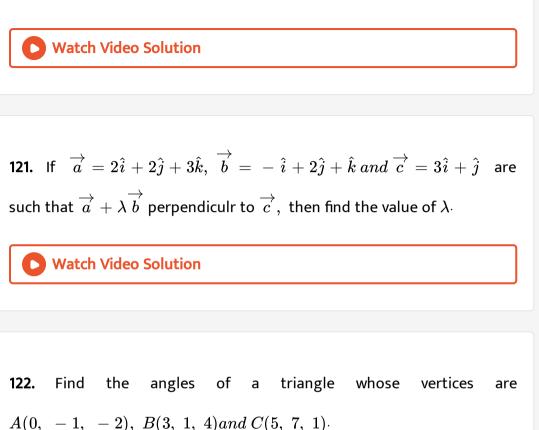
119. If either $\overrightarrow{a} = \overrightarrow{0}$ or $\overrightarrow{b} = \overrightarrow{0}$ then $\overrightarrow{a} = \overrightarrow{b} = \overrightarrow{0}$ but, the converse

need not be true. Justify your answer with an example.



120. Show that the vectors
$$\vec{a} = 3\hat{i} - 2\hat{j} + \hat{k}, \ \vec{b} = \hat{i} - 3\hat{j} + 5\hat{k}, \ \vec{c} = 2\hat{i} + \hat{j} - 4\hat{k}$$
 form a right

angled triangle.



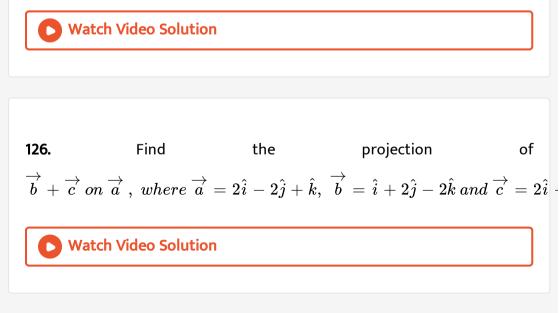
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123. Find the magnitude of two vectors \overrightarrow{a} and \overrightarrow{b} having the same magnitude and such that the angle between them is 60^0 and their scalar product is 9/2.

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

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125. If A, B, C have position vectors (0, 1, 1), (3, 1, 5), (0, 3, 3) respectively, show that DeltaABC is right angled at C.



127. If $\overrightarrow{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\overrightarrow{b} = \hat{i} + 3\hat{j} - 5\hat{k}$, then show that the vectors $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$ are orthogonal.

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128. A unit vector \overrightarrow{a} makes angles $\frac{\pi}{4}$ and $\frac{\pi}{3}$ with \hat{i} and \hat{j} respectively and an acute angle θ with \hat{k} . Find the angle θ and components of \overrightarrow{a} .

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129. If two vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} are such that $\left|\overrightarrow{a}\right| = 2$, $\left|\overrightarrow{b}\right| = 1$ and \overrightarrow{a} $\overrightarrow{b} = 1$, then find rthe value of '(3 vec a-5 vec

b)dot'(2 vec a+7 vec b)'dot

130. If \overrightarrow{a} is a unit vector, then find $\left|\overrightarrow{x}\right|$ in each of the following: $\left(\overrightarrow{x} - \overrightarrow{a}\right)^{;}\left(\overrightarrow{x} + \overrightarrow{a}\right) = 8$

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131. If \overrightarrow{a} is a unit vector, then find $\left|\overrightarrow{x}\right|$ in each of the following: $\left(\overrightarrow{x} - \overrightarrow{a}\right)^{\frac{1}{2}} \left(\overrightarrow{x} + \overrightarrow{a}\right) = 12$

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132. Find
$$\left| \overrightarrow{a} \right| and \left| \overrightarrow{b} \right|$$
, if :
 $\left(\overrightarrow{a} + \overrightarrow{b} \right)^{\frac{1}{2}} \left(\overrightarrow{a} - \overrightarrow{b} \right) = 12 and \left| \overrightarrow{a} \right| = 2 \left| \overrightarrow{b} \right|$

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133. Find
$$\left|\overrightarrow{a}\right| and \left|\overrightarrow{b}\right|$$
, if: $\left(\overrightarrow{a} + \overrightarrow{b}\right)$; $\left(\overrightarrow{a} - \overrightarrow{b}\right) = 8$ and $\left|\overrightarrow{a}\right| = 8\left|\overrightarrow{b}\right|$

134. Find
$$\left|\overrightarrow{a}\right| and \left|\overrightarrow{b}\right|$$
, if :
 $\left(\overrightarrow{a} + \overrightarrow{b}\right)^{\downarrow} \left(\overrightarrow{a} - \overrightarrow{b}\right) = 13 and \left|\overrightarrow{a}\right| = 2\left|\overrightarrow{b}\right|$

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135. Find
$$\left| \overrightarrow{a} - \overrightarrow{b} \right|$$
, if $\left| \overrightarrow{a} \right| = 2$, $\left| \overrightarrow{b} \right| = 5$ and $\overrightarrow{a} \overrightarrow{b} = 8$

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136. Find
$$\left| \overrightarrow{a} - \overrightarrow{b} \right|$$
, if $\left| \overrightarrow{a} \right| = 3$, $\left| \overrightarrow{b} \right| = 4$ and $\overrightarrow{a} \overset{\cdot}{\overrightarrow{b}} = 1$

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137. Find
$$\left| \overrightarrow{a} - \overrightarrow{b} \right|$$
, if $\left| \overrightarrow{a} \right| = 2$, $\left| \overrightarrow{b} \right| = 3$ and $\overrightarrow{a} \overrightarrow{b} = 4$

138. Find the angle between two vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} , if $: |\overrightarrow{a}| = 3$, $|\overrightarrow{b}| = 3$ and \overrightarrow{a} , $\overrightarrow{b} = 1$

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

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140. If \overrightarrow{a} and \overrightarrow{b} are two vectors of the same magnitude inclined at angle of 30^0 such that \overrightarrow{a} \overrightarrow{b} = 3, evaluate $|\overrightarrow{a}|$, $|\overrightarrow{b}|$

141. Express $2\hat{i} - \hat{j} + 3\hat{k}$ as the sum of a vector parallel and a vector perpendicular to $2\hat{i} + 4\hat{j} - 2\hat{k}$.

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142. Decompose the vector $6\hat{i} - 3\hat{j} - 6\hat{k}$ into vectors which are parallel and perpendicular to the vecrtor $\hat{i} + \hat{j} + \hat{k}$.

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143. Let
$$\overrightarrow{a} = 5\hat{i} - \hat{j} + 7\hat{k}$$
 and $\overrightarrow{b} = \hat{i} - \hat{j} + \lambda\hat{k}$. Find λ such that $\overrightarrow{a} + \overrightarrow{b}$ is orthogonal to $\overrightarrow{a} - \overrightarrow{b}$.

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144. If $\overrightarrow{a} \overrightarrow{a} = 0$ and $\overrightarrow{a} \overrightarrow{b} = 0$ what can you conclude about the vector \overrightarrow{b} ?

145. If \overrightarrow{c} is perpendicular to both \overrightarrow{a} and \overrightarrow{b} , then prove that it is perpendicular to both $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$.

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146. If
$$\left| \overrightarrow{a} \right| = a \text{ and } \left| \overrightarrow{b} \right| = b$$
, prove that $\left(\overrightarrow{a} - \overrightarrow{b} \\ a^2 - \overrightarrow{b} \\ b^2 \right)^2 = \left(\frac{\overrightarrow{a} - \overrightarrow{b}}{ab} \right)^2$

147. If
$$\overrightarrow{a}$$
, \overrightarrow{b} , \overrightarrow{c} are three non coplanar vectors such that $\overrightarrow{d} \cdot \overrightarrow{a} = \overrightarrow{d} \cdot \overrightarrow{b} = \overrightarrow{d} \cdot \overrightarrow{c} = 0$, then show that d is the null vector.

148. If a vector \overrightarrow{a} is perpendicular to two non collinear vectors \overrightarrow{b} and \overrightarrow{c} , then \overrightarrow{a} is perpendicular to every vector in the plane of \overrightarrow{b} and \overrightarrow{c}

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149. If $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$, show that the angle θ between the vectors

$$\overrightarrow{b}$$
 and \overrightarrow{c} ig givne by $\cos \theta = rac{\left|\overrightarrow{a}\right|^2 - \left|\overrightarrow{b}\right|^2 - \left|\overrightarrow{c}\right|^2}{2\left|\overrightarrow{b}\right|\left|\overrightarrow{c}\right|}$.

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150. Let
$$\overrightarrow{u}$$
, \overrightarrow{v} and \overrightarrow{w} be vector such $\overrightarrow{u} + \overrightarrow{v} + \overrightarrow{w} = 0$. if $\left|\overrightarrow{u}\right| = 3$, $\left|\overrightarrow{v}\right| = 4$ and $\left|\overrightarrow{w}\right| = 5$, then find $\overrightarrow{u} \cdot \overrightarrow{v} + \overrightarrow{v} \cdot \overrightarrow{w} + \overrightarrow{w} \cdot \overrightarrow{u}$.

151. Let $\overrightarrow{a} = x^2\hat{i} + 2\hat{j} - 2\hat{k}$, $\overrightarrow{b} = \hat{i} - \hat{j} + \hat{k}$ and $\overrightarrow{c} = x^2\hat{i} + 5\hat{j} - 4\hat{k}$ be three vectors find the values of x for which the angle between \overrightarrow{a} and \overrightarrow{b} acute and the angle between \overrightarrow{b} and \overrightarrow{c} is obtuse.

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152. Find the value of x and y if the vectors $\vec{a} = 3\hat{i} + x\hat{j} - \hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} + y\hat{k}$ are mutually perpendicular

vectors of equal magnitude.

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153. If \overrightarrow{a} and \overrightarrow{b} are two non collinear unit vectors such that $\left|\overrightarrow{a} + \overrightarrow{b}\right| = \sqrt{3}$, find $\left(2\overrightarrow{a} - 5\overrightarrow{b}\right)$. $\left(3\overrightarrow{a} + \overrightarrow{b}\right)$

154. If \overrightarrow{a} , \overrightarrow{b} are two vectors such that $\left|\overrightarrow{a} + \overrightarrow{b}\right| = \left|\overrightarrow{b}\right|$, then prove that $\overrightarrow{a} + 2\overrightarrow{b}$ is perpendicular to \overrightarrow{a} .

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155. Prove using vectors: The median to the base of an isosceles triangle

is perpendicular to the base.

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

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157. Using vector method, prove that the angel in a semi circle is a right

angle.



158. Prove that the cosine formula for triangles is equivalent to the definition of the scalar product.

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159. In a triangle OAB, $\angle AOB = 90^{\circ}$. If P and Q are points of trisection of AB prove that $OP^2 + OQ^2 = \frac{5}{9}AB^2$.

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160. Prove that; If the diagonals of a quadrilateral bisect each other at right angles, then it is a rhombus.

161. (Pythagoras's Theorem) Prove by vector method that in a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.



162. Prove by vector method that the sum of the square of the diagonals

of a parallelogram is equal to the sum of the squares of its sides.

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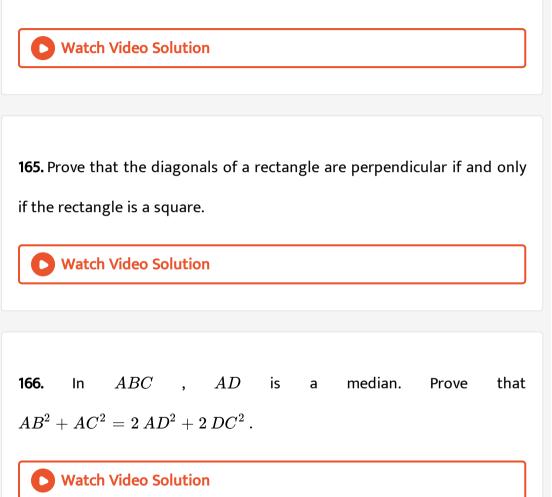
163. prove using vectors: The quadrilateral obtained by joining mid-points

of adjacent sides a rectangle is a rhombus.



164. Using analytical geometry, prove that the diagonals of a rhombus are

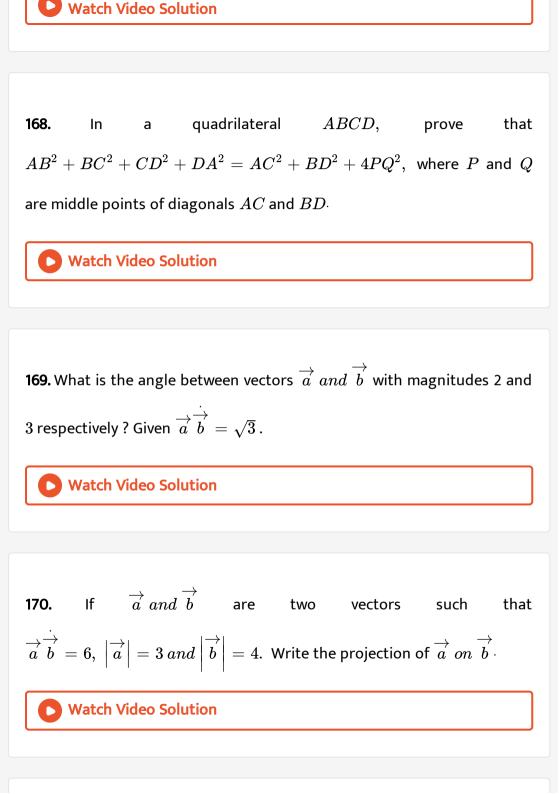
perpendicular to each other.



167. If the median to the base of a triangle is perpendicular to the base

then triangle is isosceles.





171. Find the cosine of the angle between the vectors $4\hat{i} - 3\hat{j} + 3\hat{k}$ and $2\hat{i} - \hat{j} - \hat{k}$.

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172. If the vectors $3\hat{i}+m\hat{j}+\hat{k}$ and $2\hat{i}-\hat{j}-8\hat{k}$ are orthogonal, find $m\cdot$

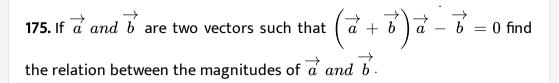
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173. If the vectors $3\hat{i}-2\hat{j}-4\hat{k}$ and $18\hat{i}-12\hat{j}-m\hat{k}$ are parallel find the

value of m·

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174. If \overrightarrow{a} and \overrightarrow{b} are vectors of equal magnitude, write the value of $\left(\overrightarrow{a} + \overrightarrow{b}\right)\overrightarrow{a} - \overrightarrow{b}$. Watch Video Solution





176. For any two vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} write when $\left|\overrightarrow{a} + \overrightarrow{b}\right| = \left|\overrightarrow{a}\right| + \left|\overrightarrow{b}\right|$

holds.

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177. For any two vectors
$$\overrightarrow{a}$$
 and \overrightarrow{b} write then $\left|\overrightarrow{a} + \overrightarrow{b}\right| = \left|\overrightarrow{a}\right| + \left|\overrightarrow{b}\right|$

holds.



178. If \overrightarrow{a} and \overrightarrow{b} are two vectors of the same magnitude inclined at an angle of 60^0 such that $\overrightarrow{a} \overrightarrow{b} = 8$ write the value of their magnitude.

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179. If
$$\overrightarrow{a} \overrightarrow{a} = 0$$
 and $\overrightarrow{a} \overrightarrow{b} = 0$ what can you conclude about the vector \overrightarrow{b} ?

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180. If
$$\overrightarrow{b}$$
 is a unit vector such that $\left(\overrightarrow{a} + \overrightarrow{b}\right)\left(\overrightarrow{a} - \overrightarrow{b}\right) = 8$, find $\left|\overrightarrow{a}\right|$.

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181. If $\widehat{a},\ \hat{b}$ are unit vector such that $\widehat{a}+\widehat{b}$ is a unit vectors, write the value of $|\widehat{a}-\widehat{b}|$.

182. If
$$\left| \overrightarrow{a} \right| = 13$$
, $\left| \overrightarrow{b} \right| = 5$ and $\overrightarrow{a} \overrightarrow{b} = 60$, then find $\left| \overrightarrow{a} \times \overrightarrow{b} \right|$

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183. If
$$\overrightarrow{a} = \hat{i} - \hat{j}$$
 and $\overrightarrow{b} = -\hat{j} + \hat{k}$ find the projection of \overrightarrow{a} on \overrightarrow{b} .

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184. For any two non zero vectors write the value of $\frac{\left|\overrightarrow{a} + \overrightarrow{b}\right|^{2} + \left|\overrightarrow{a} - \overrightarrow{b}\right|^{2}}{\left|\overrightarrow{a}\right|^{2} + \left|\overrightarrow{b}\right|^{2}}$ $\overrightarrow{a} = \frac{\left|\overrightarrow{a}\right|^{2}}{\left|\overrightarrow{a}\right|^{2}} + \left|\overrightarrow{b}\right|^{2}$ Watch Video Solution 185. Write the the projections of $\overrightarrow{r}=3\hat{i}-4\hat{j}+12\hat{k}$ on the coordinate

axes.



186. Writhe the component of \overrightarrow{b} along \overrightarrow{a} .

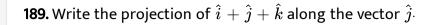
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187. Writhe the value of
$$\left(\overrightarrow{a}\stackrel{\cdot}{\hat{i}}\right)\hat{i} + \left(\overrightarrow{a}\stackrel{\cdot}{\hat{j}}\right)\hat{j} + \left(\overrightarrow{a}\stackrel{\cdot}{\hat{k}}\right)\hat{k}$$
 where \overrightarrow{a} is any

vector.

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188. Find the value of $\theta(0, \pi/2)$ for which vectors $\vec{a} = (\sin \theta)\hat{i} + (\cos \theta)\hat{j}$ and $\vec{b} = \hat{i} - \sqrt{3}\hat{j} + 2\hat{k}$ are perpendicular.





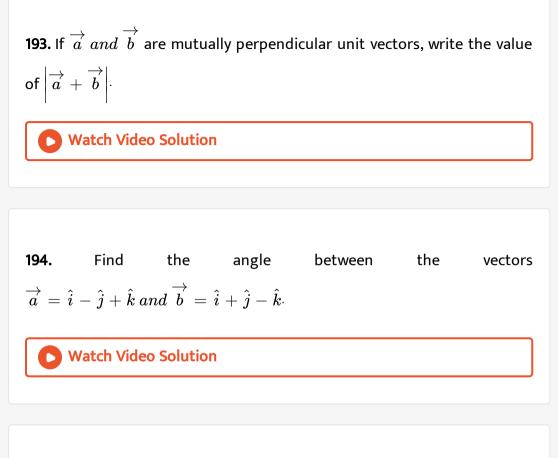
190. Writhe a vector satisfying $\overrightarrow{a}\hat{i} = \overrightarrow{a}\hat{i} + \hat{j} = \overrightarrow{a}\hat{i} + \hat{j} + \hat{k} = 1$.

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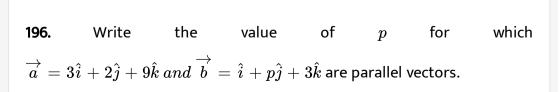
191. Find
$$rac{dy}{dx}$$
 if $y=e^{3x}$

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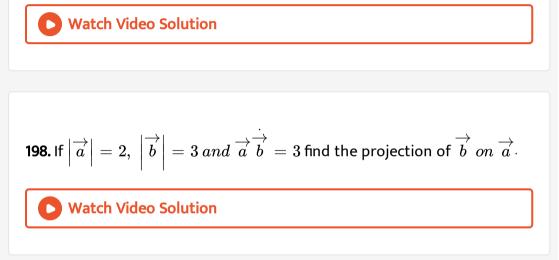
192. If \overrightarrow{a} and \overrightarrow{b} and \overrightarrow{c} are mutually perpendicular unit vectors, write the value of $\left|\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}\right|$.



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



197. Find the value of λ . If the vectors $2\hat{i} + \lambda\hat{j} + 3\hat{k}$ and $3\hat{i} + 2\hat{j} - 4\hat{k}$ are perpendicular to each other.

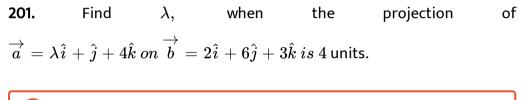


199. Writhe the angle between two vectors \overrightarrow{a} and \overrightarrow{b} with magnitudes

$$\sqrt{3}\,and\,2$$
 repsectively having $\overrightarrow{a}\stackrel{\cdot}{\overrightarrow{b}}=\sqrt{6}$.

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





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202. For what value of λ are the vectores $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$ perpendicular to each other?

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



204. Write the value of λ so that the vector $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$ are perpendicular to each

other.

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205. Write the projection of
$$\overrightarrow{b} + \overrightarrow{c}$$
 on \overrightarrow{a} , when
 $\overrightarrow{a} = 2\hat{i} - 2\hat{j} + \hat{k}, \ \overrightarrow{b} = \hat{i} + 2\hat{j} - 2\hat{k} and \ \overrightarrow{c} = 2\hat{i} - \hat{j} + 4\hat{k}$.

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206. Vectors \overrightarrow{a} and \overrightarrow{b} are such that $\left|\overrightarrow{a}\right| = 3$, $\left|\overrightarrow{b}\right| = \frac{2}{3}$ and $\left(\overrightarrow{a} \times \overrightarrow{b}\right)$ is a unit vector. Write the angle between \overrightarrow{a} and \overrightarrow{b} .

207. If \overrightarrow{a} and \overrightarrow{b} are unit vectors such that $\overrightarrow{a} \times \overrightarrow{b}$ is also a unit vector, find the angle between \overrightarrow{a} and \overrightarrow{b} .

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208. The vector
$$\overrightarrow{a}$$
 and \overrightarrow{b} satisfy the equation
 $2\overrightarrow{a} + \overrightarrow{b} = \overrightarrow{p}$ and $\overrightarrow{a} + 2\overrightarrow{b} = \overrightarrow{q}$, where $\overrightarrow{p} = \hat{i} + \hat{j}$ and $\overrightarrow{q} = \hat{i} - \overrightarrow{j}$.
If θ is the angle between \overrightarrow{a} and $\overrightarrow{b} \setminus$, then
 $a.\cos\theta = \frac{4}{5}$ b. $\sin\theta = \frac{1}{\sqrt{2}}$ c. $\cos\theta = -\frac{4}{5}$ d. $\cos\theta = -\frac{3}{5}$
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209. If
$$\overrightarrow{a}$$
. $\hat{i} = \overrightarrow{a}$. $(\hat{i} + \hat{j}) = \overrightarrow{a}$. $(\hat{i} + \hat{j} + \hat{k}) = 1$, then \overrightarrow{a} is equal to

210. If
$$\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$$
, $|\overrightarrow{a}| = 3$, $|\overrightarrow{b}| = 5$ and $|\overrightarrow{c}| = 7$ find the anglebetweeen \overrightarrow{a} and \overrightarrow{b}

211. If \overrightarrow{a} and \overrightarrow{b} be two unit vectors and θ is the angle between them. Then $\overrightarrow{a} + \overrightarrow{b}$ is an unit vector, if $\theta = \frac{\pi}{2}$ b. $\frac{2\pi}{3}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{3}$

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212. The vector $\coslpha\coseta\hat{i}+\coslpha\,s\ineta\hat{j}+\sinlpha\hat{k}$ is a $ull\,vec
ightarrow r$ b.

 $\mathit{nit} \mathit{vec}
ightarrow \mathit{r}$ c. $\mathit{constant} \mathit{vec}
ightarrow \mathit{r}$ d. none of these

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213. If the position vectors of P and Q are $\hat{i} + 3\hat{j} - 7\hat{k}$ and $5\hat{i} - 2\hat{j} + 4\hat{k}$ them the cosine of the angle between $\overrightarrow{P}Q$ and y-axis is $\frac{5}{\sqrt{162}}$ b. $\frac{4}{\sqrt{162}}$

$$\mathsf{c.} - \frac{5}{\sqrt{162}} \mathsf{ d.} \frac{11}{\sqrt{162}}$$

214. If \overrightarrow{a} and \overrightarrow{b} are unit vectors, then which of the following values \overrightarrow{a} \overrightarrow{b}

is not possible?

a. $\sqrt{3}$

b. $\sqrt{3}/2$

c. $1/\sqrt{2}$

 $\mathsf{d.}-1\,/\,2$

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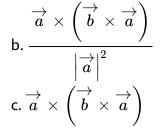
215. If the vectors $\hat{i} - 2x\hat{j} + 3y\hat{k}$ and $\hat{i} + 2x\hat{j} - y\hat{k}$ are perpendicular,

then the locus of (x,y) is

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216. The vector component of \overrightarrow{b} perpendicular to \overrightarrow{a} is

 $\mathbf{a}. \begin{pmatrix} \overrightarrow{b} \stackrel{\cdot}{\overrightarrow{c}} \\ \overrightarrow{b} \stackrel{\cdot}{\overrightarrow{c}} \end{pmatrix} \overrightarrow{a}$



d. none of these

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217. The length of the longer diagonal of the parallelogram constructed on $5\overrightarrow{a} + 2\overrightarrow{b}$ and $\overrightarrow{a} - 3\overrightarrow{b}$ if it is given that $\left|\overrightarrow{a}\right| = 2\sqrt{2}$, $\left|\overrightarrow{b}\right| = 3$ and angle between \overrightarrow{a} and \overrightarrow{b} is $\pi/4$ is a.15 b. $\sqrt{113}$ c. $\sqrt{593}$ d. $\sqrt{369}$

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218. If \overrightarrow{a} is a non zero vector of magnitude 'a' and λ a non zero scalar, then $\lambda \overrightarrow{a}$ is unit vector if

219. If θ is the angle between two vectors \overrightarrow{a} and \overrightarrow{b} , then \overrightarrow{a} . $\overrightarrow{b} \geq 0$ only

when



220. The value of
$$x$$
 for which the angle between $\overrightarrow{a} = 2x^2\hat{i} + 4x\hat{j} + \hat{k}and\overrightarrow{b} = 7\hat{i} - 2\hat{j} + \hat{k}$ is obtuse and the angle

between b and the z-axis acute and less than $\pi/6$ is given by

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221. If \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} are any time mutually perpendicular vectors of equal magnitude a, then $\left|\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}\right|$ is equal to a b. $\sqrt{2}a$ c. $\sqrt{3}a$ d. 2a e. none of these

222. If the vectors $3\hat{i} + \lambda\hat{j} + \hat{k}$ and $2\hat{i} - \hat{j} + 8\hat{k}$ are perpendicular, then λ is equal to -14 b. 7 c. 14 d. $rac{1}{7}$

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223. The projection of the vector $\hat{i}+\hat{j}+\hat{k}$ along the vector of \hat{j} is 1 b. 0

c. 2 d. -1 e. -2

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224. The vectors $2\hat{i} + 3\hat{j} - 4\hat{k}$ and $a\hat{i} = b\hat{j} + c\hat{k}$ are perpendicular if

 $a=2,\ b=3,\ c=-4$ $a=4,\ b=4,\ c=5$ $a=4,\ b=4,\ c=-5$

 $a = -4, \ b = 4, \ c = -5$

225. If
$$\left|\overrightarrow{a}\right| = \left|\overrightarrow{b}\right|$$
, then $\left(\overrightarrow{a} + \overrightarrow{b}\right)\overrightarrow{a} - \overrightarrow{b} = a$. positive b. negative c.

0 d. none of these

226. If \overrightarrow{a} and \overrightarrow{b} are unit vectors inclined at an angle θ then the value of $\left|\overrightarrow{a} - \overrightarrow{b}\right|$ is a.2 sin $\left(\frac{\theta}{2}\right)$ b. 2 sin θ c. 2 cos $\left(\frac{\theta}{2}\right)$ d. 2 cos θ

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227. If \overrightarrow{a} and \overrightarrow{b} are unit vectorts, then the greatest value fo $\sqrt{3} \left| \overrightarrow{a} + \overrightarrow{b} \right| + \left| \overrightarrow{a} - \overrightarrow{b} \right|$ is

 $(a).2~(b).~2\sqrt{2}~(c).4$ (d). none of these

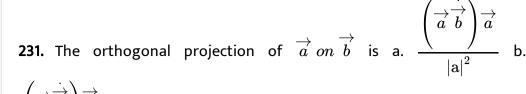
228. If the angle between the vectors $x\hat{i} + 3\hat{j} - 7\hat{k}$ and $x\hat{i} - x\hat{j} + 4\hat{k}$ acute, then x lies in the interval (-4, 7) b. [-4, 7] c. R - [-4, 7] d. R - (4, 7)

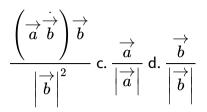
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229. If \overrightarrow{a} and \overrightarrow{b} are two unit vectors inclined at an angle θ such that |a + b|, 1, then `theta(2pi)/3c. pi/3

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230. Let $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ be three unit vectors such that $\left|\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}\right| = 1$ and \overrightarrow{a} is perpendicular to \overrightarrow{b} . If \overrightarrow{c} makes angle α and β with \overrightarrow{a} and \overrightarrow{b} respectively, then $\cos \alpha + \cos \beta = -\frac{3}{2}$ b. $\frac{3}{2}$ c. 1 d. -1





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232. If θ is an acute angle and the vector $(\sin \theta)\hat{i} + (\cos \theta)\hat{j}$ is perpendicular to the vector $\hat{i} - \sqrt{3}\hat{j}$, then $\theta = \frac{\pi}{6}$ b. $\frac{\pi}{5}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{3}$

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233. If \overrightarrow{a} and \overrightarrow{b} be two unit vectors and θ is the angle between them. Then $\overrightarrow{a} + \overrightarrow{b}$ is an unit vector, if $\theta = \frac{\pi}{2}$ b. $\frac{2\pi}{3}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{3}$