MATHS

BOOKS - ML KHANNA

ADDITION AND MULTIPLICATION OF VECTORS

Problem Set (1) (Multiple Choice Questions)

1. The figure formed by joining the mid-points of the sides of a quadrilateral taken in order is

A. parallelogram

B. rectange

C. square

D. none

Answer: A

View Text Solution

2. ABCDE is a pentagon then the resultant of forces

$\vec{A}B, \vec{A}E, \vec{B}C, \vec{D}C, \vec{E}D$ and $\vec{A}C$ is

A. $\vec{A}D$

B. $2\vec{A}C$

C. $3\vec{A}C$

D. 0

Answer: C

View Text Solution

3. In a regular hexagon ABCDEF,

$\vec{A}B + \vec{A}C + \vec{A}D + \vec{A}E + \vec{A}F =$

A. $4\vec{A}D$

B. $3\vec{A}D$

C. $2\vec{A}D$

D. 0

Answer: B

View Text Solution

4. In a regular hexagon , $\vec{A}E$ =

A. $\vec{A}C + \vec{A}F + \vec{A}B$

B. $\vec{A}C + \vec{A}F - \vec{A}B$

C. $\vec{A}C + \vec{A}B - \vec{A}F$

D. $-\vec{A}C + \vec{A}B - VECAF$

Answer: B

View Text Solution

5. If $a = 3i - 2j + k, b = 2i - 4j - 3k$

$c = \; - I + 2j + 2k,$ then $a + b + c =$

A. $3i - 4j$

B. $3i + 4j$

C. $4i - 4j$

D. $4i + 4j$

Answer: C

View Text Solution

6. The projections of a vector on the same coordinate axes are $6, \; - 3, 2$ respectively. The direction cosines of the vector are

A. $\frac{-6}{7}, \frac{-3}{7}, \frac{2}{7}$

B. $6, \; - 3, 2$

C. $\frac{6}{5}, \frac{-3}{5}, \frac{2}{5}$

D. $\frac{6}{7}, \frac{-3}{7}, \frac{2}{7}$

Answer: D

View Text Solution

7. If $\bar{a}$ and $\bar{b}$ represent the sides $\overline{AB}$ and $\overline{BC}$ of a regular hexagon ABCDEF, then $\overline{FA} =$

A. $b - a$

B. $a - b$

C. $a + b$

D. none of these

Answer: B

Watch Video Solution

8. Let ABCDEF be a regular hexagon. If $\vec{A}D = x\vec{B}C$ and $\vec{C}F = y\vec{A}B$, then xy =

A. -4

B. -2

C. 2

D. 4

Answer: A

View Text Solution

9. ABC is a triangle , D, E, F are points in the sides BC, CA, AB respectively dividing them in the ratio $1:4, 3:2$ and $3:7$ respectively. The point P divides AB in the ratio $1:3$, then

$\left(\vec{A}D + \vec{B}E + \vec{C}F\right) : \vec{C}P$ =

A. $1:1$

B. $2:5$

C. $5:2$

D. none

Answer: B

View Text Solution

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

A. $3a - b$

B. $3b - a$

C. $3a - 2b$

D. $3b - 2a$

Answer: D

View Text Solution

11. Let D, E, F be the middle points of the sides BC, CA, AB respectively of a triangle ABC. Then $\vec{A}D + \vec{B}E + \vec{C}F$ equals

A. $\vec{0}$

B. 0

C. 2

D. none of these

Answer: A

View Text Solution

12. If $ABCD$ is a rhombus whose diagonals cut at the origin O, then proved that $\vec{O}A + \vec{O}B + \vec{O}C + \vec{O}D + \vec{O}$.

A. $\vec{A}B + \vec{A}C$

B. $2\left(\vec{A}B + \vec{B}C\right)$

C. $\overrightarrow{A}C + \overrightarrow{B}D$

D. 0

Answer: D

Watch Video Solution

13. IF G is the centroid of a triangle ABC. Then $\overrightarrow{G}A + \overrightarrow{G}B + \overrightarrow{G}C$ equals

A. $\overrightarrow{0}$

B. $3\overrightarrow{G}A$

C. $3\overrightarrow{G}B$

D. $3\overrightarrow{G}C$

Answer: A

View Text Solution

14. If I is the centre of a circle inscribed in a triangle ABC, then $\left|\overrightarrow{B}C\right|\overrightarrow{I}A+\left|\overrightarrow{C}A\right|\overrightarrow{I}B+\left|\overrightarrow{A}B\right|\overrightarrow{I}C$ is

A. $\overrightarrow{0}$

B. $\overrightarrow{I}A+\overrightarrow{I}B+\overrightarrow{I}C$

C. $\dfrac{\overrightarrow{I}A+\overrightarrow{I}B+\overrightarrow{I}C}{3}$

D. none of these

Answer: A

View Text Solution

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

A. $\overrightarrow{P}A+\overrightarrow{P}B=\overrightarrow{P}C$

B. $\overrightarrow{P}A+\overrightarrow{P}B=2\overrightarrow{P}C$

C. $\overrightarrow{P}A+\overrightarrow{P}B+\overrightarrow{P}C=0$

D. $\vec{P}A + \vec{P}B + 2\vec{P}C = 0$

Answer: B

Watch Video Solution

16. IF two concurrent forces by represented by n $\vec{O}P$ and m $\vec{O}Q$ respectively, then their resultant is given by $(m+n)\vec{O}R$ where R is such that

A. $m:n = RQ:PR$

B. $m:n = PR:RQ$

C. R is mid -point of PQ

D. none

Answer: B

View Text Solution

17. In a triangle ABC, D, E, F are the mid-points of the sides BC, CA and AB respectively , the vector $\vec{A}D$ is equal to

A. $\vec{B}E + \vec{C}F$

B. $\vec{B}E - \vec{C}F$

C. $\vec{C}F - \vec{B}E$

D. $-\vec{B}E - \vec{C}F$

Answer: D

View Text Solution

18. If A, B, C, D be any four points and E and F be the middle points of AC and BD respectively, then $\vec{AB} + \vec{CB} + \vec{CD} + \overrightarrow{AD}$ is equal to

A. $3\vec{E}F$

B. $4\vec{E}F$

C. $4\vec{F}E$

D. $3\overrightarrow{F}E$

Answer: B

Watch Video Solution

19. The points $2i - j + k, I - 3j - 5k, 3 - \ - 4j - 4k$ are the vertices of a triangle which is

A. equilateral

B. isosceles

C. right angled

D. none

Answer: C

View Text Solution

20. 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 an isoscales triangle

D. form a right angled triangle

Answer: B

Watch Video Solution

21. The points having position vectors $2i + 3j + 4k, 3i + 4j + 2k, 4i + 2j + 3k$ are the vectices of

A. right angled triangle

B. isosceles triangle

C. equilateral triangle

D. collinear

Answer: C

View Text Solution

22. If $|a| = 8$, then $|(-5)a|$ is

A. -40

B. 40

C. 40 or -40

D. none of these

Answer: B

View Text Solution

23. If a and b are two parallel vectors with equal magnitudes, then

A. $a = b$

B. $a, b = 0$

C. $a \neq b$

D. a and b may or may not be equal

Answer: D

View Text Solution

24. If the vectors $\vec{A}B = 3i + 4k$ and $veAC = 5i - 2j + 4k$ represent the sides of a triangle ABC, then the length of median through A is

A. $2\sqrt{7}$

B. $3\sqrt{2}$

C. $\sqrt{14}$

D. none

Answer: B

View Text Solution

25. If position vectors of four points A, B, C and D are $I + j + k, 2i + 3j, 3i + 5j - 2k$ and $k - j$ respectively, then $\overrightarrow{A}B$ and $\overrightarrow{C}D$are related as

A. perpendicular

B. parallel

C. independent

D. none

Answer: B

View Text Solution

26. 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

Watch Video Solution

27. The points with position vectors $60i + 3j, 40i - 8j, ai - 52j$ are collinear if a. $a = -40$ b. $a = 40$ c. $a = 20$ d. none of these

A. $a = -40$

B. $a = 40$

C. a =20

D. none of these

Answer: A

Watch Video Solution

28. 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: c

Watch Video Solution

29. If the position vector of three points are a - 2b + 3c, 2a + 3b - 4c, - 7b + 10 c, then the three points are

A. collinear

B. coplanar

C. non-collinear

D. neither

Answer: A

Watch Video Solution

30. Let

$\overline{A} = (x + 4y)\bar{a} + (2x + y + 1)\bar{b}$ and $\overline{B} = (y - 2x + 2)\bar{a} + (2x - 3y - 1)$

, where $\bar{a}$ and $\bar{b}$ are non-collinear vectors, if $3\overline{A} = 2\overline{B}$, then

A. $x = 1, y = 2$

B. $x = 2, y = 1$

C. $x = -1, y = 2$

D. $x = 2, y = -1$

Answer: D

Watch Video Solution

31. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are three non-zero vectors, no two f thich are collinear and the vector $\vec{a}+\vec{b}$ is collinear with $\vec{c}$, $\vec{b}+\vec{c}$ is collinear with $\vec{a}, then \vec{a}+\vec{b}+\vec{c}=\vec{a}$ b. $\vec{b}$ c. $\vec{c}$ d. none of these

A. a

B. b

C. c

D. 0

Answer: D

Watch Video Solution

32. Let a, b, c be three vectors $(\neq 0)$, no two of which are collinear . If a + 2b is collinear with c, b + 3c is collinear with a then $a+2b+6c$ is

A. parallel to a

B. parallel to b

C. parallel to c

D. 0

Answer: D

Watch Video Solution

33. The non-zero vectors a, b and c are related by $a = 8b$ and $c = -7b$. Then the angle between a and c is :

A. 0

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

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

D. π

Answer: D

Watch Video Solution

34. If the points A, B, C and D have position vectors $\bar{a}, 2\bar{a}+\bar{b}, 4\bar{a}+2\bar{b}$ and $5\bar{a}+4\bar{b}$ respectively, then three collinear points are

A. A, B and C

B. A, C and D

C. A, B and D

D. B, C and D

Answer: C

Watch Video Solution

35. The position vector of four points A, B, C and D are a,b,c and d respectively . If a- b = 2(d-c) the

A. AB and CD bisect

B. BD and AC bisect

C. AB and CD trisect

D. BD and AC trisect

Answer: D

Watch Video Solution

36. The vectors $2\hat{i} + 3\hat{j}, 5\hat{i} + 6\hat{j}$ and $8\hat{j} + \lambda\hat{j}$ have their initial points at (1, 1). The value of λ so that the vectors terminate on one straight line, is

A. 0

B. 3

C. 6

D. 9

Answer: D

Watch Video Solution

37. If the vectors $x\hat{i}-3\hat{j}+7\hat{k}$ and $\hat{i}+y\hat{j}-z\hat{k}$ are collinear then the value of $\frac{xy^2}{z}$ is equal

A. $9/7$

B. $-9/7$

C. $6/7$

D. $-6/7$

Answer: B

Watch Video Solution

38. If $\overrightarrow{u}$ and $\overrightarrow{v}$ are unit vectors and θ is the acute angle between them, then $2u\overrightarrow{u}\times 3\overrightarrow{v}$ is a unit vector for

A. exactly two values of θ

B. more than two values of θ

C. no value of θ

D. exactly one value of θ

Answer: D

Watch Video Solution

39. If P, Q, R are three points with respective position vectors $\hat{i} + \hat{j}, \hat{i} - \hat{j}$ and $a\hat{i} + b\hat{j} + c\hat{k}$. The points P, Q, R are collinear, if

A. a = b = c = 1

B. a =b = c = 0

C. a = 1, bc ε R

D. a = 1, c = 0, b ε R

Answer: C

Watch Video Solution

40. If $a+b+c=\alpha d, b+C+d=\beta a$ a and a, b, c are non-coplanar, then $a+b+c+d$ is equal to

A. 0

B. p a

C. q b

D. $(p+q)c$

Answer: A

Watch Video Solution

41. Let a, b, c be three non-coplanar vectors such that $r_1=a-b+c, r_2=b+c-a, r_3=c+a+b$ $r=2a-3b+4c$. If $r=p_1r_1+P_2r_2+P_3r_3$, then

A. $p_1=7$

B. $p_1 + p_3 = 3$

C. $p_1 + p_2 + p_3 = 4$

D. $p_3 + p_2 = 0$

Answer: B::C

Watch Video Solution

42. Given the following vectors

$r_1 = (2, -1, 1)$ $r_2 = (1, 3, -2)$

$r_3 = (-2, 1, -3)$ $r_4 = (3, 2, -5)$.

If $r_4 = ar_1 + br_2 + cr_3$, then

A. $a = b = c$

B. $b = \dfrac{2ac}{a + c}$

C. $a + b = 2c$

D. $a = bc$

Answer: C

Watch Video Solution

43. If $a = 2p + 3q - r, b = p - 2q + 2r$ and $c = -2p + q - 2r,$ and $R = 3p - q + 2r$, where p, q, r are non-coplanar vectors, then R in terms of a, b, c is

A. $5a + 2b + 3c$

B. $3a + 5b + 2c$

C. $2a + 5b + 3c$

D. $5a + 3b + 2c$

Answer: C

Watch Video Solution

44. The vector c directed along the bisectors of the angle between the vectors $a = 7i - 4j - 4k$ and $b = \; - 2i - j + 2k$ if $|c| = 3\sqrt{6}$ is given by

A. $i - 7j + 2k$

B. $i + 7j - 2k$

C. $-i + 7j - 2k$

D. $i - 7j - 2k$

Answer: A::C

Watch Video Solution

45. The vector $\overrightarrow{a} = \alpha\hat{i} + 2\hat{j} + \beta\hat{k}$ lies in the plane of vectors $\overrightarrow{b} = \hat{i} + \hat{j}$ and $\overrightarrow{c} = \hat{j} + \hat{k}$ and bisects the angle between $\overrightarrow{b}$ and $\overrightarrow{c}$. Then which one of the following gives possible values o α and β? (A) alpha=2, beta=1(B)alpha=1, beta=1(C)alpha=2, beta=1(D)alpha=1, beta=2`

A. $\alpha = 2, \beta = 2$

B. $\alpha = 1, \beta = 2$

C. $\alpha = 2, \beta = 1$

D. $\alpha = 1, \beta = 1$

Answer: D

Watch Video Solution

46. If the vector $-\bar{i} + \bar{j} - \bar{k}$ bisects the angles between the vector $\bar{c}$ and the vector $3\bar{i} + 4\bar{j}$,then the unit vector in the direction of $\bar{c}$ is

A. $\frac{1}{15}(11i + 10j + 2k)$

B. $-\frac{1}{15}(11i - 10j + 2k)$

C. $-\frac{1}{15}(11i + 10j - 2k)$

D. $-\frac{1}{15}(11i + 10j + 2k)$

Answer: D

Watch Video Solution

47. 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. $\frac{2}{3}(-6i-8j-6k)$

B. $\frac{2}{3}(6i+8j+6k)$

C. $\frac{1}{3}(6i+13j+18k)$

D. $\frac{1}{3}(5i+12k)$

Answer: C

Watch Video Solution

48. The position vectors of points $AandB$ w.r.t. the origin are $\vec{a}=\hat{i}+3\hat{j}-2\hat{k},$ respectively. Determine vector $\vec{O}P$ which bisects angle $AOB,$ where P is a point on AB.

A. $2(-I+j+k)$

B. $2(i+j+k)$

C. $2(I+j-k)$

D. $2(I+j+k)$

Answer: C

Watch Video Solution

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

A. $1/2$

B. $1/3$

C. $1/4$

D. none

Answer: A

Watch Video Solution

50. The two sides of Δ ABC are given by $\overrightarrow{A}B = 2i + 4j + 4k, \overrightarrow{A}C = 2i + 2j + k$. The length of median through A is

A. $5\sqrt{2}$

B. 10

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

D. $\frac{1}{2}\sqrt{77}$

Answer: D

Watch Video Solution

51. The vectors $\overrightarrow{A}B = 3i + 4k$ and $\overrightarrow{A}C = 5i - 2j + 4k$ are the sides of a triangle ABC. The length of the median through A is :

A. $\sqrt{18}$

B. $\sqrt{72}$

C. $\sqrt{33}$

D. $\sqrt{288}$

Answer: C

Watch Video Solution

52. Find the horizontal force and a force inclined at an angle of 60° with the vertical so that the resultant is a vertical force of P kg wt.

A. P, 2P

B. P, $P\sqrt{3}$

C. $P\sqrt{3}, 2P$

D. none

Answer: C

Watch Video Solution

53. If the resultant of two forces is of magnitude P and equal to one of them and perpendicular to it, then the other force is

A. P

B. $P\sqrt{3}$

C. $P\sqrt{2}$

D. $2P\sqrt{3}$

Answer: C

Watch Video Solution

54. If $\begin{vmatrix} a & b & 0 \\ 0 & a & b \\ b & 0 & a \end{vmatrix}$ = 0, $(a \neq 0)$ then

A. $\frac{a}{b}$ is one of the cube roots of unity

B. a is one of the cube roots of unity

C. b is one of the cube roots of unity

D. $\frac{a}{b}$ is one of the cube roots of -1

Answer: D

Watch Video Solution

55. If $a = i + j + k, b = 4i + 3j + 4k$ and $c = i + \alpha j + \beta k$ are linearly dependent vectors and $|c| = \sqrt{3}$, then

A. $\alpha = 1, \beta = -1$

B. $\alpha = 1, \beta = \pm 1$

C. $\alpha = -1, \beta = \pm 1$

D. $\alpha = \pm 1, \beta = 1$

Answer: D

Watch Video Solution

56. The axes of coordinates are rotated about the z-axis though an angle of $\pi / 4$ in the anticlockwise direction and the components of a vector are $2\sqrt{2},\ 3\sqrt{2}, 4.$ Prove that the components of the same vector in the original system are -1,5,4.

A. $5,\ -1, 4$

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

C. $-1,\ -5, 4\sqrt{2}$

D. $-1, 5, 4$

Answer: D

Watch Video Solution

Problem Set (1) (TRUE AND FALSE)

1. The line joining the mid-points of two sides of a triangle is parallel to the third side.

Watch Video Solution

2. Prove that the internal bisectors of the angles of a triangle are concurrent

Watch Video Solution

3. The lines joining the vertices of a tetrahedron to the centroids of opposite faces are concurrent.

Watch Video Solution

Problem Set (1) (FILL IN THE BLANKS)

1. ABCD is a pentagon .prove that the resultant of force $\vec{A}B$, $\vec{A}E$,$\vec{B}C$, $\vec{D}C$,$\vec{E}D$ and $\vec{A}C$,is 3$\vec{A}C$.

Watch Video Solution

2. If D, E, F are the mid-points of the sides BC, CA and AB respectively of $\triangle ABC$, then $\overline{AD} + \frac{2}{3}\overline{BE} + \frac{1}{3}\overline{CF} =$

Watch Video Solution

3. A vector A has components A_1, A_2, A_3 along the co-ordinate axes respectively. The co-ordinate system is rotated about Z-axis through an angle $\pi/2$with anticlockwise direction. Then the components of A in new co-ordinate system are ....

Watch Video Solution

Problem Set (2) (MULTIPLE CHOICE QUESTIONS)

1. If the vectors$2i + j + k$ and $i - 4j + \lambda k$ are perpendicular,then$\lambda =$

A. 4

B. -5

C. 2

D. 1

Answer: C

Watch Video Solution

2. The valueof sine of the angle between the vectors $i - 2j + 3k$ and $2i + j + k$ is :

A. $\frac{5}{21}$

B. $\frac{5}{\sqrt{7}}$

C. $\frac{5}{\sqrt{14}}$

D. $\frac{5}{2\sqrt{7}}$

Answer: D

Watch Video Solution

3. If α, βbe two vectors whose moduli are a and b respectively and they are such that $[\alpha+\beta]$is $\perp$ to $\beta$and $\alpha$is $\perp$ to $2\beta+\alpha$, then

A. $a=b\sqrt{2}$

B. $a=2b$

C. $a=b$

D. 2a = b

Answer: A

Watch Video Solution

4. The vector $2i + 3j - 4k$ and $ai + bj + ck$ are perpendicular if

A. $a = 2, b = 3, c = 4$

B. $a = 4, b = 4, c = 5$

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

D. none of these

Answer: B

Watch Video Solution

5. If the vectors $a = i - j + 2k, b = 2i + 4j + k$ and $c = \lambda i + j + \mu k$ are mutually orthogonal, then $(\lambda, \mu) =$

A. $(2, \ - 3)$

B. $(- 2, 3)$

C. $(3, \ - 2)$

D. $(- 3, 2)$

Answer: D

Watch Video Solution

6. Let $\overrightarrow{p}$ and $\overrightarrow{q}$ be the position vectors of the point P and Q respectively with respect to origin O. The points R and S divide PQ internally and externally respectiely in the ratio $2:3$. If $\overrightarrow{OR}$ and $\overrightarrow{OS}$ are perpendicular, then which one of the following is correct?

A. $9p^2 = 4q^2$

B. $4p^2 = 9q^2$

C. $9p = 4q$

D. $4p = 9q$

Answer: A

Watch Video Solution

7. The vector $\frac{1}{3}(2i - 2j + k)$ is

A. a unit vector

B. makes an angle $\pi / 3$with the vector $2i - 4j + 3k$

C. parallel to the vector $-i + j - \frac{1}{2}k$

D. $\perp$ parallel to the vector $-i + j - \frac{1}{2}k$

Answer: A::C::D

Watch Video Solution

8. IF $\bar{a}, \bar{b}, \bar{c}$ are three vectors such that each is inclined at an angle $\frac{\pi}{3}$ with the other two and $|\bar{a}| = 1, |\bar{b}| = 2, |\bar{c}| = 3$ then the scalar product of the vectors $2\bar{a} + 3\bar{b} - 5\bar{c}$ and $4\bar{a} - 6\bar{b} + 10\bar{c}$ is equal to

A. -334

B. 188

C. -522

D. -514

Answer: A

Watch Video Solution

9. Find λ such that the scalar product of the vector $\vec{i}+\vec{j}+\vec{k}$ with the unit vector parallel to the sum of the vectors $2\vec{i}+4\vec{j}-5\vec{k}$ and $\lambda\vec{i}+2\vec{j}+3\vec{k}$ is equal to 1.

A. 5

B. 2

C. 3

D. 1

Answer: D

Watch Video Solution

10. If $a = i + 2j - 3k, b = 3i - j + 2k$, then angle between a + b and a - b is :

A. 0

B. 30°

C. 60°

D. 90°

Answer: D

Watch Video Solution

11. If $a = 2i + 3j + 6k, b = 3i - 6j + 2k$ then $a \times b$ is a vector

A. perpendicular to a only

B. perpendicular to b only

C. perpendicular to both

D. none

Answer: C

Watch Video Solution

12. Let $\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}, \overrightarrow{b} = \hat{i} - \hat{j} + 2\hat{k}$ and vec(c) = xhat(i) + (x-2)hat(j) - hat(k). $If the \overrightarrow{\longrightarrow}$ $r$vec(c)$lies \in thepla \neq of$vec(a)& $\overrightarrow{b}$, then x equals

A. 0

B. 1

C. -4

D. -2

Answer: D

Watch Video Solution

13. Number of vectors ofunit length perpendicular to vectors $\bar{a} \equiv (1, 1, 0)$ and $\bar{b} \equiv (0, 1, 1)$ is

A. one

B. two

C. three

D. infinite

Answer: B

Watch Video Solution

14. A unit vector normal to the plane through the point i,2j,3k is :

A. $6i + 3j + 2k$

B. $i + 2j + 3k$

C. $\frac{6i + 3j + 2k}{7}$

D. $\frac{6i + 3j + 2k}{9}$

Answer: C

Watch Video Solution

15. A, B and C are three vectors given by $2\hat{i}+\hat{k}$, $\hat{i}+\hat{j}+\hat{k}$ and $4\hat{i}-3\hat{j}+7\hat{k}$. Then, find R, which satisfies the relation $R \times B = C \times B$ and $R \cdot A = 0$.

A. $i - 8j + 2k$

B. $-i + 4j + 2k$

C. $-i - 8j + 2k$

D. none

Answer: C

Watch Video Solution

16. Let $a - i + j$ and $b = 2i - k$.The point of intersection of the lines $r \times a = b \times a$ and $r \times b = a \times b$ is

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

B. $(3, -1, 1)$

C. $(3, 1, -1)$

D. $(1, -1, -1)$

Answer: C

Watch Video Solution

17. Given $a = i + j - k, b = -i + 2j + k$ and $c = -i + 2j - k$. A unit vector perpendicular to both a + b and b + c is

A. i

B. j

C. k

D. $(I + j + k) / \sqrt{3}$

Answer: C

Watch Video Solution

18. Find vectors perpendicular to the plane of vectors $a = 2i - 6j + 3k$ and $b = 4i + 3j + k$.

A. $\frac{4i + 3j - k}{\sqrt{26}}$

B. $\frac{2i - 6j - 3k}{7}$

C. $\frac{3i - 2j + 6k}{7}$

D. $\frac{2i - 3j - 6k}{7}$

Answer: A

Watch Video Solution

19. Read the following passage and answer the questions. Consider the lines

$L_1 : \dfrac{x+1}{3} = \dfrac{y+2}{1} = \dfrac{z+1}{2}$, $L_2 : \dfrac{x-2}{1} = \dfrac{y+2}{2} = \dfrac{z-3}{3}$

The unit vector perpendicualr to both L_1 and L_2 is

A. $\dfrac{-\hat{i}+7\hat{j}+7\hat{k}}{\sqrt{99}}$

B. $\dfrac{-\hat{i}-7\hat{j}+5\hat{k}}{5\sqrt{3}}$

C. $\dfrac{i\hat{i}+7\hat{j}+5\hat{k}}{5\sqrt{3}}$

D. $\dfrac{7\hat{i}-7\hat{j}-\hat{k}}{\sqrt{99}}$

Answer: B

Watch Video Solution

20. The unit vector perpendicular to vector $i-j$ and $i+j$ forming a right handed system is

A. k

B. $-k$

C. $\frac{1}{\sqrt{2}}(i-j)$

D. $\frac{1}{2}(i+j)$

Answer: A

Watch Video Solution

21. If the position vectors of three points A, B, C are respectively $i+j+k, 2i+3j-4k$ and $7i+4j+9k,$ then the unit vector perpendicular to the plane of triangle ABCis

A. $(31i-38j-9k)$

B. $\frac{31i-38j-9k}{\sqrt{2486}}$

C. $\frac{31i+38j+9k}{\sqrt{2486}}$

D. none of these

Answer: B

Watch Video Solution

22. A unit vector normal to the plane through the point i,2j,3k is :

A. $6i + 3j + 2k$

B. $i + 2j + 3k$

C. $\frac{6i + 3j + 2k}{7}$

D. $\frac{6i + 3j + 2k}{9}$

Answer: C

Watch Video Solution

23. A unit vector making an obtuse angle with x-axis and perpendicular to the plane containing the points $A(1, 2, 3), B(2, 3, 4), C(1, 5, 7)$ also make an obtuse angle with

A. y-axis

B. z-axis

C. y and z axes

D. none

Answer: B

Watch Video Solution

24. The unit vector $\perp$ to each of the vector $2i - j + k$ and $3i + 4j - k$ is

A. $-3i + 4j + 11k$

B. $(-3i + 5j - 11k)/\sqrt{155}$

C. $(-3i + 5j + 11k)/\sqrt{(155)}$

D. none of these

Answer: A

Watch Video Solution

25. If $A = 2i + 2j - k, B = 6i - 3j + k$, then $A \times B$ will b given by

A. $2i - 2j - k$

B. $6i - 3j + 2k$

C. $i - 10j - 18k$

D. $i + j + k$

Answer: C

Watch Video Solution

26. If $\alpha = 2i + 3j - k, \beta = -i + 2j - 4k, \gamma = i + j + k$ then the value of $(\alpha \times \beta).(\alpha \times \gamma)$ is equal to

A. 60

B. 64

C. 74

D. -74

Answer: D

Watch Video Solution

27. If $\overrightarrow{r}=x\hat{i}+y\hat{j}+x\hat{k}$, find : $\left(\overrightarrow{r}\times\hat{i}\right).\left(\overrightarrow{r}\times\hat{j}\right)+xy$.

A. 0

B. 1

C. xy

D. $i\times j$

Answer: A

Watch Video Solution

28. If the vectors $\vec{c}, \vec{a} = x\hat{i} + y\hat{j} + z\hat{k} and \vec{b} = \hat{j}$ are such that $\vec{a}, \vec{c} and \vec{b}$ form a right-handed system, then find $\vec{\cdot}$

A. $zi = xk$

B. 0

C. yj

D. $-zi + xk$

Answer: A

Watch Video Solution

29. The vector a, b, c are equal in length and taken pairwise they mak equal-angles.

If $a = i + j, b = j + k$ and c makes obtuse angle with x-axis, then c =

A. $-1, 4, -1$

B. $1, 0, 1$

C. $-1/3, 4/3, -1/3$

D. $1/3, -4/3, 1/3$

Answer: C

Watch Video Solution

30. $\overrightarrow{A} = (1, -1, 1), \overrightarrow{C} = (-1, -1, 0)$ are given vectors then the vector B which satisfies $A \times B = C$ and A.B = 1 is

A. $(1, 0, 0)$

B. $(0, 0, 1)$

C. $(0, -1, 0)$

D. none

Answer: B

Watch Video Solution

31. The vector $\overrightarrow{B} = 3j + 4k$ is to be written as the sum of a vector $\overrightarrow{B}_1$ parallel to $\overrightarrow{A} = i + j$ and a vector $\overrightarrow{B}_2$ perpendicular to $\overrightarrow{A}$. Then $\overrightarrow{B}_1$ =

Watch Video Solution

32. $\frac{3}{2}(i + j)$

A. $\frac{2}{3}(i + j)$

B. $\frac{1}{2}(i + j)$

C. $\frac{1}{3}(i + j)$

D. $\frac{1}{3}(i + j)$

Answer: B

View Text Solution

33. and $\overrightarrow{B}_2$ is

A. $\frac{3}{2}I + \frac{3}{2}j + 4k$

B. $-\frac{3}{2}i + \frac{3}{2}j + 4k$

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

D. none

Answer: D

View Text Solution

34. Let the position vectors of the points P, A and B be $r, i + j + k$ and $-i + k$. If PA is perpendicular to PB but is not perpendicular to $r - (j + 2k)$, then r is :

A. $i + 2k$

B. $i + 2j$

C. $j - 2k$

D. $j + 2k$

Answer: D

Watch Video Solution

35. If $a \times b = c \times b \neq 0$, then

A. $a = \lambda b$

B. $a - b = \lambda c$

C. $(a - c) = \lambda b$

D. none

Answer: C

Watch Video Solution

36. $a \times b = a \times c$ where $(a \neq 0)$ implies that

A. b = c

B. a and b are parallel

C. a, b,c are mutually perpendicular

D. a,b, c are coplanar

Answer: A

Watch Video Solution

37. If a, b, c be non-zero vectors, then which of the following statements are correct

A. $a \times (b - c) = (c - b) \times a$

B. $a. (b + c) = -(b + c). a$

C. $a \times (b + c) = (c + b) \times a$

D. $a. (b - c) = (c - b). a$

Answer: A

Watch Video Solution

38. Three points with position vectors, a, b, c are collinear if

A. $a \times b + b \times c + c \times a = 0$

B. $a, b + b.\ c + c.\ A = 0$

C. $a.\ (b \times c) = 0$

D. $a + b + c = 0$

Answer: A

Watch Video Solution

39. θ is the angle between two vectors a and b then $a.\ b \leq 0$ only if

A. $0 \leq \theta \leq \pi$

B. $\pi/2 \leq \theta \leq \pi$

C. $0 \leq \theta \leq \pi/2$

D. $0 < \theta < \pi/2$

Answer: B

Watch Video Solution

40. If a, b, c be three non-zero vectors, then the equation a. b = a. c implies

A. b = c

B. a is orthogonal to both b and c

C. a is orthogonal to b-c

D. either a is orthogonal to both b and c or a is orthogonal to b -c

Answer: A::C

Watch Video Solution

41. If a. b = a . C and $a \times b = a \times c$, then

A. a is perpendicular to b -c

B. a is parallel to b -c

C. either a = 0 or b = c

D. none of these

Answer: C

Watch Video Solution

42. If $\vec{a}$ and $\vec{b}$ are two vectors such that $\vec{a} . \vec{b} = 0$ and $\vec{a} \times \vec{b} = 0$, then which one of the following is correct?

A. a is parallel to b

B. a is perpendicular to b

C. either $a = 0$ or $b = 0$

D. none of these

Answer: C

Watch Video Solution

43. If $a \times b = c$ and $b \times c = a$, then

A. a, b, c are orthogonal in pairs but $a|a| = |c|$

B. a, b, c are not orthogonal to each other

C. a, b, c ar orthogonal in a pairs and $|a| = |b| = |c| = 1$

D. a, b, c are orthogonal but $|b| \neq 1$

Answer: D

Watch Video Solution

44. If $a. b = b. c = c. a = 0$, then $a. (b \times c) =$

A. non-zero vector

B. 1

C. -1

D. $|a||b||c|$

Answer: D

Watch Video Solution

45. If $p = a \times (b + c) + b \times (c + a) + c \times (a + b)$

$q = a \times (b \times c) + b \times (c \times a) + c \times (a \times b)$

$r = (a.\ b)^2 + (a \times b)^2$ then which one is incorrect

A. $p = 0$

B. $q = 0$

C. $r = a^2b^2$

D. $r = 0$

Answer: D

Watch Video Solution

46. If a and b are not perpendicular to each other and $r \times a = b \times a, r. c = 0$, then r is equal to

A. $a - c$

B. $b = xa$ for all scalars x

C. $b - \frac{(b. c)a}{(a. c)}$

D. none of these

Answer: C

Watch Video Solution

47. Let the vectors $\overrightarrow{PQ}, \overrightarrow{QR}, \overrightarrow{RS}, \overrightarrow{ST}, \overrightarrow{TU}$ and $\overrightarrow{UP}$ represent the sides of a regular hexagon.

Statement I: $\overrightarrow{PQ} \times \left(\overrightarrow{RS} + \overrightarrow{ST}\right) \neq \overrightarrow{0}$

Statement II: $\overrightarrow{PQ} \times \overrightarrow{RS} = \overrightarrow{0}$ and $\overrightarrow{PQ} \times \overrightarrow{RS} = \overrightarrow{0}$ and $\overrightarrow{PQ} \times \overrightarrow{ST} \neq \overrightarrow{0}$

For the following question, choose the correct answer from the codes (A), (B) , (C) and (D) defined as follows:

Watch Video Solution

48. If r satisfies the equation $r \times (i + 2j + k) = i - k$ then for any scalar λ, r is equal to

A. $i + \lambda(i + 2j + k)$

B. $j + \lambda(i + 2j + k)$

C. $k + \lambda(i + 2j + k)$

D. none

Answer: B

Watch Video Solution

49. If $a = 2i + j + k$, $b = i + 2j + k$, $c = 2i - 3j + 4k$ and r is a vector such that $r \times b = c \times b$ and r.a = 0 then r is equal to

A. $-2, 2, 2$

B. $-2, 1, 3$

C. $-3, 2, 4$

D. $1, \ -5, 3$

Answer: C

Watch Video Solution

50. Given three vectors a,b,c such that b.c = 3 $a.\,c = \frac{1}{3}$. The vector r which satisfies $r \times a = b \times a$ and $r.\,c = 0$ is

A. $b + 9a$

B. $a + 9b$

C. $b - 9a$

D. none of these

Answer: C

Watch Video Solution

51. Let $\overrightarrow{r} \times \overrightarrow{a} = \overrightarrow{b} \times \overrightarrow{a}$ and $\overrightarrow{c}\overrightarrow{r} = 0$, where $\overrightarrow{a} . \overrightarrow{c} \neq 0$, then $\overrightarrow{a} . \overrightarrow{c}\left(\overrightarrow{r} \times \overrightarrow{b}\right) + \left(\overrightarrow{b} . \overrightarrow{c}\right)\left(\overrightarrow{a} \times \overrightarrow{r}\right)$ is equal to ________.

A. c

B. $(a. b)c$

C. $(a \times b) \times c$

D. 0

Answer: A

Watch Video Solution

52. If $a \times b = c \times d$ and $a \times c = b \times d$, then

A. $a - d = \lambda(b - c)$

B. $a + d = \lambda(b + c)$

C. $a - b = \lambda(c + d)$

D. none of these

Answer: A::B

Watch Video Solution

53. If a and b include an angle of 120° and their magnitudes are 2 and $\sqrt{3}$ then a.b is equal to

A. 3

B. $-2\sqrt{3}$

C. $\sqrt{3}$

D. $-\sqrt{3}$

Answer: B

Watch Video Solution

54. $u = q - r, r - p, p - q$ and $v = \frac{1}{a}, \frac{1}{b}, \frac{1}{c}$. If a, b, c be T_p, T_q, T_r of an H.P. respectively. Then the vectors u and v are connected by the relation

A. parallel

B. orthogonal

C. dot productt = 1

D. cross product $= i + j + k$

Answer: B

View Text Solution

55. In a G.P. $T_p = a, T_q = b$ and $T_r = c$ where a, b, c are $+ive$ then angle between the vectors $\log a^2 i + \log b^2 j + \log c^2 k$ and $(q - r)i + (r - p)j + (p - q)k$ is :

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

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

C. $\sin^{-1}\frac{1}{\sqrt{\sum a^2}}$

D. none

Answer: B

Watch Video Solution

56. The angle between $\left(\vec{A}\times\vec{B}\right)$ and $\left(\vec{B}\times\vec{A}\right)$ is :

A. 0°

B. 45°

C. 90°

D. 180°

Answer: D

Watch Video Solution

57. The angle between the vectors $2i + 3j + k$ and $2i - j - k$ is

A. $\pi / 2$

B. $\pi / 4$

C. $\pi / 3$

D. 0

Answer: C::D

Watch Video Solution

58. If θ is the angle between vectors a and b, then $|a \times b| = |a. b|$, then θ is equal to

A. 0

B. 180°

C. 135°

D. 45°

Answer: D

Watch Video Solution

59. If $|a| = 2, |b| = 5 \text{ and } |a \times b| = 8$, then what is a, b equal to ?

A. 4

B. 5

C. 6

D. none of these

Answer: C

Watch Video Solution

60. If $a = 4i + 2j - 5k, b = -12i - 6j + 15k$, then the vectors a, b are

A. orthogonal

B. parallel

C. non-coplanar

D. none of these

Answer: B

Watch Video Solution

61. If $a^2 - b^2 = 0$, then

A. $|a| = |b|$

B. $a + b = 1$

C. $|a + b| = 0$

D. $(a + b) \perp (a - b)$

Answer: A

Watch Video Solution

62. If $A = 2i + 2j + 3k$, $B = -i + 2j + k$ and $C = 3i + j$, then A +t B is perpendicular to C if t is equal to

A. 8

B. 4

C. 6

D. 2

Answer: A

Watch Video Solution

63. if the vector $xi + yj + zk$ makes an acute angle with the plane of the two vectors $2, 3, -1$ and $1, -1, 2$ and acute angle is $\cot^{-1}\sqrt{2}$, then

A. $xy + yz + zx = 0$

B. $x(y + z) = yz$

C. $y(z + x) = zx$

D. $z(x+y)=xy$

Answer: B

Watch Video Solution

64. Consider the parallelopiped with sides $\bar{a}=3\bar{i}+2\bar{j}+\bar{k}, \bar{b}=\bar{i}+\bar{j}+2\bar{k}$ and $\bar{c}=\bar{i}+3\bar{j}+3\bar{k}$ then angle between $\bar{a}$ and the plane containing the face determined by $\bar{b}$ and $\bar{c}$ is

A. $\sin^{-1}\frac{1}{3}$

B. $\sin^{-1}\frac{9}{14}$

C. $\cos^{-1}\frac{9}{14}$

D. $\sin^{-1}\frac{2}{3}$

Answer: B

Watch Video Solution

65. The points $A(1, 1, 2), B(3, 4, 2)$ and $C(5, 6, 4)$. The exterior angle of the triangle at the vertex B is

A. $\cos^{-1}\left[-5/\sqrt{(39)}\right]$

B. $\cos^{-1}\left[5/\sqrt{(39)}\right]$

C. $\cos^{-1}(5/9)$

D. none of these

Answer: A

Watch Video Solution

66. A tetrahedron has vertices $P(1, 2, 1), Q(2, 1, 3), R(-1, 1, 2)$ and $O(0, 0, 0)$. The angle beween the faces OPQ and PQR is :

A. $\cos^{-1}\left(\frac{19}{35}\right)$

B. $\cos^{-1}\left(\frac{17}{31}\right)$

C. 30°

D. 90°

Answer: A

Watch Video Solution

67. Let vectors $\bar{a}$, $\bar{b}$, $\bar{c}$ and $\bar{d}$ be such that

$(\bar{a} \times \bar{b}) \times (\bar{c} \times \bar{d}) = \bar{0}$

Let P_1 and P_2 be the planes determined by the pairs of vectors $\bar{a}$, $\bar{b}$ and $\bar{c}$, $\bar{d}$ respectively.

Then the angle between P_1 and P_2 is

A. 0

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

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

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

Answer: A

Watch Video Solution

68. A plane p_1 is parallel to two vectors $2j + 3k$ and $4j - 3k$. Another plane p_2 is parallel to two other vectors $j - k$ and $3i + 3j$. A vector a is parallel to the line of intersection of the given planes. The angle between a and a given vector $2i + 2j - k$ is :

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

B. $\frac{3\pi}{4}$

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

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

Answer: A::B

Watch Video Solution

69. If $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ are unit vectors such that $\left(\vec{a} \times \vec{b}\right).\left(\vec{c} \times \vec{d}\right) = 1$ and $\vec{a}.\vec{c} = \frac{1}{2}$ then (A) $\vec{a}, \vec{b}, \vec{c}$ are

non coplanar (B) $\vec{b}, \vec{c}, \vec{d}$ are non coplanar (C) $\vec{b}, \vec{d}$ are non paralel (D) $\vec{a}, \vec{d}$ are paralel and $\vec{b}, \vec{c}$ are parallel

A. $\widehat{a}, \hat{b}, \hat{c}$ are non-coplanar

B. $\hat{b}, \hat{c}, \hat{d}$ are non-coplanar

C. $\hat{b}, \hat{d}$ are non-parallel

D. $\widehat{a}, \hat{d}$ are parallel and $\hat{b}, \hat{c}$ are parallel

Answer: C

Watch Video Solution

70. Let the pair of vector $\vec{a}, \vec{b}$ and $\vec{c}, \vec{c}\, d$ each determine a plane. Then the planes are parallel if

A. $(a \times c) \times (b \times d) = 0$

B. $(a \times c). (b \times d) = 0$

C. $(a \times b) \times (c \times d) = 0$

D. $(a \times b).(c \times d) = 0$

Answer: D

Watch Video Solution

71. In cartesian co-ordinates the points A is (x_1, y_1) where $x_1 = 1$ on the curve $y = x^2 + x + 10$. The tangent at A cuts the x-axis at B. the values of the dot product $\vec{O}A.\vec{A}B$ is

A. $-\frac{520}{3}$

B. -148

C. 140

D. 12

Answer: B

Watch Video Solution

72. Vectors a and b makes an angle $\theta = \frac{2\pi}{3}$

If $|a| = 1, |b| = 2$, then $|(2a + b) \times (a + 2b)|^2 =$

A. 9

B. 18

C. 27

D. 81

Answer: C

Watch Video Solution

73. Let $\vec{a}, \vec{b}, \vec{c}$ form sides BC, CA and AB respectively of a triangle ABC then

A. $a.\ b + b.\ c + c.\ a = 0$

B. $a \times b = b \times c = c \times a$

C. $a.\ b = b.\ c = c.\ a$

D. $a \times b + b \times c + c \times a = 0$

Answer: B

Watch Video Solution

74. The vector r is equal to

A. $(r.\ i)i + (r.\ j)j + (r.\ k)k$

B. $(r.\ j)i + (r.\ k)j + (r.\ i)k$

C. $(r.\ k)i + (r.\ i)j + (r.\ j)k$

D. $(r.\ r)(i + j + k)$

Answer: A

Watch Video Solution

75. $(r.\ i)(r \times i) + (r.\ j)(r \times xj) + (r.\ k)(r \times k)$ is equal to

A. 0

B. r

C. 3r

D. none

Answer: A

Watch Video Solution

76. If $a+2b+3c=0$, then $a\times b+b\times c+c\times a$ is equal to

A. $6(b\times c)$

B. $2(a\times b)$

C. $3(c\times a)$

D. 0

Answer: A::B::C

Watch Video Solution

77. If $\overrightarrow{a} = 4i + 6j$ and $\overrightarrow{b} = 3j + 6k$ vector form of the component of a along b is

A. $\frac{18}{10\sqrt{3}}(3i + 4k)$

B. $\frac{18}{25}(3j + 4k)$

C. $\frac{18}{\sqrt{3}}(3j + 4k)$

D. $(3j + 4k)$

Answer: B

Watch Video Solution

78. Let $\overrightarrow{a} = 2\hat{i} - \hat{j} + \hat{k}, \overrightarrow{b} = \hat{i} + 2\hat{j} = \hat{k} and \overrightarrow{c} = \hat{i} + \hat{j} - 2\hat{k}$ be three vectors. A vector in the plane of $\overrightarrow{b}\, and\, \overrightarrow{c}$, whose projection on $\overrightarrow{a}$ is of magnitude $\sqrt{2/3}$, is $2\hat{i} + 3\hat{j} - 3\hat{k}$ b. $2\hat{i} - 3\hat{j} + 3\hat{k}$ c. $-2\hat{i} - \hat{j} + 5\hat{k}$ d. $2\hat{i} + \hat{j} + 5\hat{k}$

A. $2i+3j-3k$

B. $2i+3j+3k$

C. $-2i-j+5k$

D. $2i+j+5k$

Answer: A::C

Watch Video Solution

79. Let $\vec{u}, \vec{v} and \vec{w}$ be such that $\left|\vec{u}\right|=1, \left|\vec{v}\right|=2 and \left|\vec{w}\right|=3.$ If the projection of $\vec{v}$ along $\vec{u}$ is equal to that of $\vec{w}$ along $\vec{u}$ and vectors $\vec{v} and \vec{w}$ are perpendicular to each other, then $\left|\vec{u}-\vec{v}+\vec{w}\right|$ equals 2 b. $\sqrt{7}$ c. $\sqrt{14}$ d. 14

A. 2

B. $\sqrt{7}$

C. $\sqrt{14}$

D. 14

Answer: C

Watch Video Solution

80. $a = \hat{i} + \hat{j} - \hat{k}, b = \hat{i} - 2\hat{j} + \hat{k}, c = \hat{i} - \hat{j} - \hat{k},$ then a vector in plane of a and b whose projection on c is of magnitude $\frac{1}{\sqrt{3}}$ is given by :

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

B. $4\hat{i} - 7\hat{j} + 4\hat{k}$

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

D. none

Answer: D

Watch Video Solution

81. Projection of the vector $2i + 3j - 2k$ on the vector $i + 2j + 3k$ is

A. $2/\sqrt{(14)}$

B. $1/\sqrt{(14)}$

C. $3/\sqrt{(14)}$

D. none of these

Answer: A

Watch Video Solution

82. If $a = 2i + j + 2k, b = 5i - 3j + k,$ then orthogonal projection vector of a and b is :

A. $3i - 3j + k$

B. $9(5i - 3j + k)$

C. $\frac{5i - 3j + k}{35}$

D. $\frac{9(5i - 3j + k)}{35}$

Answer: D

Watch Video Solution

83. Given two vectors $a = 2i - 3j + 6k, b = 2i + 2j - k$ and $p = \frac{\text{the projection of b on a}}{\text{the projection of a on b}}$, then the value of p is

A. $3/7$

B. $7/3$

C. 3

D. 7

Answer: A

Watch Video Solution

84. Show that the vector of magnitude $\sqrt{51}$ which makes equal anges with the vectors $\vec{a} = \frac{1}{3}\left(\hat{i} - 2\hat{j} + 2\hat{k}\right), \vec{b} = \frac{1}{5}\left(-4\hat{i} - 3\hat{k}\right)$ and $\vec{c} = \hat{i} + \hat{j} + \hat{k}$.

A. $\pm(i - j + 7k)$

B. $\pm(5i - j - 5k)$

C. $\pm(i + 5j - 5k)$

D. $\pm(7i + j - k)$

Answer: B

Watch Video Solution

85. In a parallelopiped the ratio of the sum of the squares on the four diagonals to the sum of the squares on the three coterminous edges is

A. 2

B. 3

C. 4

D. 1

Answer: C

View Text Solution

86. A line makes angles $\alpha, \beta, \gamma and \delta$ with the diagonals of a cube. Show that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = 4/3.$

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

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

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

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

Answer: D

Watch Video Solution

87. If $\vec{a}, \vec{b} \, and \, \vec{c}$ are unit vectors, then $\left|\vec{a} - \vec{b}\right|^2 + \left|\vec{b} - \vec{c}\right|^2 + \left|\vec{c} - \vec{a}\right|^2$ does not exceed 4 b. 9 c. 8 d. 6

A. 4

B. 9

C. 8

D. 6

Answer: B

Watch Video Solution

88. The modulus of the sum of three mutually perpendicular unit vectors is

A. $\sqrt{3}$

B. 3

C. 0

D. none

Answer: A

Watch Video Solution

89. If $a+b+c=0, |a|=3, |b|=5, |c|=7$, then the angle between a and b is

A. $\pi/6$

B. $2\pi/3$

C. $5\pi/3$

D. $\pi/3$

Answer: D

Watch Video Solution

90. If a, b , c are vectors such that $c=a+b$ and a. b = 0 , then

A. $a^2+b^2+c^2=0$

B. $a^2-b^2=0$

C. $a^2+b^2=c^2$

D. $c = a \times b$

Answer: C

Watch Video Solution

91. If a, b, c are three unit vectors such that $a + b + c = 0$. Where 0 is null vector, then $a. b + a. c + c. a$ is

A. 1

B. 3

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

D. none of these

Answer: C

Watch Video Solution

92. Let $\vec{u}, \vec{v}$ and $\vec{w}$ be vector such $\vec{u} + \vec{v} + \vec{w} = \vec{0}$. If $|\vec{u}| = 3, |\vec{v}| = 4$ and $|\vec{w}| = 5,$ then find $\vec{u}\dot{}\vec{v} + \vec{v}\dot{}\vec{w} + \vec{w}\dot{}\vec{u}$.

A. 47

B. -25

C. 0

D. 25

Answer: B

Watch Video Solution

93. If a , b, c are three vectors such that $a + b + c = 0$ and $|a| = 1, |b| = 2, |c| = 3,$ then $a.\,b + b.\,c + c.\,a =$

A. 0

B. -7

C. 7

D. 1

Answer: B

Watch Video Solution

94. If $\vec{a}, \vec{b}, and \vec{c}$ are mutually perpendicular vectors of equal magnitudes, then find the angle between vectors $\vec{a}\, and\, \vec{a} + \vec{b} + \vec{\cdot}$

A. $\cos^{-1}(1/\sqrt{3})$

B. $\cos^{-1}(1/3)$

C. $\cos^{-1}(2/\sqrt{3})$

D. none of these

Answer: A

Watch Video Solution

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

A. $5\sqrt{2}$

B. $5/\sqrt{2}$

C. $10\sqrt{2}$

D. $5\sqrt{3}$

Answer: A

Watch Video Solution

96. let a, b, c be three vectors such that $a.(b+c)=b.(c+a)=c.(a+b)=0$ and $|a|=1, |b|=4, |c|=8,$ then $|a+b+c|$ equals

A. 13

B. 81

C. 9

D. 5

Answer: C

Watch Video Solution

97. If $|a| = |b| = |a+b| = 1,$ then $|a-b|$ is equal to

A. 1

B. $\sqrt{2}$

C. $\sqrt{3}$

D. none of these

Answer: C

Watch Video Solution

98. If all the vectors a, b, c, $a + b$, $b + c$ and a + b +c be unit vectors , then

A. $a + c$ is a unit vector

B. $|a + c| = \sqrt{2}$

C. $a.\, c = 0$

D. $a \times c = 0$

Answer: C

View Text Solution

99. If $\left(\overrightarrow{a} \times \overrightarrow{b}\right)^2 + \left(\overrightarrow{a} \dot{\overrightarrow{b}}\right)^2 = 144 and \left|\overrightarrow{a}\right| = 4,$ then find the value of $\left|\overrightarrow{b}\right|.$

A. 3

B. 8

C. 12

D. 16

Answer: A

Watch Video Solution

100. In a right angled triangle ABC, the hypotenuse AB =p, then $\overrightarrow{AB}.\overrightarrow{AC}+\overrightarrow{BC}.\overrightarrow{BA}+\overrightarrow{CA}.\overrightarrow{CB}$ is equal to:

A. $2p^2$

B. $p^2/2$

C. p^2

D. none

Answer: C

Watch Video Solution

101. The vector $3i - 2j + k, i - 3j + 5k$ and $2i + j - 4k$ form the sides of a triangle, This triangle is

A. an acute angled triangle

B. an obtuse angled triangle

C. a right angled triangle

D. an equilateral triangle

Answer: C

Watch Video Solution

102. The three vectors $7i - 11j + k, 5i + 3j - 2k$ and $12i - 8j - k$ form

A. an equilateral Δ

B. rt. Angled Δ

C. isosceles Δ

D. collinear vectors

Answer: B

Watch Video Solution

103. Values of a for which the points A, B, C with position vectors 2i - j+k, i - 3j - 5k and ai - 3j +k, respectively, are the vertices of a right angled triangle with $C = \frac{\pi}{2}$ are

A. $-2, \ -1$

B. $-2, 1$

C. $2, \ -1$

D. $2, 1$

Answer: D

Watch Video Solution

104. A unit vector a makes an angle $\pi/4$ with z-axis and if $a+i+j$ is a unit vector,k then a =

A. $\left(\frac{1}{2}, \frac{1}{2}, \frac{1}{\sqrt{2}}\right)$

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

C. $\left(-\frac{1}{2}, -\frac{1}{2}, \frac{1}{\sqrt{2}}\right)$

D. none

Answer: C

Watch Video Solution

105. A unit vector in xy-plane that makes an angle of 45^0 with the vector $\hat{i}+\hat{j}$ and angle of 60^0 with the vector $3\hat{i}-4\hat{j}$ is (A) $\hat{i}$ (B) $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$ (C) $\frac{\hat{i}-\hat{j}}{\sqrt{2}}$ (D) none of these

A. i

B. $(i + j) / \sqrt{2}$

C. $(i - j) / \sqrt{2}$

D. none of these

Answer: D

Watch Video Solution

106. If $a = i + j - k, b = i - j + k$ and c is aunit vector perpendicular to the vector a and coplanar with a and b, then a unit vector d perpendicular to both a and c is

A. $\frac{1}{\sqrt{6}}(2i - j + k)$

B. $\frac{1}{\sqrt{2}}(j + k)$

C. $\frac{1}{\sqrt{2}}(i + j)$

D. $\frac{1}{\sqrt{2}}(i + k)$

Answer: B

Watch Video Solution

107. If $a = -i + j + k$ and $b = 2i + 0j + k$, then the vector c satisfying the conditions (i) that it is coplanar with a and b (ii) that it is $\perp$ to b and (iii) that $a.\ c = 7$, is

A. $-\frac{3}{2}i + \frac{5}{2}j + 3k$

B. $-3i + 5j + 6k$

C. $-6i + 0j + k$

D. $-i + 2j + 2k$

Answer: A

Watch Video Solution

108. If $a = 1, -1, 1, a.\ b = 0, a \times b = c,$ where $c = -2, -1, 1$ then the vector b is

A. $-1, 0, 1$

B. $0, 1, 1$

C. $-1, \; -1, 0$

D. $1, 0 - 1$

Answer: B

Watch Video Solution

109. Let $\bar{a} = \hat{j} - \hat{k}$ and $\bar{c} = \hat{i} - \hat{j} - \hat{k}$ then the vector $\bar{b}$ satisfying $\bar{a} \times \bar{b} + \bar{c} = 0$ and $\bar{a}.\,\bar{b} = 3$ is

A. $2i - j + 2k$

B. $i - j - 2k$

C. $i + j - 2k$

D. $-i + j - 2k$

Answer: D

Watch Video Solution

110. If $\vec{a}$ is a vector of magnitude 50 and parallel to $\vec{b} = 6\vec{i} - 8\vec{j} - \frac{15}{2}\vec{k}$ and makes an acute angle with the z-axis then $\vec{a} =$ ___________.

A. $23i - 32j - 30k$

B. $-24i + 32j + 30k$

C. $12i - 16j - 15k$

D. none of these

Answer: B

Watch Video Solution

111. Let A,B and C be the unit vectors . Suppose that A.B=A.C =0 and the angle between B and C is $\frac{\pi}{6}$ then prove that $A = \pm 2(B \times C)$

A. $\pm 2(b \times c)$

B. $2(b \times c)$

C. $\pm \frac{1}{2}(b \times c)$

D. $-\frac{1}{2}(b \times c)$

Answer: A

Watch Video Solution

112. Let $\overrightarrow{u} = \hat{i} + \hat{j}, \overrightarrow{v} = \hat{i} - \hat{j}$ and $\overrightarrow{w} = \hat{i} + 2\hat{j} + 3\hat{k}$. If $\widehat{n}$ is a unit vector such that $\overrightarrow{u} . \overrightarrow{n}$ = 0 and $\overrightarrow{v} . \widehat{n} = 0$ then $\left|\overrightarrow{w} . \widehat{n}\right|$ is equal to.

A. 0

B. 1

C. 2

D. 3

Answer: D

Watch Video Solution

113. A unit vector perpendicular to the vector $-\bar{i} + 2\bar{j} + 2\bar{k}$ and making equal angles with x and y- axis can be

A. $\pm\frac{1}{3}(2i + 2j - k)$

B. $\pm\frac{1}{3}(i + j - k)$

C. $\pm\frac{1}{3}(2i - 2j - k)$

D. none of these

Answer: A

Watch Video Solution

114. The vectors a, b and c are of the same length and taken pairwise, they form equal angles. If $a = i + j$ and $b = j + k$, then c is equal to

A. $i + k$

B. $i + 2j + 3k$

C. $-i + j + 2k$

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

Answer: A::D

Watch Video Solution

115. The vector a, b, c are equal in length and taken pairwise they mak equal-angles.

If $a = i + j, b = j + k$ and c makes obtuse angle with x-axis, then c =

A. $-i + 4j - k$

B. $i + k$

C. $\frac{1}{3}(-i + 4j - k)$

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

Answer: C

Watch Video Solution

116. The vector r satisfying the conditions that

I. it is perrpendicular to $3\hat{i}+2\hat{j}+2\hat{j}$ and $18\hat{i}-22\hat{j}-5\hat{k}$

II. It makes an obtuse angle with Y-axis

III. $|r|=14.$

A. $-2(2i+3j-6k)$

B. $2(2i-3j+6k)$

C. $4i+6j-12k$

D. none of these

Answer: A

Watch Video Solution

117. The values of λ for which the angle between the vectors $a=\lambda i-3j-k$ and $b=2\lambda i+\lambda j-k$ is acute and the angle between

b and y-axis lies between $\pi / 2$ and π are

A. -1

B. all $\lambda > 0$

C. 1

D. all $\lambda < 0$

Answer: A::D

Watch Video Solution

118. If a and b are two unit vectors inclined at an angle 2θ to each other, then $|a+b| < 1$ if

A. $\frac{\pi}{3} < \theta < \frac{2\pi}{3}$

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

C. $\theta < \frac{2\pi}{3}$

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

Answer: A

Watch Video Solution

119. The vectors $\left(2\hat{i} - m\hat{j} + 3mk\right)$ and $\left\{(1+m)\hat{i} - 2m\hat{j} + \hat{k}\right\}$ include and acute angle for

A. all value of m

B. $m < -2$

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

D. $m\varepsilon\left[-2, -\frac{1}{2}\right]$

Answer: B::C::D

Watch Video Solution

120. If the vectors $a = (2, \log_3 x, \lambda)$ and $b = (-3, \lambda \log_3 x, \log_3 x)$ are inclined at an acute angle, then

A. $\lambda = 0$

B. $\lambda > 0$

C. $\lambda > 0$

D. none of these

Answer: D

Watch Video Solution

121. The set of values of λ for which the vectors $\vec{a} = (\lambda(\log)_2 x)\hat{i} - 6\hat{j} + 3\hat{k} and \vec{b} = ((\log)_2 x)\hat{i} + 2\hat{j} + (2\lambda(\log)_2 x)\hat{k}$ make an obtuse angle for any $x \in (0, \infty)$ $\left(0, \frac{4}{3}\right)$ (b) $\left(-\frac{4}{3}, 0\right)$ $\left(\frac{4}{3}, \infty\right)$ (d) $\left(-\frac{4}{3}, 0\right]$

A. $(-\infty, 0)$

B. $(0\infty, -4/3)$

C. $(-4/3, 0)$

D. $(-4/3, \infty)$

Answer: B::C

Watch Video Solution

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

A. $1, 2$

B. $-2, -3$

C. $\forall x < 0$

D. $\forall x > 0$

Answer: C

Watch Video Solution

123. The vectors $a = 2\lambda^2 i + 4\lambda j + k$ and $b = 7i - 2j + \lambda k$ make an obtuse angle whereas the angle between b and k is acute and less then $\pi/6$ domain of λ is

A. $0 < \lambda < \frac{1}{2}$

B. $\lambda > \sqrt{159}$

C. $-\frac{1}{2} < \lambda < 0$

D. null set

Answer: D

Watch Video Solution

124. If unit vectors $\vec{a}$ and $\vec{b}$ are inclined at an angle 2θ such that $\left|\vec{a} - \vec{b}\right| < 1$ and $0 \leq \theta \leq \pi$, then θ lies in the interval

A. $[0, \pi/6]$

B. $(5\pi/6, \pi)$

C. $(\pi/6, \pi/2)$

D. $(\pi/2, 5\pi/6)$

Answer: A

Watch Video Solution

125. Lelt two non collinear unit vectors $\hat{a}$ and $\hat{b}$ form and acute angle. A point P moves so that at any time t the position vector $\overrightarrow{OP}$ (where O is the origin) is given by $\hat{a}\cos t + \hat{b}\sin t$. When P is farthest from origin O, let M be the length of $\overrightarrow{OP}$ and $\hat{u}$ be the unit vector along $\overrightarrow{OP}$ Then (A)

$$\hat{u} = \frac{\hat{a}+\hat{b}}{\left|\hat{a}+\hat{b}\right|} \text{ and } M = \left(1+\hat{a}.\,\hat{b}\right)^{\frac{1}{2}}$$ (B)

$$\hat{u} = \frac{\hat{a}-\hat{b}}{\left|\hat{a}-\hat{b}\right|} \text{ and } M = \left(1+\hat{a}.\,\hat{b}\right)^{\frac{1}{2}}$$ (C)

$$\hat{u} = \frac{\hat{a}+\hat{b}}{\left|\hat{a}+\hat{b}\right|} \text{ and } M = \left(1+2\hat{a}.\,\hat{b}\right)^{\frac{1}{2}}$$ (D)

$$\hat{u} = \frac{\hat{a}-\hat{b}}{\left|\hat{a}-\hat{b}\right|} \text{ and } M = \left(1+2\hat{a}.\,\hat{b}\right)^{\frac{1}{2}}$$

A. $\hat{u} = \dfrac{a+b}{|a+b|}$ and $M = (1+a.\,b)^{1/2}$

B. $\widehat{u} = \dfrac{a-b}{|a-b|}$ and $M = (1 + a.\, b)^{1/2}$

C. $\widehat{u} = \dfrac{a+b}{|a+b|}$ and $M = (1 + 2a.\, b)^{1/2}$

D. $\widehat{u} = \dfrac{a-b}{|a-b|}$ and $M = (1 + 2a.\, b)^{1/2}$

Answer: B

Watch Video Solution

126. For any vector $\overrightarrow{a}$

$\left|\overrightarrow{a} \times \hat{i}\right|^2 + \left|\overrightarrow{a} \times \hat{j}\right|^2 + \left|\overrightarrow{a} \times \hat{k}\right|^2$ is equal to

A. a^2

B. $2a^2$

C. $3a^2$

D. 0

Answer: B

Watch Video Solution

127. If $|a| = |b|$, then $(a + b).\ (a - b)$ is

A. $+$ ive

B. $-$ ive

C. zero

D. none of these

Answer: C

Watch Video Solution

128. A vector a has components 2p and 1 with respect to a rectangular cartesian system. This system is rotated through a certain angle about the origin in the counter-clockwise sense. If with respect to new system, a has components $p + 1$ and 1, then

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

Watch Video Solution

129. Let $a=i+j+pk$ and $b=i+j+k, |a+b|=|a|+|b|$, holds for

A. all real p

B. no real p

C. one real p

D. two real p

Answer: D

Watch Video Solution

130. If x and y are two unit vectors and ϕ is the angle between them, then $\frac{1}{2}|x-y|$ is equal to

A. 0

B. $\left|\sin\left(\frac{\phi}{2}\right)\right|$

C. $\left|\frac{\sin(1)}{2}\phi\right|$

D. $\left|\frac{\cos(1)}{2}\phi\right|$

Answer: B

Watch Video Solution

131. Let $\hat{a}$, $\hat{b}$ be two unit vectors and θ be the angle between them.

What is $\cos\left(\frac{\theta}{2}\right)$ equal to ?

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

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

C. $\frac{|a| - |b|}{2}$

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

Answer: B

Watch Video Solution

132. $(a + b). (a - b) = 0$ implies that

A. $a = b$

B. $|a| = |b|$

C. $a \neq b$

D. $a = -b$

Answer: B

Watch Video Solution

133. The vectors $\vec{A}$ and $\vec{B}$ are such that $\left|\vec{A}+\vec{B}\right| = \left|\vec{A}-\vec{B}\right|$. The angle between the two vectors is

A. $\pi/4$

B. $\pi/3$

C. $\pi/2$

D. none of these

Answer: A

Watch Video Solution

134. $(a+b) \times (a-b)$ is equal to

A. $a^2 - b^2$

B. $2(a \times b)$

C. $2(b \times a)$

D. none of these

Answer: A::C

Watch Video Solution

135. If $u = a - b, v = a + b$ and $|a| = |b| = 2,$ then $|u \times v|$ is

A. $2\sqrt{16 - (a. b)^2}$

B. $2\sqrt{4 - (a. b)^2}$

C. $\sqrt{16 - (a. b)^2}$

D. $\sqrt{4 - (a. b)^2}$

Answer: A

Watch Video Solution

136. Let $\vec{a}\, and\, \vec{b}$ be two non-collinear unit vector. If $\vec{u} = \vec{a} - \left(\vec{a} \cdot \vec{b}\right)\vec{b}\, and\, \vec{v} = \vec{a} \times \vec{b}, then \left|\vec{v}\right|$ is $\left|\vec{u}\right|$ b.

$\left|\vec{u}\right| + \left|\vec{u}\dot{\vec{a}}\right|$ c. $\left|\vec{u}\right| + \left|\vec{u}\dot{\vec{b}}\right|$ d. $\left|\vec{u}\right| + \hat{u}\left|\vec{a} \dot{+} \vec{b}\right|$

A. $|u|$

B. $|u| + |u.\ a|$

C. $|u| + |u.\ b|$

D. $|u| + u.\ (a + b)$

Answer: A

Watch Video Solution

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

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

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

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

D. $\dfrac{2\pi}{3} < \theta < \pi$

Answer: D

Watch Video Solution

138. If $\overrightarrow{a}$ and $\overrightarrow{b}$ are two unit vectors such that $\overrightarrow{a} + 2\overrightarrow{b}$ and $5\overrightarrow{a} - 4\overrightarrow{b}$ are perpendicular to each other, then the angle between $\overrightarrow{a}$ and $\overrightarrow{b}$ is

A. 45°

B. 60°

C. $\cos^{-1}\left(\frac{1}{3}\right)$

D. $\cos^{-1}\left(\frac{2}{7}\right)$

Answer: B

Watch Video Solution

139. The vector $a + 3b$ is perpendicular to $7a - 5b$ and $a - 5b$ is perpendicular to $7a + 3b$. The angle between a and b is

A. $\pi/4$

B. $\pi/6$

C. $\pi/2$

D. none

Answer: C

Watch Video Solution

140. Four points with position vectors $7i - 4j + 7k, i - 6j + 10k, \ -i - 3j + 4k$ and $5i - j + k$ form a

A. rhombus

B. parallelogram but not rhombus

C. rectangle

D. square

Answer: C

Watch Video Solution

141. a, b, c, d are the vertices of a square, then

A. $(b-a)=(c-b)$

B. $a+b+c=0$

C. $(c-a).(d-b)=0$

D. none of these

Answer: C

Watch Video Solution

142. $ai+3j+4k$ and $\sqrt{b}i+5k$ are two vectors, where $a, b > 0$ are two vectors, where $a, b \geq 0$ are two scalars, then the length of the vectors is equal for

A. all value of (a, b)

B. only finite number of values of (a, b)

C. infinite number of values of (a, b)

D. no value of (a, b).

Answer: C

Watch Video Solution

143. A parallelogram is constructed on the vectors $r_1 = 3a - b, r_2 = a + 3b,$ If $|a| = |b| = 2$ and the angle between a and b is $\frac{\pi}{3}$, then the length of a diagonal of the parallelogram is

A. $4\sqrt{5}$

B. $4\sqrt{3}$

C. $4\sqrt{7}$

D. none of these

Answer: B::C

Watch Video Solution

144. The vectors $a = 3i - 2j + 2k$ and $b = \ - i - 2k$ are adjacement sides of a parallelogram. Then angle between its diagonalsc is

A. $\pi / 4$

B. $\pi / 3$

C. $3\pi / 4$

D. $2\pi / 3$

Answer: A::C

Watch Video Solution

145. 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: B

Watch Video Solution

146. OABC is a parallelogram such that $OA = a, OB = b$ and $OC = c$, then the value $\vec{O}A.\vec{B}A$ is

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

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

C. $\frac{a^2 + 3b^2 - c^2}{2}$

D. $\frac{3a^2 + b^2 - c^2}{2}$

Answer: B

View Text Solution

147. Find the length of perpendicular from the piont $A(1, 4, -2)$ to the line joining $P(2, 1, -2)$ and $Q(0, -5, 1)$

A. $\frac{3}{2}\sqrt{13}$

B. $\frac{3}{7}\sqrt{26}$

C. $3\sqrt{26}$

D. $\frac{3}{2}\sqrt{26}$

Answer: B

Watch Video Solution

148. Let the points P, Q and R have position vectors

$r_1 = 3i - 2j - k$

$r_2 = i + 3j + 4k$

and $r_3 = 2i + j - 2k$

relative to an origin O.

The distance of P from the plane OQR is

A. 2

B. 3

C. 1

D. 5

Answer: B

Watch Video Solution

149. Given the vectors $a = 3i - j + 5k$ and $b = i + 2j - 3k$. A vector c which is perpendicular to the z-axis and satisfies $c \cdot a = 9$ and $c \cdot b = -4$ is

A. $2, -3, 0$

B. $1, 2, 4$

C. $4, -2, 0$

D. $2, \ -2, 0$

Answer: A

Watch Video Solution

150. IF $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of the vertices of an equilateral triangle whose orthocentre is at the origin, then

A. $a+b+c=0$

B. $a^2=b^2+c^2$

C. $a+b=c$

D. none of these

Answer: A

Watch Video Solution

151. If a, b, c, d are the position vectors of points A, B, C and D respectively such that

$(a - d).(b - c) = (b - d).(c - a) = 0$

then D is the

A. centroid of ΔABC

B. circumcentre of ΔABC

C. orthocentre of ΔABC

D. none of these

Answer: C

Watch Video Solution

152. The position vectors of four points A, B, C, D lying in a plane are a, b, c, d respectively. They satisfy the relation $|a - d| = |b - d| = |c - d|$ then the point D is

A. centroid of ΔABC

B. circumcentre of ΔABC

C. orthocentre of ΔABC

D. incentre of ΔABC

Answer: B

Watch Video Solution

153. Area of parallelogram whose adjacent sides of $a = i + 2j + 3k, b = 3i - 2j + k$ is

A. $5\sqrt{2}$

B. $8\sqrt{3}$

C. 6

D. none

Answer: B

Watch Video Solution

154. The vector $A = 3i - k, b = i + 2j$ are adjacent sides of a parallelogram . Its area is

A. $\frac{1}{2}\sqrt{17}$

B. $\frac{1}{2}\sqrt{14}$

C. $\sqrt{41}$

D. $\frac{1}{2}\sqrt{7}$

Answer: C

Watch Video Solution

155. The area of a parallelogram having diagonals $a = 3i + j - 2k$ and $b = i - 3j + 4k$ is

A. $26\sqrt{5}$

B. $24\sqrt{5}$

C. $22\sqrt{5}$

D. $20\sqrt{5}$

Answer: B

Watch Video Solution

156. The area of a parallelogram is $5\sqrt{3}$ then its diagonals are given by vectors

where vector x, y, z is $xi + yj + zk$.

A. 10

B. $20\frac{1}{2}$

C. 3

D. 4

Answer: B

View Text Solution

157. The area of the triangle whose two sides are given by $2i - 7j + k$ and $4j - 3k$ is

A. 17

B. $17/2$

C. $17/4$

D. $\frac{1}{2}\sqrt{389}$

Answer: D

Watch Video Solution

158. The area of parallelogram constructed on the vector $a = m + 2n$ and $b = 2m + n$ where m and n are unit vectors forming an angle of 30° is

A. $3/2$

B. $5/2$

C. $7/2$

D. none of these

Answer: A

Watch Video Solution

159. If $u = q - r, r - p, p - q$ and $v = \frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ and a, b, c are T_p, T_q, T_r of an HP then the angle between the vectors u and v is ....

Watch Video Solution

160. If $u = q - r, r - p, p - q$ and $v = \log a^2, \log b^2, \log c^2$ and a,b, c and $T_p, T_q, T_r$of a G.P. then angle between vectors u and v is ....

Watch Video Solution

161. Let $\vec{r} \times \vec{a} = \vec{b} \times \vec{a}$ and $\vec{c}\,\vec{r} = 0$, where $\vec{a}\,.\,\vec{c} \neq 0$, then $\vec{a}\,.\,\vec{c}\left(\vec{r} \times \vec{b}\right) + \left(\vec{b}\,.\,\vec{c}\right)\left(\vec{a} \times \vec{r}\right)$ is equal to ________.

A. centroid of ΔABC

B. (a.b) c

C. $(a \times b) \times c$

D. 0

Answer: D

Watch Video Solution

162. If a, b, c are non-collinear vectors such that $a + b$ is parallel to c, and c + a is parallel to b, then

A. $a + b = c$

B. a, b,c taken in order, form the sides of a triangle

C. $b + c = a$

D. none of these

Answer: B

Watch Video Solution

163. The locus of a point equidistant from two given points whose position vectors are a and b is equal to

A. $\left[r-\frac{1}{2}(a+b)\right].(a+b)=0$

B. $\left[r-\frac{1}{2}(a+b)\right].(a-b)=0$

C. $\left[r-\frac{1}{2}(a+b)\right].a=0$

D. $[r-(a+b)].b=0$

Answer: B

Watch Video Solution

164. If a, b, c are three non-zero, non -coplanar vectors and

$$b_1 = b - \frac{b.\ a}{|a|^2}a,\ b_2 = b + \frac{b.\ a}{|a|^2}a \text{ and } c_1 = c - \frac{c.\ a}{|a|^2}a - \frac{c.\ b}{|b|^2},$$

$$c_2 = c - \frac{c.\ a}{|a|^2}a - \frac{c.\ b}{|b_1|^2}b_1,$$

$$c_3 = c - \frac{c.\ a}{|a|^2}a - \frac{c.\ b_2}{|b_2|^2}b_2,$$

$$c_4 = a - \frac{c.\ a}{|a|^2}a.$$

Then which of the following is a set of mutually orthogonal vectors

A. $\{a, b_1, c_1\}$

B. $\{a, b_1, c_2\}$

C. $\{a, b_2, c_3\}$

D. $\{a, b_2, c_4\}$

Answer: B

Watch Video Solution

165. A plane p_1 is parallel to two vectors $2j + 3k$ and $4j - 3k$. Another plane p_2 is parallel to two other vectors $j - k$ and $3i + 3j$. A vector a is parallel to the line of intersection of the given planes. The angle between a and a given vector $2i + 2j - k$ is :

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

B. $\frac{3\pi}{4}$

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

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

Answer: A::B

Watch Video Solution

Problem Set (2) (TRUE AND FALSE)

1. Prove by vector method, that in a right-angled triangle ABC, $AB^2 + AC^2 + BC^2$, the angle A being right angled. Also prove that mid-point of the hypotenuse is equidistant from vertex.

Watch Video Solution

2. Prove using vectors: The median to the base of an isosceles triangle is perpendicular to the base.

Watch Video Solution

3. (i) If $|a+b| = |a-b|$, then a and b are parallel. True or False

Watch Video Solution

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

Watch Video Solution

5. If the vectors a, b and c are complanar, then $\begin{vmatrix} 1 & b & c \\ a \cdot a & a \cdot b & a \cdot c \\ b \cdot a & b \cdot b & b \cdot c \end{vmatrix}$ is equal to

Watch Video Solution

6. Prove that $|a \times b|^2 = a^2 b^2 - (a.\, b)^2$

Watch Video Solution

7. If a , b, c be the vectors determined by sides BC, CA and AB of a triangle ABC and of magnitude a, b, c then are the following relations true or false :

(i) $a^2 = b^2 + c^2 - 2bc \cos A$

(ii) $a = b \cos C + c \cos B$

(iii) $|a \times b| = |b \times c| = |c \times a|$

(iv) $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

Watch Video Solution

8. Prove

(i) $r = (r.\, i)i + (r.\, j)j + (r.\, k)k$

(ii) $i \times (a \times i) + j \times (a \times j) + k \times (a \times k) = 2a$

(iii) $[(i \times a).\, b]i + [(j \times a).\, b] + [(k \times a).\, b].\, k = a \times b$

Watch Video Solution

9. The ratio of lengths of diagonals of the parallelogram constructed on the vectors $\overrightarrow{a} = 3\overrightarrow{p} - \overrightarrow{q}, \overrightarrow{b} = \overrightarrow{p} + 3\overrightarrow{q}$ is (given that $\left|\overrightarrow{p}\right| = \left|\overrightarrow{q}\right| = 2$ and angle between $\overrightarrow{p}$ and $\overrightarrow{q}$ is $\pi/3$).

Watch Video Solution

10. A vector of magnitude 9 perpendicular to both the vectors $a = 4i - j + k$ and $b = -2i + j - 2k$ is $-3i + 6j + 6k$. True or False

Watch Video Solution

11. The area of a parallelogram constructed on the vectors $a + 3b$ and $3a + b$ where $|a| = |b| = 1$ and the angle between a and b is 60°, is 4sq. Units. True or False

Watch Video Solution

12. Let $a = i + 2j - 3k$ and $b = 2i + j - k$ then the vector r satisfying $a \times r = a \times b$ and $a.\ r = 0$ is of length $\sqrt{10}$. True or False

Watch Video Solution

13. If a, b, c, are non-zero vectors such that $a \times b = b \times c$ then $a + c = \lambda b$ for some scalar λ. True or False.

Watch Video Solution

14. If T_p, T_q and T_r of a G.P. are $+$ive numbers a, b, c respectively, the vectors

$\alpha = i \log a + j \log b + k \log c,$

$\beta = i(q - r) + j(r - p) + k(p - q)$

are perpendicular . True and False ?

Watch Video Solution

15. In a triangle ABC,

$\cos 3A + \cos 2B + \cos 2C \geq -3/2$. True or False.

Watch Video Solution

16. For any two vectors u and v, find

if $\left(1 + |u|^2\right)\left(1 + |v|^2\right) = (1 - u.\,v)^2 + |u + v + (u \times v)|^2$

is True or False ?

Watch Video Solution

17. Using dot product of vectors; prove that a parallelogram; whose diagonal are equal; is a rectangle.

Watch Video Solution

18. If AC and BD are the diagonals of a quadrilateral ABCD, prove that its area is equal to $\frac{1}{2}\left|\overrightarrow{AC}\times\overrightarrow{BD}\right|$.

Watch Video Solution

19. IF a quadrilateral ABCD is such that $\vec{A}B = b, \vec{A}D = d$ and $\vec{A}C = pb + qd(p + q \geq 1)$. Then the area of he quadrilateral is $\frac{1}{2}(p+q)|b \times d|$. Is this statement true or false ?

Watch Video Solution

20. If a and b are non-collinear, then the point of intersectioon of the lines $r = 6a - b + \lambda(2b - a)$ and $r = a - b + \mu(a + 3b)$ is $3a + 4b$. Is it true or false ?

Watch Video Solution

Problem Set (2) (FILL IN THE BLANKS)

1. If $a = i + 2j + 2k,$ and $b = 3i + 6j + 2k,$ then the vector in the direction of a and having magnitude of b is.......

Watch Video Solution

2. If $a = (2, 3, 5), b = (3, -6, 2), c = (6, 2, -3)$ then $a \times b = \ldots ?$ and $b \times c = ..?$ and $(a \times b) \times c = a \times (b \times c) = 0$. True or False

Watch Video Solution

3. If $A = (1, 2, 5), B = (5, 7, 9)$ and C = (3, 2, -1)` then a unit vector normal to the plane of triangle ABC is ....

Watch Video Solution

4. If for all real x the vector $cx\hat{i} - 6\hat{j} + 3\hat{k}$ and $x\hat{i} + 2\hat{j} + 2cx\hat{k}$ makes an obtuse angle with one another then find the value of c

Watch Video Solution

5. Projection of $b = 2i + 3j - 2k$ in the direction of vector $a = i + 2j + 3k$ is .... And the vector determined by the projection is ....

Watch Video Solution

6. $(i) a \times (b + c) + b \times (c + a) + c \times (a + b) =$

Watch Video Solution

7. (i) If $\vec{O}A = a, \vec{O}B = b$, then the vector area of triangle OAB is ....and the vector area of triangle ABC is ....where $\vec{O}C = c$

(ii) If a, b, c are vectors from origin to the point A,B, C then $(a \times b + b \times c + c \times a)$ is .... to plane ABC.

(iii) Vertices of a triangle are $(1, 2, 4), (3, 1, -2)$ and $(4, 3, 1)$ then its area is ....

Watch Video Solution

8. If the diagonals of a parallelogram are $3i + j - 2k$ and $i - 3j + 4k$ then its area is.

Watch Video Solution

9. If $a = 2i - 3j + k, b = -i + k, c = 2j - k$ then the area of parallelogram whose diagonals are $a + b$ and $b + c$ is ....

Watch Video Solution

10. $a = i - 2j + 3k, b = 3i + j + 2k$ then a vector c which is linear combination of a and b and also perpendicular to b is ....

Watch Video Solution

11. The distance of the point $B(i + 2j + 3k)$ from the line which is passing through $A(4i + 2j + 2k)$ and which is parallel to the vector $\vec{C} = 2i + 3j + 6k$ is ....

Watch Video Solution

12. If $\vec{a}, \vec{b}, \vec{c}$ are non coplanar vector and $\vec{n}.\vec{a} = \vec{n}.\vec{b} = \vec{n}.\vec{c} = 0,$ Show that $\vec{n}$ is a zero vector

Watch Video Solution

13. A,B,C,D are four points in space and $\left|\overline{AB} \times \overline{CD} + \overline{BC} \times \overline{AD} + \overline{CA} \times \overline{BD}\right| = \lambda$ (area ΔABC) then value of λ is _____

Watch Video Solution

14. If [I, j, k] be a set of orthogonal unit vectors, then fill up the blanks :

(i) $i.\, i + j.\, j + k.\, k = \ldots\ldots\ldots$

(ii) $i.\, j + j.\, k + k.\, i. \ = \ldots\ldots\ldots$

(iii) $i.\, i = j.\, j = k.\, k =$ ....

(iv) $i.\, j = j.\, k = k.\, i. \ =$ ....

Watch Video Solution

15. The components of a vector $\vec{a}$ along and perpendicular to a non-zero vector $\vec{b}$ are _______ and _________, respectively.

Watch Video Solution

16. If r be any vector, then

$|r \times i|^2 + |r \times j|^2 + |r \times k|^2 =$ ....

Watch Video Solution

17. The points O, A, B, C, D are such that $\vec{O}A = a, \vec{O}B = b, \vec{O}C = 2a + 3b$ and $\vec{O}D = a - 2b$. If $a = 3b$. Then the angle between $\vec{B}D$ and $\vec{A}C$ is ....

Watch Video Solution

18. Let $\vec{O}A - \vec{a}, \hat{O}B = 10\vec{a} + 2\vec{b} and \vec{O}C = \vec{b}, where O, A and C$ are non-collinear points. Let p denotes the areaof quadrilateral $OACB$, and let q denote the area of parallelogram with $OA and OC$ as adjacent sides. If $p = kq,$ then find$k$.

Watch Video Solution

19. A non-zero vector is a parallel to theline of intersection of the plane determined by the vectors $i, i + j$ and the plane dtermined by the vectors $i - j, i + k$. The angle between a and the vector $i - 2j + 2k$ is ....

Watch Video Solution

20. A vector of magnitude $\sqrt{2}$ units and coplanar with vector $3i - j - k$ and $i + j - 2k$ and perpendicular to vector $2i + 2j + k$.....

Watch Video Solution

21. A unit vector coplanar with $i + j + 2k$ and $i + 2j + k$ and perpendicular to $i + j + k$ is.......

Watch Video Solution

22. In a parallelogram ABCD, bisectors of consecutive angles A and B intersect at P. Find the measure of $\angle APB$:

Watch Video Solution

23. If α, β, γ satisfy $k \times (k \times a) = 0$ and $a = \alpha i + \beta j + \gamma k$, where $\alpha + \beta + \gamma = 2$, then $\gamma =$ ....

Watch Video Solution

Problem Set (3) (MULTIPLE CHOICE QUESTIONS)

1. The volume of the parallelopiped whose edges are represented by $-12i + \lambda j, 3j - k, 2i + j - 15k$ is 546, then λ is

A. 2

B. 1

C. 3

D. 0

Answer: C

Watch Video Solution

2. The volume of a parallelopiped whose sides are given by $\overrightarrow{O}A = 2i - 3j, \overrightarrow{O}B = i + j - k, \overrightarrow{O}C = 3i - k$ is

A. $4/13$

B. 4

C. $2/7$

D. none of these

Answer: B

Watch Video Solution

3. Let a, b and c be three non-zero and non-coplanar vectors and p, q and r be three given by $\vec{p} = \vec{a} + \vec{b} - 2\vec{c}, \vec{q} = 3\vec{a} - 2\vec{b} + \vec{c}$ and $r = \vec{a} - 4\vec{b} + 2\vec{c}$. If the volume of the parallelopiped determined by $\vec{a}, \vec{b}$ and $\vec{c}$ is V_1 and that of the parallelopiped determined by $\vec{p}, \vec{q}$ and $\vec{r}$ is V_2, then $V_2 : V_1 =$

A. $2:3$

B. $5:7$

C. $15:1$

D. $1:1$

Answer: C

Watch Video Solution

4. $[a \times (3b + 2c), b \times (c - 2a), 2c \times (a - 3b)] =$

A. $18[a \quad b \quad c]^2$

B. $-18[a \quad b \quad c]^2$

C. $6[a \times b, b \times c, c \times a]$

D. $-[a \times bb \times c \times a]$

Answer: B

Watch Video Solution

5. If a, b, c are three non-coplanar vectors such that volume of parallelopiped formed with a ,b , c as coterminous edges is equal to volume of parallelopiped formed with $a \times b, b \times c, c \times a$ as coterminous edges, then :

A. $[abc] = 0$

B. $[abc] = 1$

C. $[abc] = -1$

D. $[abc] \varepsilon [-1, 1]$

Answer: B::C

Watch Video Solution

6. The edges of a parallelopiped are of unit length and a parallel to non-coplanar unit vectors $\widehat{a}, \hat{b}, \hat{c}$ such that $\widehat{a}. \hat{b} = \hat{b}. \hat{c} = \hat{c}. \overrightarrow{a} = 1/2$. Then the volume of the parallelopiped in cubic units is

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

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

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

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

Answer: A

Watch Video Solution

7. The volume of the tetrahedron whose vertices are points $A(1, -1, 10), B(-1, -3, 7), C(5, -1, \lambda), D(7, -4, 7)$ be 11 cubic units then the value of λ is

A. -1

B. 1

C. -7

D. 7

Answer: B::D

Watch Video Solution

8. Let $\vec{a} = \vec{i} - \vec{k}, \vec{b} = x\vec{i} + \vec{j} + (1-x)\vec{k}$ and $\vec{c} = y\vec{i} + x\vec{j} + (1+x-y)\vec{k}$. Then $\left[\vec{a}\vec{b}\vec{c}\right]$ depends on only x (b) only y Neither xn or y (d) both $xandy$

A. only x

B. only y

C. neither x nor y

D. both x and y

Answer: C

Watch Video Solution

9. The value of a so that the volume of parallelopiped formed by vectors $i + aj + k, j + ak, ai + k$ becomes minimum is

A. $\sqrt{3}$

B. 2

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

D. 3

Answer: C

View Text Solution

10. Let $\vec{b} = -\vec{i} + 4\vec{j} + 6\vec{k}$, $\vec{c} = 2\vec{i} - 7\vec{j} - 10\vec{k}$. If $\vec{a}$ be a unit vector and the scalar triple product $\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ has the greatest value then $\vec{a}$ is

A. $\frac{1}{\sqrt{3}}(i + j + k)$

B. $\frac{1}{\sqrt{5}}\left(\sqrt{2}i - j - \sqrt{2}k\right)$

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

D. $\frac{1}{\sqrt{5}}(3i - 7j - k)$

Answer: C

Watch Video Solution

11. Let $a = 3i + 2k$ and $b = 2j + k$. If c is a unit vector, then the maximum value of $\left[\vec{a}, \vec{b}, \vec{c}\right]$ is :

A. $\sqrt{59}$

B. $\sqrt{61}$

C. $\sqrt{108}$

D. none

Answer: B

Watch Video Solution

12. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three vectors. Then scalar triple product $\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ is equal to

A. [bac]

B. [c b a]

C. [b c a]

D. [a c b]

Answer: C

Watch Video Solution

13. For three vectors $\vec{u}, \vec{v}, \vec{w}$ which of the following expressions is not eqal to any of the remaining three?

A. $u \cdot (v \times w)$

B. $(v \times w) \cdot u$

C. $v \cdot (u \times w)$

D. $(u \times v) \cdot w$

Answer: C

Watch Video Solution

14. If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar vectors, then $\frac{\vec{a} . \left(\vec{b} \times \vec{c}\right)}{\left(\vec{c} \times \vec{a}\right) . \vec{b}} + \frac{\vec{b} . \left(\vec{a} \times \vec{c}\right)}{\vec{a} . \left(\vec{a} \times \vec{b}\right)}$ is equal to

A. 1

B. 2

C. 0

D. none

Answer: C

Watch Video Solution

15. If $\vec{d} = \gamma\left(\vec{a} \times \vec{b}\right) + \mu\left(\vec{b} \times \vec{c}\right) + v\left(\vec{c} \times \vec{a}\right)$ and $\left[\vec{a}\vec{b}\vec{c}\right] = \frac{1}{8}$, then $\lambda = \mu + v$ is equal to:

A. $8(r.\ a)$

B. $8(r.\ b)$

C. $8(r.\ c)$

D. $8r(.\ (a + b + c)$

Answer: D

Watch Video Solution

16. If a, b, c are non-coplanar vectors and r is a unit vector, then $|(r.a)(b \times c) + (r.b)(c \times a) + (r.c)(a \times b)| =$

A. $[abc]^2$

B. $|[abc]|$

C. 1

D. none

Answer: B

Watch Video Solution

17. Let $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$, $\vec{b} = b_2\hat{j} + b_3\hat{k}$ and $\vec{c} = c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$ gve three non-zero vectors such that $\vec{c}$ is a unit vector perpendicular to both

$\vec{a}$ and $\vec{b}$. If the angle between $\vec{a}$ and $\vec{b}\, is \frac{\pi}{6}$, then prove that

$$\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix} p = \frac{1}{4}\left(a_1^2 + a_2^2 + a_3^2\right)\left(b_1^2 + b_2^2 + b_3^2\right)$$

A. 0

B. 1

C. $\frac{1}{4}\Sigma a_1^2.\ \Sigma b_1^2$

D. $\frac{3}{4}\Sigma a_1^2.\ \Sigma b_1^2.\ \Sigma a_1^2$

Answer: C

Watch Video Solution

18. The scalar $\vec{A}\,\vec{B} \dot{+} \vec{C} \times \left(\vec{A} + \vec{B} + \vec{C}\right)$ equals 0 b. $\left[\vec{A}\,\vec{B}\,\vec{C}\right] + \left[\vec{B}\,\vec{C}\,\vec{A}\right]$ c. $\left[\vec{A}\,\vec{B}\,\vec{C}\right]$ d. none of these

A. 0

B. [ABC] + [BCA]

C. [ABC]

D. none of these

Answer: A

Watch Video Solution

19. If $[(3a+5b)(c)(d)] = p[acd]+q[bcd]$, them $p+q=$

A. 8

B. -8

C. 2

D. 0

Answer: C

Watch Video Solution

20. $(a+2b-c).\ [(a-b)\times(a-b-c)]$ is equal to

A. $[abc]$

B. $2[abc]$

C. $3[abc]$

D. none of these

Answer: C

Watch Video Solution

21. If a, b and c three non-coplanar vectors, then $(a+b+c).\,[a+b) \times (a+c)$ equals

A. 0

B. $[abc]$

C. $2[abc]$

D. $-[abc]$

Answer: D

Watch Video Solution

22. If $\vec{u}, \vec{v} and \vec{w}$ are three non-copOlanar vectors, then prove that $\left(\vec{u}+\vec{v}-\vec{w}\right)\vec{u}\dot{-}\vec{v}\times\left(\vec{v}-\vec{w}\right)=\vec{u}\dot{\vec{v}}\times\vec{w}$

A. 0

B. $[uvw]$

C. $u.\ w\times v$

D. $3u.\ v\times w$

Answer: B

Watch Video Solution

23. If $\vec{a}, \vec{b} and \vec{c}$ are unit coplanar vectors, then the scalar triple product $\left[2\vec{a}-\vec{b}\,2\vec{b}-\vec{c}\,2\vec{c}-\vec{a}\right]$ is 0 b. 1 c. $-\sqrt{3}$ d. $\sqrt{3}$

A. 0

B. 1

C. $-\sqrt{3}$

D. $\sqrt{3}$

Answer: A

Watch Video Solution

24. If a,b,c ar enon-coplanar vectors and λ is a real number, then the vectors $a+2b+3c$, $\lambda b+4c$ and $(2\lambda-1)c$ are non-coplanar for

A. all values of λ

B. all expect one value of λ

C. all except two values of λ

D. no value of λ

Answer: C

Watch Video Solution

25. If $\bar{a}, \bar{b}, \bar{c}$ are non-coplanar vectors and λ is a real numbers then $[\lambda(\bar{a}+\bar{b})\lambda^2\bar{b} \quad \lambda\bar{c}] = [\bar{a}\bar{b}+\bar{c}\bar{b}]$ for

A. exactly 3 value of λ

B. exactly 2 values of λ

C. exactly 1 value of λ

D. no value of λ

Answer: D

Watch Video Solution

26. The resultant of two forces P N and 3 N is a force of 7 N. If the direction of 3 N force were reversed, the resultant would be $\sqrt{19}$ N. The value of P is (1) 5 N (2) 6 N (3) 3N (4) 4N

A. 5 N

B. 6 N

C. 3 N

D. 4 N

Answer: A

Watch Video Solution

27. $a = \hat{i} + \hat{j} - \hat{k}, b = \hat{i} - 2\hat{j} + \hat{k}, c = \hat{i} - \hat{j} - \hat{k}$, then a vector in plane of a and b whose projection on c is of magnitude $\left(\frac{1}{\sqrt{3}}\right)$ is given by :

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

B. $4\hat{i} - 7\hat{j} + 4\hat{k}$

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

D. $4\hat{i} + 13\hat{j} - 10\hat{k}$

Answer: D

Watch Video Solution

28. Let $a = i - j, b = j - k, c = k - i$. If d is a unit vector such that $a.\,d = 0 = \left[\overrightarrow{b}, \overrightarrow{c}, \overrightarrow{d}\right]$ then d equals

A. $\pm(k + j - 2k)/\sqrt{6}$

B. $\pm(i + j - k)/\sqrt{3}$

C. $\pm(i + j + k)/\sqrt{3}$

D. $\pm k$

Answer: A

Watch Video Solution

29. x,y,z are distinct scalars such that $[xa + yb + zc, xb + yc + za, xc + ya + zb] = 0$ where a,b,c are non-coplanar vectors, then

A. $x + y + z = 0$

B. $xy + yz + zx = 0$

C. $x^3 + y^3 + z^3 = 0$

D. $x^2 + y^2 + z^2 = 0$

Answer: A

Watch Video Solution

30. If I,j,k are the usual three perpendicular unit vectors then the value of i.(j x k)+j.(i x k)+k.(i x j) is

A. 0

B. 1

C. 2

D. 3

Answer: B

Watch Video Solution

31. Write the value of $\hat{i}\hat{j} \dot{\times} \hat{k} + \hat{j}\hat{k} \dot{\times} \hat{i} + \hat{k}\hat{i} \dot{\times} \hat{j}$.

A. 0

B. i

C. j

D. k

Answer: A

Watch Video Solution

32. If $a = i + j - k, b = i - j + k$ and $c = i - j - k$ then $a \times (b \times c)$

=

A. $i.\, j + k$

B. $2i - 2j$

C. $3i - j + k$

D. $2i + 2j - k$

Answer: B

Watch Video Solution

33. If a,b,c be three non-coplanar vectors, then

$(i)[a - b, b - c, c - a] =$

A. $[abc]$

B. $2[abc]$

C. 0

D. $[abc]^2$

Answer: C

Watch Video Solution

34. If A, B, C are three points with position vectors $i+j, i-j$ and $p.\ i+qj+rk$ respectively, then the points are collinear if

A. $p=q=r=1$

B. $p=q=r=0$

C. $p=q, r=0$

D. $p=1, q=2, r=0$

Answer: D

Watch Video Solution

35. If $a=i+j+k, b=4i+3j+4k$ and $c=i+\alpha j+\beta k$ are linearly dependent vectors and $|c|=\sqrt{3}$, then

A. $\alpha=1, \beta=-1$

B. $\alpha=1, \beta=\pm 1$

C. $\alpha = -1, \beta = \pm 1$

D. $\alpha = \pm 1, \beta = 1$

Answer: D

Watch Video Solution

36. If $a.\ b = b.\ c = c.\ a = 0$, then $a.\ (b \times c) =$

A. a non-zero vector

B. 1

C. -1

D. $|a||b||c|$

Answer: D

Watch Video Solution

37. For non-coplanar vectors a, b and c, $|(a \times b) \cdot c| = |a||b||c|$ holds if and only if

A. $a.\ b = b.\ c = c.\ a = 0$

B. $a.\ b. \ = b.\ c = 0$

C. $b.\ c = c.\ a = 0$

D. $c.\ a = a.\ b = 0$

Answer: A

Watch Video Solution

38. If $x = 3i - 6j - k, y = i + 4j - 3k$ and $z = 3i - 4j - 12k,$ then the magnitude of the projection of $x \times y$ on z is

A. 14

B. -14

C. 12

D. 15

Answer: B

Watch Video Solution

39. IF a,b,c are non-coplanar vectors, then

$$\begin{vmatrix} a.\ a & a.\ b. & a.\ c \\ b.\ a & b.\ b & b.\ c \\ c.\ a & c.\ b & c.\ c \end{vmatrix} \text{ equals}$$

A. $[abc]^2$

B. $[abc]$

C. $[abc]^3$

D. none of these

Answer: A

View Text Solution

40. a,b,c are unit vectors such that aand b are mutualy perpendicular and c is equally inclined to a and b at an angle θ. If $c = xa + yb + z(a \times b)$, then :

A. $z^2 = 1 - 2y^2$

B. $z^2 = 1 - x^2 - y^2$

C. $z^2 = 1 - 2x^2$

D. $x^2 = y^2$

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

View Text Solution

41. If a,b and c are three non-coplanar vectors, then the scalar product of vectors $a \times b + b \times c + c \times a$ and $a + b + c$ is

A. $[abc]$

B. $2[abc]$

C. $3[abc]$

D. none

Answer: C

Watch Video Solution

42. If a, b and c are non-zero vectors such that $a \times b = c, b \times c = a$ and $c \times a = b$ then

A. $|a| = |b|$

B. $|b| = |c|$

C. $|c| = |a|$

D. $|a| = |b| = |c|$

Answer: D

Watch Video Solution

43. $a = 2i - j + k, b = i + 2j - 3k, c = 3i + \lambda j + 5k$ and if these vectors be coplanar, then λ is

A. 4

B. 6

C. -4

D. 2

Answer: C

Watch Video Solution

44. The position vectors of the points A,B,C,D are $\overrightarrow{3i} - \overrightarrow{2j} - \overrightarrow{k}, \overrightarrow{2i} + \overrightarrow{3j} - \overrightarrow{4k} - \overrightarrow{i} + \overrightarrow{j} + \overrightarrow{2k}$ and $\overrightarrow{4j} + \overrightarrow{5j} + \overrightarrow{\lambda k}$ respectively Find lamda if A,B,C,D are coplanar.

A. $\frac{53}{17})$

B. $-\frac{146}{17}$

C. $\frac{230}{17}$

D. none

Answer: B

Watch Video Solution

45. The value of λ for which the points $L(1, 0, 3), M(-1, 3, 4), N(1, 2, 1)$ and $P(\lambda, 2, 5)$ are coplanar is

A. -1

B. 0

C. 1

D. 2

Answer: A

Watch Video Solution

46. If $\vec{a}$ lies in the plane of vectors $\vec{b}$ and $\vec{c}$, then which of the following is correct?

A. $[abc] = 0$

B. $[abc] = 1$

C. $[abc] = 3$

D. $[bca] = 1$

Answer: A

Watch Video Solution

47. IF r.a = 0, r. b = 0 and r. c= 0 for some non-zero vector r. Then, the value of [a b c] is

A. 2

B. 3

C. 0

D. none of these

Answer: C

Watch Video Solution

48. If a, b,c are non-coplanar vectors such that $r. a = r. b = r. c = 0$, then

A. $r = 0$

B. $[abc] = 0$

C. $r \neq 0, [abc] = 0$

D. $r = 0[abc] \neq 0$

Answer: D

Watch Video Solution

49. Blank,

View Text Solution

50. If $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3+1 & b^3+1 & c^2+1 \end{vmatrix} = 0$ and the vectors given by $A(1, a, a^2), B(1, b, b^2), C(1, c, c^2)$ are non-collinear, then $abc =$

A. 1

B. -1

C. 0

D. none

Answer: B

Watch Video Solution

51. If the vectors ai + j + k , i + bj + k and i + j + ck, where a, b, c $\neq 1$, are coplanar,

then : $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=\ldots$

A. 1

B. -1

C. 2

D. none

Answer: A

Watch Video Solution

52. Another form $\frac{1+a}{1-a}+\frac{1+b}{1-b}+\frac{1+c}{1-c}=$

A. -2

B. -1

C. 1

D. 2

Answer: B

View Text Solution

53. If the vectors $ai + j + k, i - bj + k, i + j - ck$ are co-planar, then abc + 2 =

A. $a + b - c$

B. $a - b - c$

C. $a + b + c$

D. $a - b + c$

Answer: B

Watch Video Solution

54. If the vector $ai + j + k, i + bj + k$ and $i + j + ck$ are coplanar, then :

A. $abc = -1$

B. $a + b + c = 0$

C. $a + b + c = abc + 2$

D. $ab + bc + ca = 0$

Answer: C

Watch Video Solution

55. Let a, b, c be distinct non-negative numbers. If the vectors $a\hat{i} + a\hat{j} + c\hat{k}, \hat{i} + \hat{k}$ and $c\hat{i} + c\hat{j} + b\hat{k}$ lies in a plane then c is

A. the Arithmetic Mean of a and b

B. the Geometric Mean of a and b

C. the Harmonic Mean of a and b

D. equal to zero

Answer: B

Watch Video Solution

56. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are any three coplanar unit vectors , then :

A. $a.\ (b \times c) = 1$

B. $a.\ (b \times c) = 3$

C. $(a \times b).\ c = 0$

D. $(c \times a).\ b = 1$

Answer: C

Watch Video Solution

57. If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar mutually perpendicular unit vectors, then $\begin{bmatrix} \vec{a} & \vec{b} & \vec{c} \end{bmatrix}$ is

A. -1

B. 0

C. ± 1

D. 2

Answer: C

Watch Video Solution

58. The vector $\vec{a}$ lies in the plane of vectors $\vec{b}$ and $\vec{c}$. Which one of the following is correct ?

A. $a.\ (b \times c) \Rightarrow 0$

B. $a.\ b \times c = 1$

C. $a.\ b \times c = \ -1$

D. $a.\,b \times c = 3$

Answer: A

Watch Video Solution

59. If $a = i - j + k, b = i - 2j - k$ and $c = 3i + pj + 5k$ are coplanar, then p =

A. 6

B. -6

C. 2

D. -2

Answer: D

Watch Video Solution

60. If $l(b \times c) + m(c \times a) + n(a \times b) = 0$ and at least one of l, m, n is not zero then the vectors, a, b and c are

A. parallel

B. coplanar

C. mutually perpendicular

D. none

Answer: B

Watch Video Solution

61. The vectors $(x, x+1, x+2), (x+3, x+3, x+5)$ and $(x+6, x+7, x+8)$ are coplanar for (A) all values of x (B) $x < 0$ (C) $x > 0$ (D) none of these

A. all values of x

B. $x < 0$

C. $x > 0$

D. none

Answer: A::B::C

Watch Video Solution

62. If the vectors, a,b,c are coplanar, then

A. $[abc] = 0$

B. $\begin{vmatrix} a & b & c \\ a.\,a & a.\,b & a.\,c \\ b.\,a & b.\,b & b.\,c \end{vmatrix}$

C. $\begin{vmatrix} a.\,a & a.\,b & a.\,c \\ b.\,a & b.\,b & b.\,c \\ c.\,a & c.\,b & c.\,c \end{vmatrix}$

D. None of these

Answer: A::B::C

View Text Solution

63. Let $\vec{a} = 2i + j + k$, $\vec{b} = i + 2j - k$ and a unit vector $\vec{c}$ be coplanar. If $\vec{c}$ is pependicular to $\vec{a}$. Then $\vec{c}$ is

A. $\pm \frac{1}{\sqrt{2}}\Big)(-j+k)$

B. $\frac{1}{\sqrt{3}}(-i-j-k)$

C. $\frac{1}{\sqrt{5}}(i-2j)$

D. $\frac{1}{\sqrt{3}}(i-j-k)$

Answer: A

Watch Video Solution

64. IF $(\sec^2 A)\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + (\sec^2 B)\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + (\sec^2 C)\hat{k}$ are coplanar then $\cot^2 A + \cot^2 B + \cot^2 C$ is

A. 0

B. 1

C. 2

D. Not defined

Answer: D

Watch Video Solution

65. A unit vector coplanar with $i + j + 2k$ and $i + 2j + k$ and perpendicular to $i + j + k$ is.......

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

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

C. $\pm \frac{j - k}{\sqrt{2}}$

D. none

Answer: B

Watch Video Solution

66. The vector $r = a \times (b \times c)$ is

A. coplanar with a and b

B. coplanar with b and c

C. perpendicular to a

D. perpendicular to c

Answer: B::C

Watch Video Solution

67. Given, two vectors are $\hat{i} - \hat{j}$ and $\hat{i} + 2\hat{j}$, the unit vector coplanar with the two vectors and perpendicular to first is:

A. $\pm \frac{1}{\sqrt{2}}(i + j)$

B. $\frac{1}{\sqrt{2}}(i + k)$

C. $\frac{1}{\sqrt{5}}(2i + j)$

D. none

Answer: A

Watch Video Solution

68. The unit vector which is orthogonal to $a = 3i + 2j + 6k$ and coplanar with $b = 2i + j + k$ and $c = i - j + k$ is

A. $\dfrac{6i - 5k}{\sqrt{61}}$

B. $\dfrac{3j - k}{\sqrt{10}}$

C. $\dfrac{2i - 5j}{\sqrt{29}}$

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

Answer: B

Watch Video Solution

69. If $a = (-1, 1, 1)$ and $b = (2, 0, 1)$ then the vector r satisfying the conditions

(i) that it is coplanar with a and b

(ii) that it is perpendicular to b

(iii) that $a.\, r = 7$ is

A. $-3i + 4j + 6k$

B. $-\frac{3}{2}i + \frac{5}{2}j + 3k$

C. $3i + 16j - 6k$

D. none of these

Answer: B

Watch Video Solution

70. If a, b, c are three unit vectors such that $a \times (b \times c) = \frac{1}{2}b$ then the angles which a makes with b and c (b and c being non-parallel)

A. $30^\circ, 60^\circ$

B. $60^\circ, 90^\circ$

C. $90^\circ, 60^\circ$

D. none

Answer: C

Watch Video Solution

71. If $\vec{a}, \vec{b}\ and\ \vec{c}$ are non-coplanar unit vectors such that $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \frac{\vec{b} + \vec{c}}{\sqrt{2}}$, then the angle between $\vec{a}\ and\ \vec{b}$ is $3\pi/4$ b. $\pi/4$ c. $\pi/2$ d. π

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

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

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

D. π

Answer: A

Watch Video Solution

72. If a is perpendicular to b and c, then

A. $a \times (b \times c) = 1$

B. $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \vec{0}$

C. $a \times (b \times c) = -1$

D. none of these

Answer: B

Watch Video Solution

73. If a vector $\vec{a}$ is expressed as the sum of two vectors $\vec{\alpha}$ and $\vec{\beta}$ along and perpendicular to a given vector $\vec{b}$ then $\vec{\beta}$ is equal to

A. $\dfrac{(a \times b) \times b}{|b|^2}$

B. $\dfrac{b \times (a \times b)}{|b|^2}$

C. $\dfrac{b \times (a \times b)}{|b|}$

D. $\left(\dfrac{a.\,b}{|b|^2}\right)b$

Answer: B

Watch Video Solution

74. $u = a \times (b \times c) + b \times (c \times a) + c \times (a \times b)$, then

A. u is unit vector

B. $u = a + b + c$

C. $u = 0$

D. $u \neq 0$

Answer: C

Watch Video Solution

75. If $u = i \times (a \times i), \; + j \times (a \times j) + k \times (a \times k)$, then

A. u is unit vector

B. $u = a + i + j + k$

C. $u = 2a$

D. $u = 8(i + j + k)$

Answer: C

Watch Video Solution

76. If $a = i + j + k \text{ and } b = i - j$ then the vectors

$(a.\ i)i + (a.\ j)j + (a.\ k)k,$

$(b.\ i) + (b.\ j)j + (b.\ k)k, \text{ and } i + j - 2k$

A. are mutually perpendicular

B. are coplanar

C. form a parallelopiped of volume 6 units

D. form a parallelopiped of volume 3 units

Answer: A::C

Watch Video Solution

77. $[abi]i + [abj]j + [abk]k$ is a equal to

A. $a \times b$

B. $a + b$

C. $a - b$

D. $b \times a$

Answer: A

Watch Video Solution

78. The vector

$\hat{i} \times \left[(a \times b) \times \hat{i}\right] + \hat{j} \times \left[(a \times b) \times \hat{j}\right] + \hat{k} \times \left[(a \times b) \times \hat{k}\right]$ is equal

A. $2(a \times b)$

B. b

C. $(a. b)b$

D. 0

Answer: A

Watch Video Solution

79. If $a \times b = c, b \times c = a$ and a,b,c be moduli of the vector a, b,c respectively , then

A. $a = 1, b = c$

B. $c = 1, a = 1$

C. $b = 2, c = 2a$

D. $b = 1, c = a$

Answer: D

Watch Video Solution

80. Vector $(b \times c) \times (c \times a)$ is a vector

A. in the direction of a

B. along b

C. in the direction of c

D. none of the above

Answer: C

Watch Video Solution

81. If $(a \times b) \times c = a \times (b \times c)$, then

A. $b \times (c \times a) = 0$

B. $(c \times a) \times b = 0$

C. $c \times (a \times b) = 0$

D. none of these

Answer: A::B

Watch Video Solution

82. If $\left(\vec{a} \times \vec{b}\right) \times \vec{c} = \vec{a} \times \left(\vec{b} \times \vec{c}\right)$, where $\vec{a}$, $\vec{b}$ and $\vec{c}$ are any three vectors such that $\vec{a} . \vec{b} \neq 0$, $\vec{b} . \vec{c} \neq 0$, then $\vec{a}$ and $\vec{c}$ are:

A. inclined at an angle of $\pi/6$

B. perpendicular

C. parallel

D. inclined at an angle fo $\pi/3$

Answer: C

Watch Video Solution

83. $[a \quad b \quad a \times b]$ is equal to

A. a^2b^2

B. $(a.\ b)^2$

C. $(a \times b)^2$

D. $|a \times b|^2$

Answer: C::D

Watch Video Solution

84. $a \times [a \times (a \times b)]$ equals

A. $(a.\ a)(a \times b)$

B. $(a.\ a)(b \times a)$

C. $(b.\ b)(a \times b)$

D. $(b.\ b)(b \times a)$

Answer: B

Watch Video Solution

85. If the vectors $\vec{a}$ and $\vec{b}$ are mutually perpendicular, then $\vec{a} \times \left\{\vec{a} \times \left\{\vec{a} \times \left\{\vec{a} \times \vec{b}\right\}\right\}\right\}$ is equal to:

A. $|a|^2 b$

B. $|a|^3 b$

C. $|a|^4$ b

D. none of these

Answer: C

Watch Video Solution

86. If $|a| = 2 and |b| = 3$ and $a\dot{b} = 0, then(a \times (a \times (a \times (a \times b))))$ is equal to $48\hat{b}$ b. $-48\hat{b}$ c. $48\widehat{a}$ d. $-48\widehat{a}$

A. 16 a

B. 16b

C. $-16a$

D. $-16b$

Answer: B

Watch Video Solution

87. $[a \quad b \quad a \times b] + [a.\,b]^2 =$

A. $(a+b)^2$

B. $|a|^2|b|^2$

C. $|a|^2 + |b|^2$

D. 2

Answer: B

Watch Video Solution

88. If $a = 1, 2, 4, b = 2, \ -3, \ -1, c = 1, 4 - 4,$ then the vector $a \times (b \times c)$ is orthogonal to

A. a

B. b

C. c

D. $a + b + c$

Answer: A

Watch Video Solution

89. The magnitudes of vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are respectively 1, 1 and 2. If $\vec{a}\, x\left(\vec{a}\, x\, \vec{c}\right) + \vec{b} = \vec{0}$, then the acute angle between $\vec{a}\, \&\, \vec{c}$ is $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{4}$ (d) None of these

A. $\pi / 6$

B. $\pi / 4$

C. $\pi/3$

D. $\pi/2$

Answer: A

Watch Video Solution

90. For non-coplanar vectors a, b and c, $|(a \times b) \cdot c| = |a||b||c|$ holds if and only if

A. $a.\ b = 0,\ b.\ c = 0$

B. $b.\ c = 0,\ c.\ a = 0$

C. $c.\ a = 0,\ a.\ b = 0$

D. $a.\ b = b.\ c = c.\ a = 0$

Answer: C

Watch Video Solution

91. Let $\overrightarrow{a} = 2i + j + k$, and $b = i + j$ if c is a vector such that $\overrightarrow{a} . \overrightarrow{c} = \left|\overrightarrow{c}\right|, \left|\overrightarrow{c} - \overrightarrow{a}\right| = 2\sqrt{2}$ and the angle between $\overrightarrow{a} \times \overrightarrow{b}$ and $\overrightarrow{i} s30^\circ$, then $\left|\left(\overrightarrow{a} \times \overrightarrow{b}\right)\right| \times \overrightarrow{c}\Big|$ is equal to

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

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

C. 2

D. 3

Answer: B

Watch Video Solution

92. Let $a = 2i + j - 2k$ and $b = i + j$. If c is a vector such that $a. c = |c|, |c - a| = 2\sqrt{2}$ and the angle between $(a \times b)$ and c. is 30°, then $|(a \times b) \times c| =$

A. $i - j + k$

B. $2j - k$

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

D. 2i

Answer: C

Watch Video Solution

93. Let the unit vectors a and b be perpendicular and the unit vector c be inclined at an angle θ to both a and b. If $c = \alpha a + \beta b + \gamma(a \times b)$, then

A. $x \cos \alpha, y = \sin \alpha, z = \cos 2\alpha$

B. $x = \sin \alpha, y = \cos \alpha, z = -\cos 2\alpha$

C. $x = y = \cos \alpha, z^2 = \cos 2\alpha$

D. $x = y = \cos \alpha, z^2 = -\cos 2\alpha$

Answer: D

Watch Video Solution

94. The equation of the plane containing the line $\overrightarrow{r} = \overrightarrow{a} + k\overrightarrow{b}$ and perpendicular to the plane $\overrightarrow{r}. Vecn = q$ is :

A. $(r - b).\,(n \times a) = 0$

B. $(r - a).\,\{(n \times (a \times b)\} = 0$

C. $(r - a).\,(n \times b) = 0$

D. $(r - b).\,\{(n \times (a \times b)\} = 0$

Answer: C

Watch Video Solution

95. $(a \times b) \times (a \times c).\,d$ equals

A. $[abc][b.\,d]$

B. $[abc](a.\,d)$

C. $[abc](c.\,d)$

D. none of these

Answer: B

Watch Video Solution

96. If a,b,c and d be four vectors, then $(a \times b).\,(c \times d) + (b \times c).\,(a \times d) + (c \times a).\,(b \times d) =$

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

B. 0

C. $a.\,c + b.\,d$

D. none

Answer: B

Watch Video Solution

97. If the non-zero vectors a and b are perpendicular to each other, then the solution of the equation, $r \times a = b$ is given by

A. $r = xa + \frac{1}{a.\,a}(a \times b)$

B. $r = xb - \frac{1}{b.\,b}(a \times b)$

C. $r = xa \times b$

D. $r = xb \times a$

Answer: A

Watch Video Solution

98. Let $veda, \vec{b}, \vec{c}$ be three noncolanar vectors and $\vec{p}, \vec{q}, \vec{r}$ are vectors defined by the relations vecp= (vecbxxvecc)/([veca vecb vecc]), vecq= (veccxxvecca)/([veca vecb vecc]), vecr= (vecaxxvecb)/([veca vecb vecc])$thenthevalueofthe \exp ression$(veca+vecb).vecp+ (vecb+vecc).vecq+(vecc+veca).vecr`. is equal to (A) 0 (B) 1 (C) 2 (D) 3

A. 0

B. 1

C. 2

D. 3

Answer: D

Watch Video Solution

99. Let a,b,c be any threee non zero non-coplanar vectors, then any vector r is equal to where

$$x = \frac{\left[\vec{r} \quad \vec{b} \quad \vec{c}\right]}{\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]}, y = \frac{\left[\vec{r} \quad \vec{c} \quad \vec{a}\right]}{\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]}, z = \frac{\left[\vec{r} \quad \vec{a} \quad \vec{b}\right]}{\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]}$$

A. $za + xb + yc$

B. $xa + yb + zc$

C. $ya + zb + xc$

D. none of these

Answer: B

Watch Video Solution

100. If a,b,c and p,q,r are reciprocal systemm of vectors, then $a \times p + b \times q + c \times r$ is equal to

A. $[abc]$

B. $p + q + r$

C. 0

D. $a + b + c$

Answer: C

Watch Video Solution

101. If $a.\ (b \times c) = 3$ then

A. $c.\ (a \times b) = -3$

B. $a.\ (c \times b) = -3$

C. $b.\ (a \times c) = 3$

D. $(a \times c), b = 3$

Answer: B

Watch Video Solution

102. Let a,b,c be three non-coplanar vectors and r be any vector in space such that $r.\ a = 1, r.\ b = 2$ and $r.\ c = 3$. If [abc] = 1, then r is equal to :

A. $(b.\ c)a + 2(c.\ a)b + 3(a.\ b)c$

B. $(b \times c) + 2(c \times a) + 3(a \times b)$

C. $a + 2b + 3c$

D. none

Answer: B

Watch Video Solution

103. Unit vector $\vec{c}$ is inclined at an angle θ to unit vectors $\vec{a}$ and $\vec{b}$ which are perpendicular.

If $\vec{c} = \lambda\left(\vec{a} + \vec{b}\right) + \mu\left(\vec{a} \times \vec{b}\right)$, λ, μ real, then θ belongs to:

A. $\left[0, \frac{\pi}{2}\right]$

B. $\left[\frac{\pi}{2}, \pi\right]$

C. $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$

D. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

Answer: C

Watch Video Solution

104. If $\vec{u}, \vec{v}, \vec{w}$ are non -coplanar vectors and p, q, are real numbers then the equality

$\left[3\vec{u}\,p\vec{v}\,p\vec{w}\right] - \left[p\vec{v}\,\vec{w}\,q\vec{u}\right] - \left[2\vec{w} - q\vec{v}\,q\vec{u}\right] = 0$ holds for

A. all values of (p, q)

B. exactly one value of (p, q)

C. exactly two values of (p, q)

D. more than two but not all values of (p, q)

Answer: B

Watch Video Solution

Problem Set (3) (TRUE AND FALSE)

1. If p, q, r are distinct $+ive$ real numbers, then the vectors $a = p\hat{i} + q\hat{j} + r\hat{k}, b = q\hat{i} + r\hat{j} + p\hat{k}, c = r\hat{i} + p\hat{j} + q\hat{k}$ are coplanar.

View Text Solution

2. If l, m, n be three non-coplanar vectors, then

$$[lmn](a \times b) = \begin{vmatrix} l.\,a & l.\,b & l \\ m.\,a & m.\,b & m \\ n.\,a & n.\,b & n \end{vmatrix}$$

View Text Solution

3. The vector $r = a \times [a \times \{a \times a \times (a \times b)\}]$ where $|a| = 2, |b| = 5$,and a $\perp$ b forms an orthonormal system of vectors with a and b.

True or False?

Watch Video Solution

Problem Set (3) (FILL IN THE BLANKS)

1. If a,b,c are coplanar vectors, then

$(i)a + b \quad , \quad b + c \quad , \quad c + a$ are ....

$(ii)a \times b \quad , \quad b \times c \quad , \quad c \times a$ are ....

Watch Video Solution

2. IF the vectors a, b, c are non-coplanar, then $a \times b, b \times c$ and $c \times a$ are

....

Watch Video Solution

3. Three vectors $a = (12, 4, 3), b = (8, -12, -9), c = (33, -4, -24)$ define a parallelopiped.

(i) The lengths of its edges ....

(ii) Area of its faces ....

(iii) Its volume ....

View Text Solution

4. If $\begin{vmatrix} (x-a)^2 & (x-b)^2 & (x-c)^2 \\ (y-a)^2 & (y-b)^2 & (y-c)^2 \\ (z-a)^2 & (z-b)^2 & (z-c)^2 \end{vmatrix} = 0$and vectors

$X = (x^2, x, 1), Y = (y^2, y, 1), Z = (z^2, z, 1)$

are non-coplanar, the vectors

$A = (a^2, a, 1), B = (b^2, b, 1), C = (c^2, c, 1)$ are.......

View Text Solution

5. If $a \times (b \times c) + (a.\,b)b = (4 - 2\beta - \sin\alpha)b + (\beta^2 - 1)c$ and (c.c) a = c where b and c are non-collinear, then scalars $\alpha = ...\beta = ...$

View Text Solution

6. Let $\vec{r}, \vec{a}, \vec{b}$ and $\vec{c}$ be four non zero vectors such that $\vec{r}.\,\vec{a} = 0, \left|\vec{r} \times \vec{b}\right| = \left|\vec{r}\right|\left|\vec{b}\right|$ and $\left|\vec{r} \times \vec{c}\right| = \left|\vec{r}\right|\left|\vec{c}\right|$. Then [abc] is equal to

Watch Video Solution

7. If a,b, c and a', b', c' are reciprocal system of vectors then fill in the blanks in the following :

(i) $a \times a' + b \times b' + c \times c' =$ ....

(ii) $a' \times b' + b' \times c' + c' \times a' =$ ....

(iii) $a.\, a' + b.\, b' + c.\, c' =$ ....

$(iv) a'.\, (a + b) + b'.\, (b + c) + c'.\, (c + a) =$ ....

(v) $(a + b + c).\, (a' + b' + c') =$ ....

(vi) $[abc][a'b'c'] =$ ....

View Text Solution

8. The set of vectors reciprocal to the set $a = 2i + 3j - k,\ b = i - j - 2k,\ c = -i + 2j + 2k$ is ....

Watch Video Solution

Problem Set (4) (MULTIPLE CHOICE QUESTIONS)

1. The moment of the force $5i + 10j + 16k$ acting at the point P, $2i - 7j + 10k$ about the point O, $-5i + 6j - 10k$ is

A. $20i - 12j + 135k$

B. $-408i - 12j + 135k$

C. $20k$

D. none

Answer: B

Watch Video Solution

2. Find the vector moment of the forces :

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

acting on a particle at a point P (0, 1, 2) about the point $A(1, -2, 0)$.

A. $-2(4i - 2j - 5k)$

B. $4i + 5j + 6k)$

C. $7i + 2k$

D. none

Answer: A

Watch Video Solution

3. A particle acted by constant forces $4\hat{i} + \hat{j} - 3\hat{k} and 3\hat{i} + \hat{9} - \hat{k}$ is displaced from point $\hat{i} + 2\hat{j} + 3\hat{k}$ to point $5\hat{i} + 4\hat{j} + \hat{k}$. find the total work done by the forces in units.

A. 20 units

B. 30 units

C. 40 units

D. 50 units

Answer: C

Watch Video Solution

4. A force $F = 2i + j - k$ acts as a point A whose position vector is $2i - j$. IF point of application of F moves from the point A to the point B with P.V. $2i + j$, then the work done by F is

A. 4

B. 20

C. 2

D. none

Answer: C

Watch Video Solution

5. Constant forces $\overrightarrow{} = 2\hat{i} - 5\hat{j} + 6\hat{k}$ and $\overrightarrow{Q} = -\hat{i} + 2\hat{j} - \hat{k}$ act on a particle. Determine the work done when the particle is displaced form a point A with position vector $4\hat{i} - 3h * j + 2\hat{k}$ to point B with position vector $6\hat{i} + \hat{j} - 3\hat{k}$.

A. 15

B. 20

C. 10

D. 3

Answer: A

Watch Video Solution

6. Constant forces $P_1 = \hat{i} - \hat{j} + \hat{k}, P_2 = -\hat{i} + 2\hat{j} - \hat{i}k$ and $P_3 = \hat{j} - \hat{k}$ act on a particle at a point A . Determine the work done when particle is displaced from position $A\left(4\hat{i} - 3\hat{j} - 2\hat{k}\right)$ $\text{to} B\left(6\hat{i} + \hat{j} - 3\hat{k}\right)$

A. 3

B. 9

C. 20

D. None

Answer: B

Watch Video Solution

7. A particle is displaced from the point $A(5, -5, -7)$ to the point $B(6, 2, -2)$ under the action of forces $P_1 = 10i - j + 11k, P_2 = 4i + 5j + 6k, P_3 = -2i + j - 9k,$ then the work done is

A. 81

B. 85

C. 87

D. none

Answer: C

Watch Video Solution

8. A force of magnitude 6 units acting parallel to $2i - 2j + k$ displaces the point of application from $A(1, 2, 3)$ to $B(5, 3, 7)$. Then the work done is

A. 20

B. 30

C. 40

D. 50

Answer: A

Watch Video Solution

Self Assessment Test (MULTIPLE CHOICE QUESTIONS)

1. When two vectors are said to be equal vectors?

A. their magnitudes are same,

B. direction is same,

C. originate from the same point,

D. they have same magnitude and same sense of direction.

Answer: D

Watch Video Solution

2. Two vectors a and b are parallel and have equal magnitudes. Then

A. they are equal,

B. they are not equal,

C. they may or may not be equal,

D. they have same sense of direction,

Answer: C

Watch Video Solution

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

A. $m = \pm 1$

B. $a = |m|$

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

D. $m = \frac{1}{|\bar{a}|}$

Answer: D

Watch Video Solution

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

A. $\theta = \pi/3$

B. $\theta = \pi/4$

C. $\theta = \pi/2$

D. $\theta = 2\pi / 3$

Answer: D

Watch Video Solution

5. The position vector of A and B are a and b respectively, then the position vector of a point P which divides AB in the ratio $1:2$ is

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

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

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

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

Answer: B

Watch Video Solution

6. 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: C

Watch Video Solution

7. θ is the angle between two vectors a and b then $a.b \leq 0$ only if

A. $0 \leq \theta \leq \pi$

B. $\pi/2 \leq \theta \leq \pi$

C. $0 \leq \theta \leq \pi/2$

D. $0 < \theta < \pi/2$

Answer: B

Watch Video Solution

8. If a be a non-zero vector, then which of the following is correct ?

A. $a. a = 0$

B. $a. a > 0$

C. $a. a \geq 0$

D. $a. a \leq 0$

Answer: B

Watch Video Solution

9. a and b are two non-zero vectors, then $(a + b). (a - b)$ is equal to

A. $a + b$

B. $(a-b)^2$

C. $(a+b)^2$

D. a^2-b^2

Answer: D

Watch Video Solution

10. $a.b=0$ implies only

A. $a=0$

B. $b=0$

C. $\theta=90^\circ$

D. either a = 0 or b = 0 or $\theta=90^\circ$

Answer: D

Watch Video Solution

11. If a, b, c be three non-zero vectors, then the equation a. b = a. c implies

A. b =c

B. a is orthogonal to both b and c

C. a is orthogonal to b -c

D. Either a is orthogonal to both b and c or a is orthogonal to $b - c$

Answer: A::C

Watch Video Solution

12. If a and b include an angle of 120° and their magnitudes are 2 and $\sqrt{3}$ then a.b is equal to

A. 3

B. $-\sqrt{3}$

C. $\sqrt{3}$

D. -3

Answer: B

Watch Video Solution

13. If [I, j, k] be a set of orthogonal unit vectors, then fill up the blanks :

(i) $i.\ i+j.\ j+k.\ k=\ldots\ldots\ldots$

(ii) $i.\ j+j.\ k+k.\ i.\ =\ldots\ldots\ldots$

(iii) $i.\ i=j.\ j=k.\ k=$ ....

(iv) $i.\ j=j.\ k=k.\ i.\ =$ ....

A. $i.\ i+j.\ j+k.\ k=$ ....

B. $i.\ j+j.\ k+k.\ i=$ ....

C. $i.\ i=j.\ j=k.\ k=$ ......

D. $i.\ j=j.\ k=k.\ i=$ ....

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

Watch Video Solution

14. If θ be the angle between the vectors $4(i-k)$ and $i+j+k$, then θ is

A. $\pi/4$

B. $\pi/3$

C. $\pi/2$

D. $\cos^{-1}(1/\sqrt{3})$

Answer: C

Watch Video Solution

15. If θ be the angle between the vectors $i+j$ and $j+k$, then θ is

A. 0

B. $\pi/4$

C. $\pi/2$

D. $\pi/3$

Answer: D

Watch Video Solution

16. The angle between the vectors $2i + 3j + k \text{ and } 2i - j - k$ is

A. $\pi / 2$

B. $\pi / 4$

C. $\pi / 3$

D. 0

Answer: A

Watch Video Solution

17. If a and b are two unit vectors, then $a \times b$ is a unit vector if ....

Watch Video Solution

18. If $[i, j, k]$ be orthogonal set of unit vectors, then fill in the blanks.

(a) $i \times j = \dots\dots$

(b) $j \times i =$ ....

(c) $i \times (j \times k) =$ ....

(d) $i \times (j \times k) + j \times (k \times i) + k \times (i \times j)$........

(e) $i.\,(j \times k) + j.\,(k \times i) + k.\,(i \times j)$........

View Text Solution

19. [abc] is the scalar triple product of three vectors a, b and c then [abc] is equal to

A. [bac]

B. [cba]

C. [bca]

D. [acb]

Answer: C

View Text Solution

20. If θ is the angle between vectors a and b, then $|a \times b| = |a. b|$, then θ is equal to

A. 0

B. 180°

C. 135°

D. 45°

Answer: D

Watch Video Solution

21. $a \times (b \times c)$ is equal to

A. $(a. b)c - (a. c)b$

B. $(a. b)a + (a. b)c$

C. $(b. c)a - (b. c)b$

D. $(a. c)b - (a. b)c$

Answer: D

Watch Video Solution

22. $u = a \times (b \times c) + b \times (c \times a) + c \times (a \times b)$ then

A. u is unit vector

B. $u = a + b + c$

C. u = 0

D. $u \neq 0$

Answer: C

Watch Video Solution

23. If $a = 4i + 2j - 5k$, $b = -12i - 6j + 15k$, then the vectors a, b are

A. perpendicular

B. parallel,

C. non-coplanar

D. none of these.

Answer: B

Watch Video Solution

24. If the position vector of three points are a - 2b + 3c, 2a + 3b - 4c, - 7b + 10 c, then the three points are

A. collinear

B. coplanar

C. non-collinear

D. neither.

Answer: A

Watch Video Solution

25. If $a + b + c = 0, |a| = 3, |b| = 5, |c| = 7$, then the angle between a and b is

A. $\pi / 6$

B. $2\pi / 3$

C. $5\pi / 3$

D. $\pi / 3$

Answer: D

Watch Video Solution

26. If the vectors a,b,c satisfy the condition $a + b + c = 0,$ the value of $a.\ b + b.\ c + c.\ a$ if $|a| = 1, |b| = 3$ and $|c| = 4$ is

A. 11

B. -13

C. 15

D. 12

Answer: B

Watch Video Solution

27. If $\vec{a}, \vec{b}, \vec{c}$ are any three coplanar unit vectors , then :

A. $a.(b \times c) = 1$

B. $a.(b \times c) = 3$

C. $(a \times b).c = 0$

D. $(c \times a).b = 1$

Answer: C

Watch Video Solution

28. If $a.\, b = a.\, c$ and $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}$, then

A. a is perpendicular to $b - c$

B. a is parallel to $b - c$

C. either $a = 0$ or $b = c$,

D. none of these

Answer: C

Watch Video Solution

29. The vector $2i + j - k$ is perpendicular to $i - 4j + \lambda k$ if λ is equal to

A. 0

B. -1

C. -2

D. -3

Answer: C

Watch Video Solution

30. The vector $2i + 3j - 4k$ and $ai + bj + ck$ are perpendicular if

A. $a = 2, b = 3, c = -4$

B. $a = 4, b = 4, c = 5$

C. $a = 4, b = 4, c = -5$

D. none of these

Answer: B

Watch Video Solution

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

A. $3a - b$

B. $3b - a$

C. $3a - 2b$

D. $3b - 2a$

Answer: D

Watch Video Solution

32. a and b are the position vectors of the points A and B with respect to an origin O. A point C on OA is such that $2AC = CO, CD$ is parallel to OB and $\left|\overrightarrow{C}D\right| = 3\left|\overrightarrow{O}B\right|$, then the vector $\overrightarrow{A}D$ is ....

Watch Video Solution

33. If $A = 2i + 2j - k, B = 6i - 3j + 2k,$ then $A \times B$ will be given by

A. $2i - 2j - k$

B. $6i - 3j + 2k$

C. $i - 10j - 18k$

D. $i + j + k$

Answer: C

Watch Video Solution

34. The number of vectors of unit length perpendicular to vectors $\vec{a} = (1, 1, 0) and \vec{b} = (0, 1, 1)$ is a. one b. two c. three d. infinite

A. one

B. two

C. three

D. infinite

Answer: B

Watch Video Solution

35. A vector a has components 2p and 1 with respect to a rectangular cartesian system. This system is rotated through a certain angle about the origin in the counter-clockwise sense. If with respect to new system, a has components $p+1$ and 1, then

A. $p=0$

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

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

D. $p=1 \text{ or } p=-1$

Answer: B

Watch Video Solution

36. If $\left|\vec{\alpha}+\vec{\beta}\right|=\left|\vec{\alpha}-\vec{\beta}\right|$, then

A. α is parallel to $\vec{\beta}$

B. α is perpendicular to $\vec{\beta}$

C. $\left|\vec{\alpha}\right|=\left|\vec{\beta}\right|$

D. none of these

Answer: B

Watch Video Solution

37. If $\vec{a}$ and $\vec{b}$ are two vectors such that $\vec{a}.\vec{b}=0$ and $\vec{a}\times\vec{b}=\vec{0}$, then

A. $\vec{a}$ is parallel to $\vec{b}$

B. $\vec{a}$ is perpendicular to $\vec{b}$

C. either $\vec{a}$ or $\vec{b}$ is a null vector

D. none of these

Answer: C

Watch Video Solution

38. Let $\vec{a}, \vec{b}, \vec{c}$ be three non-coplanar vectors and $\vec{p}, \vec{q}, \vec{r}$ be the vectors defined by the relations.

$$\vec{p} = \frac{\vec{b} \times \vec{c}}{\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]}, \vec{q} = \frac{\vec{c} \times \vec{a}}{\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]}, \vec{r} = \frac{\vec{c} \times \vec{a}}{\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]}$$

Then the value of the expression

$\left(\vec{a} + \vec{b}\right). \vec{p} + \left(\vec{b} + \vec{c}\right). \vec{q} + \left(\vec{c} + \vec{a}\right). \vec{r}$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: D

Watch Video Solution

39. The components of a vector $\overrightarrow{a}$ along and perpendicular to a non-zero vector $\overrightarrow{b}$ are _______ and _________, respectively.

Watch Video Solution

40. For any three vectors a, b, c

$(a - b).\{(b - c) \times (c - a)\} = 2a.(b \times c).$

(a) True

(b) False.

Watch Video Solution

41. If $a = 4i + 6j$ and $b = 3j + 4k$, then the vector form of component of a along b is

A. $\frac{18}{10\sqrt{(3)}}(3j + 4k)$

B. $\frac{18}{25}(3j + 4k)$

C. $\frac{18}{\sqrt{(3)}}(3j+4k)$

D. $3j+4k$

Answer: B

Watch Video Solution

42. A unit vector perpendicular to the vector

$4i-j+3k$ and $-2i+j-2k$ is

A. $\frac{1}{3}(i-2j+2k)$

B. $\frac{1}{3}(-i+2j+2k)$

C. $\frac{1}{3}(2i+j+2k)$

D. $\frac{1}{3}(2i-2j+2k)$

Answer: B

Watch Video Solution

43. The unit vector perpendicular to the two vectors i-j and i+2j, and perpendicular to the first, is

Watch Video Solution

44. If $u = i \times (a \times i), + j \times (a \times j) + k \times (a \times k)$, then

A. u is a unit vector

B. $u = a + i + j + k$

C. $u = 2a$

D. $u = 8(i + j + k)$

Answer: C

Watch Video Solution

45. The volume of a parallelopiped whose sides are given by $\vec{O}A = 2i - 3j, \vec{O}B = i + j - k, \vec{O}C = 3i - k$ is

A. $4/13$

B. 4

C. $2/7$

D. none of these

Answer: B

Watch Video Solution

46. If $\alpha = 2i + 3j - k, \beta = -i + 2j - 4k, \gamma = i + j + k$ then the value of $(\alpha \times \beta).(\alpha \times \gamma)$ is equal to

A. 60

B. 64

C. 74

D. -74

Answer: D

Watch Video Solution

47. Let $\overrightarrow{a} = 2\hat{i} - \hat{j} + \hat{k}, \overrightarrow{b} = \hat{i} + 2\hat{j} = \hat{k} and \overrightarrow{c} = \hat{i} + \hat{j} - 2\hat{k}$ be three vectors. A vector in the plane of $\overrightarrow{b} and \overrightarrow{c}$, whose projection on $\overrightarrow{a}$ is of magnitude $\sqrt{2/3}$, is $2\hat{i} + 3\hat{j} - 3\hat{k}$ b. $2\hat{i} - 3\hat{j} + 3\hat{k}$ c. $-2\hat{i} - \hat{j} + 5\hat{k}$ d. $2\hat{i} + \hat{j} + 5\hat{k}$

A. $2i + 3j - 3k$

B. $2i + 3j + 3k$

C. $-2i - j + 5k$

D. $2i + j + 5k$

Answer: A::C

Watch Video Solution

48. If the vectors $\overrightarrow{c}, \overrightarrow{a} = x\hat{i} + y\hat{j} + z\hat{k} and \overrightarrow{b} = \hat{j}$ are such that $\overrightarrow{a}, \overrightarrow{c} and \overrightarrow{b}$ form a right-handed system, then find $\overrightarrow{\cdot}$

A. $zi - xk$

B. 0

C. yj

D. $-zi + xk$

Answer: A

Watch Video Solution

49. If $\vec{a}$ lies in the plane of vectors $\vec{b}$ and $\vec{c}$, then which of the following is correct?

A. $a.\ (b \times c) = 0$

B. $a.\ b \times c = 1$

C. $a.\ b \times c = -1$

D. $a.\ b \times c = 3$

Answer: A

Watch Video Solution

50. If $a \times b = c, b \times c = a$ and a, b,c be moduli of the vectors a, b,c respectively, then

A. $a = 1, b = c$

B. $c = 1, a = 1$

C. $b = 2, c = 2a$

D. $b = 1, c = a$

Answer: D

Watch Video Solution

51. Let $a - i + j$ and $b = 2i - k$.The point of intersection of the lines $r \times a = b \times a$ and $r \times b = a \times b$ is

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

B. $(3, -1, 1)$

C. $(3, 1, -1)$

D. $(1, -1, -1)$

Answer: C

Watch Video Solution

52. Let a,b, c be three non-coplanar vectors and r be any vector in space such that $r.\ a = 1, r.\ b = 2$ and $r.\ c = 3$ If $[abc] = 1$, then r is equal to :

A. $(b.\ c)a + 2(c.\ a)b + 3(a.\ b)c$

B. $(b \times c) + 2(c \times a) + 3(a \times b)$

C. $a + 2b + 3c$

D. none

Answer: B

View Text Solution

53. Let a, b, c be unit vectors such that $a + b + c = 0$ which one of the following is correct ?

A. $a \times b = b \times c = c \times a = 0$

B. $a \times b = b \times c = c \times a \neq 0$

C. $a \times b = b \times c = a \times c = 0$

D. $a \times b, b \times c, c \times a$ are mutually perpendicular

Answer: B

Watch Video Solution

54. Unit vector $\overrightarrow{c}$ is inclined at an angle θ to unit vectors $\overrightarrow{a}$ and $\overrightarrow{b}$ which are perpendicular.

If $\overrightarrow{c} = \lambda\left(\overrightarrow{a} + \overrightarrow{b}\right) + \mu\left(\overrightarrow{a} \times \overrightarrow{b}\right)$, λ, μ real, then θ belongs to:

A. $\left[0, \frac{\pi}{2}\right]$

B. $\left[\frac{\pi}{2}, \pi\right]$

C. $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$

D. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

Answer: C

Watch Video Solution

55. If $\widehat{a}, \hat{b}, \hat{c}$ and $\hat{d}$ are unit vectors such that $\left(\widehat{a} \times \hat{b}\right).\left(\hat{c} \times \hat{d}\right) = 1$ and $\widehat{a}.\hat{c} = 1/2$ then

A. $\widehat{a}, \hat{b}, \hat{c}$ are non-coplanar

B. $\hat{b}, \hat{c}, \hat{d}$ are non-coplanar

C. $\hat{b}, \hat{d}$ are non-parallel

D. $\widehat{a}, \hat{d}$ are parallel and $\hat{b}, \hat{c}$ are parallel

Answer: C

View Text Solution

56. If $\vec{u}, \vec{v}, \vec{w}$ are non -coplanar vectors and $p, q,$ are real numbers then the equality

$\left[3\vec{u}\,p\vec{v}\,p\vec{w}\right] - \left[p\vec{v}\,\vec{w}\,q\vec{u}\right] - \left[2\vec{w} - q\vec{v}\,q\vec{u}\right] = 0$ holds for

A. all values of (p, q)

B. exactly one value of (p, q)

C. exactly two values of (p, q)

D. more than two but not all values of (p, q)

Answer: B

Watch Video Solution

57. Let ABCD be a parallelogram such that $\vec{A}B = \vec{q}, \vec{A}D = \vec{p}\, and \angle BAD$ be an acute angle. If $\vec{r}$ is the vector that coincides with the altitude directed from the vertex B to the side AD, then $\vec{r}$ is given by (1) $\vec{r} = 3\vec{q} - \frac{3\left(\vec{p}\cdot\vec{q}\right)}{\left(\vec{p}\cdot\vec{p}\right)}\vec{p}$ (2)

$\vec{r} = -\vec{q} + \left(\frac{\vec{p}\cdot\vec{q}}{\vec{p}\cdot\vec{p}}\right)\vec{p}$ (3) $\vec{r} = \vec{q} + \left(\frac{\vec{p}\cdot\vec{q}}{\vec{p}\cdot\vec{p}}\right)\vec{p}$ (4)

$\vec{r} = -3\vec{q} + \frac{3\left(\vec{p}\cdot\vec{q}\right)}{\left(\vec{p}\cdot\vec{p}\right)}\vec{p}$

A. $r = 3q - \frac{3(p.\,q)}{(p.\,p)}p$

B. $r = -q + \left(\frac{(p.\,q)}{(p.\,p)}\right)p$

C. $r = q - \left(\frac{(p.\,q)}{(p.\,p)}\right)p$

D. $r = -3q + \frac{3(p.\,q)}{(p.\,p)}p$

Answer: B

Watch Video Solution

58. Two vectors a and b are not perpendicular and c and d are two vectors satifying $b \times c = b \times d$ and $a.\,d = 0$ Then vector d is equal to

A. $b-\left(\frac{b.c}{a.b}\right)c$

B. $c+\left(\frac{a.c}{a.b}\right)b$

C. $b+\left(\frac{b.c}{a.b}\right)c$

D. $c-\left(\frac{a.c}{a.b}\right)b$

Answer: D

Watch Video Solution

59. IF a and b are vectors such that $|a+b|=\sqrt{29}$ and $a\times(2i+3j+4k)=(2i+3j+4k)\times b$, then a possible value of $[a+b].(-7i+2j+3k)$ is

Watch Video Solution

60. If the vectors $a=i-j+2k, b=2i+4j+k$ and $c=\lambda i+j+\mu k$ are mutually orthogonal, then $(\lambda, \mu)=$

A. $(-3, 2)$

B. $(2, -3)$

C. $(-2, 3)$

D. $(3, -2)$

Answer: A

Watch Video Solution

61. Let P, Q, R and S be the points on the plane with position vectors $-2i - j, 4i, 3i + 3jand - 3j + 2j,$ respectively. The quadrilateral $PQRS$ must be a Parallelogram, which is neither a rhombus nor a rectangle Square Rectangle, but not a square Rhombus, but not a square

A. Parallelogram, which is neither a rhombus nor a rectangle

B. square

C. rectangle but not a square

D. rhombus, but not a square

Answer: A

Watch Video Solution

62. If $a = \frac{1}{\sqrt{10}}(3i + k)$ and $b = \frac{1}{7}(2i + 3j - 6k)$, then the value of $(2a - b).\,[(a \times b) \times (a + 2b)]$ is

A. -5

B. -3

C. 5

D. 3

Answer: B

Watch Video Solution

63. Two adjacent sides of a parallelogram ABCD are given by $\overrightarrow{AB} = 2\hat{i} + 10\hat{j} + 11\hat{k}$ and $\overrightarrow{AD} = -\hat{i} + 2\hat{j} + 2\hat{k}$. The side AD is rotated by an acute angle α in the plane of the parallelogram so that AD becomes AD'. If AD' make a right angle withe the side AB then the cosine of the angle α is given by

A. $\frac{8}{9}$

B. $\frac{\sqrt{17}}{9}$

C. $\frac{1}{9}$

D. $\frac{4\sqrt{5}}{9}$

Answer: B

Watch Video Solution

64. The vector(s) which is/are coplanar with vectors $\hat{i}+\hat{j}+2\hat{k}$ and $\hat{i}+2\hat{j}+\hat{k}$ are perpendicular to the vector $\hat{i}+\hat{j}+\hat{k}$ is are

A. $j-k$

B. $-i+j$

C. $i - j$

D. $-j + k$

Answer: A::D

Watch Video Solution

65. If the straight lines $\frac{x-1}{2} = \frac{y+1}{k} = \frac{z}{2}$ and $\frac{z+1}{5} = \frac{y+1}{2} = \frac{z}{k}$ are coplanar, then the plane(s) containing these two lines is/are

A. $y = 2z = -1$

B. $y + z = -1$

C. $y - z = -1$

D. $y - 2z = -1$

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

Watch Video Solution

66. If a, b and c are unit vectors satisfying $|a-b|^2+|b-c|^2+|c-a|^2=9$, then $|2a+5b+5x|$ is

A. 3

B. 4

C. 5

D. 6

Answer: A

Watch Video Solution

67. Let $\vec{a}=-\hat{i}-\hat{k}, \vec{b}=-\hat{i}+\hat{j} and \vec{c}=\hat{i}+2\hat{j}+3\hat{k}$ be three given vectors. If $\vec{r}$ is a vector such that $\vec{r}\times\vec{b}=\vec{c}\times\vec{c} and \vec{r}\dot{\vec{a}}=0,$ then find the value of $\vec{r}\dot{\vec{b}}\cdot$

A. 9

B. 6

C. 3

D. 0

Answer: A

Watch Video Solution

68. If a and b are vectors in space given by $a = \frac{\hat{i} - 2\hat{j}}{\sqrt{5}}$ and $b = \frac{2\hat{i} + \hat{j} + 3\hat{k}}{\sqrt{14}}$, then the value of $(2a + b) \cdot [(a \times b) \times (a - 2b)]$ is

A. 5

B. 6

C. 3

D. 0

Answer: A

Watch Video Solution

69. The vectors $\overrightarrow{A}B = 3i + 4k$ and $\overrightarrow{A}C = 5i - 2j + 4k$ are the sides of a triangle ABC. The length of the median through A is :

A. $\sqrt{18}$

B. $\sqrt{72}$

C. $\sqrt{33}$

D. $\sqrt{45}$

Answer: C

Watch Video Solution

Self Assessment Test (Assertion/Reason)

1. Let the vectors $\overrightarrow{PQ}, \overrightarrow{QR}, \overrightarrow{RS}, \overrightarrow{ST}, \overrightarrow{TU}$ and $\overrightarrow{UP}$ represent the sides of a regular hexagon.

Statement I:$\overrightarrow{PQ} \times \left(\overrightarrow{RS} + \overrightarrow{ST}\right) \neq \overrightarrow{0}$

Statement II: $\overrightarrow{PQ} \times \overrightarrow{RS} = \overrightarrow{0}$ and $\overrightarrow{PQ} \times \overrightarrow{RS} = \overrightarrow{0}$ and $\overrightarrow{PQ} \times \overrightarrow{ST} \neq \overrightarrow{0}$

For the following question, choose the correct answer from the codes (A), (B) , (C) and (D) defined as follows:

Watch Video Solution

Self Assessment Test (Comprehension)

1. $a.\ b = 0 \Rightarrow$ Vectors a and b are orthogonal

(b)IF ABCD be a cyclic quadrilateral, then $A + C = \frac{\pi}{2}$ and $B + D = \frac{\pi}{2}$

(c)$[abc] = a.\ (b \times c)$.

If $u = q - r, r - p, p - q$ and $v = \frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ and a,b,c are T_p, T_q, T_r of an HP, then the angle between the vectors u and v is .....

View Text Solution

2. $a.\ b=0 \Rightarrow$ Vectors a and b are orthogonal

(b)IF ABCD be a cyclic quadrilateral, then $A+C=\frac{\pi}{2}$ and $B+D=\frac{\pi}{2}$

(c)$[abc]=a.\ (b \times c)$.

If $u=q-r, r-p, p-q$ and $v=\log a^2, \log b^2, \log c^2$ and a, b, c are T_p, T_q, T_s of a G.P. then angle between vectors u and v is ...

View Text Solution

3. If a, b,c ,d be the position vectors of the vertices of a cyclic quadrilateral ABCD, then show that

$$\frac{|a \times b+b \times d+d \times a|}{(b-a).\ (d-a)}+\frac{(b-a) \times (d-a)}{(b-a).\ (d-a)}=0$$

View Text Solution