MATHS

BOOKS - ARIHANT MATHS (ENGLISH)

VECTOR ALGEBRA

Example

1. Classify the following measures as scalars and vectors

(i) 20 m north-west

(ii) 10 newton

(iii) 30 km/h

(iv) 50m/s towards north

(v) 10^{-19} coloumb

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2. Represent graphically

(i) a displacement of 60 km, 40° east of north

(ii) A displacement of 50 km south-east.

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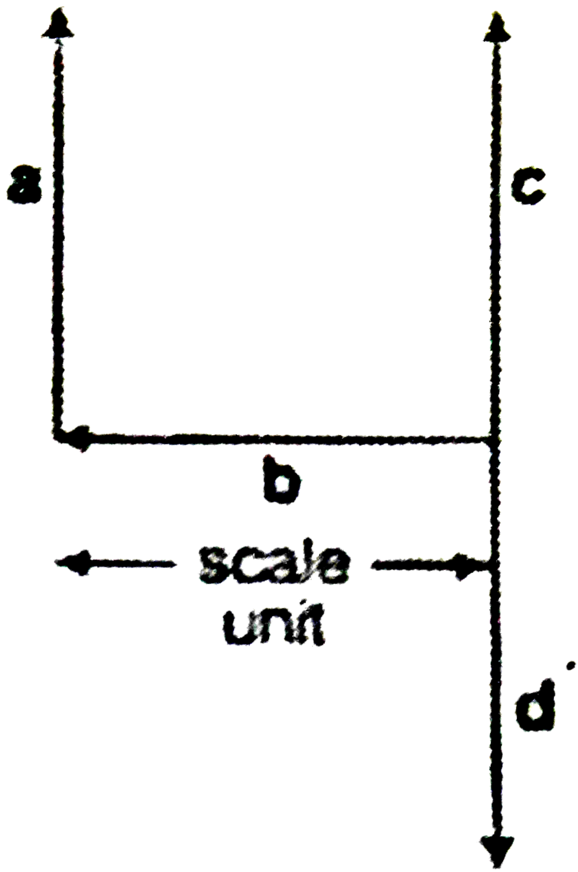
3. In the following figure, which of the vectors are:

(i) Collinear

(ii) Equal

(iii) Co-initial

(iv) collinear but not equal .



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

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5. Let $a = 12\hat{i} + n\hat{j}$ and $|a| = 13$, find th value of n.

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6. Write two different vectors having same magnitude.

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7. If one side of a squre be represented by the vectors $3\hat{i} + 4\hat{j} + 5\hat{k}$, then the area of the square is

A. 12

B. 13

C. 25

D. 50

Answer: D

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8. The direction cosines of the vector $3\hat{i} - 4\hat{j} + 5\hat{k}$ are

A. $\frac{3}{5}, \frac{-4}{5}, \frac{1}{5}$

B. $\frac{3}{5\sqrt{2}}, \frac{-4}{5\sqrt{2}}, \frac{1}{\sqrt{2}}$

C. $\frac{3}{\sqrt{2}}, \frac{-4}{\sqrt{2}}, \frac{1}{\sqrt{2}}$

D. $\frac{3}{5\sqrt{2}}, \frac{4}{5\sqrt{2}}, \frac{1}{\sqrt{2}}$.

Answer: B

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

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10. Let AB be a vector in two dimensional plane with the magnitude 4 units and making an angle of 30° with X-axis and lying in the first quadrant. Find the components of AB along the two axes off coordinates. Hence, represent AB in terms of unit vectors $\hat{i}$ and $\hat{j}$.

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11. Find the unit vector parallel to the resultant vector of $2\hat{i}+4\hat{j}-5\hat{k}$ and $\hat{i}+2\hat{j}+3\hat{k}$.

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

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13. If S is the mid-point of side QR of a ΔPQR, then prove that $PQ + PR = 2PS$.

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14. If ABCDEF is a regular hexagon, prove that $AD + EB + FC = 4AB$.

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

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16. If the position vectors of A and B respectively $\hat{i} + 3\hat{j} - 7\hat{k}$ and $5\hat{i} - 2\hat{j} + 4\hat{k}$, then find AB

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

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

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19. Let α, β, γ be distinct real numbers. The points with position vectors $\alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}, \beta\hat{i} + \gamma\hat{j} + \alpha\hat{k}, \gamma\hat{i} + \alpha\hat{j} + \beta\hat{k}$

A. are collinear

B. form an equilateral triangle

C. form a scalene triangle

D. form a right angled triangle

Answer:

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20. If the position vectors of the vertices of a triangle be $2\hat{i} + 4\hat{j} - \hat{k}, 4\hat{i} + 5\hat{j} + \hat{k} \text{ and } 3\hat{i} + 6\hat{j} - 3\hat{k}$, then the triangle is

A. right angled

B. isosceles

C. equilateral

D. none of these

Answer: A::B

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21. The sides of a parallelogram are $2\hat{i}+4\hat{j}-5\hat{k}$ and $\hat{i}+2\hat{j}+3\hat{k}$. The unit vector parallel to one of the diagonals is

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

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23. If the sum of two unit vectors is a unit vector, then the magnitude of their difference is

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24. If $\vec{a}$ is a non-zero vector of modulus a and m is a non-zero scalar, then $m\vec{a}$ is a unit vector if

A. $m = \pm 1$

B. $m = |a|$

C. $m = \frac{1}{|a|}$

D. $m = \pm 2$

Answer: C

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25. For a non-zero vector a, the set of real number, satisfying $|(5-x)a| < |2a|$ consists of all x such that

A. $0 < x < 3$

B. $3 < x < 7$

C. $-7 < x < -3$

D. $-7 < x < 3$

Answer: B

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26. Find a vector of magnitude (5/2) units which is parallel to the vector $3\hat{i} + 4\hat{j}$.

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27. If D,E and F are the mid-points of the sides BC,CA and AB respectively of the ΔABC and O be any point, then prove that $OA + OB + OC = OD + OE + OF$

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28. 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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29. The position vectors of the vertices A,B and C of a triangle are $\hat{i}-\hat{j}-3\hat{k}, 2\hat{i}+\hat{j}-2\hat{k}$ and $-5\hat{i}+2\hat{j}-6\hat{k}$, respectively. The length of the bisector AD of the $\angle BAC$, where D is on the segment BC, is

A. $\frac{3}{4}\sqrt{3}$

B. $\frac{1}{4}$

C. $\frac{11}{2}$

D. None of these

Answer: A

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30. The median AD of the triangle ABC is bisected at E and BE meets AC at F. Find AF:FC.

A. $3/4$

B. $1/3$

C. $1/2$

D. $1/4$

Answer: B

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31. The sum of the magnitudes of two forces acting at a point is 16 N. The resultant of these forces is perpendicular to the smaller force has a magnitude of 8 N. If the smaller force is magnitude x, then the value of x is (A) 2N (B) 4N (C) 6N (D) 7N

A. 13,5

B. 12,6

C. 14,4

D. 11,7

Answer: A

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32. The length of longer diagonal of the parallelogram constructed on $5a + 2b$ and $a - 3b$. If it is given that $|a| = 2\sqrt{2}$, $|b|$ = 3 and angle between a and b is $\frac{\pi}{4}$ is

A. 15

B. $\sqrt{113}$

C. $\sqrt{593}$

D. $\sqrt{369}$

Answer: C

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33. The vector $\vec{c}$, directed along the internal bisector of the angle between the vectors $\vec{a} = 7\hat{i} - 4\hat{j} - 4\hat{k}$ and $\vec{b} = -2\hat{i} - \hat{j} + 2\hat{k}$ with $\left|\vec{c}\right| = 5\sqrt{6}$, is

A. (a) $\frac{5}{3}\left(\hat{i}-7\hat{j}+2\hat{k}\right)$

B. (b) $\frac{5}{3}\left(5\hat{i}+5\hat{j}+2\hat{k}\right)$

C. (c) $\frac{5}{3}\left(\hat{i}+7\hat{j}+2\hat{k}\right)$

D. (d) $\frac{5}{3}\left(-5\hat{i}+5\hat{j}+2\hat{k}\right)$

Answer: A

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34. 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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35. Prove that the ponts $A(1, 2, 3), B(3, 4, 7), C(-3, -2, -5)$ are collinear and find the ratio in which B divides AC.

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36. If the position vectors of A,B,C and D are

$2\hat{i}+\hat{j}, \hat{i}-3\hat{j}, 3\hat{i}+2\hat{j}$ and $\hat{i}+\lambda\hat{j}$ respectively and |AB||CD. Then λ will be

A. -8

B. -6

C. 8

D. 6

Answer: B

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37. The points with position vectors $60\hat{i}+3\hat{j}, 40\hat{i}-8\hat{j}, a\hat{i}-52\hat{j}$ are collinear if (A) $a=-40$ (B) $a=40$ (C) $a=20$ (D) none of these

A. -40

B. 40

C. 20

D. none of these

Answer: A

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38. If a,b and c are three non-zero vectors such that no two of these are collinear. If the vector a+2b is collinear with c and b+3c is collinear with a(λ being some non-zero scalar), then a+2b+6c is equal to

A. A. 0

B. B. λb

C. C. λc

D. D. λa

Answer: A

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39. Check whether the given three vectors are coplnar or non- coplanar :

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

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40. If the vectors $4\hat{i} + 11\hat{j} + m\hat{k}, 7\hat{i} + 2\hat{j} + 6\hat{k}$ and $\hat{i} + 5\hat{j} + 4\hat{k}$ are coplanar, then m is equal to

A. 38

B. 0

C. 10

D. -10

Answer: C

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41. If a,b and c are non-coplanar vectors, prove that 3a-7b-4c, 3a-2b+c and a+b+2c are coplanar.

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42. The value of λ for which the four points $2\hat{i}+3\hat{j}-\hat{k}, \hat{i}+2\hat{j}+3\hat{k}, 3\hat{i}+4\hat{j}-2\hat{k}$ and $\hat{i}-\lambda\hat{j}+6\hat{k}$ are coplanar.

A. 8

B. 0

C. -2

D. 6

Answer: C

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43. Show that the points $P(a+2b+c), Q(a-b-c), R(3a+b+2c)$ and $S(5a+3b+5c)$ are coplanar given that a,b and c are non-coplanar.

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44. Show that the vectors $\hat{i}-3\hat{j}+2\hat{k}, 2\hat{i}-4\hat{j}-\hat{k}$ and $3\hat{i}+2\hat{j}-\hat{k}$ and linearly independent.

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45. If $\overrightarrow{a}=\hat{i}+\hat{j}+\hat{k}, \overrightarrow{b}=4\hat{i}+3\hat{j}+4\hat{k}$ and $\overrightarrow{c}=\hat{i}+\alpha\hat{j}+\beta\hat{k}$ are linearly dependent vectors and $\left|\overrightarrow{c}\right|=\sqrt{3}$ then:

A. (a) $\alpha=1, \beta=-1$

B. (b) $\alpha=1, \beta=\pm 1$

C. (c) $\alpha=\pm 1, \beta=\pm 1$

D. (d) $\alpha = \pm 1, \beta = 1$

Answer: D

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46. The non-zero vectors are $\vec{a}, \vec{b}$ and $\vec{c}$ are related by $\vec{a} = 8\vec{b}$ and $\vec{c} = -7\vec{b}$. Then the angle between $\vec{a}$ and $\vec{c}$ is

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

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

C. π

D. 0

Answer: C

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47. A unit vector $\widehat{a}$ makes an angle $\frac{\pi}{4}$ with z-axis, if $\widehat{a}+\hat{i}+\hat{j}$ is a unit vector then $\widehat{a}$ is equal to

(A) $\hat{i}+\hat{j}+\frac{\hat{k}}{2}$ (B) $\frac{\hat{i}}{2}+\frac{\hat{j}}{2}-\frac{\hat{k}}{\sqrt{2}}$ (C) $-\frac{\hat{i}}{2}-\widehat{/}2+\frac{\hat{k}}{\sqrt{2}}$ (D) $\frac{\hat{i}}{2}-\frac{\hat{j}}{2}-\frac{\hat{k}}{\sqrt{2}}$

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

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

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

D. D. none of these

Answer: C

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48. If the resultannt of two forces of magnitudes P and Q acting at a point at an angle of 60° is $\sqrt{7}Q$, then P/Q is

A. 1

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

C. 2

D. 4

Answer: C

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49. The vector $\vec{a}$ has the components $2p$ and 1 w.r.t. a rectangular Cartesian system. This system is rotated through a certain angel about the origin in the counterclockwise sense. If, with respect to a new system, $\vec{a}$ has components $(p+1)and1$, then p is equal to a. -4 b. $-1/3$ c. 1 d. 2

A. p=0

B. p=1 or $p = -\frac{1}{3}$

C. p=-1 or $p = \frac{1}{3}$

D. p=1 or $p = -1$

Answer: B

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50. ABC is an isosceles triangle right angled at A. forces of magnitude $2\sqrt{2}, 5$ and 6 act along BC, CA and AB respectively. The magnitude of their resultant force is

A. 4

B. 5

C. $11 + 2\sqrt{2}$

D. 30

Answer: B

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51. A line segment has length 63 and direction ratios are $3, -2, 6.$ The components of the line vector are

A. $-27, 18, 54$

B. $27, -18, 54$

C. $27, -18, -54$

D. $-27, -18, -54$

Answer: B

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52. If the vectors $6\hat{i}-2\hat{j}+3\hat{k}k, 2\hat{i}+3\hat{j}-6\hat{k}$ and $3\hat{i}+6\hat{j}-2\hat{k}$ form a triangle, then it is

A. right angled

B. obtuse angled

C. equilateral

D. isosceles

Answer: B

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53. 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 $\hat{i}+4\hat{j}-3\hat{k}$ respectively . These points

A. form an isosceles triangle

B. form a right angled triangle

C. are collinear

D. form a scalene triangle

Answer: C

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54. The position vector of a point C with respect to B is $\hat{i} + \hat{j}$ and that of B with respect to A is $\hat{i} - \hat{j}$. The position vector of C with respect to A is

A. $2\hat{i}$

B. $2\hat{j}$

C. $-2\hat{j}$

D. $-2\hat{i}$

Answer: A

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55. In a ΔABC, if 2AC=3CB, then 2OA+3OB is equal to

A. 5OC

B. $-OC$

C. OC

D. none of these

Answer: A

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56. If $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}, \overrightarrow{d}$ are the position vector of point A, B, C and D, respectively referred to the same origin O such that no three of these point are collinear and $\overrightarrow{a} + \overrightarrow{c} = \overrightarrow{b} + \overrightarrow{d}$, than prove that quadrilateral $ABCD$ is a parallelogram.

A. square

B. rhombus

C. rectangle

D. parallelogram

Answer: D

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57. P is a point on the side BC off the ΔABC and Q is a point such that PQ is the resultant of AP,PB and PC. Then, ABQC is a

A. square

B. rectangle

C. parallelogram

D. trapezium

Answer: C

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58. If ABCD is a parallelogram and the position vectors of A,B and C are $\hat{i}+3\hat{j}+5\hat{k}, \hat{i}+\hat{j}+\hat{k}$ and $7\hat{i}+7\hat{j}+7\hat{k}$, then the poisitionn vector of D will be

A. $7\hat{i}+5\hat{j}+3\hat{k}$

B. $7\hat{i}+9\hat{j}+11\hat{k}$

C. $9\hat{i} + 11\hat{j} + 13\hat{k}$

D. $8\hat{i} + 8\hat{j} + 8\hat{k}$

Answer: B

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59. $ABCD$ is a parallelogram whose diagonals meet at P. If O is a fixed point, then $\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC} + \overrightarrow{OD}$ equals :

A. (a) $\overrightarrow{OP}$

B. (b) $2\overrightarrow{OP}$

C. (c) $3\overrightarrow{OP}$

D. (d) $4\overrightarrow{OP}$

Answer: D

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60. If C is the middle point of AB and P is any point outside AB, then

A. PA+PB=PC

B. PA+PB=2PC

C. PA+PB+PC=0

D. PA+PB+2PC=0

Answer: B

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61. Let O, O' and G be the circumcentre, orthocentre and centroid of a ΔABC and S be any point in the plane of the triangle.

Statement -1: $\overrightarrow{O'A}+\overrightarrow{O'B}+\overrightarrow{O'C}=2\overrightarrow{O'O}$

Statement -2: $\overrightarrow{SA}+\overrightarrow{SB}+\overrightarrow{SC}=3\overrightarrow{SG}$

A. OO'

B. $2O'O$

C. $2OO'$

D. 0

Answer: B

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62. Five points given by A,B,C,D and E are in a plane. Three forces AC,AD and AE act at A annd three forces CB,DB and EB act B. then, their resultant is

A. 2AC

B. 3AB

C. 3DB

D. 2BC

Answer: B

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63. In a regular hexagon $ABCDEF, \ \overrightarrow{AB} = a, \ \overrightarrow{BC} = \overrightarrow{b} \ and \ \overrightarrow{C}D = \ \cdot Then \ \overrightarrow{A}E =$ $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}$ b. $2\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}$ c. $\overrightarrow{b} + \overrightarrow{c}$ d. $\overrightarrow{a} + 2\overrightarrow{b} + 2\overrightarrow{c}$

A. $2b - a$

B. $b - a$

C. $2a - b$

D. $a + b$

Answer: A

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64. If $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}, \left|\overrightarrow{a}\right| = 3, \left|\overrightarrow{b}\right| = 5, \left|\overrightarrow{c}\right| = 7,$ then angle between $\overrightarrow{a}$ and $\overrightarrow{b}$ is : a. $\frac{\pi}{2}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{6}$

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

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

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

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

Answer: B

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65. If $\vec{a}$ & $\vec{b}$ are the position vectors of A & B respectively and C is a point on AB produced such that $AC = 3AB$ then the position vector of C is:

A. (a) $3\vec{a} - \vec{b}$

B. (b) $3\vec{b} - \vec{a}$

C. (c) $3\vec{a} - 2\vec{b}$

D. (d) $3\vec{b} - 2\vec{a}$

Answer: D

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66. Let A and B be points with position vectors $\vec{a}$ and $\vec{b}$ with respect to origin O. If the point C on OA is such that $2\overrightarrow{AC} = \overrightarrow{CO}$, $\overrightarrow{CD}$ is parallel to $\overrightarrow{OB}$ and $\left|\overrightarrow{CD}\right| = 3\left|\overrightarrow{OB}\right|$ then $\overrightarrow{AD}$ is (A) $\vec{b} - \frac{\vec{a}}{9}$ (B) $3\vec{b} - \frac{\vec{a}}{3}$ (C) $\vec{b} - \frac{\vec{a}}{3}$ (D) $\vec{b} + \frac{\vec{a}}{3}$

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

B. $3b + \frac{a}{2}$

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

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

Answer: C

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67. If the position vector of a point A is $\vec{a} + 2\vec{b}$ and $\vec{a}$ divides AB in the ratio $2:3$, then the position vector of B, is

A. $2a - b$

B. $b - 2a$

C. $a - 3b$

D. b

Answer:

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68. If D, E and F are respectively, the mid-points of AB, AC and BC in ΔABC, then BE + AF is equal to

A. DC

B. $\frac{1}{2}BF$

C. $2BF$

D. $\frac{3}{2}BF$

Answer: A

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69. In a quadrilateral $PQRS, \vec{P}Q = \vec{a}, \vec{Q}R = \vec{b}, \vec{S}P = \vec{a} - \vec{b}, M$ is the midpoint of $\vec{Q}RandX$ is a point on SM such that $SX = \frac{4}{5}SM$. Prove that P, $XandR$ are collinear.

A. $PX = \frac{1}{5}PR$

B. $PX = \frac{3}{5}PR$

C. $PX = \frac{2}{5}PR$

D. none of these

Answer: B

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70. Orthocenter of an equilateral triangle ABC is the origin O. If $\overrightarrow{OA} = \vec{a}, \overrightarrow{OB} = \vec{b}, \overrightarrow{OC} = \vec{c}$, then $\overrightarrow{AB} + 2\overrightarrow{BC} + 3\overrightarrow{CA} =$

A. 3c

B. 3a

C. 0

D. 3b

Answer: B

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71. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are position vectors of A,B, and C respectively of ΔABC and if $\left|\vec{a}-\vec{b}\right|, \left|\vec{b}-\vec{c}\right| = 2, \left|\vec{c}-\vec{a}\right| = 3,$ then the distance between the centroid and incenter of $\triangle\ ABC$ is

A. 1

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

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

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

Answer: C

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72. Let position vectors of point A,B and C of triangle ABC represents be $\hat{i}+\hat{j}+2\hat{k}$, $\hat{i}+2\hat{j}+\hat{k}$ and $2\hat{i}+\hat{j}+\hat{k}$. Let l_1, l_2 and l_3 be the length of perpendicular drawn from the orthocenter 'O' on the sides AB, BC and CA, then $(l_1+l_2+l_3)$ equals

A. $\frac{2}{\sqrt{6}}$

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

C. $\frac{\sqrt{6}}{2}$

D. $\frac{\sqrt{6}}{3}$.

Answer: C

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73. ABCDEF is a regular hexagon in the x-y plance with vertices in the anticlockwise direction. If $\overrightarrow{A}B = 2\hat{i}$, then $\overrightarrow{C}D$ is

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

B. $\hat{i}9 + 2\hat{j}$

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

D. none of these

Answer:

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74. The vertices of a triangle are A(1,1,2), B (4,3,1) and C (2,3,5). The vector representing internal bisector of the angle A is

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

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

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

D. none of these

Answer: C

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75. Let $\overrightarrow{a} = (1, 1, -1)$, $\overrightarrow{b} = (5, -3, -3)$ and $\overrightarrow{c} = (3, -1, 2)$. If $\overrightarrow{r}$ is collinear with $\overrightarrow{c}$ and has length $\frac{\left|\overrightarrow{a} + \overrightarrow{b}\right|}{2}$, then $\overrightarrow{r}$ equals

A. $\pm 3c$

B. $\pm \frac{3}{2}c$

C. $\pm c$

D. $\pm \frac{2}{3}c$

Answer: C

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76. In a trapezium ABCD the vector $\overrightarrow{BC} = \lambda\overrightarrow{AD}$. If $\overrightarrow{p} = \overrightarrow{AC} + \overrightarrow{BD}$ is coillinear with $\overrightarrow{AD}$ such that $\overrightarrow{p} = \mu\overrightarrow{AD}$, then

A. $\mu = \lambda + 1$

B. $\lambda = \mu + 1$

C. $\lambda + \mu = 1$

D. $\mu = 2 + \lambda$

Answer: A

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77. If the position vectors of the points A,B and C be $\hat{i} + \hat{j}, \hat{i} - \hat{j}$ and $a\hat{i} + b\hat{j} + c\hat{k}$ respectively, then the points A,B and C are collinear, if

A. a=b=c=1

B. a=1,b and c are arbitrary scalars

C. ab=c=0

D. c=0,a=1 and b is arbitrary scalars

Answer: D

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78. Let a,b and c be distinct non-negative numbers and the vectors $a\hat{i} + a\hat{j} + c\hat{k}, \hat{i} + \hat{k}, c\hat{i} + c\hat{j} + b\hat{k}$ lie in a plane, then the quadratic equation $ax^2 + 2cx + b = 0$ has

A. real annd equal roots

B. real and unequal roots

C. unreal roots

D. both roots real and positive

Answer: A

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79. The number of distinct real values of λ for which the vectors $\vec{a} = \lambda^3\hat{i} + \hat{k}$, $\vec{b} = \hat{i} - \lambda^3\hat{j}$ and $\vec{c} = \hat{i} + (2\lambda - \sin\lambda)\hat{j} - \lambda\hat{k}$ are coplanar is

A. (a)0

B. (b)1

C. (c)2

D. (d)3

Answer: A

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80. The points $A(2 - x, 2, 2)$, $B(2, 2 - y, 2)$, $C(2, 2, 2 - z)$ and $D(1, 1, 1)$ are coplanar, then locus of $P(x, y, z)$ is

A. $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$

B. $x + y + z = 1$

C. $\frac{1}{1-x}+\frac{1}{1-y}+\frac{1}{1-z}=1$

D. none of these

Answer: A

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81. $p=2a-3b, q=a-2b+c$ and $r=-3a+b+2c,$ where a, b, c being non-coplanar vectors, then the vector $-2a+3b-c$ is equal to

A. (a) $p-4q$

B. (b) $\frac{-7q+r}{5}$

C. (c) $2p-3q+r$

D. (d) $4p-2r$

Answer: B

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82. If a_1 and a_2 are two values of a for which the unit vector $a\overrightarrow{i}+b\overrightarrow{j}+\frac{1}{2}\overrightarrow{k}$ is linearly dependent with $\overrightarrow{i}+2\overrightarrow{j}$ and $\overrightarrow{j}-2\overrightarrow{k}$, then $\frac{1}{a_1}+\frac{1}{a_2}$ is equal to

A. (a)1

B. (b)$\frac{1}{8}$

C. (c)$\frac{-16}{11}$

D. (d)$\frac{-11}{16}$

Answer: C

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83. The vector $\hat{i}+x\hat{j}+3\hat{k}$ is rotated through an angle θ and is doubled in magnitude. It now becomes $4\hat{i}+(4x-2)\hat{j}+2\hat{k}$. The values of x are

A. 1

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

C. 2

D. $\frac{4}{3}$

Answer: B::C

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84. $\vec{a}, \vec{b}, \vec{c}$ are three coplanar unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$. If three vectors $\vec{p}, \vec{q}, and\, \vec{r}$ are parallel to $\vec{a}, \vec{b}, and\, \vec{c}$, respectively, and have integral but different magnitudes, then among the following options, $\left|\vec{p} + \vec{q} + \vec{r}\right|$ can take a value equal to a. 1 b. 0 c. $\sqrt{3}$ d. 2

A. 1

B. 0

C. $\sqrt{3}$

D. 2

Answer: C::D

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85. A,B C and dD are four points such that $\overrightarrow{AB} = m\left(2\hat{i} - 6\hat{j} + 2\hat{k}\right)\overrightarrow{BC} = \left(\hat{i} - 2\hat{j}\right)$ and $\overrightarrow{CD} = n\left(-6\hat{i} + 15\hat{j} - 3\hat{k}\right)$. If CD intersects AB at some points E, then

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

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

C. $m = n$

D. $m < n$

Answer: A::B

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86. If non-zero vectors $\vec{a}$ and $\vec{b}$ are equally inclined to coplanar vector $\vec{c}$, then $\vec{c}$ can be

A. $\dfrac{|a|}{|a| = 2|b|}a + \dfrac{|b|}{|a| + |b|}b$

B. $\dfrac{|b|}{|a| + |b|}a + \dfrac{|a|}{|a| + |b|}b$

C. $\dfrac{|a|}{|a| + |b|}a + \dfrac{|b|}{|a| + 2|b|}b$

D. $\dfrac{|b|}{2|a| + |b|}a + \dfrac{|a|}{2|a| + |b|}b$

Answer: B::D

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87. The vectors $x\hat{i} + (x+1)\hat{j} + (x+2)\hat{k}, (x+3)\hat{i} + (x+4)\hat{j} + (x+5)\hat{k}$ and $(x+6)\hat{i}$

are coplanar if x is equal to a. 1 b. -3 c. 4 d. 0

A. 1

B. -3

C. 4

D. 0

Answer: A::B::C::D

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88. Given three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are non-zero and non-coplanar vectors. Then which of the following are coplanar.

A. $a+b, b+c, c+a$

B. $a-b, b+c, c+a$

C. $a+b, b-c, c+a$

D. $a+b, b+c, c-a$

Answer: B::C::D

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89. In a four-dimensional space where unit vectors along the axes are $\hat{i}, \hat{j}, \hat{k}$ and $\hat{l}$, and a_1, a_2, a_3, a_4 are four non-zero vectors such that no vector can be expressed as a linear combination of other $(\lambda - 1)(a_1 - a_2) + \mu(a_2 + a_3) + \gamma(a_3 + a_4 - 2a_2) + a_3 + \delta a_4 = 0$, then

A. (a) $\lambda = 1$

B. (b) $\mu = -\frac{2}{3}$

C. (c) $\gamma = \frac{2}{3}$

D. (d) $\delta = \frac{1}{3}$

Answer: A::B::D

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90. Statement 1: $\left|\vec{a}\right| = 3, \left|\vec{b}\right| = and \left|\vec{a} + \vec{b}\right| = 5, then \left|\vec{a} - \vec{b}\right| = 5.$ Statement 2: The length of the diagonals of a rectangle is the same.

A. Statement-II and statement II ar correct and Statement III is the correct explanation of statement I

B. Both statement I and statement II are correct but statement II is not the correct explanation of statement I

C. Statement I is correct but statement II is incorrect

D. Statement II is correct but statement I is incorrect

Answer: A

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91. Statement 1: If $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}-\vec{b}\right|, then\, \vec{a}\, and\, \vec{b}$ are perpendicular to each other. Statement 2: If the diagonal of a parallelogram are equal magnitude, then the parallelogram is a rectangle.

A. Statement-II and statement II ar correct and Statement III is the correct explanation of statement I

B. Both statement I and statement II are correct but statement II is not the correct explanation of statement I

C. Statement I is correct but statement II is incorrect

D. Statement II is correct but statement I is incorrect

Answer: A

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92. Assertion: If I is the incentre of $\triangle ABC, then$|vec(BC)| vec(IA) +|vec(CA)| vec(IB) +|vec(AB)| vec(IC) =0

$Reason: If O is the$ or $ig \in$ $, then the position \overrightarrow{\longrightarrow} r of centroid of$ /_\ABC$is \frac{\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC}}{3}$

A. Both A and R are correct and R is the correct explanation of A

B. Both A and R are correct but R is not the correct explanation of A

C. A is correct but R is incorrect

D. R is correct but A is incorrect

Answer: B

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93. Statement 1: If $\vec{u}\, and\, \vec{v}$ are unit vectors inclined at an angle $\alpha and \vec{x}$ is a unit vector bisecting the angle between them, then $\vec{x}=\left(\vec{u}+\vec{v}\right)/(2\sin(\alpha/2)$. Statement 2: If $\mathrm{Delta}ABC$ is an isosceles triangle with $AB=AC=1,$ then the vector representing the bisector of angel A is given by $\vec{A}D=\left(\vec{A}B+\vec{A}C\right)/2.$

A. Statement-II and statement II ar correct and Statement III is the correct explanation of statement I

B. Both statement I and statement II are correct but statement II is not the correct explanation of statement I

C. Statement I is correct but statement II is incorrect

D. Statement II is correct but statement I is incorrect

Answer: D

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94. Statement I: If $a = 2\hat{i} + \hat{k}, b = 3\hat{j} + 4\hat{k}$ and $c = \lambda a + \mu b$ are coplanar, then $c = 4a - b$.

Statement II: A set vector $a_1, a_2, a_3, . . , a_n$ is said to be linearly independent, if every relation of the form $l_1 a_1 + l_2 a_2 + l_3 a_3 + . . . + l_n a_n = 0$ implies that $l_1 = l_2 = l_3 = . . . = l_n = 0$ (scalar).

A. Statement-I and statement II ar correct and Statement II is the correct explanation of statement I

B. Both statement I and statement II are correct but statement II is not the correct explanation of statement I

C. Statement I is correct but statement II is incorrect

D. Statement II is correct but statement I is incorrect

Answer: B

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95. Statement 1 : Let $A\left(\vec{a}\right), B\left(\vec{b}\right)$ and $C\left(\vec{c}\right)$ be three points such that $\vec{a} = 2\hat{i} + \hat{k}, veb = 3\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{c} = -\hat{i} + 7\hat{j} - 5\hat{k}$. Then OABC is tetrahedron.

Statement 2 : Let $A\left(\vec{a}\right), B\left(\vec{b}\right)$ and $C\left(\vec{c}\right)$ be three points such that vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are non-coplanar. Then OABC is a tetrahedron, where O is the origin.

A. Statement-II and statement II ar correct and Statement III is the correct explanation of statement I

B. Both statement I and statement II are correct but statement II is not the correct explanation of statement I

C. Statement I is correct but statement II is incorrect

D. Statement II is correct but statement I is incorrect

Answer: A

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96. Statement 1: Let $\vec{a}, \vec{b}, \vec{c} and \vec{d}$ be the position vectors of four points $A, B, CandD$ and $3\vec{a} - 2\vec{b} + 5\vec{c} - 6\vec{d} = 0.$ Then points $A, B, C, andD$ are coplanar. Statement 2: Three non-zero, linearly dependent coinitial vector $\left(\vec{P}Q, \vec{P}RandP\vec{P}S\right)$ are coplanar. Then $\vec{P}Q = \lambda\vec{P}R + \mu\vec{P}S, where\lambda and\mu$ are scalars.

A. Statement-II and statement II ar correct and Statement III is the correct explanation of statement I

B. Both statement I and statement II are correct but statement II is not the correct explanation of statement I

C. Statement I is correct but statement II is incorrect

D. Statement II is correct but statement I is incorrect

Answer: A

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97. Given that p(3,2,-4) , Q (5,4, -6) and R (9,8,-10) are collinear find the ratio in which Q divides PR

A. $1:2$

B. $1:3$

C. $3:1$

D. $2:1$

Answer: C

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98. Given that p(1,2,-4) , Q (5,4, -6) and R (0,8,-10) are collinear find the ratio in which Q divides PR

A. $1:2$

B. $1:3$

C. $3:1$

D. $2:1$

Answer: B

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99. ABCD is a parallelogram. L is a point on BC which divides BC in the ratio $1:2$. AL intersects BD at P.M is a point on DC which divides DC in the ratio $1:2$ and AM intersects BD in Q.

$PQ:DB$ is equal to

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

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

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

D. $\frac{3}{4}$

Answer: B

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100. Let A,B,C,D,E represent vertices of a regular pentangon ABCDE. Given the position vector of these vertices be a,a+b,b,λa and λb respectively.

Q. AD divides EC in the ratio

A. $1-\cos\frac{3\pi}{5}:\cos\frac{3\pi}{5}$

B. $1+2\cos\frac{2\pi}{5}:\cos\frac{\pi}{5}$

C. $1+2\cos\frac{\pi}{5}:2\cos\frac{\pi}{5}$

D. none of these

Answer: C

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101. Let A,B,C,D,E represent vertices of a regular pentangon ABCDE. Given the position vector of these vertices be a,a+b,b,λa and λb respectively.

Q. AD divides EC in the ratio

A. $\cos\frac{2\pi}{5}:1$

B. $\cos\frac{3\pi}{5}:1$

C. $1:2\cos\frac{\pi}{5}$

D. $1:2$

Answer: C

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102. In a parallelogram $OABC$, vectors $\vec{a}, \vec{b}, \vec{c}$ are respectively the positions of vectors of vertices A, B, C with reference to O as origin. A point E is taken on the side BC which divide the line $2:1$ internally. Also the line segment AE intersect the line bisecting the angle O internally in point P. If CP, when extended meets AB in point F. Then The position vector of point P, is

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103. In a parallelogram OABC vectors a,b,c respectively, THE POSITION VECTORS OF VERTICES A,B,C with reference to O as origin. A point E is taken on the side BC which divides it in the ratio of 2:1 also, the line segment AE intersects the line bisecting the angle $\angle AOC$ internally at point P. if CP when extended meets AB in points F, then

Q. The position vector of point P is

A. $\dfrac{2|a|}{||a|-3|c||}$

B. $\dfrac{|a|}{||a|-3|c||}$

C. $\dfrac{3|a|}{||a|-3|c||}$

D. $\dfrac{3|c|}{3||c|-|a||}$

Answer: B

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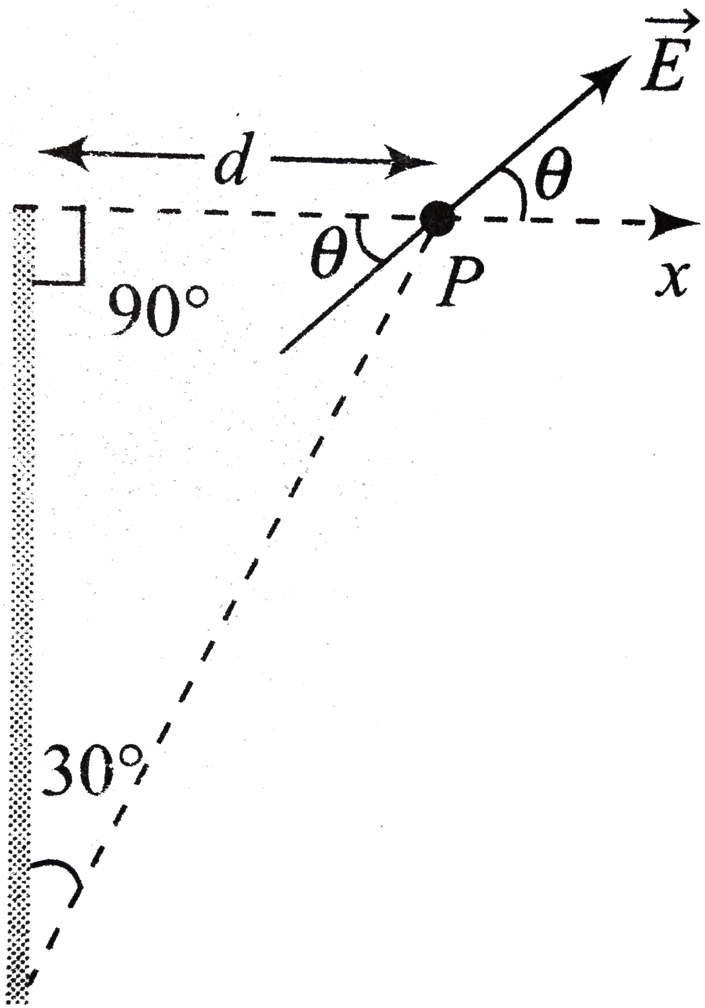
104. The direction (θ) of $\vec{E}$ at point P due to uniformly charged finite rod will be



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105. P, Q have position vectors $\vec{a} \& \vec{b}$ relative to the origin $'O' \& X, Y and \vec{P} Q$ internally and externally respectgively in the ratio $2:1$ Vector $\vec{X} Y = \frac{3}{2}\left(\vec{b} - \vec{a}\right)$ b. $\frac{4}{3}\left(\vec{a} - \vec{b}\right)$ c. $\frac{5}{6}\left(\vec{b} - \vec{a}\right)$ d. $\frac{4}{3}\left(\vec{b} - \vec{a}\right)$

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106. $A(1, -1, -3), B(2, 1, -2) \& C(-5, 2, -6)$ are the position vectors of the vertices of a triangle ABC. The length of the bisector of its internal angle at A is :

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107. Let ABC be a triangle whose centroid is G, orthocentre is H and circumcentre is the origin 'O'. If D is any point in the plane of the triangle such that no three of O,A,C and D are collinear satisfying the relation. AD+BD+CH+3HG=λHD, then what is the value of the scalar λ.

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108. Let $\overrightarrow{a}$, $\overrightarrow{b}$ and $\overrightarrow{c}$ be unit vectors such that $\overrightarrow{a}+\overrightarrow{b}-\overrightarrow{c}=0$. If the area of triangle formed by vectors $\overrightarrow{a}$ and $\overrightarrow{b}$ is A, then what is the value of $4A^2$?

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109. The values of x for which the angle between the vectors $\overrightarrow{a}=x\hat{i}-3\hat{j}-\hat{k}$ and $\overrightarrow{b}=2x\hat{i}+x\hat{j}-\hat{k}$ is acute, and the angle, between the vector $\overrightarrow{b}$ and the axis of ordinates is obtuse, are

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110. If the points $a\left(\cos\alpha+\hat{i}\sin\gamma\right), b\left(\cos\beta+\hat{i}\sin\beta\right)$ and $c\left(\cos\gamma+\hat{i}\sin\gamma\right)$ are collinear, then the value of $|z|$ is _____ where $z = bc\sin(\beta - \gamma) + ca\sin(\gamma - \alpha) + ab\sin(\alpha + \beta) + 3\hat{i}$

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111. A particle, in equilibrium, is subjected to four forces $\vec{F}_1, \vec{F}_2, \vec{F}_3$ and $\vec{F}_4$,

$\vec{F}_1 = -10\hat{k}, \vec{F}_2 = u\left(\frac{4}{13}\hat{i} - \frac{12}{13}\hat{j} + \frac{3}{13}\hat{k}\right), \vec{F}_3 = v\left(-\frac{4}{13}\hat{i} - \frac{12}{13}\hat{j} +$

then find the values of u,v and w

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112. Find the all the values of λ such that (x,y,z)! =(0,0,0)and $x\left(\hat{i} + \hat{j} + 3\hat{k}\right) + y\left(3\hat{i} - 3\hat{j} + \hat{k}\right) + z\left(-4\hat{i} + 5\hat{j}\right) = \lambda\left(x\hat{i} + y\hat{j} + z\hat{k}\right)$

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113. If G is the centroid of ΔABC and G' is the centroid of $\Delta A'B'C'$ then $\overrightarrow{AA}' + \overrightarrow{BB}' + \overrightarrow{CC}' =$

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114. If D,E and F are the mid-points of the sides BC,CA and AB, respectively of a ΔABC and O is any point, show that

(i) AD+BE+CF=0

(ii) OE+OF+DO=OA

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115. If $\overrightarrow{A} nd \overrightarrow{B}$ are two vectors and k any scalar quantity greater than zero, then prove that $\left|\overrightarrow{A} + \overrightarrow{B}\right|^2 \leq (1+k)\left|\overrightarrow{A}\right|^2 + \left(1 + \frac{1}{k}\right)\left|\overrightarrow{B}\right|^2.$

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116. If O is the circumcentre and O' the orthocenter of ΔABC prove that

(i) SA+SB+SC=3SG, where S is any point in the plane of ΔABC.

(ii) OA+OB+OC=OO'

Where, AP is diameter of the circumcircle.

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118. Statement -1 : If a transversal cuts the sides OL, OM and diagonal ON of a parallelogram at A, B, C respectively, then

$$\frac{OL}{OA} + \frac{OM}{OB} = \frac{ON}{OC}$$

Statement -2 : Three points with position vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ are collinear iff there exist scalars x, y, z not all zero such that $x\vec{a} + y\vec{b} + z\vec{c} = \vec{0}$, where $x + y + z = 0$.

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119. If D, E and F are three points on the sides BC, CA and AB, respectively, of a triangle ABC such that the lines AD, BE and CF are concurrent, then show that

$$\frac{BD}{CD}\cdot\frac{CE}{AE}\cdot\frac{AF}{BF}=-1$$

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120. Let $\overrightarrow{A}(t)=f_1(t)\hat{i}+f_2(t)\hat{j}$ and $\overrightarrow{B}(t)=g(t)\hat{i}+g_2(t)\hat{j}, t\in[0,1], f_1, f_2, g_1g_2$ are continuous functions. If $\overrightarrow{A}(t)$ and $\overrightarrow{B}(t)$ are non-zero vectors for all t and $\overrightarrow{A}(0)=2\hat{i}+3\hat{j}, \overrightarrow{A}(1)=6\hat{i}+2\hat{j}, \overrightarrow{B}(0)=3\hat{i}+2\hat{i}$ and $\overrightarrow{B}(1)=2\hat{i}$ Then,show that $\overrightarrow{A}(t)$ and $\overrightarrow{B}(t)$ are parallel for some t.

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121. Prove that if $\cos\alpha \neq 1, \cos\beta \neq 1$ and $\cos\gamma \neq 1$, then the vectors $a = \hat{i}\cos\alpha + \hat{j} + \hat{k}, b = \hat{i} + \hat{j}\cos\beta + \hat{k}$ and $c = \hat{i} + \hat{j} + \hat{k}\cos\gamma$ can never be coplanar.

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122. If the vectors $x\hat{i} + \hat{j} + \hat{k}, \hat{i} + y\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + z\hat{k}$ are coplanar where, $x \neq 1, y \neq 1$ and $z \neq 1$, then prove that

$$\frac{1}{1-x} + \frac{1}{1-y} + \frac{1}{1-z} = 1$$

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123. If $\vec{a}, \vec{b}$ and $\vec{c}$ are any three non-coplanar vectors, then prove that points

$l_1\vec{a} + m_1\vec{b} + n_1\vec{c}, l_2\vec{a} + m_2\vec{b} + n_2\vec{c}, l_3\vec{a} + m_3\vec{b} + n_3\vec{c}, l_4\vec{a} + m_4$

are coplanar if $\begin{vmatrix} l_1 & l_2 & l_3 & l_4 \\ m_1 & m_2 & m_3 & m_4 \\ n_1 & n_2 & n_3 & n_4 \\ 1 & 1 & 1 & 1 \end{vmatrix} = 0$

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124. If r_1, r_2 and r_3 are the position vectors of three collinear points and scalars l and m exists such that $r_3 = lr_1 + mr_2$, then show that $l + m = 1$.

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125. Show that points with position vectors $2\vec{a} - 2\vec{b} + 3\vec{c}, -2\vec{a} + 3\vec{b} - \vec{c}$ and $6\vec{a} - 7\vec{b} + 7\vec{c}$ are collinear. It is given that vectors $\vec{a}, \vec{b}$ and $\vec{c}$ and non-coplanar.

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Exercise For Session 1

1. Classify the following measures as scalars and vector:

(i) 20 kg weight

(ii) 45°

(iii) 10 m south-east

(iv) 50m/$\sec^2$

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2. Represent the following graphically: A displacement of 70km, 40° north of west.

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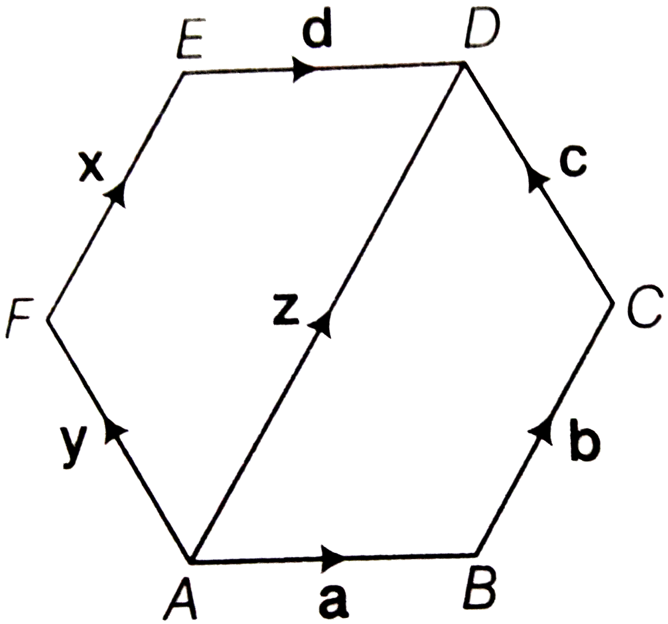
3. In the given figure, $ABCDEF$ is a regular hexagon, which vectors are:



(i) Collinear

(ii) Equal

(iii) Coinitial

(iv) Collinear but not equal.

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4. Answer the following as true or false.(i) $\rightarrow a$and $- \rightarrow a$are collinear. (ii) Two collinear vectors are always equal in magnitude.(iii) Two vectors having same magnitude are collinear.(iv) Two collinear vectors having the same magni

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5. Find the perimeter of a triangle with sides $3\hat{i}+4\hat{j}+5\hat{k}, 4\hat{i}-3\hat{j}-5\hat{k}$ and $7\hat{i}+\hat{j}$.

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6. Find the angle of vector $\overrightarrow{a}=6\hat{i}+2\hat{j}-3\hat{k}$ with x-axis.

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7. Write the direction ratios of the vector $r = \hat{i} - \hat{j} + 2\hat{k}$ and hence calculate its direction cosines.

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Exercise For Session 2

1. If $a = 2\hat{i} - \hat{j} + 2\hat{k}$ and $b = -\hat{i} + \hat{j} - \hat{k}$, then find a+b. Also, find a unit vector along a+b.

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

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3. Find the direction cosines of the resultant of the vectors $\left(\hat{i}+\hat{j}+\hat{k}\right), \left(-\hat{i}+\hat{j}+\hat{k}\right), \left(\hat{i}-\hat{j}+\hat{k}\right)$ and $\left(\hat{i}+\hat{j}-\hat{k}\right)$.

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4. In a regular hexagon ABCDEF, $\overrightarrow{AE}$

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5. Prove that $3\overrightarrow{OD}+\overrightarrow{DA}+\overrightarrow{DB}+\overrightarrow{DC}$ is equal to $\overrightarrow{OA}+\overrightarrow{OB}+\overrightarrow{OC}$.

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6. In a regular hexagon $ABCDEF, \overline{AB}+\overline{AC}+\overline{AD}+\overline{AE}+\overline{AF}=k\overline{AD}$ then k is equal to

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7. $ABCDE$ is a pentagon. Prove that the resultant of forces $\overrightarrow{AB}, \overrightarrow{AE}, \overrightarrow{BC}, \overrightarrow{DC}, \overrightarrow{ED}$ and $\overrightarrow{AC}$ is $3\overrightarrow{AC}$.

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9. If $P(-1, 2)$ and $Q(3, -7)$ are two points, express the vector PQ in terms of unit vectors $\hat{i}$ and $\hat{j}$ also, find distance between point P and Q. What is the unit vector in the direction of PQ?

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10. If $\overrightarrow{OP} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\overrightarrow{OQ} = 3\hat{i} - 4\hat{j} + 2\hat{k}$ find the modulus and direction cosines of $\overrightarrow{PQ}$.

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11. Show that the points A, B and C having position vectors $\left(3\hat{i}-4\hat{j}-4\hat{k}\right), \left(2\hat{i}-\hat{j}+\hat{k}\right)$and $\left(\hat{i}-3\hat{j}-5\hat{k}\right)$ respectively, from the vertices of a right-angled triangle.

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12. If $a=2\hat{i}+2\hat{j}-\hat{k}$ and $\left|x\overrightarrow{a}\right|=1$, then find x.

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13. If $p=7\hat{i}-2\hat{j}+3\hat{k}$ and $q=3\hat{i}+\hat{j}+5\hat{k}$, then find the magnitude of p-2q.

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

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15. If $a = \hat{i} + 2\hat{j} + 2\hat{k}$ and $b = 3\hat{i} + 6\hat{j} + 2\hat{k}$, then find a vector in the direction of a and having magnitude as |b|.

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

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17. If the position vector of one end of the line segment AB be $2\hat{i} + 3\hat{j} - \hat{k}$ and the position vector of its middle point be $3\left(\hat{i} + \hat{j} + \hat{k}\right)$, then find the position vector of the other end.

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Exercise For Session 3

1. Show that the points A(1,3,2),B(-2,0,1) and C(4,6,3) are collinear.

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2. If the position vectors of the points A,B and C be a,b and 3a-2b respectively, then prove that the points A,B and C are collinear.

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3. The position vectors of four points P,Q,R annd S are 2a+4c,5a+ $3\sqrt{3}b+4c, \; -2\sqrt{3}b+c$ and $2a+c$ respectively, prove that PQ is parallel to RS.

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4. If three points A,B and C have position vectors (1,x,3),(3,4,7) and (y,-2,-5), respectively and if they are collinear, then find (x,y).

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5. Find the condition that the three points whose position vectors, $a = a\hat{i} + b\hat{j} + c\hat{k}, b = \hat{i} + c\hat{j}$ and $c = -\hat{i} - \hat{j}$ are collinear.

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6. a and b are non-collinear vectors. If $c = (x-2)a + b$ and $d = (2x+1)a - b$ are collinear vectors, then find the value of x.

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7. Let a,b,c are three vectors of which every pair is non-collinear, if the vectors a+b and b+c are collinear with c annd a respectively, then find a+b+c.

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8. Show that the vectors $\hat{i} - \hat{j} - \hat{k}, 2\hat{i} + 3\hat{j} + \hat{k}$ and $7\hat{i} + 3\hat{j} - 4\hat{k}$ are coplanar.

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9. If the vectors $2\hat{i} - \hat{j} + \hat{k}, \hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + a\hat{j} + 5\hat{k}$ are coplanar, the prove that a=-4.

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10. Show that the vectors $a - 2b + 4c, \ -2a + 3b - 6c$ and $-b + 2c$ are coplanar vector, where a,b,c are non-coplanar vectors.

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11. If $\vec{a}, \vec{b}$ and $\vec{c}$ are non-coplanar vectors, prove that the four points $2\vec{a}+3\vec{b}-\vec{c}, \vec{a}-2\vec{b}+3\vec{c}, 3\vec{a}+4\vec{b}-2\vec{c}$ and $\vec{a}-6\vec{b}+6\vec{c}$ are coplanar.

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Exercise Single Option Correct Type Questions

1. If $a=3\hat{i}-2\hat{j}+\hat{k}, b=2\hat{i}-4\hat{j}-3\hat{k}$ and $c=-\hat{i}+2\hat{j}+2\hat{k},$ then a+b+c is

A. $3\hat{i}-4\hat{j}$

B. $3\hat{i}+4\hat{j}$

C. $4\hat{i}-4\hat{j}$

D. $4\hat{i}+4\hat{j}$

Answer: C

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2. What should be added in vector $a = 3\hat{i} + 4\hat{j} - 2\hat{k}$ to get its resultant a unit vector $\hat{i}$?

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

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

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

D. none of these

Answer: A

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3. If $a = 2\hat{i} + 2\hat{j} - 8\hat{k}$ and $b = \hat{i} + 3\hat{j} - 4\hat{k}$, then the magnitude of a+b is equal to

A. 13

B. $\frac{13}{5}$

C. $\frac{3}{13}$

D. $\frac{4}{13}$

Answer: A

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4. If $a = 2\hat{i} + 5\hat{j}$ and $b = 2\hat{i} - \hat{j}$, then the unit vector along a+b will be

A. $\frac{\hat{i} - \hat{j}}{\sqrt{2}}$

B. $\hat{i} + \hat{j}$

C. $\sqrt{2}\left(\hat{i} + \hat{j}\right)$

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

Answer: D

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5. Find the unit vector parallel to the resultant vector of $2\hat{i}+4\hat{j}-5\hat{k}$ and $\hat{i}+2\hat{j}+3\hat{k}$.

A. $\frac{1}{7}\left(3\hat{i}+\hat{j}+\hat{k}\right)$

B. $\dfrac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}$

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

D. $\frac{1}{\sqrt{69}}\left(-\hat{i}-\hat{j}+8\hat{k}\right)$

Answer: A

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6. If $a=\hat{i}+2\hat{j}+3\hat{k}, b=-\hat{i}+2\hat{j}+\hat{k}$ and $c=3\hat{i}+\hat{j}$, then the unit vector along its resultant is

A. $3\hat{i}+5\hat{j}+4\hat{k}$

B. $\dfrac{3\hat{i}+5\hat{j}+4\hat{k}}{50}$

C. $\dfrac{3\hat{i}+5\hat{j}+4\hat{k}}{5\sqrt{2}}$

D. none of these

Answer: C

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7. If $a=(2,5)$ and $b=(1,4)$, then vector parallel to (a+b) is

A. (3,5)

B. (1,1)

C. (1,3)

D. (8,5)

Answer: C

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8. In the ΔABC, $AB = a$, $AC = c$ and $BC = b$, then

A. a+b+c=0

B. a+b-c=0

C. a-b+c=0

D. $-a+b+c=0$

Answer: B

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9. If O is origin annd the position vector fo A is $4\hat{i}+5\hat{j}$, then unit vector parallel to OA is

A. $\frac{4}{\sqrt{41}}\hat{i}$

B. $\frac{5}{\sqrt{41}}\hat{i}$

C. $\frac{1}{\sqrt{41}}\left(4\hat{i}+5\hat{j}\right)$

D. $\frac{1}{\sqrt{41}}\left(4\hat{i}-5\hat{j}\right)$

Answer: C

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10. The position vectors of the points A,B and C are $\hat{i}+2\hat{j}-\hat{k}$, $\hat{i}+\hat{j}+\hat{k}$ and $2\hat{i}+3\hat{j}+2\hat{k}$, respectively. If A is chosen as the origin, then the position vectors of B and C are

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

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

C. $-\hat{j}+2\hat{k}$, $\hat{i}- \ -\hat{j}+3\hat{k}$

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

Answer: D

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11. The position vectors of P and Q are $5\hat{i}+4\hat{j}+a\hat{k}$ and $-\hat{i}+2\hat{j}-2\hat{k}$, respectively. If the distance between them is 7, then find the value of a.

A. $-5, 1$

B. $5, 1$

C. $0, 5$

D. 1,0

Answer: A

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12. If position vector of points A,B and C are respectively $\hat{i}, \hat{j},$ and $\hat{k}$ and $AB = CX$, then position vector of point X is

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

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

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

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

Answer: A

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13. The position vectors of A and B are $2\hat{i} - 9\hat{j} - 4\hat{k}$ and $6\hat{i} - 3\hat{j} + 8\hat{k}$ respectively, then the magnitude of AB is

A. 11

B. 12

C. 13

D. 14

Answer: D

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14. If the position vectors of P and Q are $\left(\hat{i}+3\hat{j}-7\hat{k}\right)$ and $\left(5\hat{i}-2\hat{j}+4\hat{k}\right)$, then |PQ| is

A. $\sqrt{158}$

B. $\sqrt{160}$

C. $\sqrt{161}$

D. $\sqrt{162}$

Answer: D

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15. If the position vectors of P and Q are $\hat{i}+2\hat{j}-7\hat{k}$ and $5\hat{i}-2\hat{j}+4\hat{k}$ respectively, the cosine of the angle between PQ and Z-axis is

A. $\dfrac{4}{\sqrt{162}}$

B. $\dfrac{11}{\sqrt{162}}$

C. $\dfrac{5}{\sqrt{162}}$

D. $\frac{-5}{\sqrt{162}}$

Answer: B

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16. If the position vectors of A and B are $\hat{i}+3\hat{j}-7\hat{k}$ and $5\hat{i}-2\hat{j}+4\hat{k}$, then the direction cosine of AB along Y-axis is

A. $\frac{4}{\sqrt{162}}$

B. $-\frac{5}{\sqrt{162}}$

C. -5

D. 11

Answer: B

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17. The direction cosines of vector $a = 3\hat{i} + 4\hat{j} + 5\hat{k}$ in the direction of positive axis of X, is

A. A. $\pm\frac{3}{\sqrt{50}}$

B. B. $\frac{4}{\sqrt{50}}$

C. C. $\frac{3}{\sqrt{50}}$

D. D. $-\frac{4}{\sqrt{50}}$

Answer: C

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18. The direction cosines of the vector $3\hat{i} - 4\hat{j} + 5\hat{k}$ are

A. A. $\frac{3}{5}, -\frac{4}{5}, \frac{1}{5}$

B. B. $\frac{3}{5\sqrt{2}}, \frac{-4}{5\sqrt{2}}, \frac{1}{\sqrt{2}}$

C. C. $\frac{3}{\sqrt{2}}, \frac{-4}{\sqrt{2}}, \frac{1}{\sqrt{2}}$

D. D. $\frac{3}{5\sqrt{2}}, \frac{4}{5\sqrt{2}}, \frac{1}{\sqrt{2}}$.

Answer: B

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19. The point having position vectors $2\hat{i} + 3\hat{j} + 4\hat{k}, 3\hat{i} + 4\hat{j} + 2\hat{k}$ and $4\hat{i} + 2\hat{j} + 3\hat{k}$ are the vertices of

A. A. right angled triangle

B. B. isosceles triangle

C. C. equilateral triangle

D. D. collinear

Answer: C

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20. If the position vectors of the vertices A,B and C of a ΔABC are $7\hat{j} + 10k, \ -\hat{i} + 6\hat{j} + 6\hat{k}$ and $-4\hat{i} + 9\hat{j} + 6\hat{k},$ respectively, the triangle is

A. A. equilateral

B. B. isosceles

C. C. scalene

D. D. right angled and isosceles also

Answer: D

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21. If a,b and c are the position vectors of the vertices A,B and C of the ΔABC, then the centroid of ΔABC is

A. A. $\dfrac{a+b+c}{3}$

B. B. $\dfrac{1}{2}\left(a+\dfrac{b+c}{2}\right)$

C. C. $a+\dfrac{b+c}{2}$

D. D. $\dfrac{a+b+c}{2}$

Answer: A

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22. If a and b are position vector of two points A,B and C divides AB in ratio 2:1, then position vector of C is

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

B. $\frac{2a+b}{3}$

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

D. $\frac{a+b}{2}$

Answer: A

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23. Find the position vector of the point which divides the join of the points $\left(2\vec{a}-3\vec{b}\right)$ and $\left(3\vec{a}-2\vec{b}\right)$ (i) internally and (ii) externally in the ratio $2:3$.

A. $\frac{12}{5}a+\frac{13}{5}b$

B. $\frac{12}{5}a-\frac{13}{5}b$

C. $\frac{3}{5}a-\frac{2}{5}b$

D. none of these

Answer: B

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24. If O is origin and C is the mid - point of A (2, -1) and B (-4, 3) . Then value of OC is

A. $\hat{i}+\hat{j}$

B. $\hat{i}-\hat{j}$

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

D. $-\hat{i}-\hat{j}$

Answer: C

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25. If the position vectors of the points A and B are $\hat{i} + 3\hat{j} - \hat{k}$ and $3\hat{i} - \hat{j} - 3\hat{k}$, then what will be the position vector of the mid-point of AB

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

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

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

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

Answer: B

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26. The position vectors of A and B are $\hat{i}-\hat{j}+2\hat{k}$ and $3\hat{i}-\hat{j}+3\hat{k}$. The position vector of the middle points of the line AB is

A. $\frac{1}{2}\hat{i}-\frac{1}{2}\hat{j}+\hat{k}$

B. $2\hat{i}-\hat{j}+\frac{5}{2}\hat{k}$

C. $\frac{3}{2}\hat{i}-\frac{1}{2}\hat{j}+\frac{3}{2}\hat{k}$

D. none of these

Answer: B

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27. If the vector $\vec{b}$ is collinear with the vector $\vec{a}\left(2\sqrt{2},\ -1, 4\right)$ and $\left|\vec{b}\right|=10$, then

A. $a\pm b=0$

B. $a\pm 2b=0$

C. $2a\pm b=0$

D. none of these

Answer: C

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

A. 4

B. 3

C. 2

D. 0

Answer: C

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29. 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, if a is equal to

A. -8

B. 4

C. 8

D. 12

Answer: C

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30. The vectors $\hat{i}+2\hat{j}+3\hat{k}, \lambda\hat{i}+4\hat{j}+7\hat{k}, -3\hat{i}-2\hat{j}-5\hat{k}$ are collinear, of λ is equal to (A)3 (B)4 (C)5 (D)6

A. 3

B. 4

C. 5

D. 6

Answer: A

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31. If the points $a+b, a-b \text{ and } a+kb$ be collinear, then k is equal to

A. A. 0

B. B. 2

C. C. -2

D. D. any real number

Answer: D

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32. If the position vectors of A,B,C and D are $2\hat{i} + \hat{j}, \hat{i} - 3\hat{j}, 3\hat{i} + 2\hat{j}$ and $\hat{i} + \lambda\hat{j}$ respectively and $\overrightarrow{AB} \mid \mid \overrightarrow{CD}$. Then λ will be

A. -8

B. -6

C. 8

D. 6

Answer: B

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33. If the vectors $3\hat{i} + 2\hat{j} - \hat{k}$ and $6\hat{i} - 4x\hat{j} + y\hat{k}$ are parallel, then the value of x and y will be

A. $-1, \ -2$

B. $1, \ -2$

C. $-1, 2$

D. $1, 2$

Answer: A

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34. If a and b are two non collinear vectors; then every vector r coplanar with a and b can be expressed in one and only one way as a linear combination: xa+yb=0.

A. (a)x=0, but y is not necessarily zero

B. (b)y=0, but x is not necessarily zero

C. (c)x=0,y=0

D. (d)none of these

Answer: C

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35. Four non-zero vectors will always be

A. linearly dependent

B. linearly independent

C. either (a) or (b)

D. none of these

Answer: A

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36. The vectors a,b and a+b are

A. collinear

B. coplanar

C. non-coplanar

D. none of these

Answer: B

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37. Find the all the values of lamda such that $(x, y, z) \ne (0, 0, 0)$and $x\left(\hat{i}+\hat{j}+3\hat{k}\right)+y\left(3\hat{i}-3\hat{j}+\hat{k}\right)+z\left(-4\hat{i}+5\hat{j}\right)=\lambda\left(x\hat{i}+y\hat{j}+z\hat{k}\right)$

A. A. $-2, 0$

B. B $0, \ -2$

C. C. $-1, 0$

D. D. $0, \ -1$

Answer: D

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38. The number of integral values of p for which $(p+1)\hat{i}-3\hat{j}+p\hat{k}, p\hat{i}+(p+1)\hat{j}-3\hat{k}$ and $-3\hat{i}+p\hat{j}+(p+1)\hat{k}$ are linearly dependent vectors is q

A. 0

B. 1

C. 2

D. 3

Answer: B

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39. If vectors $\overrightarrow{AB} = -3\hat{i} + 4\hat{k}$ and $\overrightarrow{AC} = 5\hat{i} - 2\hat{j} + 4\hat{k}$ are the sides of a ΔABC, then the length of the median throught A is

A. $\sqrt{18}$

B. $\sqrt{72}$

C. $\sqrt{33}$

D. $\sqrt{288}$

Answer: C

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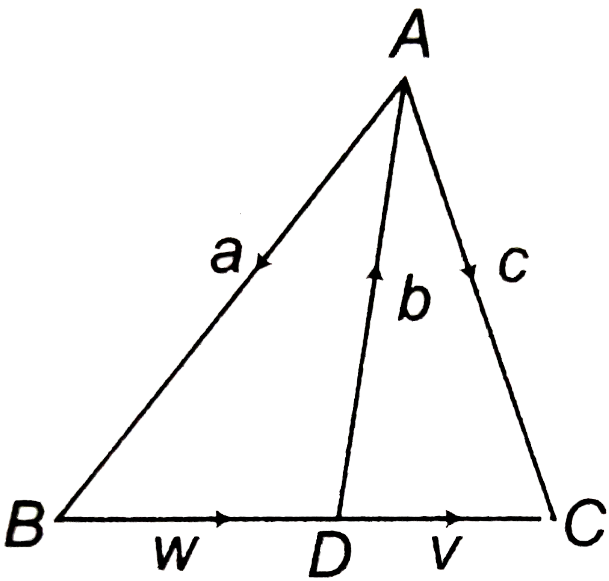
40. In the figure, a vectors x satisfies the equation x+w=v. then, x is equal to



A. $2a+b+c$

B. $a+2b+c$

C. $a+b+2c$

D. $a+b+c$

Answer: B

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41. Vectors $\overrightarrow{a}=\hat{i}+2\hat{j}+3\hat{k}$, $\overrightarrow{b}=2\hat{i}-\hat{j}+\hat{k}$ and $\overrightarrow{c}=3\hat{i}+\hat{j}+4\hat{k}$ are so placed that the end point of one vector is the starting point of the next vector. Then the vectors are

A. not coplanar

B. coplanar but cannot form a triangle

C. coplanar and form a triangle

D. coplanar and can form a right angled triangle.

Answer: B

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42. If OP=8 and OP makes angles 45° and 60° with OX-axis and OY-axis respectively, then OP is equal to

A. $8\left(\sqrt{2}\hat{i}+\hat{j}\pm\hat{k}\right)$

B. $4\left(\sqrt{2}\hat{i}+\hat{j}\pm\hat{k}\right)$

C. $\frac{1}{4}\left(\sqrt{2}\hat{i}+\hat{j}\pm\hat{k}\right)$

D. $\frac{1}{8}\left(\sqrt{2}\hat{i}+\hat{j}\pm\hat{k}\right)$

Answer: B

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43. Let a,b and c be three unit vectors such that $3a+4b+5c=0$. Then which of the following statements is true?

A. a is parallel to b

B. a is perpendicular to b

C. a is neither parallel nor perpendicular to b

D. none of these

Answer: D

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44. if A,B,C,D and E are five coplanar points, then $\overrightarrow{DA} + \overrightarrow{DB} + \overrightarrow{DC} + \overrightarrow{AE} + \overrightarrow{BE} + \overrightarrow{CE}$ is equal to :

A. DE

B. 3DE

C. 2DE

D. 4ED

Answer: B

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45. If the vectors $\overrightarrow{a}$ and $\overrightarrow{b}$ are linearly independent satisfying $(\sqrt{3}\tan\theta+1)\overrightarrow{a}+(\sqrt{3}\sec\theta-2)\overrightarrow{b}=0$, then the most general values of θ are

A. $n\pi-\dfrac{\pi}{6}, n\in Z$

B. $2n\pi\pm\dfrac{11\pi}{6}n\in Z$

C. $n\pi\pm\dfrac{\pi}{6}, n\in Z$

D. $2n\pi+\dfrac{11\pi}{6}, n\in Z$

Answer: D

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46. The unit vector bisecting $\overrightarrow{OY}$ and $\overrightarrow{OZ}$ is

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

B. $\dfrac{\hat{j}-\hat{k}}{\sqrt{2}}$

C. $\dfrac{\hat{j}+\hat{k}}{\sqrt{2}}$

D. $\dfrac{-\hat{j}+\hat{k}}{\sqrt{2}}$.

Answer: C

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47. A line passes through the points whose position vectors are $\hat{i}+\hat{j}-2\hat{k}$ and $\hat{i}-3\hat{j}+\hat{k}$. The position vector of a point on it at unit distance from the first point is (A) $\frac{1}{5}\left(5\hat{i}+\hat{j}-7\hat{k}\right)$ (B) $\frac{1}{5}\left(5\hat{i}+9\hat{j}-13\hat{k}\right)$ (C) $\left(\hat{i}-4\hat{j}+3\hat{k}\right)$ (D) $\frac{1}{5}\left(\hat{i}-4\hat{j}+3\hat{k}\right)$

A. A. $\frac{1}{5}\left(5\hat{i}+\hat{j}-7\hat{k}\right)$

B. $\frac{1}{5}\left(4\hat{i}+9\hat{j}-15\hat{k}\right)$

C. $\left(\hat{i}-4\hat{j}+3\hat{k}\right)$

D. $\frac{1}{5}\left(\hat{i}-4\hat{j}+3\hat{k}\right)$

Answer: A

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48. If D, E and F be the middle points of the sides BC,CA and AB of the ΔABC, then $AD + BE + CF$ is

A. A. a zero vector

B. B. a unit vector

C. C. 0

D. D. none of these

Answer: A

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49. If P and Q are the middle points of the sides BC and CD of the parallelogram ABCD, then AP+AQ is equal to

A. AC

B. $\frac{1}{2}AC$

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

D. $\frac{3}{2}AC$

Answer: D

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50. If the figure formed by the four points $\hat{i}+\hat{j}-\hat{k}, 2\hat{i}+3\hat{j}, 3\hat{i}+5\hat{j}-2\hat{k}$ and $\hat{k}-\hat{j}$ is

A. rectangle

B. parallelogram

C. trapezium

D. none of these

Answer: C

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51. A and B are two points. The position vector of A is 6b-2a. A point P divides the line AB in the ratio 1:2. if a-b is the position vector of P, then the position vector of B is given by

A. A. 7a-15b

B. B. 7a+15b

C. C. 15a-7b

D. D. 15a+7b

Answer: A

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52. If three points A,B and C are collinear, whose position vectors are $\hat{i}-2\hat{j}-8\hat{k}, 5\hat{i}-2\hat{k}$ and $11\hat{i}+3\hat{j}+7\hat{k}$ respectively, then the ratio in which B divides AC is

A. A. $1:2$

B. B. $2:3$

C. C. $2:1$

D. D. $1:1$

Answer: B

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53. If in a triangle AB=a,AC=b and D,E are the mid-points of AB and AC respectively, then DE is equal to

A. $\frac{a}{4}-\frac{b}{4}$

B. $\frac{a}{2}-\frac{b}{2}$

C. $\frac{b}{4}-\frac{a}{4}$

D. $\frac{b}{2}-\frac{a}{2}$

Answer: D

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54. The sides of a parallelogram are $2\hat{i}+4\hat{j}-5\hat{k}$ and $\hat{i}+2\hat{j}+3\hat{k}$. The unit vector parallel to one of the diagonals is

A. $\dfrac{1}{\sqrt{69}}\left(\hat{i}+2\hat{j}-8\hat{k}\right)$

B. $\dfrac{1}{69}\left(\hat{i}+2\hat{j}-8\hat{k}\right)$

C. $\dfrac{1}{\sqrt{69}}\left(-\hat{i}-2\hat{j}+8\hat{k}\right)$

D. $\dfrac{1}{69}\left(-\hat{i}-2\hat{j}+8\hat{k}\right)$

Answer: C

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55. If A,B and C are the vertices of a triangle with position vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ respectively and G is the centroid of ΔABC, then $\overrightarrow{GA}+\overrightarrow{GB}+\overrightarrow{GC}$ is equal to

A. 0

B. $A + B + C$

C. $\dfrac{a + b + c}{3}$

D. $\dfrac{a + b - c}{3}$

Answer: A

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56. Consider the regular hexagon ABCDEF with centre at O (origin).

Q. AD+EB+FC is equal to

A. 0

B. 2AB

C. 3AB

D. 4AB

Answer: D

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57. ABCDE is a pentagon. Forces AB,AE,DC and ED act at a point. Which force should be added to this systemm to make the resultant 2AC?

A. AC

B. AD

C. BC

D. BD

Answer: C

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58. In a regular hexagon ABCDEF, prove that AB+AC+AD+AE+AF=3AD.

A. 2

B. 3

C. 4

D. 6

Answer: B

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59. Let us define the length of a vector $a\hat{i} + b\hat{j} + c\hat{k}$ and $|a| + |b| + |c|$. This definition coincides with the usual definition of length of a vector $a\hat{i} + b\hat{j} + c\hat{k}$ if an only if

A. a=b=c=0

B. any two of a,b and c are zero

C. any one of a,b and c is zero

D. a+b+c=0

Answer: B

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60. If a and b are two non-zero and non-collinear vectors then a+b and a-b are

A. linearly dependent vectors

B. linearly independent vectors

C. linearly dependent annd independent vectors

D. none of these

Answer: B

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61. If $\left|\vec{a}+\vec{b}\right|<\left|\vec{a}-\vec{b}\right|$, then the angle between $\vec{a}$ and $\vec{b}$ can lie in the interval

A. $(\pi/2, \pi/2)$

B. $(0, \pi)$

C. $(\pi/2, 3\pi/2)$

D. $(0, 2\pi)$

Answer: C

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62. The magnitudes of mutually perpendicular forces a,b and c are 2,10 and 11 respectively. Then the magnitude of its resultant is

A. 12

B. 15

C. 9

D. none of these

Answer: B

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63. If $\hat{i}-3\hat{j}+5\hat{k}$ bisects the angle between $\hat{a}$ and $-\hat{i}+2\hat{j}+2\hat{k}$, where $\hat{a}$ is a unit vector, then

A. $a=\frac{1}{105}\left(41\hat{i}+88\hat{j}-40\hat{k}\right)$

B. $a=\frac{1}{105}\left(41\hat{i}+88\hat{j}+40\hat{k}\right)$

C. $a=\frac{1}{105}\left(-41\hat{i}+88\hat{j}-40\hat{k}\right)$

D. $a=\frac{1}{105}\left(41\hat{i}-88\hat{j}-40\hat{k}\right)$

Answer: D

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64. Let $\vec{a}=\hat{i}$ be a vector which makes an angle of 120° with a unit vector $\vec{b}$ in XY plane. then the unit vector $\left(\vec{a}+\vec{b}\right)$ is

A. $-\frac{1}{2}\hat{i}+\frac{\sqrt{3}}{2}\hat{j}$

B. $-\frac{\sqrt{3}}{2}\hat{i}+\frac{1}{2}\hat{j}$

C. $\frac{1}{2}\hat{i}+\frac{\sqrt{3}}{2}\hat{j}$

D. $\frac{\sqrt{3}}{2}\hat{i} - \frac{1}{2}\hat{j}$

Answer: C

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65. Given three vectors $\overrightarrow{a} = 6\hat{i} - 3\hat{j}, \overrightarrow{b} = 2\hat{i} - 6\hat{j} and \overrightarrow{c} = -2\hat{i} + 21\hat{j}$ such that $\overrightarrow{\alpha} = \overrightarrow{a} + \overrightarrow{b} + \overrightarrow{\cdot}$ Then the resolution of the vector $\overrightarrow{\alpha}$ into components with respect to $\overrightarrow{a} and \overrightarrow{b}$ is given by a. $3\overrightarrow{a} - 2\overrightarrow{b}$ b. $3\overrightarrow{b} - 2\overrightarrow{a}$ c. $2\overrightarrow{a} - 3\overrightarrow{b}$ d. $\overrightarrow{a} - 2\overrightarrow{b}$

A. 3a-2b

B. 3b-2a

C. 2a-3b

D. a-2b

Answer: C

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66. $'I'$ is the incentre of triangle ABC whose corresponding sides are $a, b, c,$ rspectively. $a\overrightarrow{I}A + b\overrightarrow{I}B + c\overrightarrow{I}C$ is always equal to **(a).** $\overrightarrow{0}$ **(b).** $(a+b+c)\overrightarrow{B}C$ **(c).** $\left(\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}\right)\overrightarrow{A}C$ **(d).** $(a+b+c)\overrightarrow{A}B$

A. 0

B. (a+b+c)BC

C. (a+b+c)AC

D. (a+b+c)AB

Answer: A

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67. If $\overrightarrow{x}$ and $\overrightarrow{y}$ are two non-collinear vectors and ABC is a triangle with side lengths a, b and c satisfying

$(20a - 15b)\overrightarrow{x} + (15b - 12c)\overrightarrow{y} + (12c - 20a)\left(\overrightarrow{x} \times \overrightarrow{y}\right) = \overrightarrow{0}$, then triangle ABC is

A. an acute angled triangle

B. an obtuse angled triangle

C. a right angled triangle

D. a scalane triangle

Answer: C

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68. If $\overrightarrow{x}\, and\, \overrightarrow{y}$ are two non-collinear vectors and a, b, and c represent the sides of a ABC satisfying $(a-b)\overrightarrow{x} + (b-c)\overrightarrow{y} + (c-a)\left(\overrightarrow{x} \times \overrightarrow{y}\right) = 0$, then ABC is (where $\overrightarrow{\times}\, x\, \overrightarrow{y}$ is perpendicular to the plane of $x and y$) a. an acute-angled triangle b. an obtuse-angled triangle c. a right-angled triangle d. a scalene triangle

A. an acute angled triangle

B. ann obtuse angled triangle

C. a right angled triangle

D. a scalene triangle

Answer: A

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69. If the resultant of two forces is equal in magnitude to one of the components and perpendicular to it direction, find the other components using the vector method.

A. $P\sqrt{2}$

B. P

C. $P\sqrt{3}$

D. none of these

Answer: A

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70. If $\vec{b}$ is a vector whose initial point divides the join of $5\hat{i}$ and $5\hat{j}$ in the ratio $k:1$ and whose terminal point is the origin and $\left|\vec{b}\right| \leq \sqrt{37}, then, k$ lies in the interval

a. $[-6, -1/6]$

b. $(-\infty, -6] \cup [-1/6, \infty)$

c. $[0, 6]$

d. none of these

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71. If $4\hat{i}+7\hat{j}+8\hat{k}, 2\hat{i}+3\hat{j}+4\hat{k}$ and $2\hat{i}+5\hat{j}+7\hat{k}$ are the position vectors of the vertices A, B and C, respectively, of triangle ABC, then the position vector of the point where the bisector of angle A meets BC is

A. $\frac{1}{3}\left(6\hat{i} + 13\hat{j} + 18\hat{k}\right)$

B. $\frac{2}{3}\left(6\hat{i} + 12\hat{j} - 8\hat{k}\right)$

C. $\frac{1}{3}\left(-6\hat{i} - 8\hat{j} - 9\hat{k}\right)$

D. $\frac{2}{3}\left(-6\hat{i} - 12\hat{j} + 8\hat{k}\right)$

Answer: A

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72. If $\vec{a}$ and $\vec{b}$ are two unit vectors and θ is the angle between them, then the unit vector along the angular bisector of $\vec{a}$ and $\vec{b}$ will be given by

A. $\frac{a-b}{2\cos(\theta/2)}$

B. $\frac{a+b}{2\cos(\theta/2)}$

C. $\frac{a-b}{\cos(\theta/2)}$

D. none of these

Answer: B

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73. A, B, C and D have position vectors $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$, repectively, such that $\vec{a} - \vec{b} = 2\left(\vec{d} - \vec{c}\right)$. Then

A. AB and CD bisect each other

B. BD and AC bisect each other

C. AB and CD trisect each other

D. BD and AC trisect each other

Answer: D

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74. On the xy plane where O is the origin, given points, $A(1, 0), B(0, 1)$ and $C(1, 1)$. Let $P, Q,$ and R be moving points on the

line OA, OB, OC respectively such that $\overline{OP} = 45t\overline{(OA)}, \overline{OQ} = 60t\overline{(OB)}, \overline{OR} = (1-t)\overline{(OC)}$ with $t > 0$. If the three points P, Q and R are collinear then the value of t is equal to

A $\frac{1}{106}$

B $\frac{7}{187}$

C $\frac{1}{100}$

D none of these

A. $\frac{1}{106}$

B. $\frac{7}{187}$

C. $\frac{1}{100}$

D. none of these

Answer: B

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75. If $a+b+c=\alpha d$, $b+c+d=\beta a$ and a, b, c are non-coplanar, then the sum of $a+b+c+d=$

A. 0

B. αa

C. βb

D. $(\alpha+\beta)c$

Answer: A

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76. The position vectors of the points P and Q with respect to the origin O are $\vec{a}=\hat{i}+3\hat{j}-2\hat{k}$ and $\vec{b}=3\hat{i}-\hat{j}-2\hat{k}$, respectively. If M is a point on PQ, such that OM is the bisector of POQ, then $\overrightarrow{OM}$ is

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

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

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

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

Answer: B

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77. $ABCD$ is a quadrilateral. E is the point of intersection of the line joining the midpoints of the opposite sides. If O is any point and $\overrightarrow{O}A+\overrightarrow{O}B+\overrightarrow{O}C+\overrightarrow{O}D=x\overrightarrow{O}E, thenx$ is equal to a. 3 b. 9 c. 7 d. 4

A. 3

B. 9

C. 7

D. 4

Answer: D

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78. In the $\triangle OAB$, M is the midpoint of AB, C is a point on OM, such that $2OC = CM$. X is a point on the side OB such that OX = 2XB. The line XC is produced to meet OA in Y. Then $\frac{OY}{YA} =$

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

B. $\frac{2}{7}$

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

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

Answer: B

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79. Points X and Y are taken on the sides QR and RS, respectively of a parallelogram PQRS, so that QX=4XR and RY=4YS. The line XY cuts the line PR at Z. Then, PZ is

A. $\frac{21}{25}PR$

B. $\frac{16}{25}PR$

C. $\frac{17}{25}PR$

D. none of these

Answer: A

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80. Find the value of λ so that the points P, Q, R and S on the sides OA, OB, OC and AB, respectively, of a regular tetrahedron OABC are coplanar. It is given that $\frac{OP}{OA}=\frac{1}{3}, \frac{OQ}{OB}=\frac{1}{2}, \frac{OR}{OC}=\frac{1}{3}$ and $\frac{OS}{AB}=\lambda$.

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

B. $\lambda=-1$

C. $\lambda=0$

D. fo no value of λ

Answer: B

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81. OABCDE is a regular hexagon of side 2 units in the XY-plane in the first quadrant. O being the origin and OA taken along the x-axis. A point P is taken on a line parallel to the z-axis through the centre of the hexagon at a distance of 3 units from O in the positive Z direction. Then find vector $\overrightarrow{AP}$.

A. $-\hat{i}+3\hat{j}+\sqrt{5}\hat{k}$

B. $\hat{i}-\sqrt{3}\hat{j}+5\hat{k}$

C. $-\hat{i}+\sqrt{3}\hat{j}+\sqrt{5}\hat{k}$

D. $\hat{i}+\sqrt{3}\hat{j}+\sqrt{5}\hat{k}$

Answer: C

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Vector Algebra Exercises 1 Single Option Correct Type Questions

1. Find $\frac{dy}{dx}$ if $y=\frac{1}{2}-x^4$

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Exercise More Than One Correct Option Type Questions

1. If the vectors $\hat{i}-\hat{j}, \hat{j}+\hat{k}$ and $\overrightarrow{a}$ form a triangle then $\overrightarrow{a}$ may be (A) $-\hat{i}-\hat{k}$ (B) $\hat{i}-2\hat{j}-\hat{k}$ (C) $2\hat{i}+\hat{j}+\hat{j}k$ (D) hati+hatk`

A. $-\hat{i}-\hat{k}$

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

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

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

Answer: A::B::D

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2. If the resultant of three forces $\vec{F}_1 = p\hat{i} + 3\hat{j} - \hat{k}$, $\vec{F}_2 = 6\hat{i} - \hat{k}$ and $\vec{F}_3 = -5\hat{i} + \hat{j} + 2\hat{k}$ acting on a particle has a magnitude equal to 5 units, then the value of p is

A. -6

B. -4

C. 2

D. 4

Answer: B::C

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3. Let ABC be a triangle, the position vectors of whose vertices are $7\hat{j} + 10\hat{k}$, $-\hat{i} + 6\hat{j} + 6\hat{k}$ and $-4\hat{i} + 9\hat{j} + 6\hat{k}$. Then ΔABC is

A. isosceles

B. equilateral

C. right angled

D. none of these

Answer: A::C

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4. The sides of a parallelogram are $2\hat{i}+4\hat{j}-5\hat{k}$ and $\hat{i}+2\hat{j}+3\hat{k}$. The unit vector parallel to one of the diagonals is

A. $\frac{1}{7}\left(3\hat{i}+6\hat{j}-2\hat{k}\right)$

B. $\frac{1}{7}\left(3\hat{i}-6\hat{j}-2\hat{k}\right)$

C. $\frac{1}{\sqrt{69}}\left(\hat{i}+2\hat{j}+8\hat{k}\right)$

D. $\frac{1}{\sqrt{69}}\left(-\hat{i}-2\hat{j}+8\hat{k}\right)$

Answer: A::D

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5. If $A(-4, 0, 3)$ and $B(14, 2, -5)$, then which one of the following points lie on the bisector of the angle between $\overrightarrow{OA}$ and $\overrightarrow{OB}$ (O is the origin of reference) ?

A. (2,2,4)

B. (2,11,5)

C. (-3,-3,-6)

D. (1,1,2)

Answer: A::C::D

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6. If points $\hat{i}+\hat{j}, \hat{i}-\hat{j}$ and $p\hat{i}+q\hat{j}+r\hat{k}$ are collinear, then

A. p=1

B. r=0

C. $q \in R$

D. $q \neq 1$

Answer: A::B::D

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7. If $\vec{a}, \vec{b}$ and $\vec{}$ are non-coplanar vectors and λ is a real number, then the vectors $\vec{a} + 2\vec{b} + 3\vec{c}, \lambda\vec{b} + \mu\vec{c}$ and $(2\lambda - 1)\vec{c}$ are coplanar when

A. $\mu \in R$

B. $\lambda = \frac{1}{2}$

C. $\lambda = 0$

D. no value of λ

Answer: A::B::C::D

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Exercise Statement I And Ii Type Questions

1. Statement 1 : In $\Delta ABC, \overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = 0$

Statement 2 : If $\overrightarrow{OA} = \overrightarrow{a}, \overrightarrow{OB} = \overrightarrow{b}$, then $\overrightarrow{AB} = \overrightarrow{a} + \overrightarrow{b}$

A. Both Statement I and Statement II are correct and statement II is the correct explanation of statement I

B. Both statement I and statement II are correct but statement II is not the correct explanation of statement I

C. Statement I is correct but statement II is incorrect

D. Statement II is correct but statement I is incorrect

Answer: C

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2. Statement I: $a = \hat{i} + p\hat{j} + 2\hat{k}$ and $b = 2\hat{i} + 3\hat{j} + q\hat{k}$ are parallel vectors, iff $p = \frac{3}{2}$ and $q = 4$.

Statement II: $a = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ and $b = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$ **are parallel** $\frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3}$.

A. Both Statement I and Statement II are correct and statement II is the correct explanation of statement I

B. Both statement I and statement II are correct but statement II is not the correct explanation of statement I

C. Statement I is correct but statement II is incorrect

D. Statement II is correct but statement I is incorrect

Answer: A

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3. Statement 1: if three points $P, QandR$ **have position vectors** $\vec{a}, \vec{b}, and \vec{c}$ **, respectively, and** $2\vec{a} + 3\vec{b} - 5\vec{c} = 0,$ **then the points** $P, Q, andR$ **must be collinear. Statement 2: If for three points** $A, B, andC, \vec{A}B = \lambda\vec{A}C,$ **then points** $A, B, andC$ **must be collinear.**

A. Both Statement I and Statement II are correct and statement II is the correct explanation of statement I

B. Both statement I and statement II are correct but statement II is not the correct explanation of statement I

C. Statement I is correct but statement II is incorrect

D. Statement II is correct but statement I is incorrect

Answer: A

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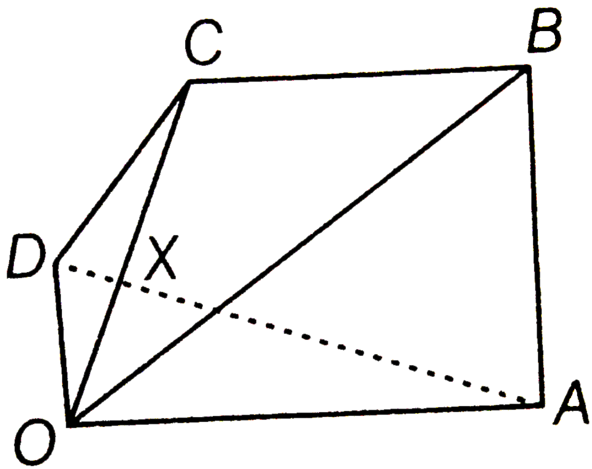
Exercise Passage Based Questions

1. Let OABCD be a pentagon in which the sides OA and CB are parallel and the sides OD and AB are parallel. Also, OA:CB=2:1 and OD:AB=1:3.



Q. The ratio $\frac{AX}{XD}$ is

A. $3/4$

B. $1/3$

C. $2/5$

D. $1/2$

Answer: C

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2. Let OABCD be a pentagon in which the sides OA and CB are parallel and the sides OD and AB are parallel as shown in figure. Also, OA:CB=2:1 and OD:AB=1:3. if the diagonals OC and AD meet at x, find OX:OC.

A. $5/2$

B. 6

C. 7//3`

D. 4

Answer: B

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3. If ABCDEF is a regular hexagon then $\overrightarrow{AD}+\overrightarrow{EB}+\overrightarrow{FC}$ equals :

A. (a)2AB

B. (b)3AB

C. (c)4AB

D. (d)none of these

Answer: C

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4. Consider the regular hexagon ABCDEF with centre at O (origin).

Q. Five forces AB,AC,AD,AE,AF act at the vertex A of a regular hexagon ABCDEF. Then, their resultant is (a)3AO (b)2AO (c)4AO (d)6AO

A. 3AO

B. 2AO

C. 4AO

D. 6AO

Answer: D

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5. Three points A,B, and C have position vectors $-2\vec{a}+3\vec{b}+5\vec{c}$, $\vec{a}+2\vec{b}+3\vec{c}$ and $7\vec{a}-\vec{c}$ with reference to an origin O. Answer the following questions?

Which of the following is true?

A. AC=2AB

B. AC=-3AB

C. AC=3AB

D. none of these

Answer: C

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6. Three points A,B, and C have position vectors $-2\vec{a}+3\vec{b}+5\vec{c}$, $\vec{a}+2\vec{b}+3\vec{c}$ and $7\vec{a}-\vec{c}$ with reference to an origin O. Answer the following questions?

Which of the following is true?

A. 2OA-3OB+OC=0

B. 2OA+7OB+9OC=0

C. OA+OB+OC=0

D. none of these

Answer: A

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7. Three points A,B, and C have position vectors $-2\vec{a}+3\vec{b}+5\vec{c}$, $\vec{a}+2\vec{b}+3\vec{c}$ and $7\vec{a}-\vec{c}$ with reference to an origin O. Answer the following questions?

B divided AC in ratio

A. $2:1$

B. $2:3$

C. $2:-3$

D. $1:2$

Answer: D

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8. If two vectors OA and OB are there, then their resultant OA+OB can be found by completing the parallelogram OACB and OC=OA+OB. Also, if |OA|=|OB|, then the resultant will bisect the angle between them.

Q. A vector C directed along internal bisector of angle between vectors $A = 7\hat{i} - 4\hat{j} - 4\hat{k}$ and $B = -2\hat{i} - \hat{j} + 2\hat{k}$ with $|C| = 5\sqrt{6}$ is

A. $\frac{5}{3}\left(\hat{i} - \hat{j} + \hat{k}\right)$

B. $\frac{5}{3}\left(\hat{i} - 7\hat{j} + 2\hat{k}\right)$

C. $\frac{5}{3}\left(5\hat{i} + 5\hat{j} + 2\hat{k}\right)$

D. $\frac{5}{3}\left(-5\hat{i} + 5\hat{j} + 3\hat{k}\right)$

Answer: B

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9. Find $\frac{dy}{dx}$ if $2x - 3y = \sin x$

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10. Let $C: \vec{r}(t) = x(t)\hat{i} + y(t)\hat{j} + z(t)\hat{k}$ be a differentiable curve i.e.,

$$\exists \lim_{h \to 0} \frac{\vec{r}(t+h) - \vec{r}(t)}{h} \forall t$$

$$\therefore \vec{r}'(t) = x'(t)\hat{i} + y'(t)\hat{j} + z'(t)\hat{k}$$

$\vec{r}'(t)$ is tangent to the curve C at the point $P[x(t), y(t), z(t)]$, $\vec{r}'(t)$ points in the direction of increasing t.

The point P on the curve $\vec{r}(t) = (1-2t)\hat{i} + t^2\hat{j} + 2e^{2(t-1)}\hat{k}$ at which the tangent vector $\vec{r}'(t)$ is parallel to the radius vector $\vec{r}(t)$ is:

A. (a) $(-1, 1, 2)$

B. (b) $(1, -1, 2)$

C. (c) $(-1, 1, -2)$

D. (d) $(1, 1, 2)$

Answer: A

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11. Let $C: \overrightarrow{r}(t) = x(t)\hat{i} + y(t)\hat{j} + z(t)\hat{k}$ be a differentiable curve, i.e. $\exists \lim_{h \to 0} \frac{\overrightarrow{r}(t+h) - \overrightarrow{r}(t)}{h} \forall t$

$\therefore \overrightarrow{r}'(t) = x'(t)\hat{i} + y'(t)\hat{j} + z'(t)\hat{k}$

$\overrightarrow{r}'(t)$ is tangent to the curve C at the point $P[x(t), y(t), z(t)]$ and points in the direction of increasing t.

The tangent vector to $\overrightarrow{r}(t) = (2t^2)\hat{i} + (1-t)\hat{j} + (3t^2+2)\hat{k}$ at $(2, 0, 5)$ is:

A. (a) $4\hat{i} + \hat{j} - 6\hat{k}$

B. (b) $4\hat{i} - \hat{j} + 6\hat{k}$

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

D. (d) $2\hat{i} + \hat{j} - 6\hat{k}$

Answer: B

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Exercise Matching Type Questions

1. a and b form the consecutive sides of a regular hexagon ABCDEF.

	Column I		Column II
a.	If $\mathbf{CD} = x\mathbf{a} + y\mathbf{b}$, then	p.	$x = -2$
b.	If $\mathbf{CE} = x\mathbf{a} + y\mathbf{b}$, then	q.	$x = -1$
c.	If $\mathbf{AE} = x\mathbf{a} + y\mathbf{b}$, then	r.	$y = 1$
d.	If $\mathbf{AD} = -x\mathbf{b}$, then	s.	$y = 2$

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Exercise Single Integer Answer Type Questions

1. If the resultant of three forces $\overrightarrow{F}_1 = p\hat{i} - 3\hat{j} - \hat{k}, \overrightarrow{F}_2 = -5\hat{i} + \hat{j} + 2\hat{k}$ and $\overrightarrow{F}_3 = 6\hat{i} - \hat{k}$ acting on a particle has a magnitude equal to 5 units, then what is difference in the values of p ?

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2. Vectors along the adjacent sides of parallelogram are $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + 4\hat{j} + \hat{k}$. Find the length of the longer diagonal of the parallelogram.

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3. If vectors $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{c} = \lambda\hat{i} + \hat{j} + 2\hat{k}$ are coplanar, then find the value of $(\lambda - 4)$.

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4. If determinant of A = 5 and A is a square matrix of order 3 then find the determinant of adj(A)

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5. Let p be the position vector of orthocentre and g is the position vector of the centroid of ΔABC, where circumcentre is the origin. If $p = kg$, then the value of k is

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6. In a ΔABC, a line is drawn passing through centroid dividing AB internaly in ratio 2:1 and AC in $\lambda : 1$ (internally). The value of λ is

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7. The vector $\vec{a}$ has the components $2p$ and 1 w.r.t. a rectangular Cartesian system. This system is rotated through a certain angel about the origin in the counterclockwise sense. If, with respect to a new system, $\vec{a}$ has components $(p+1) and 1$, then p is equal to a. -4 b. $-1/3$ c. 1 d. 2

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Exercise Subjective Type Questions

1. A vector a has components a_1, a_2, a_3 in a right handed rectangular cartesian coordinate system $OXYZ$ the coordinate axis is rotated about z axis through an angle $\frac{\pi}{2}$. The components of a in the new system

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2. Find the magnitude and direction of $r_1 - r_2$ when $|r_1| = 5$ and points North-East while $|r_2| = 5$ but points North-West.

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3. Let $OACB$ be a parallelogram with O at the origin andOC a diagonal. Let D be the midpoint of OA. using vector methods prove that $BDandCO$ intersect in the same ratio. Determine this ratio.

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4. ΔABC is a triangle with the point P on side BC such that 3BP=2PC, the point Q is on the line CA such that 4CQ=QA. Find the ratio in which the line joining the common point R of AP and BQ and the point S divides AB.

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5. In $\triangle ABC$ internal angle bisector AI,BI and CI are produced to meet opposite sides in A', B', C' respectively. Prove that the maximum value of $\frac{AI \times BI \times CI}{AA' \times BB' \times CC'}$ is $\frac{8}{27}$

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6. Let $r_1, r_2, r_3, \ldots, r_n$ be the position vectors of points $P_1, P_2, P_3, \ldots, P_n$ relative to an origin O. show that if then a similar equation will also hold good with respect to any other origin O'. If $a_1 + a_2 + a_3 + \ldots + a_n = 0.$

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7. Let OABCD be a pentagon in which the sides OA and CB are parallel and the sides OD and AB are parallel as shown in figure. Also, OA:CB=2:1 and OD:AB=1:3. if the diagonals OC and AD meet at x, find OX:XC.

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8. If u,v and w is a linearly independent system of vectors, examine the system p,q and r, where $p=(\cos a)u+(\cos b)v+(\cos c)w$

$q=(\sin a)u+(\sin b)v+(\sin c)w$

$r=\sin(x+a)u+\sin(x+b)v+\sin(x+c)w$ for linearly dependent.

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Exercise Questions Asked In Previous 13 Years Exam

1. If vectors $\overrightarrow{AB}=-3\hat{i}+4\hat{k}$ and $\overrightarrow{AC}=5\hat{i}-2\hat{j}+4\hat{k}$ are the sides of a ΔABC, then the length of the median throught A is

A. $\sqrt{18}$

B. $\sqrt{72}$

C. $\sqrt{33}$

D. $\sqrt{45}$

Answer: C

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2. Let a,b and c be three non-zero vectors which are pairwise non-collinear. If a+3b is collinear with c and b+2c is collinear with a, then a+3b+6c is

A. a+c

B. a

C. c

D. 0

Answer: D

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3. The non-zero vectors a,b and c are related by a=8b and c=-7b angle between a and c is

A. π

B. 0

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

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

Answer: A

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4. If C is the mid-point of AB and P is any point outside AB, then

A. PA+PB+PC=0

B. PA+PB+2PC=0

C. PA+PB=PC

D. PA+PB=2PC

Answer: D

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5. If a,b and c are three non-zero vectors such that no two of these are collinear. If the vector a+2b is collinear with c and b+3c is collinear with a(λ being some non-zero scalar), then a+2b+6c is equal to

A. λa

B. λb

C. λc

D. 0

Answer: D

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6. If $\overrightarrow{a}, \overrightarrow{b}$ and $\overrightarrow{\ }$ are non-coplanar vectors and λ is a real number, then the vectors $\overrightarrow{a} + 2\overrightarrow{b} + 3\overrightarrow{c}, \lambda\overrightarrow{b} + \mu\overrightarrow{c}$ and $(2\lambda - 1)\overrightarrow{c}$ are coplanar when

A. all value of λ

B. all except one value of λ

C. all except two value of λ

D. no value of λ

Answer: C

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7. Consider points A,B,C annd D with position vectors $7\hat{i}-4\hat{j}+7\hat{k}$, $\hat{i}-6\hat{j}+10\hat{k}$, $-1\hat{i}-3\hat{j}+4\hat{k}$ and $5\hat{i}-\hat{j}+5\hat{k}$, respectively. Then, ABCD is

A. square

B. rhombus

C. rectangle

D. none of these

Answer: D

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8. If a,b, and c are all different and if

$\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix}$=0 Prove that abc =-1.

A. 2

B. -1

C. 1

D. 0

Answer: B

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9. The vector $\hat{i} + x\hat{j} + 3\hat{k}$ is rotated through an angle θ and doubled in magnitude, then it becomes $4\hat{i} + (4x - 2)\hat{j} + 2\hat{k}$. Then value of x are $-\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) 2

A. $\left\{-\frac{2}{3}, 2\right\}$

B. $\left(\frac{1}{3}, 2\right)$

C. $\left\{\frac{2}{3}, 0\right\}$

D. $\{2, 7\}$

Answer: A

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