MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

ALGEBRA OF VECTORS

Others

1. Prove that a necessary and sufficient condition for three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ to be coplanar is that there exist scalars l, m, n not all zero simultaneously such that $l\vec{a} + m\vec{b} + n\vec{c} = \vec{0}$.

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2. Prove that the following vectors are non-coplanar: $3\hat{i} + \hat{j} - \hat{k}, 2\hat{i} - \hat{j} + 7\hat{k}$ and $7\hat{i} - \hat{j} + 23\hat{k}$ $\hat{i} + 2\hat{j} + 3\hat{k}, 2\hat{i} + \hat{j} + 3$

and $\hat{i}+\hat{j}+\hat{k}$

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3. Using vectors show that the points A(-2,3,5), B(7,0,-1), C(-3,-2,-5) and D(3,4,7) are such that AB and CD intersect at the point P(1,2,3).

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4. Prove that 1,1,1 cannot be direction cosines of a straight line.

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5. A vector $\vec{r}$ is inclined at equal acute angles of $x-a\xi s,\ y-a\xi s$ and $z-a\xi s\cdot$ if $\left|\vec{r}\right|=6$ units, find $\vec{r}$.

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6. Find the angles at which the following vectors are inclined to each of the coordinate axes: $\hat{i}-\hat{j}+\hat{k}\ \hat{j}-\hat{k}\ 4\hat{i}+8\hat{j}+\hat{k}$

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7. Find the direction cosines of the following vectors: $2\hat{i}+2\hat{j}-\hat{k}$ $6\hat{i}-2\hat{j}-3\hat{k}\ 3\hat{i}-4\hat{k}$

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8. Prove that the sum of three vectors determined by the medians of a triangle directed from the vertices is zero.

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9. If P is a point and $ABCD$ is a quadrilateral and $\overrightarrow{A}P+\overrightarrow{P}B+\overrightarrow{P}D=\overrightarrow{P}C$, show that $ABCD$ is a parallelogram.

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10. If $\vec{a}$ is a vector and m is a scalar such that $m\vec{a} = \vec{0}$, then what are the alternatives for m and $\vec{a}$?

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11. If $\vec{a}$, $\vec{b}$ are two vectors, then write the truth value of the following statements: $\vec{a} = -\vec{b} \left|\vec{a}\right| = \left|\vec{b}\right| \quad \left|\vec{a}\right| = \left|\vec{b}\right| \vec{a} = \pm\vec{b}$ $\left|\vec{a}\right| = \left|\vec{b}\right| \vec{a} = \vec{b}$

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12. $ABCD$ is a quadrilateral. Find the sum the vectors $\vec{B}A$, $\vec{B}C$, and $\vec{D}A$.

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13. $ABCDE$ is pentagon, prove that $\overrightarrow{A}B + \overrightarrow{B}C + \overrightarrow{C}D + \overrightarrow{D}E + \overrightarrow{E}A = \overrightarrow{0}$ $\overrightarrow{A}B + \overrightarrow{A}E + \overrightarrow{B}C + \overrightarrow{D}C + \overrightarrow{E}D + \overrightarrow{A}C = 3\overrightarrow{A}C$

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14. If P, Q and R are three collinear points such that $\overrightarrow{P}Q = \overrightarrow{a}$ and $\overrightarrow{Q}R = \overrightarrow{b}$. Find the vector $\overrightarrow{P}R$.

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15. Give a condition that three vectors $\overrightarrow{a}$, $\overrightarrow{b}$ and $\overrightarrow{c}$ from the three sides of a triangle. What are the other possibilities?

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16. If $\vec{a}$ and $\vec{b}$ are two non-collinear vectors having the same initial point. What are the vectors represented by $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$.

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17. Find the unit vector in the direction of $3\hat{i} + 4\hat{j} - 12\hat{k}$.

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18. The vertices A, B, C of triangle ABC have respectively position vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ with respect to a given origin O. Show that the point D where the bisector of $\angle A$ meets BC has position vector $\vec{d} = \frac{\beta\vec{b} + \gamma\vec{c}}{\beta + \gamma}$, where $\beta = \left|\vec{c} - \vec{a}\right|$ and, $\gamma = \left|\vec{a} - \vec{b}\right|$. Hence, deduce that incentre I has position vector $\frac{\alpha\vec{a} + \beta\vec{b} + \gamma\vec{c}}{\alpha + \beta + \gamma}$ where $\alpha = \left|\vec{b} - \vec{c}\right|$

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19. Find a unit vector parallel to the vector $\hat{i} + \sqrt{3}\hat{j}$

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20. Show that the four points A, B, C, D with position vectors $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ respectively such that $3\vec{a} - 2\vec{b} + 5\vec{c} - 6\vec{d} = \vec{0}$, are coplanar. Also, find the position vector of the point of intersection of the line segments AC and BD.

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21. If $\vec{a}, \vec{b}$ are the position vectors of A, B respectively, find the position vector of a point C in AB produced such that $AC = 3AB$ and that a point D in BA produced such that $BD = 2BA$.

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22. Let $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ be the position vectors of the four distinct points A, B, C, D. If $\vec{b} - \vec{a} = \vec{a} - \vec{d}$, then show that $ABCD$ is parallelogram.

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23. 6). If $\vec{PQ} = 3\hat{i} + 2\hat{j} - \hat{k}$ and the coordinates of P are $(1, -1, 2)$, find the coordinates of Q. (7). prove that the points $\hat{i} - \hat{j}, 4\hat{i} - 3\hat{j} + \hat{k}, 2\hat{i} - 4\hat{j} + 5\hat{k}$ are the vertices of a right angled triangle.

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24. Prove that the points $\hat{i} - \hat{j}, 4\hat{i} - 3\hat{j} + \hat{k}$ and $2\hat{i} - 4\hat{j} + 5\hat{k}$ are the vertices of a right angled triangle.

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

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26. Can a vector have direction angles 45^0, 60^0, 120^0

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27. A vector makes an angle of $\frac{\pi}{4}$ with each of x-axis and y-axis Find the angle made by it with the z-axis.

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28. Show that the point A, B, C with position vectors $\vec{a} - 2\vec{b} + 3\vec{c}, 2\vec{a} + 3\vec{b} - 4\vec{c}$ and $-7\vec{b} + 10\vec{c}$ are collinear.

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29. If $\overrightarrow{A}O + \overrightarrow{O}B = \overrightarrow{B}O + \overrightarrow{O}C$, prove that A, B, C are collinear points.

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

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31. Show that the four points $A, B, CandD$ with position vectors $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ and $\overrightarrow{d}$ respectively are coplanar if and only if $3\overrightarrow{a} - 2\overrightarrow{b} + \overrightarrow{c} - 2\overrightarrow{d} = 0.$

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32. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $\hat{i}+2\hat{j}-\hat{k}$and $-\hat{i}+\hat{j}+\hat{k}$respectively, in the ratio 2 : 1(i) internally (ii) externally

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33. Five forces $\overrightarrow{A}B$, $\overrightarrow{A}C$, $\overrightarrow{A}D$, $\overrightarrow{A}E$ and $\overrightarrow{A}F$ act at the vertex of a regular hexagon $ABCDEF$. Prove that the resultant is $6\overrightarrow{A}O$, where O is the centre of hexagon.

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34. If $\overrightarrow{a}=\hat{i}+\hat{j}+\hat{k}$, $\overrightarrow{b}=4\hat{i}-2\hat{j}+3\hat{k}$ and $\overrightarrow{c}=\hat{i}-2\hat{j}+\hat{k}$, find a vector of magnitude 6 units which is parallel to the vector $2\overrightarrow{a}-\overrightarrow{b}+3\overrightarrow{\cdot}$

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35. Answer the following as true or flase: $\vec{a}$ and $\vec{b}$ are collinear. Two collinear vectors are always equal in magnitude. Zero vector is unique. Two vectors having same magnitude are collinear. Two collinear vectors having the same magnitude are equal.

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36. Find the coordinates of the tip of the position vector which is equivalent to $\vec{AB}$, where the coordinates of A and B are $(-1, 3)$ and $(-2, 1)$ respectively.

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37. Express $\vec{AB}$ in terms of unit vectors $\hat{i}$ and $\hat{j}$, when the points are: i)$A(4, -1), B(1, 3)$ ii)$A(-6, 3), B(-2, -5)$ Find $\left|\vec{AB}\right|$ in each case.

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38. If the position vectors of the points $A(3, 4), B(5, -6)$ and $(4, -1)$ are $\vec{a}, \vec{b}, \vec{c}$ respectively compute $\vec{a} + 2\vec{b} - 3\vec{c}$

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39. $ABCD$ is parallelogram. If the coordinates of A, B, C are $(-2, -1), (3, 0)$ and $(1, -2)$ respectively, find the coordinates of D.

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40. If the position vector of a point $(-4, -3)$ be $\vec{a}$, find $|a|$.

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41. Find a vector of magnitude 4 units which is parallel to the vector $\sqrt{3}\hat{i} + \hat{j}$.

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42. If the position vector $\vec{a}$ of a point $(12, n)$ is such that $\left|\vec{a}\right| = 13$, find the value (s) of n.

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43. Show that the sum of three vectors determined by the medians of a triangle directed from the vertices is zero.

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44. $ABCD$ is parallelogram and P is the point of intersection of its diagonals. If O is the origin of reference, show that $\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC} + \overrightarrow{OD} = 4\overrightarrow{OP}$.

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45. If O is a point in space, ABC is a triangle and D, E, F are the mid-points of the sides BC, CA and AB respectively of the triangle, prove that $\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC} = \overrightarrow{OD} + \overrightarrow{OE} + \overrightarrow{OF}$.

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46. Show that the point $2\hat{i}, \ -\hat{i} - 4\hat{j}$ and $-\hat{i} + 4\hat{j}$ from an isosceles triangle.

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47. If $\vec{a}$ be the position vector whose tip is $(5, -3)$, find the coordinates of a point B such that $\vec{AB} = \vec{a}$, the coordinates of A being $(4, -1)$.

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48. Show that the line segments joining the mid-points of opposite sides of a quadrilateral bisects each other.

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49. $ABCD$ are four points in a plane and Q is the point of intersection of the lines joining the mid-points of AB and CD; BC and AD. Show that $\vec{PA} + \vec{PB} + \vec{PC} + \vec{PD} = 4\vec{PQ}$, where P is any point.

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50. If $\vec{a}$ and $\vec{b}$ are non-collinear vectors, find the value of x for which the vectors $\vec{\alpha} = (2x+1)\vec{a} - \vec{b}$ and $\vec{\beta} = (x-2)\vec{a} + \vec{b}$ are collinear.

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51. The projection of a vector on the coordinate axes are $(6, -3, 2)$ Find its length and direction cosines.

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52. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are three non- null vectors such that any two of them are non-collinear. If $\vec{a} + \vec{b}$ is collinear with $\vec{c}$ and $\vec{b} + \vec{c}$ is collinear with $\vec{a}$, then find $\vec{a} + \vec{b} + \vec{c}$

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53. Show that the vectors $2\vec{a} - \vec{b} + 3\vec{c}, \vec{a} + \vec{b} - 2\vec{c} and \vec{a} + \vec{b} - 3\vec{c}$ are non-coplanar vectors (where $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar vectors)

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54. Show that the points A, B, C with position vectors $-2\vec{a} + 3\vec{b} + 5\vec{c}, \vec{a} + 2\vec{b} + 3\vec{c} and 7\vec{a} - \vec{c}$ respectively, are collinear.

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55. Prove that the line joining the mid-points of the diagonals of a trapezium is parallel to the parallel sides of trapezium and is half of their difference.

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56. Prove that the segment joining the middle points of two non-parallel sides of a trapezium is parallel to the parallel sides and half of their sum.

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57. Using vector method, prove that the line segments joining the mid-points of the adjacent sides of a quadrilateral taken in order form a parallelogram.

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58. If the points with position vectors $60\hat{i}+2\hat{j}, 40\hat{i}-8\hat{j}$ and $a\hat{i}-52\hat{j}$ are collinear, find the value of a.

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59. If $ABCD$ is quadrilateral and $EandF$ are the mid-points of $ACandBD$ respectively, prove that $\overrightarrow{A}B+\overrightarrow{A}D+\overrightarrow{C}B+\overrightarrow{C}D=4\overrightarrow{E}F$.

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60. If D and E are the mid-points of sides AB and AC of a triangle ABC respectively, show that $\overrightarrow{B}E+\overrightarrow{D}C=\frac{3}{2}\overrightarrow{B}C$.

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61. If G is the centroid of a triangle ABC, prove that $\overrightarrow{G}A+\overrightarrow{G}B+\overrightarrow{G}C=\overrightarrow{0}$.

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62. Prove using vectors: Medians of a triangle are concurrent.

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63. Points L, M, N divide the sides BC, CA, AB of ABC in the ratio 1:4, 3:2, 3:7 respectively. Prove thatAL + BM + CŃ is a vector parallel to CK where K divides AB in the ratio 1: 3.

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64. Prove using vectors: The diagonals of a quadrilateral bisect each other iff it is a parallelogram.

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65. Show that the line segments joining the mid-points of opposite sides of a quadrilateral bisects each other.

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66. Prove that the line segment joining the mid points of two side of a triangle is parallel to the third side and equal to half of it.

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67. A vector $\vec{r}$ is inclined at equal to $OX, OY and OZ$. If the magnitude of $\vec{r}$ is 6 units, find $\vec{r}$.

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68. A vector $\vec{r}$ has length 21 and its direction ratios are proportional to $2, -3, 6$. Find the direction cosines and components of $\vec{r}$, is given that $\vec{r}$ Makes an acute angle with $x -$ axis.

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69. If $\vec{a}$ and $\vec{b}$ are non-collinear vectors and vectors $\vec{\alpha} = (x + 4y)\vec{a} + (2x + y + 1)\vec{b}$ and $\vec{\beta} = (-2x + y + 2)\vec{a} + (2x - 3y - 1)\vec{b}$ are connected by the relation $3\vec{\alpha} = 2\vec{\beta}$,find the value of x and y?

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70. $ABCD$ is a parallelogram. E, F are mid-points of BC, CD respectively. AE, AF meet the diagonal BD at points Q and P respectively. Show that points P and Q trisect DB`.

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71. If $a\ and\ b$ ar non collinear vector such that $x_1\vec{a} + y_1\vec{b} = x_2\vec{a} + y_2\vec{b}$, then prove that $x_1 = x_2 and\ y_1 = y_2$.

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72. Show that the vectors a, b, c given by $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}, \vec{b} = 2\hat{i} + \hat{j} + 3\hat{k} and \vec{c} = \hat{i} + \hat{j} + \hat{k}$ are non-coplanar. Express vector $\vec{d} = 2\hat{i} - 3\hat{k}$ as a liner combination of the vectors $\vec{a}, \vec{b}, and \vec{c}$.

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73. A vector $\vec{OP}$ is inclined to OX at 50^0 and OY at 60^0. Find the angle at which $\vec{OP}$ is inclined to OZ.

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74. If a vector makes angles $\alpha, \beta, \gamma. with. OX, OY and OZ$ respectively, prove that $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2.$

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75. $ABCD$ is a parallelogram. If L and M are the mid-points of BC and DC respectively, then express $\overrightarrow{A}L$ and $\overrightarrow{A}M$ in terms of $\overrightarrow{A}B$ and $\overrightarrow{A}D$. Also, prove that $\overrightarrow{A}L + \overrightarrow{A}M = \frac{3}{2}\overrightarrow{A}C$.

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76. Find a unit vector in the direction of the resultant of the vectors $\hat{i} - \hat{j} + 3\hat{k}, 2\hat{i} + \hat{j} - 2\hat{k} \text{and} 3\hat{i} + 2\hat{j} - 2\hat{k}$.

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77. Find the position vector of the mid-point of the vector joining the points $P\left(2\hat{i} - 3\hat{j} + 4\hat{k}\right) and \text{Q}\left(4\hat{i} + \hat{j} - 2\hat{k}\right)$.

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78. Show that the line joining one vertex of a parallelogram to the mid-point of an opposite side trisects the diagonal and is trisected thereat.

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79. Let $\vec{a}, \vec{b}, \vec{c}$ be three non-zero vectors such that any two of them are non-collinear. If $\vec{a} + 2\vec{b}$ is collinear with $\vec{c}$ and $\vec{b} + 3\vec{c}$ is collinear with $\vec{a}$ then prove that $\vec{a} + 2\vec{b} + 6\vec{c} = \vec{0}$

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80. If $\vec{a}, \vec{b}$ are the position vectors of the points $(1, -1), (-2, m)$, find the value of m for which $\vec{a}$ and $\vec{b}$ are collinear.

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81. Find the position vector of a point A in space such that $\overrightarrow{OA}$ is inclined at $60^0 \to OX$ and at $45^0 \to OY and \left|\overrightarrow{OA}\right| = 10 units.$

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82. Show that the points $A(6, -7, 0), B(16, -19, -4), C(0, 3, -6) and\ D(2, -5, 10)$ are such that AB and CD intersect at the point $P(1, -1, 2).$

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83. Prove that the lines joining the vertices of a tetrahedron to the centroids of opposite faces are concurrent.

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84. Find a vector $\vec{r}$ of magnitude $3\sqrt{2}units$ which makes an angle of $\frac{\pi}{4}$ and $\frac{\pi}{2}$ with y and $z-$ axis respectively.

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

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86. Three vectors of magnitude $a, 2a, 3a$ meet in a point and their directions are along the diagonals of the adjacent faces of a cube. Determine their resultant.

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87. Show that the vectors $\vec{a} - 2\vec{b} + 3\vec{c}, \vec{a} - 3\vec{b} + 5\vec{c} \text{ and } -2\vec{a} + 3\vec{b} - 4\vec{c}$ are coplanar, where $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar.

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88. Find the angles at which the vector $2\hat{i} - \hat{j} + 2\hat{k}$ is inclined to each of the coordinate axes.

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89. Prove that four points $2\vec{a} + 3\vec{b} - \vec{c}, \vec{a} - 2\vec{b} + 3\vec{c}, 3\vec{a} + 4\vec{b} - 2\vec{c} \text{ and } \vec{a} - 6\vec{b} + 6\vec{c}$ are coplanar.

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90. Find the direction cosines of the vector joining the points $A(1, 2, -3) and B(-1, -2, 1)$, directed from $A and B$.

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91. If $\vec{a} and \vec{b}$ are two non-collinear vectors, show that points $l_1\vec{a} + m_1\vec{b}, l_2\vec{a} + m_2\vec{b}$ and $l_3\vec{a} + m_3\vec{b}$ are collinear if $|l_1 l_2 l_3 m_1 m_2 m_3 111| = 0.$

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92. If the position vector $\vec{a}$ of a point $(12, n)$ is such that $\left|\vec{a}\right| = 13$, find the value of n.

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93. If $A=(0,1)B=(1,0), C=(1,2), D=(2,1)$, prove that $\overrightarrow{A}B=\overrightarrow{C}D$.

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94. Show that the points with position vectors $\overrightarrow{a}-2\overrightarrow{b}+3\overrightarrow{c}, -2\overrightarrow{a}+3\overrightarrow{b}+2\overrightarrow{c}$ and $-8\overrightarrow{a}+13\overrightarrow{b}$ are collinear whatever be $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{\cdot}$

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95. Find the position vector of a point R which divides the line joining the two points P and Q with position vectors $\overrightarrow{OP}=2\overrightarrow{a}+\overrightarrow{b}$ and $\overrightarrow{OQ}=\overrightarrow{a}-2\overrightarrow{b}$, respectively in the ratio $1:2$ internally and externally.

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96. If D is the mid-point of the side BC of a triangle ABC, prove that $\overrightarrow{A}B + \overrightarrow{A}C = 2\overrightarrow{A}D$.

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97. Show that the found points A, B, C, D with position vectors $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}, \overrightarrow{d}$ respectively such that $3\overrightarrow{a} - 2\overrightarrow{b} + 5\overrightarrow{c} - 6\overrightarrow{d} = \overrightarrow{0}$, are coplanar. Also, find the position vector of the point of intersection of the line segments AC and BD.

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98. Let $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ be the position vectors of three distinct points A, B, C. If there exist scalars x, y, z (not all zero) such that $x\overrightarrow{a} + y\overrightarrow{b} + z\overrightarrow{c} = 0 and x + y + z = 0,$ then show that $A, B and C$ lie on a line.

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99. If $\vec{a}$ and $\vec{b}$ are position vectors of points $AandB$ respectively, then find the position vector of points of trisection of AB .

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100. If $\vec{a}\,and\,\vec{b}$ are position vectors of $AandB$ respectively, find the position vector of a point $ConBA$ produced such that $BC = 1.5BA$.

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101. If $\vec{c} = 3\vec{a} + 4\vec{b}$ and $2\vec{c} = \vec{a} - 3\vec{b}$, show that (i) $\vec{c}$ and $\vec{a}$ have the same direction and $\left|\vec{c}\right| > \left|\vec{a}\right|$(ii) $\vec{b}$ and $\vec{c}$ have opposite direction and $\left|\vec{c}\right| > \left|\vec{b}\right|$

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102. Find the position vectors of the points which divide the join of the points $2\vec{a} - 3\vec{b}\ and 3\vec{a} - 2\vec{b}$ internally and externally in the ratio $2:3$.

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103. Let O be the centre of a regular hexagon $ABCDEF$. Find the sum of the vectors $\vec{O}A, \vec{O}B, \vec{O}C, \vec{O}D, \vec{O}E and \vec{O}F$.

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104. For any two vectors $\vec{a} and \vec{b}$, prove that $\left|\vec{a} + \vec{b}\right| \leq \left|\vec{a}\right| + \left|\vec{b}\right|$ (ii) $\left|\vec{a} - \vec{b}\right| \leq \left|\vec{a}\right| + \left|\vec{b}\right|$ (iii) $\left|\vec{a} - \vec{b}\right| \geq \left|\vec{a}\right| - \left|\vec{b}\right|$

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105. IF P_1, P_2, P_3, P_4 are points in a plane or space and O is the origin of vectors, show that P_4 coincides with $O \Leftrightarrow \left(\overrightarrow{O}P\right)_1 + \overrightarrow{P}_1P_2 + \overrightarrow{P}_2P_3 + \overrightarrow{P}_3P_4 = \overrightarrow{0}$.

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106. Using vectors, find the value of λ such that the points $(\lambda, -10, 3), (1, -1, 3) and (3, 5, 3)$ are collinear.

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107. If $\overrightarrow{a}, \overrightarrow{b}$ are any two vectors, then give the geometrical interpretation of relation $\left|\overrightarrow{a} + \overrightarrow{b}\right| = \left|\overrightarrow{a} - \overrightarrow{b}\right|$

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108. If $\overrightarrow{PO} + \overrightarrow{OQ} = \overrightarrow{QO} + \overrightarrow{OR}$, show that the point, P, Q, R are collinear.

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

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

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111. Vectors drawn the origin O to the points $A, BandC$ are respectively $\vec{a}$, $\vec{b}\,and\,\vec{4}\,a - \vec{3}\,b$. find $\vec{A}\,CandD\vec{B}\,C$.

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112. If $\vec{a}\,and\,\vec{b}$ represent two adjacent sides $\vec{A}\,BandD\vec{B}\,C$ respectively of a parallelogram $ABCD$, then show that its diagonals $\vec{A}\,CandD\vec{D}\,B$ are equal to $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ respectively.

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113. A , B ,Â P,Â QÂ andÂ R are five points in a plane. Show that the sum of the vectors AP Ã¢Â†Â' ,Ã‚Â AQ Ã¢Â†Â' ,Ã‚Â AR Ã¢Â†Â' ,Ã‚Â PB Ã¢Â†Â' ,Ã‚Â QB Ã¢Â†Â' Ã‚Â andÃ‚Â RB Ã¢Â†Â' Ã‚Â isÃ‚Â 3Ã‚Â AB Ã¢Â†Â' .

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114. Let $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ be the position vectors of the four distinct points A, B, C, D. If $\vec{b} - \vec{a} = \vec{c} - \vec{d}$, then show that $ABCD$ is parallelogram.

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115. Find a vector of magnitude 11 in the direction opposite to that of $\vec{PQ}$, where P and Q are the points (1,3,2) and (1,0,8) respectively.

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116. Find the unit vector in the direction of $3\hat{i} - 6\hat{j} + 2\hat{k}$.

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117. If $\vec{a}$ is a position vector whose tip is $(1, -3)$. Find the coordinates of the point B such that $\vec{AB} = \vec{a}$, if A has coordinates

$(-1, 5)$.

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118. Find the coordinates of the tip of the position vector which is equivalent to $\overrightarrow{AB}$, where the coordinates of $AandBare(3, 1)and(5, 0)$ respectively.

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119. Write all the unit vectors in $XY - plane$.

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120. Find a unit vector parallel to the vector $3\hat{i} + 4\hat{j}$.

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121. If A, B, C have position vectors $(2, 0, 0), (0, 1, 0), (0, 0, 2),$ show that ABC is isosceles.

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122. If the points $(-1, 1, 2), (2, m, 5) and (3, 11, 6)$ are collinear, find the value of m.

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

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124. If the position vectors of the points $A, B, C, D are 2\hat{i} + 4\hat{k}, 5\hat{i} + 3\sqrt{3}\hat{j} + 4\hat{k}, -2\sqrt{3}\hat{j} + \hat{k} and 2\hat{i} + \hat{k}$ respectively, prove that CD is parallel to $AB and CD = \frac{2}{3}AB$.

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125. Represent graphically

i. a displacement of 40 km, 30^0 west of south ii 60 km, 40^0 east of north iii.50 km south east.

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126. Classify the following measures as scalars and vectors

a.10 kg b.10 meters north –west c.10 Newton

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127. Classify the following measures as scalars and vectors

a.30 km / hr b.50 m/ sec towards north c.10^{-19} coloumb

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128. In a fig 23.4 (a square), identify the following vectors: i.Coinitial ii.Equal iii.Collinear but not equal

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129. In fig 23.3, which of the vectors are: i.Collinear ii. Equal iii. Co-initial

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130. Represent the following graphically:

i.A displacement of 40 km, 30^0 east of north ii.A displacement of 50 km south east iii.A displacement of 70 km, 40^0 north of west

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131. Classify the following measures as scalars and vectors: a.15 kg b. 520 kg weight c. 45^0 d.10 meters south east e. 50 $m/\sec^2$

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132. Classify the following as scalars and vector quantities: a.Time period b. Distance c. Displacement d.Force e. Work f. Velocity g.Acceleration

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133. In Fig. $ABCD$ is a regular hexagon, which vectors are: (i) Collinear (ii) Equal (iii) Coinitial (iv) Collinear but not equal

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134. Answer the following as true or flase: (a) $\vec{a}$ and $\vec{a}$ are collinear. (b) Two collinear vectors are always equal in magnitude. (c) Zero vector is unique. (d)Two vectors having same magnitude are collinear. (e) Two collinear vectors having the same magnitude are equal.

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135. If $\vec{a}$, $\vec{b}$, $\vec{c}$ be the vectors represented by the sides of a triangle, taken in order, then prove that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$.

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136. If P, Q and R are three collinear points such that $\vec{PQ} = \vec{a}$ and $\vec{QR} = \vec{b}$. Find the vector $\vec{PR}$.

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137. Give a condition that three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ from the three sides of a triangle. What are the other possibilities?

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138. If $\vec{a}$ and $\vec{b}$ are two non-collinear vectors having the same initial point. What are the vectors represented by $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$.

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139. If $\vec{a}$ is a vector and m is a scalar such that $m\vec{a} = \vec{0}$, then what are the alternatives for m and $\vec{a}$?

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140. If $\vec{a}$, $\vec{b}$ are two vectors, then which of the following statements is/ are correct : $\vec{a} = -\vec{b} \Rightarrow \left|\vec{a}\right| = \left|\vec{b}\right|$

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141. If $\vec{a}$, $\vec{b}$ are two vectors ,then which of the following statements is/ are correct : $|\vec{a}| = |\vec{b}| \Rightarrow \vec{a} = \pm \vec{b}$

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142. If $\vec{a}$, $\vec{b}$ are two vectors, then which of the following statements is/ are correct :: $|\vec{a}| = |\vec{b}| \Rightarrow \vec{a} = \vec{b}$

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143. $ABCD$ is a quadrilateral. Find the sum the vectors $\vec{B}A$, $\vec{B}C$, and $\vec{D}A$.

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144. $ABCDE$ is pentagon, prove that $\overrightarrow{A}B + \overrightarrow{B}C + \overrightarrow{C}D + \overrightarrow{D}E + \overrightarrow{E}A = \overrightarrow{0}$

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145. $ABCDE$ is pentagon, prove that $\overrightarrow{A}B + \overrightarrow{A}E + \overrightarrow{B}C + \overrightarrow{D}C + \overrightarrow{E}D + \overrightarrow{A}C = 3\overrightarrow{A}C$

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

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147. If P is a point and $ABCD$ is a quadrilateral and $\overrightarrow{A}P + \overrightarrow{P}B + \overrightarrow{P}D = \overrightarrow{P}C$, show that $ABCD$ is a parallelogram.

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148. Five forces $\overrightarrow{A}B$, $\overrightarrow{A}C$, $\overrightarrow{A}D$, $\overrightarrow{A}E$ and $\overrightarrow{A}F$ act at the vertex of a regular hexagon $ABCDEF$. Prove that the resultant is $6\overrightarrow{A}O$, where O is the centre of hexagon.

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149. The position vectors of A, B,C and D are $\overrightarrow{a}$, $\overrightarrow{b}$, $\overrightarrow{2}a + \overrightarrow{3}b$ and $\overrightarrow{a} - \overrightarrow{2}b$ respectively show that $\overrightarrow{D}B = 3\overrightarrow{b} - \overrightarrow{a}$ and $\overrightarrow{A}C = \overrightarrow{a} + \overrightarrow{3}b$

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150. Let ABCD be as parallelogram. If $\vec{a}$, $\vec{b}$, $\vec{c}$ be the position vectors $of\ A,\ B,\ C$ respectively with reference to the origin O, find the position vector of D reference to O.

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151. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $\left(2\vec{a}+\vec{b}\right)$ and ($\vec{a}-3\vec{b}\Big)$ respectively, externally in the ratio 1:2.Also, show that P is the mid-point of the line segment RQ.

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152. Let $\vec{a}$, $\vec{b}$, $\vec{c}$, $\vec{d}$ be the position vectors of the four distinct points A, B, C, D. If $\vec{b}-\vec{a}=\vec{c}-\vec{a}$, then show that $ABCD$ is parallelogram.

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153. If $\vec{a}$, $\vec{b}$ are the position vectors of A, B respectively, find the position vector of a point C in AB produced such that $AC = 3AB$ and that a point D in BA produced such that $BD = 2BA$.

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154. Show that the found points A, B, C, D with position vectors $\vec{a}$, $\vec{b}$, $\vec{c}$, $\vec{d}$ respectively such that $3\vec{a} - 2\vec{b} + 5\vec{c} - 6\vec{d} = \vec{0}$, are coplanar. Also, find the position vector of the point of intersection of the line segments AC and BD.

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155. Show that the four points P, Q, R, S with position vectors $\vec{p}$, $\vec{q}$, $\vec{r}$, $\vec{s}$ respectively such that $5\vec{p} - 2\vec{q} + 6\vec{r} - 9\vec{s} = \vec{0}$,

are coplanar. Also find the position vector of the point of intersection of the line segments PR and QS.

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156. The vertices A, B, C of triangle ABC have respectively position vectors $\vec{a}, \vec{b}, \vec{c}$ with respect to a given origin O. Show that the point D where the bisector of $\angle A$ meets BC has position vector $\vec{d} = \frac{\beta \vec{b} + \gamma \vec{c}}{\beta + \gamma}$, where $\beta = \left|\vec{c} - \vec{a}\right|$ and, $\gamma = \left|\vec{a} - \vec{b}\right|$.

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157. Evaluate $\int e^{5x} dx$

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158. If O is a point in space, ABC is a triangle and D, E, F are the mid-points of the sides BC, CA and AB respectively of the triangle, prove that $\overrightarrow{O}A + \overrightarrow{O}B + \overrightarrow{O}C = \overrightarrow{O}D + \overrightarrow{O}E + \overrightarrow{O}F$.

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159. Show that the sum of three vectors determined by the medians of a triangle directed from the vertices is zero.

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160. $ABCD$ is parallelogram and P is the point of intersection of its diagonals. If O is the origin of reference, show that $\overrightarrow{O}A + \overrightarrow{O}B + \overrightarrow{O}C + \overrightarrow{O}D = 4\overrightarrow{O}P$.

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161. Show that the line segments joining the mid-points of opposite sides of a quadrilateral bisects each other.

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162. $ABCD$ are four points in a plane and Q is the point of intersection of the lines joining the mid-points of AB and CD; BC and AD. Show that $\overrightarrow{P}A + \overrightarrow{P}B + \overrightarrow{P}C + \overrightarrow{P}D = 4\overrightarrow{P}Q$, where P is any point.

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163. Evaluate $\int x^7 + \sin 2x dx$

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164. Find the values of x and y so that the vectors $2\hat{i}+3\hat{j}$and $x\hat{i}+y\hat{j}$ are equal.

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165. ABCD is a parallelogram. If the coordinates of $A,\ B,\ C\ are\ (2,3),\ (1,4)and\ (0,\ -2)$ respectively, find the coordinates of D.

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166. Find the vector of magnitude 5 units which is parallel to the vector $2\hat{i}-4\hat{j}$.

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167. Find the components along the coordinates axes of the position vector of each of the following points: $P(5, 4)$

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168. Find the components along the coordinates axes of the position vector of each of the following points: $Q\ (-4,\ 3)$

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169. Find the components along the coordinates axes of the position vector of each of the following points: $R\ (5,\ -7)$

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170. Find the components along the coordinates axes of the position vector of each of the following points: $S(-4, -5)$

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171. Find the scalar and vector components of the vector with initial point $A(2, 1)$ and terminal point $B(-5, 7)$.

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172. Write down a unit vector in XY-plane, making an angle of 30° with the positive direction of x-axis.

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173. A girl walks 4 km towards west, then she walks 3 km in a direction $30o$east of north and stops. Determine the girls displacement from her initial point of departure.

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174. If the position vector of a point $(-4, -3)be\ \vec{a}$, find $\left|\vec{a}\right|$.

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175. If the position vector $\vec{a}$ of a point $(12, n)$ is such that $\left|\vec{a}\right| = 13$, find the value of n.

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176. Find a vector of magnitude 4 units which is parallel to the vector $\sqrt{3}\hat{i} + \hat{j}$.

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177. Express $\overrightarrow{AB}$ in terms of unit vectors $\hat{i}$ and $\hat{j}$, when the points are: i)$A(4, -1), B(1, 3)$ ii)$A(-6, 3), B(-2, -5)$ Find $\left|\overrightarrow{AB}\right|$ in each case.

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178. Find the coordinates of the tip of the position vector which is equivalent to $\overrightarrow{AB}$, where the coordinates of A and B are $(-1, 3)$ and $(-2, 1)$ respectively.

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179. $ABCD$ is parallelogram. If the coordinates of A, B, C are $(-2, -1), (3, 0)$ and $(1, -2)$ respectively, find the coordinates of D.

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180. If the position vectors of the points $A(3, 4), B(5, -6)$ and C $(4, -1)$ are $\vec{a}, \vec{b}, \vec{c}$ respectively compute $\vec{a} + 2\vec{b} - 3\vec{c}$

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181. If $\vec{a}$ be the position vector whose tip is $(5, -3)$, find the coordinates of a point B such that $\vec{AB} = \vec{a}$, the coordinates of A being $(4, -1)$.

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182. Show that the point $2\hat{i},\ -\hat{i}-4\hat{j}$ and $-\hat{i}+4\hat{j}$ from an isosceles triangle.

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183. Find a unit vector parallel to the vector $\hat{i}+\sqrt{3}\hat{j}$

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184. Find the components along the coordinate axes of the position vector of each of the following points: $P(3,\ 2)$

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185. Find the components along the coordinate axes of the position vector of each of the following points: $(-5,\ 1)$

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186. Find the components along the coordinate axes of the position vector of each of the following points: $R(-11, -9)$

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187. Find the components along the coordinate axes of the position vector of each of the following points: $S(4, -3)$

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

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189. Find the sum of vectors $\vec{a} = \hat{i} - 2\hat{j} + \hat{k}$, $\vec{b} = -2\hat{i} + 4\hat{j} + 5\hat{k}$ and $\vec{c} = \hat{i} - 6\hat{j} - 7\hat{k}$.

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190. Find the distance between the points $A(2, 3, 1)$ and $B(-1, 2, -3)$, using vector method.

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

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192. Find the unit vector in the direction of $\vec{a} + \vec{b}$, if $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = -\hat{i} + \hat{j} - \hat{k}$.

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193. Find the unit vector in the direction of vector $\vec{PQ}$, where P and Q are the points (1,2,3) and (4,5,6), respectively.

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194. Find the magnitude of the vectors $\vec{a} = 2\hat{i} + 3\hat{j} - 6\hat{k}$.

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195. Find the unit vector in the direction of $3\hat{i} + 4\hat{j} - 12\hat{k}$.

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196. The adjacent sides of a parallelogram are represented by the vectors $\vec{a} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} + 2\hat{k}$. Find unit vectors parallel to the diagonals of the parallelogram.

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

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198. If $\vec{PQ} = 3\hat{i} + 2\hat{j} - \hat{k}$ and the coordinates of P are $(1, -1, 2)$, find the coordinates of Q.

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199. Prove that the points $\hat{i} - \hat{j}, 4\hat{i} - 3\hat{j} + \hat{k}$ and $2\hat{i} - 4\hat{j} + 5\hat{k}$ are the vertices of a right angled triangle.

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200. If the vertices A, B, C of a triangle ABC are the point with position vectors $a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$, $b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$, $c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$ respectively, what are the vectors determined by its sides? Find the length of these vectors.

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201. Find the position vector from the origin O to the centroid of the triangle whose vertices are $(1, -1, 2)$, $(2, 1, 3)$ and $(-1, 2, -1)$.

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202. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $\hat{i}+2\hat{j}-\hat{k}$ and $-\hat{i}+\hat{j}+\hat{k}$ respectively, in the ratio 2 : 1 (i) internally (ii) externally

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203. Find the unit vector in the direction of vector $\overrightarrow{PQ}$, where P and Q are the points (1,2,3) and (4,5,6), respectively.

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204. Show that the points $A\left(2\hat{i}-\hat{j}+\hat{k}\right), B\left(\hat{i}-3\hat{j}-5\hat{k}\right), C\left(3\hat{i}-4\hat{j}-4\hat{k}\right)$ are the vertices of a right angled triangle.

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205. Find the position vector of the mid point of the vector joining the points $P(2, 3, 4) and\ Q(4, 1, -2)$.

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

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207. If $\vec{a}=\hat{i}+\hat{j}+\hat{k}, \vec{b}=4\hat{i}-2\hat{j}+3\hat{k}$ and $\vec{c}=\hat{i}-2\hat{j}+\hat{k}$, find a vector of magnitude 6 units which is parallel to the vector $2\vec{a}-\vec{b}+3\vec{c}$

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

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209. Two vectors $\hat{j}+\hat{k}$ and $3\hat{i}-\hat{j}+4\hat{k}$ represents the two side vectors $\overrightarrow{A}B$ and $\overrightarrow{A}C$ respectively of ΔABC Find the length of median from A.

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210. Find a vector magnitude 5 units, and parallel to the resultant of the vectors $\overrightarrow{a}=2\hat{i}+3\hat{j}-\hat{k}$ and $\overrightarrow{b}=\hat{i}-2\hat{j}+\hat{k}$.

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211. If $a\,and\,b$ ar non collinear vector such that $x_1\overrightarrow{a}+y_1\overrightarrow{b}=x_2\overrightarrow{a}+y_2\overrightarrow{b}$, then prove that $x_1=x_2 and\, y_1=y_2$.

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212. Show that the points with position vectors $\vec{a} - 2\vec{b} + 3\vec{c}$, $-2\vec{a} + 3\vec{b} - \vec{c}$ and $4\vec{a} - 7\vec{b} + 7\vec{c}$ are collinear.

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213. Show that the three points $A(-2, 3, 5)$; $B(1, 2, 3)$ and $C(7, 0, -1)$ are collinear.

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214. The position vectors of the points P, Q, R are $\hat{i} + 2\hat{j} + 3\hat{k}$, $-2\hat{i} + 3\hat{j} + 5\hat{k}$ and $7\hat{i} - \hat{k}$ respectively. Prove that P, Q and R are collinear points.

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215. Show that the point A, B, C with position vectors $\vec{a} - 2\vec{b} + 3\vec{c}, 2\vec{a} + 3\vec{b} - 4\vec{c}$ and $-7\vec{b} + 10\vec{c}$ are collinear.

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216. If $a,\ b,\ c$ are non coplanar vectors prove that the points having the following position vectors are collinear: $\vec{a},\ \vec{b},\ 3\vec{a} - 2\vec{b}$

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217. If $a,\ b,\ c$ are non coplanar vectors prove that the points having the following position vectors are collinear: $\vec{a} + \vec{b} + \vec{c},\ 4\vec{a} + 3\vec{b},\ 10\vec{a} + 7\vec{b} - 2\vec{c}$

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218. Prove that the points having position vectors $\hat{i}+2\hat{j}+3\hat{k},\ 3\hat{i}+4\hat{j}+7\hat{k},\ -3\hat{i}-2\hat{j}-5\hat{k}$ are collinear.

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

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220. If $\vec{a}$, $\vec{b}$ are two non-collinear vectors, prove that the points with position vectors $\vec{a}+\vec{b}$, $\vec{a}-\vec{b}$ and $\vec{a}+\lambda\vec{b}$ are collinear for all real values of λ.

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221. If $\overrightarrow{A}O + \overrightarrow{O}B = \overrightarrow{B}O + \overrightarrow{O}C$, prove that A, B, C are collinear points.

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222. If the points $A(m, -1)$, $B(2, 1) and\, C(4, 5)$ are collinear find the value of m.

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223. Show that the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}\, and - 4\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear.

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224. Show that the points (3,4), (-5, 16), (5,1) are collinear.

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225. If the vectors $\vec{a} = 2\hat{i} - 3\hat{j}$ *and* $\vec{b} = -6\hat{i} + m\hat{j}$ are collinear, find the value of m

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

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227. Using vectors show that the points A(-2,3,5), B(7,0,-1), C(-3,-2,-5) and D(3,4,7) are such that AB and CD intersect at the point P(1,2,3).

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228. Show that the points whose position vectors are as given below are collinear: $2\hat{i}+\hat{j}-\hat{k},\ 3\hat{i}-2\hat{j}+\hat{k}\ and\ \hat{i}+4\hat{j}-3\hat{k}$

$3\hat{i}-2\hat{j}+4\hat{k},\ \hat{i}+\hat{j}+\hat{k}\ and-\ \hat{i}+4\hat{j}-2\hat{k}$

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229. Using vector method, prove that the following points are collinear:

A(6,-7,-1) B(2,-3,1) C(4,-5,0)

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230. Using vector method, prove that the following points are collinear:

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

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231. Using vector method, prove that the following points are collinear:

A(1,2,7) B(2,6,3) C(3,10,-1)

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232. Using vector method, prove that the following points are collinear: A(-3,-2-5),B(1,2,3)and C(3,4,7)

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233. If a, b, c are non zero non coplanar vectors, prove that the following vectors are coplanar.

$5\vec{a} + 6\vec{b} + 7\vec{c}$, $7\vec{a} - 8\vec{b} + 9\vec{c}$ *and* $3\vec{a} + 20\vec{b} + 5\vec{c}$

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234. Let $\vec{a}, \vec{b}$ and $\vec{c}$, be non-zero non-coplanar vectors. Prove that: $\vec{a} - 2\vec{b} + 3\vec{c}, -2\vec{a} + 3\vec{b} - 4\vec{c}$ and $\vec{c} - 3\vec{b} + 5\vec{c}$ are coplanar vectors. $2\vec{a} - \vec{b} + 3\vec{c}, \vec{a} + \vec{b} - 2\vec{c}$ and $\vec{a} + \vec{b} - 3\vec{c}$ are non-coplanar vectors.

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235. Show that the four points having position vectors $6\hat{i} - 7\hat{j}, 16\hat{i} - 19\hat{j} - 4\hat{k}, 3\hat{j} - 6\hat{k}, 2\hat{i} - 5\hat{j} + 10\hat{k}$ are coplanar.

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236. Prove that the following vectors are coplanar: $2\hat{i} - \hat{j} + \hat{k}, \hat{i} - 3\hat{j} - 5\hat{k}$ and $3\hat{i} - 4\hat{j} - 4\hat{k}$

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237. Prove that the following vectors are coplanar: $\hat{i}+\hat{j}+\hat{k},\ 2\hat{i}+3\hat{j}-\hat{k}\ and\ -\hat{i}-2\hat{j}+2\hat{k}$

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238. Prove that the following vectors are non coplanar: $3\hat{i}+\hat{j}-\hat{k}, 2\,\hat{i}-\hat{j}+7\hat{k}\ and\ 7\hat{i}-\hat{j}+23\hat{k}$

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239. Prove that the following vectors are non-coplanar: $\hat{i}+2\hat{j}+3\hat{k}, 2\,\hat{i}+\hat{j}+3\hat{k}\ and\ \hat{i}+\hat{j}+\hat{k}$

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240. If $\vec{a}, \vec{b}, \vec{c}$ are non coplanar vectors, prove that the following vectors are non coplanar:

$2\vec{a} - \vec{b} + 3\vec{c}, \vec{a} + \vec{b} - 2\vec{c}$ and $\vec{a} + \vec{b} - 3\vec{c}$

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241. If $\vec{a}, \vec{b}, \vec{c}$ are non coplanar vectors, prove that the following vectors are non coplanar:

$\vec{a} + 2\vec{b} + 3\vec{c}, 2\vec{a} + \vec{b} + 3\vec{c}$ and $\vec{a} + \vec{b} + \vec{c}$

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242. Prove that a necessary and sufficient condition for three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ to be coplanar is that there exist scalars l, m, n not all zero simultaneously such that $l\vec{a} + m\vec{b} + n\vec{c} = \vec{0}$.

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

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244. The direction cosines of a vector $\vec{r}$, which is equally inclined to OX, OY and OZ If $\left|\vec{r}\right|$ is given, the total number of such vectors is given by

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245. Can a vector have direction angles $45^0, 60^0, 120^0$

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246. Prove that 1,1,1 cannot be direction cosines of a straight line.

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247. A vector makes an angle of $\frac{\pi}{4}$ with each of $x - a\xi s$ and $y - a\xi s$. Find the angle made by it with the z-axis.

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248. A vector $\overrightarrow{r}$ is inclined at equal acute angles of $x - a\xi s,\ y - a\xi s$ and $z - a\xi s$. if $\left|\overrightarrow{r}\right| = 6$ units, find $\overrightarrow{r}$.

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249. A vector $\overrightarrow{r}$ is inclined to x-axis at 45^0 and y-axis at 60^0. If $\left|\overrightarrow{r}\right| = 8$ units, find $\overrightarrow{r}$.

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250. Find the direction cosines of the following vectors: $2\hat{i}+2\hat{j}-\hat{k}$ $6\hat{i}-2\hat{j}-3\hat{k}$ $3\hat{i}-4\hat{k}$

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251. Find the direction cosines of the following vectors: $2\hat{i}+2\hat{j}-\hat{k}$ $6\hat{i}-2\hat{j}-3\hat{k}$ $3\hat{i}-4\hat{k}$

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252. Find the direction cosines of the following vectors: $2\hat{i}+2\hat{j}-\hat{k}$ $6\hat{i}-2\hat{j}-3\hat{k}$ $3\hat{i}-4\hat{k}$

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253. Find the angles at which the following vectors are inclined to each of the coordinate axes: $\hat{i} - \hat{j} + \hat{k}$

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254. Find the angles at which the following vectors are inclined to each of the coordinate axes: $\hat{j} - \hat{k}$

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255. Find the angles at which the following vectors are inclined to each of the coordinate axes: $4\hat{i} + 8\hat{j} + \hat{k}$

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256. Show that the vector $i + j + k$ is equally inclined with the axes $OX,\ OY\ and\ OZ$.

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257. Show that the direction cosines of a vector equally inclined to the axes $OX,\ OY\ and\ OZ$ are $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$.

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

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259. Find a vector $\vec{r}$ of magnitude $3\sqrt{2}$ units which makes an angle of $\frac{\pi}{4}$ and $\frac{\pi}{2}$ with y and z-axis respectively.

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260. A vector $\vec{r}$ is inclined at equal angle to the three axes. If the magnitude of $\vec{r}$ is $2\sqrt{3}$ find $\vec{r}$

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261. Define zero vector.

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262. Define unit vector.

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263. Define position vector of point.

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264. Write $\overrightarrow{P}Q + \overrightarrow{R}P + \overrightarrow{Q}R$ in the simplified form.

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265. If $\overrightarrow{a}$ and $\overrightarrow{b}$ represent two adjacent sides of a parallel then write vectors representing its diagonals.

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266. If $\overrightarrow{a}$, $\overrightarrow{b}$, $\overrightarrow{c}$ represent the sides of a triangle taken in order, then write the value of $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}$

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267. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are position vectors of the vertices A, B and C respectively, of a triangle ABC, write the value of $\vec{A}B + \vec{B}C + \vec{C}A$.

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268. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are position vectors of the vertices of a triangle, then write the position vector of its centroid.

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269. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are position vectors o the point A, B, and C respectively, write the value of $\vec{A}B + \vec{B}C + \vec{A}C$.

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270. If G denotes the centroid of ΔABC, then write the value of $\overrightarrow{GA} + \overrightarrow{GB} + \overrightarrow{GC}$.

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271. If D is the mid point of side BC of a triangle ABC such that $\overrightarrow{A}B + \overrightarrow{A}C = \lambda \overrightarrow{A}D$, write the value of λ.

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272. If D, E, F are the mid points of the side BC, CA and AB respectively of a triangle ABC, write the value of $\overrightarrow{A}D + \overrightarrow{B}E + \overrightarrow{C}F$.

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273. If $\overrightarrow{a}$ is a non zero vecrtor iof modulus a and m is a non zero scalar such that ma is a unit vector, write the value of m.

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274. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are the position vectors of the vertices of an equilateral triangle whose orthocentre is the origin, then write the value of $\vec{a}+\vec{b}+\vec{c}$

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275. Write a unit vector making equal acute angle with the coordinates axes.

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276. If a vector makes angle α, β, γ with OX, OY and OZ respectively, then write the value of $\sin^2\alpha+\sin^2\beta+\sin^2\gamma$.

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277. Write a vector of magnitude 12 units which makes 45^0 angle with X-axis 60^0 angle with Y-axis and an obtuse angle with Z-axis.

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278. Write the length (magnitude) of a vector whose project on the coordinate axes are 12,3 and 4 units.

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279. Write the position vector of a point dividing the line segment joining points A and B with position vectors $\vec{a}$ and $\vec{b}$ externally in the ration 1:4 where $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = -\hat{i} + \hat{j} + \hat{k}$.

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280. Write the direction cosines of the vector $\vec{r} = 6\hat{i} - 2\hat{j} + 3\hat{k}$.

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281. If $\vec{a} = i + j$, $\vec{b} = j + k$ *and* $\vec{c} = k + i$, write unit vectors parallel to $\vec{a} + \vec{b} - 2\vec{c}$

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282. If $\vec{a} = \hat{i} + \hat{j}$, $\vec{b} = \hat{j} + \hat{k}$ *and* $\vec{c} = \hat{k} + \hat{i}$, write unit vectors parallel to $\vec{a} + \vec{b} - 2\vec{c}$

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283. If $\vec{a} = \hat{i} + 2\hat{j}$, $\vec{b} = \hat{j} + 2\hat{k}$, write a unitvector along the vector $3\vec{a} - 2\vec{b}$.

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284. Write the position vector of a point dividing the line segment joining points having position vectors $\hat{i}+\hat{j}-2\hat{k}\ and\ 2\hat{i}-\hat{j}+3\hat{k}$ externally in the ratio 2:3.

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285. If $\vec{a}=\hat{i}+\hat{j},\ \vec{b}=\hat{j}+\hat{k},\ \vec{c}=\hat{k}+\hat{i}$ find the unit vector in the direction of $\vec{a}+\vec{b}+\vec{\cdot}$

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

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287. A unit vector $\vec{r}$ makes angle $\frac{\pi}{3}$ and $\frac{\pi}{2}$ with $\hat{j} and\ \hat{k}$ respectively and an acute angle $\theta\ with\ i,$ Find θ.

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288. Find a unit vector in the direction of $\vec{a} = 3\hat{i} - 2\hat{j} + 6\hat{k}$

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289. If $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}\ and\ \vec{b} = 2\hat{i} + 4\hat{j} + 9\hat{k}$ find a unit vector parallel to $\vec{a} + \vec{b}$.

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

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291. Find the position vector of the mid point of the line segment AB, where A is the point (3, 4, -2) and B is the point (1, ,2 4).

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292. Find a vector in the direction of $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$, which has magnitude of 6 units.

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293. 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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294. Write two different vectors having same magnitude.

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295. Write two different vectors having same direction.

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296. Find a vector in the direction of vector $5\hat{i} - \hat{j} + 2\hat{k}$which has magnitude 8 units.

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297. Writhe the direction cosines of the vector $\hat{i} + 2\hat{j} + 3\hat{k}$.

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298. Find a unit vector in the direction of $\vec{a} = 2\hat{i} - 3\hat{j} + 6\hat{k}$

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299. 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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300. Writhe the direction cosines of the vectors $-2\hat{i} + \hat{j} - 5\hat{k}$.

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301. Find the sum of the following vectors $\vec{a} = \hat{i} - 2\hat{j}$, $\vec{b} = 2\hat{i} - 3\hat{j}$, $\vec{c} = 2\hat{i} + 3\hat{k}$.

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302. Find a unit vector in the direction of the vector $\vec{a} = 3\hat{i} - 2\hat{j} + 6\hat{k}$.

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303. If $\vec{a} = x\hat{i} + 2\hat{j} - z\hat{k}$ and $\vec{b} = 3\hat{i} - y\hat{j} + \hat{k}$ are two equal vectors, then write the value of $x + y + z$.

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304. Write a unit vector in the direction of the sum of the vectors $\vec{a} = 2\hat{i} + 2\hat{j} - 5\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} - 7\hat{k}$.

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305. Find the value of $'p'$ for which the vectors $3\hat{i}+2\hat{j}+9\hat{k}\ and\ \hat{i}-2p\hat{j}+3\hat{k}$ are parallel.

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306. Find a vector $\vec{a}$ of magnitude $5\sqrt{2}$ making an angle of $\frac{\pi}{4}$ with x-axis, $\frac{\pi}{2}$ with y-axis and an acute angle θ with z-axis.

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307. Write a unit vector in the direction of $\vec{PQ},\ where\ P\ and\ Q$ are the points (1, 3, 0) and (4, 5, 6) respectively.

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308. Find a vector in the direction of vector $2\hat{i} - 3\hat{j} + 6\hat{k}$ which has magnitude 21 units.

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309. It $\left|\overrightarrow{a}\right| = 4$ and $-3 \leq \lambda \leq 2$, then write the range fo $\lambda\left|\overrightarrow{a}\right|$.

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

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311. If in a $\text{Delta}ABC$, $A = (0, 0)$, $B = \left(3, 3\sqrt{3}\right), C \equiv \left(-3\sqrt{3}, 3\right)$ then the vector of magnitude $2\sqrt{2}$ units directed along

AO, *where* O is the circumcentre of ABC is

a. $(1-\sqrt{3})\hat{i}+(1+\sqrt{3})\hat{j}$ b. $(1+\sqrt{3})\hat{i}+(1-\sqrt{3})\hat{j}$ c. $(1+\sqrt{3})\hat{i}+(\sqrt{3}-1)\hat{j}$ d. none of these

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312. If $\vec{a}$, $\vec{b}$ are the vectors forming consecutive sides of a regular of a regular hexagon $ABCDEF$, then the vecrtor representing side CD is

a. $\vec{a}+\vec{b}$ b. $\vec{a}-\vec{b}$ c. $\vec{b}-\vec{a}$ d. $-\left(\vec{a}+\vec{b}\right)$

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313. Evaluate $\int \tan^2 x dx$

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314. If points $A\left(60\hat{i}+3\hat{j}\right)$, $B\left(40\hat{i}-8\hat{j}\right)$ and $C\left(a\hat{i}-52\hat{j}\right)$ are collinear, then a is equal to

a.40 b. -40 c. 20 d. -20

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315. If G is the intersection of diagonals of a parallelogram $ABCD$ and O is any point then $O\vec{A}+O\vec{B}+O\vec{C}+O\vec{D}=$

a.$2\vec{O}G$

b. $4\vec{O}G$

c. $5\vec{O}G$

d. $3\vec{O}G$

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316. The vector $\cos\alpha\cos\beta\hat{i}+\cos\alpha\sin\beta\hat{j}+\sin\alpha\hat{k}$ is a a.null vector b. unit vector c. constant vector d. none of these

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317. In a regular hexagon $ABCDEF$, $\overrightarrow{AB} = a$, $\overrightarrow{BC} = \overrightarrow{b}$ and $\overrightarrow{C}D = c$ Then\ $\overrightarrow{A}E =$

a. $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}$ b. $2\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}$ c. $\overrightarrow{b} + \overrightarrow{c}$ d. $\overrightarrow{a} + 2\overrightarrow{b} + 2\overrightarrow{c}$

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318. The vector equation of the plane passing through $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ is $\overrightarrow{r} = \alpha\overrightarrow{a} + \beta\overrightarrow{b} + \gamma\overrightarrow{c}$ provided that

a. $\alpha + \beta + \gamma = 0$ b. $\alpha + \beta + \gamma = 1$ c. $\alpha + \beta = \gamma$ d. $\alpha^2 + \beta^2 + \gamma^2 = 1$

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319. If O and O' are circumcentre and orthocentre of ABC, then $\overrightarrow{O}A + \overrightarrow{O}B + \overrightarrow{O}C$ equals

a. $2\overrightarrow{OO'}$ b. $\overrightarrow{OO'}$ c. $\overrightarrow{O'O}$ d. $2\overrightarrow{O'O}$

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320. If $\overrightarrow{a}$, $\overrightarrow{b}$, $\overrightarrow{c}$ and $\overrightarrow{d}$ are the position vectors of points A, B, C, D such that no three of them are collinear and $\overrightarrow{a}+\overrightarrow{c}=\overrightarrow{b}+\overrightarrow{d}$, *then* $ABCD$ is a a. rhombus b. rectangle c. square d. parallelogram

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321. Let G be the centroid of triangle ABC. If $\overrightarrow{AB}=\overrightarrow{a}$, $\overrightarrow{AC}=\overrightarrow{b}$, then the bisector $\overrightarrow{AG}$, in terms of $\overrightarrow{a}$ *and* $\overrightarrow{b}$ is $\frac{2}{3}\left(\overrightarrow{a}+\overrightarrow{b}\right)$ b. $\frac{1}{6}\left(\overrightarrow{a}+\overrightarrow{b}\right)$ c. $\frac{1}{3}\left(\overrightarrow{a}+\overrightarrow{b}\right)$ d. $\frac{1}{2}\left(\overrightarrow{a}+\overrightarrow{b}\right)1$

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322. If $ABCDEF$ is a regular hexagon, them $\overrightarrow{A}D + \overrightarrow{E}B + \overrightarrow{F}C$ equals $2\overrightarrow{A}B$ b. $\overrightarrow{0}$ c. $3\overrightarrow{A}B$ d. $4\overrightarrow{A}B$

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323. The position vectors of the points A, B, C are $2\hat{i} + \hat{j} - \hat{k}$, $3\hat{i} - 2\hat{j} + \hat{k}$ *and* $\hat{i} + 4\hat{j} - \hat{k}$ respectively. These points a.Form an isosceles triangle b.Form a right triangle c.Are collinear d.Form a scalene triangle

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324. If three points A, B, *and* C have position vectors $\hat{i} + x\hat{j} + 3\hat{k}$, $3\hat{i} + 4\hat{j} + 7\hat{k}$ *and* $y\hat{i} - 2\hat{j} - 5\hat{k}$ respectively are collinear, them $(x, y) =$ a.$(2, -3)$ b. $(-2, 3)$ c. $(-2, -3)$ d. $(2, 3)$

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325. $ABCD$ isa parallelogram with $AC\ and\ BD$ as diagonals. Then, $\overrightarrow{A}C - \overrightarrow{B}D =$ $4\overrightarrow{A}B$ b. $3\overrightarrow{A}B$ c. $2\overrightarrow{A}B$ d. $\overrightarrow{A}B$

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