# MATHS

## BOOKS - OBJECTIVE RD SHARMA ENGLISH

## SCALAR AND VECTOR PRODUCTS OF THREE VECTORS

### Illustration

1. 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. $\left[\vec{b}\quad\vec{a}\quad\vec{c}\right]$

B. $\left[\vec{a}\,\vec{c}\,\vec{b}\right]$

C. $\left[\vec{c}\,\vec{b}\,\vec{a}\right]$

D. $\left[\vec{b}\,\vec{c}\,\vec{a}\right]$

**Answer: D**

Watch Video Solution

**2.** If $\left[\vec{a}\vec{b}\vec{c}\right]=1$ then value of $\frac{\vec{a}.\vec{b}\times\vec{c}}{\vec{c}\times\vec{a}.\vec{b}}+\frac{\vec{b}.\vec{c}\times\vec{a}}{\vec{a}\times\vec{b}.\vec{c}}+\frac{\vec{c}.\vec{a}\times\vec{b}}{\vec{b}\times\vec{c}.\vec{a}}$ is

A. $3$

B. $1$

C. $-1$

D. None of these

**Answer: A**

Watch Video Solution

**3.** If $\vec{u}, \vec{v}, \vec{w}$ are three vectors such that $\left[\vec{u}\ \vec{v}\ \vec{w}\right] = 1$, then

$3\left[\vec{u}\ \vec{v}\ \vec{w}\right] - \left[\vec{v}\ \vec{w}\ \vec{u}\right] - 2\left[\vec{w}\ \vec{v}\ \vec{u}\right] =$

A. 0

B. 2

C. 3

D. 4

**Answer: D**

Watch Video Solution

**4.** If $\vec{r} = x\left(\vec{a} \times \vec{b}\right) + y\left(\vec{b} \times \vec{c}\right) + z\left(\vec{c} \times \vec{a}\right)$

Such that $x + y + z \neq 0$ and $\vec{r}.\left(\vec{a} + \vec{b} + \vec{c}\right) = x + y + z$, then

$\left[\vec{a}\ \vec{b}\ \vec{c}\right] =$

A. 0

B. 1

C. $-1$

D. 2

**Answer: B**

Watch Video Solution

**5.** If $\vec{\alpha} = x(\vec{a} \times \vec{b}) + y(\vec{b} \times \vec{c}) + z(\vec{c} \times \vec{a})$ and $[\vec{a}\,\vec{b}\,\vec{c}] = \frac{1}{8}$, then $x + y + z =$

A. $8\vec{\alpha}.(\vec{a} + \vec{b} + \vec{c})$

B. $\vec{\alpha}.(\vec{a} + \vec{b} + \vec{c})$

C. $8(\vec{a} + \vec{b} + \vec{c})$

D. None of these

**Answer: A**

Watch Video Solution

**6.** If $\overrightarrow{a} = 2\hat{i} + 3\hat{j} + \hat{k}$, $\overrightarrow{b} = \hat{i} - 2\hat{j} + \hat{k}$ and $\overrightarrow{c} = -3\hat{i} + \hat{j} + 2\hat{k}$, then $\left[\overrightarrow{a}\overrightarrow{b}\overrightarrow{c}\right] =$

A. 30

B. -30

C. 15

D. -15

**Answer: B**

Watch Video Solution

**7.** Let $\overrightarrow{a} = \hat{i} - \hat{k}$, $\overrightarrow{b} = x\hat{i} + \hat{j} + (1 - x)\hat{k}$ and $\overrightarrow{c} = y\hat{i} + x\hat{j} + (1 + x - y)\hat{k}$, then $\left[\overrightarrow{a}\overrightarrow{b}\overrightarrow{c}\right]$ depends on

A. neither $x$ nor $y$

B. both $x$ and $y$

C. only $x$

D. only $y$

**Answer: A**

Watch Video Solution

**8.** Volume of the parallelopiped with its edges represented by the vectors $\hat{i}+\hat{j}, \hat{i}+2\hat{j}$ and $\hat{i}+\hat{j}+\pi\hat{k}$, is

A. $\pi$

B. $\pi/2$

C. $\pi/3$

D. $\pi/4$

**Answer: A**

Watch Video Solution

**9.** Let $\overrightarrow{PR} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\overrightarrow{SQ} = \hat{i} - 3\hat{j} - 4\hat{k}$ determine diagonals of a parallelogram PQRS. And $\overrightarrow{PT} = \hat{i} + 2\hat{j} + 3\hat{k}$ be onther vector. Then the volume of the parallelepiped determined by the vectors $\overrightarrow{PT}, \overrightarrow{PQ}$ and $\overrightarrow{PS}$ is

A. $5$

B. $20$

C. $10$

D. $30$

**Answer: A**

Watch Video Solution

**10.** If $\vec{a}, \vec{b}, \vec{c}$ are non coplanar vectors and $\lambda$ is a real number, then the vectors $\vec{a} + 2\vec{b} + 3\vec{c}, \lambda\vec{b} + 4\vec{c}$ and $(2\lambda - 1)\vec{c}$ are non coplanar for

A. no value of $\lambda$

B. all except one value of $\lambda$

C. all except two values of $\lambda$

D. all values of $\lambda$

**Answer: C**

Watch Video Solution

11. The points with position vectors $\alpha\hat{i}+\hat{j}+\hat{k}, \hat{i}-\hat{j}-\hat{k}, \hat{i}+2\hat{j}-\hat{k}, \hat{i}+\hat{j}+\beta\hat{k}$ are coplanar if

A. $(1-\alpha)(1+\beta)=0$

B. $(1-\alpha)(1-\beta)=0$

C. $(1+\alpha)(1+\beta)=0$

D. $(1+\alpha)(1-\beta)=0$

**Answer: A**

Watch Video Solution

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

A. 0

B. 1

C. 1

D. 3

**Answer: B**

Watch Video Solution

**13.** Let $\overrightarrow{a}=\hat{i}+\hat{j}+\hat{k}$, $\overrightarrow{b}=\hat{i}-\hat{j}+2\hat{k}$ and $\overrightarrow{c}=x\hat{i}+(x-2)\hat{j}-\hat{k}$. If the vector $\overrightarrow{c}$ lies in the plane of $\overrightarrow{a}$ and $\overrightarrow{b}$, then x is equal to:

A. $-4$

B. $-2$

C. $0$

D. $1$

**Answer: B**

Watch Video Solution

**14.** If u, v and w are non-coplanar vectors and p, q are real numbers, then the equality [3u pv pw]-[pv w qu]-[2w qv pu]=0 holds for

A. exactly one value of $(p, q)$

B. exactly two values of $(p, q)$

C. more than two but not all values of $(p, q)$

D. all values of $(p, q)$

**Answer: A**

Watch Video Solution

**15.** The value of $\vec{a} \cdot \left(\vec{b} + \vec{c}\right) \times \left(\vec{a} + \vec{b} + \vec{c}\right)$, is

A. $2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

B. $\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

C. 0

D. None of these

**Answer: C**

Watch Video Solution

**16.** The vectors

$\vec{a} = x\hat{i} + (x+1)\hat{j} + (x+2)\hat{k}$,

$\vec{b} = (x+3)\hat{i} + (x+4)\hat{j} + (x+5)\hat{k}$

and $\vec{c} = (x+6)\hat{i} + (x+7)\hat{j} + (x+8)\hat{k}$ are coplanar for

A. all values of $x$

B. $x < 0$ only

C. $x > 0$ only

D. None of these

**Answer: A**

Watch Video Solution

**17.** If a,b and c are non-coplanar vectors and $\lambda$ is a real number, then $\left[\lambda(a+b)\middle|\lambda^2 b\middle|\lambda c \mid \lambda c\right] = [a \quad a+c \quad b]$ fforr

A. exactly two values of $\lambda$

B. exactly two values of $\lambda$

C. no value of $\lambda$

D. exacty one value of $\lambda$

**Answer: C**

Watch Video Solution

**18.** The number of real values of a for which the vectors $\hat{i} + 2\hat{j} + \hat{k}, a\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} + 2\hat{j} + a\hat{k}$ are coplanar is

A. 1

B. 2

C. 3

D. 0

**Answer:**

Watch Video Solution

**19.** The number of distinct real values of $\lambda$, for which the vectors $-\lambda^2\hat{i} + \hat{j} + \hat{k}, \hat{i} - \lambda^2\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} - \lambda^2\hat{k}$ are coplanar, is

A. 0

B. 1

C. 2

D. 3

**Answer: C**

Watch Video Solution

**20.** If $\overrightarrow{a}$, $\overrightarrow{b}$ and $\overrightarrow{c}$ are unit coplanar vectors, then

$$\left[2\overrightarrow{a}-3\overrightarrow{b}\quad 7\overrightarrow{b}-9\overrightarrow{c}\quad 12\overrightarrow{c}-23\overrightarrow{a}\right]$$

A. 0

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

C. $24$

D. $32$

**Answer: A**

Watch Video Solution

**21.** If the vectors $\vec{a}, \vec{b}, \vec{c}$ are non -coplanar and $l, m, n$ are distinct scalars such that

$\left[l\vec{a}+m\vec{b}+n\vec{c} \quad l\vec{b}+m\vec{c}+n\vec{a} \quad l\vec{c}+m\vec{a}+n\vec{b}\right]=0$ then

A. $lm+mn+nl=0$

B. $l+m+n=0$

C. $l^2+m^2+n^2=0$

D. $l^3+m^3+n^3=0$

**Answer: B**

Watch Video Solution

**22.** For any three vectors $\vec{a}, \vec{b}, \vec{c}$ the value of $\left[\vec{a}+\vec{b} \quad \vec{b}+\vec{c} \quad \vec{c}+\vec{a}\right]$ is

A. $0$

B. $2\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

C. $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

D. $-\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

**Answer: B**

Watch Video Solution

**23.** For any three vectors $\vec{a}, \vec{b}, \vec{c}$ the value of $\left[\vec{a}-\vec{b} \quad \vec{b}-\vec{c} \quad \vec{c}-\vec{a}\right]$, is

A. $0$

B. $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

C. $-\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

D. $-2\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

**Answer: A**

Watch Video Solution

**24.** If $\vec{u}, \vec{v}$ and $\vec{w}$ are three non coplanar vectors then $\left(\vec{u}+\vec{v}-\vec{w}\right).\left(\vec{u}-\vec{v}\right)\times\left(\vec{v}-\vec{w}\right)$ equals (A) $\vec{u}.\left(\vec{v}\times\vec{w}\right)$ (B) $\vec{u}.\vec{w}\times\vec{v}$ (C) $2\vec{u}.\left(\vec{v}\times\vec{w}\right)$ (D) 0

A. $\vec{u}.\left(\vec{v}\times\vec{w}\right)$

B. $\vec{u}.\left(\vec{w}\times\vec{v}\right)$

C. $3\vec{u}.\left(\vec{c}\times\vec{w}\right)$

D. 0

**Answer: A**

Watch Video Solution

**25.** If $\vec{a}, \vec{b}, \vec{c}$ are unit coplanar vectors then the scalar triple product $\left[2\vec{a}-\vec{b}, 2\vec{b}-c, \vec{2}c-\vec{a}\right]$ is equal to (A) $0$ (B) $1$ (C) $-\sqrt{3}$ (D) $\sqrt{3}$

A. $0$

B. $1$

C. $-\sqrt{3}$

D. $\sqrt{3}$

**Answer: A**

Watch Video Solution

**26.** Let $\vec{a}, \vec{b}, \vec{c}$ be three non-zero non coplanar vectors and $\vec{p}, \vec{q}$ and $\vec{r}$ be three vectors given by $\vec{p} = \vec{a} + \vec{b} - 2\vec{c}, \vec{q} = 3\vec{a} - 2\vec{b} + \vec{c}$ and $\vec{r} = \vec{a} - 4\vec{b} + 2\vec{c}$

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. $3:1$

B. $7:1$

C. $11:1$

D. $15:1$

**Answer: D**

Watch Video Solution

27. $\vec{a}, \vec{b}$ and $\vec{c}$ are three non-coplanar vectors and $\vec{r}$. Is any arbitrary vector. Prove that $\left[\vec{b}\vec{c}\vec{r}\right]\vec{a} + \left[\vec{c}\vec{a}\vec{r}\right]\vec{b} + \left[\vec{a}\vec{b}\vec{r}\right]\vec{c} = \left[\vec{a}\vec{b}\vec{c}\right]\vec{r}$.

A. $2\left[\vec{a}\ \ \vec{b}\ \ \vec{c}\right]\vec{r}$

B. $3\left[\vec{a}\ \ \vec{b}\ \ \vec{c}\right]\vec{r}$

C. $\left[\vec{a}\ \ \vec{b}\ \ \vec{c}\right]$

D. None of these

**Answer: C**

Watch Video Solution

**28.** If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vetors represented by non-current edges of a parallelopiped of volume 4 units, then the value of

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

, is

A. 12

B. 4

C. $\pm 12$

D. 0

**Answer: C**

Watch Video Solution

**29.** The three concurrent edges of a parallelopiped represent the vectors $\vec{a}, \vec{b}, \vec{c}$ such that $\left[\vec{a}\ \vec{b}\ \vec{c}\right]=V$. Then the volume of the parallelopiped whose three concurrent edges are the three diagonals of three faces of the given parallelopiped is

A. $2V$

B. $3V$

C. $V$

D. $6V$

**Answer: A**

Watch Video Solution

**30.** The edges of a parallelopiped are of unit length and are parallel to non-coplanar unit vectors $\widehat{a}, \hat{b}, \hat{c}$ such that $\widehat{a}\cdot\hat{b} = \hat{b}\cdot\hat{c} = \hat{c}\cdot\widehat{a} = \frac{1}{2}$. Then, the volume of the parallelopiped 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

**31.** $Let \vec{a}, \vec{b}$, and $\vec{c}$ be three non-coplanar ubit vectors such the angle between every pair of them is $\frac{\pi}{3}$. if $\vec{a} \times \vec{b} + \vec{b} \times \vec{c} = p\vec{a} + q\vec{b} + r\vec{c}$, where p,q and r are scalars , then the value of $\frac{p^2 + 2q^2 + r^2}{q^2}$ is

A. $2$

B. $4$

C. $6$

D. $8$

**Answer: B**

Watch Video Solution

**32.** The volume of the tetrahedron whose vertices are the points $\hat{i}$, $\hat{i}+\hat{j}$, $\hat{i}+\hat{j}+\hat{k}$ and $2\hat{i}+3\hat{j}+\lambda\hat{k}$ is $1/6$ units,

Then the values of $\lambda$

A. does not exist

B. is 7

C. is -1

D. is any real value

**Answer: D**

Watch Video Solution

**33.** Let $G_1, G_2$ and $G_3$ be the centroids of the trianglular faces OBC,OCA and OAB, respectively, of a tetrahedron OABC. If $V_1$ denotes the volume of the tetrahedron OABC and $V_2$ that of the parallelepiped with $OG_1, OG_2$ and $OG_3$ as three concurrent edges, then prove that $4V_1 = 9V_2$ .

A. $4V_1 = 9V_2$

B. $9V_1 = 4V_2$

C. $3V_1 = 2V_2$

D. $3V_2 = 2V_1$

**Answer: A**

Watch Video Solution

**34.** For any three vectors $\vec{a}, \vec{b}, \vec{c}$ the value of $\vec{a} \times \left(\vec{b} \times \vec{c}\right) + \vec{b} \times \left(\vec{c} \times \vec{a}\right) + \vec{c} \times \left(\vec{a} \times \vec{b}\right)$, is

A. $\vec{0}$

B. $\left[\vec{a} \ \vec{b} \ \vec{c}\right]\vec{a}$

C. $\left[\vec{a} \ \vec{b} \ \vec{c}\right]\vec{b}$

D. $\left[\vec{a} \ \vec{b} \ \vec{c}\right]\vec{c}$

**Answer: A**

Watch Video Solution

35. Let $\vec{a}, \vec{b}, \vec{c}$ be any three vectors.Then vectors $\vec{u}=\vec{a}\times\left(\vec{b}\times\vec{c}\right), \vec{v}=\vec{b}\times\left(\vec{c}\times\vec{a}\right)$ and $\vec{w}=\vec{c}\times\left(\vec{a}\times\vec{b}\right)$ are such that they are

A. collinear

B. non-coplanar

C. coplanar

D. none of these

**Answer: C**

Watch Video Solution

36. Prove that $\hat{i}\times\left(\vec{a}\times\vec{i}\right)+\hat{j}\times\left(\vec{a}\times\vec{j}\right)+\hat{k}\times\left(\vec{a}\times\vec{k}\right)=2\vec{a}$

A. $\vec{a}$

B. $2\vec{a}$

C. $3\vec{a}$

D. $\vec{0}$

**Answer: B**

Watch Video Solution

**37.** let $\vec{a}, \vec{b}$ and $\vec{c}$ be three unit vectors such that $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \frac{\sqrt{3}}{2}\left(\vec{b} + \vec{c}\right)$. If $\vec{b}$ is not parallel to $\vec{c}$, then the angle between $\vec{a}$ and $\vec{b}$ is:

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

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

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

D. $\frac{5\pi}{6}$

**Answer: D**

Watch Video Solution

**38.** If $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \vec{b} \times \left(\vec{c} \times \vec{a}\right)$ and $\left[\vec{,} \ \vec{b} \ \ \vec{c}\right] \neq 0$ then $\vec{a} \times \left(\vec{b} \times \vec{c}\right)$ is equal to

A. $\vec{0}$

B. $\vec{a} \times \vec{b}$

C. $\vec{b} \times \vec{c}$

D. $\vec{c} \times \vec{a}$

**Answer: A**

Watch Video Solution

**39.** If $\vec{a}, \vec{b}, \vec{c}$ are three vectors, then

$\left[\vec{a} \times \vec{b} \ \ \vec{b} \times \vec{c} \ \ \vec{c} \times \vec{a}\right] =$

A. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

B. $2\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

C. $3\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

D. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]^2$

**Answer: D**

Watch Video Solution

**40.** If $\left[\vec{a} \times \vec{b}\ \vec{b} \times \vec{c}\ \vec{c} \times \vec{a}\right] = \lambda\left[\vec{a}\,\vec{b}\,\vec{c}\right]^2$, then $\lambda$ is equal to

A. 0

B. 1

C. 2

D. 3

**Answer: B**

Watch Video Solution

41. If $\vec{a}, \vec{b}, \vec{c}$ are non coplanar non null vectors such that $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right] = 2$ then $\left\{\left[\vec{a} \times \vec{b} \quad \vec{b} \times \vec{c} \quad \vec{c} \times \vec{a}\right]\right\}^2 =$

A. 4

B. 16

C. 8

D. none of these

**Answer: B**

Watch Video Solution

**42.** If $(a \times b) \times c = a \times (b \times c)$, where a, b and c are any three vactors such that $a \cdot b \neq 0, b \cdot c \neq 0,$ then a and c are

A. inclined at angle $\frac{\pi}{3}$ between them

B. inclined at angle of $\frac{\pi}{6}$ between them

C. perpendicular

D. parallel

**Answer: D**

Watch Video Solution

43. $\vec{a}, \vec{b}$ and $\vec{c}$ are unimodular and coplanar. A unit vector $\vec{d}$ is perpendicualt to them , $\left(\vec{a} \times \vec{b}\right) \times \left(\vec{c} \times \vec{d}\right) = \frac{1}{6}\hat{i} - \frac{1}{3}\hat{j} + \frac{1}{3}\hat{k}$ , and the angle between $\vec{a}$ and $\vec{b}\, is 30^\circ$ then $\vec{c}$ is

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

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

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

D. $\pm\frac{1}{3}\left(-\hat{i} + 2\hat{j} - 2\hat{k}\right)$

**Answer: D**

Watch Video Solution

**44.** Let $\vec{x}, \vec{y}$ and $\vec{z}$ be three vectors each of magnitude $\sqrt{2}$ and the angle between each pair of them is $\frac{\pi}{3}$ if $\vec{a}$ is a non-zero vector perpendicular to $\vec{x}$ and $\vec{y} \times \vec{z}$ and $\vec{b}$ is a non-zero vector perpendicular to $\vec{y}$ and $\vec{z} \times \vec{x}$, then

A. $\vec{b} = \left(\vec{b} . \vec{z}\right)\left(\vec{z} - \vec{x}\right)$

B. $\vec{a} = \left(\vec{a} . \vec{y}\right)\left(\vec{y} - \vec{z}\right)$

C. $\vec{a} . \vec{b} = -\left(\vec{a} . \vec{y}\right)\left(\vec{b} . \vec{z}\right)$

D. $\vec{a} = \left(\vec{a} . \vec{y}\right)\left(\vec{z} - \vec{y}\right)$

**Answer: A::B::C**

Watch Video Solution

**45.** If $\vec{a}, \vec{b}, \vec{c}$ and $\vec{a}', \vec{b}', \vec{c}'$ form a reciprocal system of vectors then

$\vec{a} . \vec{a}' + \vec{b} . \vec{b}' + \vec{c} . \vec{c}' =$

A. 0

B. 1

C. 2

D. 3

**Answer: D**

Watch Video Solution

**46.** If $\vec{a}, \vec{b}, \vec{c}$ and $\vec{a}', \vec{b}', \vec{c}'$ form a reciprocal system of vectors then

$\vec{a}.\vec{a}' + \vec{b}.\vec{b}' + \vec{c}.\vec{c}' =$

A. $\vec{0}$

B. $\vec{a} \times b$

C. $\vec{b} \times \vec{c}$

D. $\vec{c} \times \vec{a}$

**Answer: A**

Watch Video Solution

**47.** If $\vec{a}, \vec{b}, \vec{c}$ and $\vec{a}', \vec{b}', \vec{c}'$ form a reciprocal system of vectors then $\left[\vec{a}', \vec{b}', \vec{c}',\right] =$

A. $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

B. $\dfrac{1}{\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]}$

C. $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]^2$

D. $\dfrac{-1}{\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]}$

**Answer: B**

Watch Video Solution

**48.** If $\vec{a} = -\hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + 0\hat{j} + \hat{k}$ then find vector $\vec{c}$ satisfying the following conditions, (i) that it is coplaner with $\vec{a}$ and $\vec{b}$, (ii) that it is $\perp$ to $\vec{b}$ and (iii) that $\vec{a}.\vec{c} = 7$.

A. $-3\hat{i} + 5\hat{j} + 6\hat{k}$

B. $\frac{1}{2}\left(-3\hat{i} + 5\hat{j} + 6\hat{k}\right)$

C. $3\hat{i} - 5\hat{j} + 6\hat{k}$

D. $\frac{1}{2}\left(3\hat{i} + 5\hat{j} - 6\hat{k}\right)$

**Answer: B**

Watch Video Solution

**49.** A solution of the vector equation $\vec{r} \times \vec{b} = \vec{a} \times \vec{b}$, where $\vec{a}, \vec{b}$ are two given vectors is

where $\lambda$ is a parameter.

A. $\vec{r} = \lambda \vec{b}$

B. $\vec{r} = \vec{a} + \lambda \vec{b}$

C. $\vec{r} = \vec{b} + \lambda \vec{a}$

D. $\vec{r} = \lambda \vec{a}$

**Answer: B**

Watch Video Solution

**50.** If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vectors, then a vector $\vec{r}$ satisfying $\vec{r}.\vec{a} = \vec{r}.\vec{b} = \vec{r}.\vec{c} = 1$, is

A. $\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}$

B. $\dfrac{1}{\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]}\left\{\vec{a} \times \vec{b} + \vec{b} \times \overrightarrow{+} \vec{c} \times \vec{a}\right\}$

C. $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]\left\{\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \overrightarrow{\times} \vec{a}\right\}$

D. none of these

**Answer: B**

Watch Video Solution

## Section I Solved Mcqs

**1.** Which of the following expressions are meaningful? a. $\vec{u}.\left(\vec{v}\times\vec{w}\right)$ b. $\vec{u}.\vec{v}.\vec{w}$ c. $\left(\vec{u}\vec{v}\right).\vec{w}$ d. $\vec{u}\times\left(\vec{v}.\vec{w}\right)$

A. $\vec{u}.\left(\vec{v}\times\vec{w}\right)$

B. $\left(\vec{u}.\vec{v}\right).\vec{w}$

C. $\left(\vec{u}.\vec{v}\right)\vec{w}$

D. $\vec{u}\times\left(\vec{v}.\vec{w}\right)$

**Answer: A::C**

Watch Video Solution

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

A. $\vec{u}.\left(\vec{v}\times\vec{w}\right)$

B. $\left(\vec{u}\times\vec{w}\right).\vec{u}$

C. $\vec{v}.\left(\vec{u}\times\vec{w}\right)$

D. $\left(\vec{u}\times\vec{v}\right).\vec{w}$

**Answer: C**

Watch Video Solution

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

**4.** The volume of the tetrahedron whose vertices are the points with positon vectors $\hat{i}-6\hat{j}+10\hat{k},\ -\hat{i}-3\hat{j}+7\hat{k}, 5\hat{i}-\hat{j}+\lambda\hat{k}$ and $7\hat{i}-4\hat{j}+7\hat{k}$ is 11 cubic units if the value of $\lambda$ is

A. $-1, 7$

B. $1, 7$

C. $-7$

D. $-1,\ -7$

**Answer: B**

Watch Video Solution

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

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

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

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

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

**Answer: B**

Watch Video Solution

**6.** $\vec{a}$ and $\vec{b}$ are two given vectors. With theses vectors as adjacent sides, a parallelogram is construted. The vector which is the altitude of the parallelogram and which is perpendicular to $\vec{a}$ is

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

B. $\frac{1}{\left|\vec{a}\right|^2}\left\{\left(\vec{a}.\vec{b}\right)\vec{a}-\left(\vec{a}.\vec{a}\right)\vec{b}\right\}$

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

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

**Answer: D**

Watch Video Solution

**7.** The angles of a triangle , two of whose sides are respresented by vectors $\sqrt{3}\left(\hat{a}\times\vec{b}\right)$ and $\hat{b}-(\hat{a}.Vecb)\hat{a}$ where $\vec{b}$ is a non - zero vector and $\vec{a}$ is a unit vector in the direction of $\vec{a}$. Are

A. $\pi/4, \pi/4, \pi/2$

B. $\pi/4, \pi/3, \pi/12$

C. $\pi/6, \pi/3, \pi/2$

D. none of these

**Answer: C**

Watch Video Solution

**8.** The three vectors $\hat{i}+\hat{j}, \hat{j}+\hat{k}, \hat{k}+\hat{i}$ taken two at a time form three planes, The three unit vectors drawn perpendicular to these planes form a parallelopiped of volume: ____________

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

B. $4$

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

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

**Answer: D**

Watch Video Solution

9. Let $\vec{a} = 2\hat{i} + \hat{j} + \hat{k}$, and $\vec{b} = \hat{i} + \hat{j}$ if c is a vector such that $\vec{a} . \vec{c} = |\vec{c}|, |\vec{c} - \vec{a}| = 2\sqrt{2}$ and the angle between $\vec{a} \times \vec{b}$ and $\vec{i}\ s30^\circ$, then $\left|\left|\left(\vec{a} \times \vec{b}\right)\right| \times \vec{c}\right|$ is equal to

A. $2/3$

B. $3/2$

C. $2$

D. $3$

**Answer: B**

Watch Video Solution

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

A. $|\vec{u}| + \left|\vec{u} . \left(\vec{a} \times \vec{b}\right)\right|$

B. $\left|\vec{u}\right| + \left|\vec{u} . \vec{a}\right|$

C. $\left|\vec{u}\right| + \left|\vec{u} . \vec{b}\right|$

D. $\left|\vec{u}\right| + \vec{u} . \left(\vec{a} + \vec{b}\right)$

**Answer: C**

Watch Video Solution

**11.** If the vectots $p\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + q\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + r\hat{k}(p \neq q \neq r \neq 1)$ are coplanar, then the value of $pqr - (p + q + r)$, is

A. $0$

B. $-1$

C. $-2$

D. $2$

**Answer: C**

Watch Video Solution

**12.** If $\vec{r} \times \vec{b} = \vec{c} \times \vec{b}$ and $\vec{r} \perp \vec{a}$ then $\vec{r}$ is equal to

A. $\dfrac{\vec{a} \times \left(\vec{c} \times \vec{b}\right)}{\vec{a} \cdot \vec{b}}$

B. $\dfrac{\vec{b} \times \left(\vec{a} \times \vec{c}\right)}{\vec{a} \cdot \vec{b}}$

C. $\dfrac{\vec{c} \times \left(\vec{a} \times \vec{b}\right)}{\vec{a} \cdot \vec{b}}$

D. $\dfrac{\vec{c} \times \left(\vec{a} \times \vec{b}\right)}{\vec{b} \cdot \vec{c}}$

**Answer: A**

Watch Video Solution

**13.** If $\vec{a}, \vec{b}, \vec{c}$ are any three vectors such that $\left(\vec{a} + \vec{b}\right) . \vec{c} = \left(\vec{a} - \vec{b}\right)\vec{c} = 0$ then $\left(\vec{a} \times \vec{b}\right) \times \vec{c}$ is

A. $\vec{0}$

B. $\vec{a}$

C. $\vec{b}$

D. none of these

**Answer: A**

Watch Video Solution

**14.** Let $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$. Then , the value of $\lambda$ for which the vector $\vec{c} = \lambda\hat{i} + \hat{j} + (2\lambda - 1)\hat{k}$ is parallel to the plane containing $\vec{a}$ and $\vec{b}$. Is

A. $1$

B. $0$

C. $-1$

D. $2$

**Answer: B**

Watch Video Solution

15. Let $\vec{a}, \vec{b}, \vec{c}$ be three unit vectors such that $\vec{a}.\vec{b} = \vec{a}.\vec{c} = 0$, If the angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{3}$ then the volume of the parallelopiped whose three coterminous edges are $\vec{a}, \vec{b}, \vec{c}$ is

A. $\frac{\sqrt{3}}{2}$ cubic units

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

C. 1 cubic unit

D. none of these

**Answer: A**

Watch Video Solution

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

A. $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]\vec{c}$

B. $\left[\vec{b} \quad \vec{c} \quad \vec{a}\right]\vec{a}$

C. $\left[\vec{c} \quad \vec{a} \quad \vec{b}\right]\vec{b}$

D. none of these

**Answer: B**

Watch Video Solution

**17.** If the acute angle that the vector $\alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$ makes with the plane of the two vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $\hat{i} - \hat{j} + 2\hat{k}$ is $\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$ then

A. $\alpha(\beta + \gamma) = \beta\gamma$

B. $\beta(\gamma + \alpha) = \gamma\alpha$

C. $\gamma(\alpha + \beta) = \alpha\beta$

D. $\alpha\beta = \beta\gamma + \gamma\alpha = 0$

**Answer: A**

Watch Video Solution

18. If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vectors and $\vec{p}, \vec{q}, \vec{r}$ are their reciprocal then $\left(l\vec{a}+m\vec{b}+n\vec{c}\right).\left(\vec{l}p+\vec{m}q+\vec{n}r\right)$ is equal to

A. $l^2+m^2+n^2$

B. $lm+mn+nl$

C. $0$

D. none of these

**Answer: A**

Watch Video Solution

19. If $\vec{a}\vec{b}$ are non zero and non collinear vectors, then $\left[\vec{a}\ \vec{b}\ \vec{i}\right]\hat{i}+\left[\vec{a}\ \vec{b}\ \vec{j}\right]\hat{j}+\left[\vec{a}\ \vec{b}\ \vec{k}\right]\hat{k}$ is equal to

A. $\vec{a}+\vec{b}$

B. $\vec{a} \times \vec{b}$

C. $\vec{a} - \vec{b}$

D. $\vec{b} \times \vec{a}$

**Answer: B**

Watch Video Solution

**20.** If $\vec{r}$ is a unit vector such that

$\vec{r} = x\left(\vec{b} \times \vec{c}\right) + y\left(\vec{c} \times \vec{a}\right) + z\left(\vec{a} \times \vec{b}\right)$, then $\left|\left(\vec{r}.\vec{a}\right)\left(\vec{b} \times \vec{c}\right) + \left(\vec{r}.\vec{b}\right)\left(\vec{c} \times \vec{a}\right) + \left(\vec{r}.\vec{c}\right)\left(\vec{c} \times \vec{b}\right)\right|$ is equal to

A. $\left|\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]\right|$

B. $1$

C. $\left|\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]\right|$

D. $0$

**Answer: A**

Watch Video Solution

**21.** Let a,b,c be three vectors such that [a b c]=2, if $r = l(b \times c) + m(c \times a) + n(a \times b)$ is perpendicular to a+b+c, then the value of $(l + m + n)$ is

A. 2

B. 1

C. 0

D. none of these

**Answer: C**

Watch Video Solution

**22.** If $\vec{b}$ is a unit vector, then $\left(\vec{a}\,.\,\vec{b}\right)\vec{b}+\vec{b}\times\left(\vec{a}\times\vec{b}\right)$ is a equal to

A. $\left|\vec{a}\right|^{2}\vec{b}$

B. $\left(\vec{a}\,.\,\vec{b}\right)\vec{a}$

C. $\vec{a}$

D. $\left(\vec{a}\,.\,\vec{b}\right)\vec{b}$

**Answer: C**

Watch Video Solution

**23.** If $\vec{a},\vec{b},\vec{c}$ are any three non coplanar vectors, then $\left[\vec{a}+\vec{b}+\vec{c}\quad \vec{a}-\vec{c}\quad \vec{a}-\vec{b}\right]$ is equal to

A. $0$

B. $\left[\vec{a}\quad\vec{b}\quad\vec{c}\right]$

C. $2\left[\vec{a}\quad\vec{b}\quad\vec{c}\right]$

D. $= 3\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

**Answer: D**

Watch Video Solution

**24.** If $\vec{a}, \vec{b}, \vec{c}$ are any three non coplanar vectors, then

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

A. $0$

B. $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

C. $2\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

D. $3\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

**Answer: B**

Watch Video Solution

25. Let $\overrightarrow{a}, \overrightarrow{b}$ and $\overrightarrow{c}$ be three having magnitude 1,1 and 2 respectively such that $\overrightarrow{a} \times \left(\overrightarrow{a} \times \overrightarrow{c}\right) + \overrightarrow{b} = \overrightarrow{0}$, then the acute angle between $\overrightarrow{a}$ and $\overrightarrow{c}$ is

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

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

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

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

**Answer: C**

Watch Video Solution

26. If $\overrightarrow{a} = \left(\hat{i} + \hat{j} + \hat{k}\right), \overrightarrow{a}.\overrightarrow{b} = 1$ and $\overrightarrow{a} \times \overrightarrow{b} = \hat{j} - \hat{k},$ then $\overrightarrow{b}$ is

(a)$\hat{i} - \hat{j} + \hat{k}$ (b) $2\hat{i} - \hat{k}$ (c) $\hat{i}$ (d) $2\hat{i}$

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

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

C. $\hat{i}$

D. $2\hat{i}$

**Answer: C**

Watch Video Solution

**27.** If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar non-zero vectors, then

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

is equal to

A. $\left[\vec{a} \ \vec{b} \ \vec{c}\right]^2 \left(\vec{a} + \vec{b} + \vec{c}\right)$

B. $\left[\vec{a} \ \vec{b} \ \vec{c}\right] \left(\vec{a} + \vec{b} + \vec{c}\right)$

C. $\vec{0}$

D. none of these

**Answer: B**

Watch Video Solution

**28.** If the vectors $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ are coplanar vectors, then $\left(\vec{a} \times \vec{b}\right) \times \left(\vec{c} \times \vec{d}\right)$ is equal to

A. $\vec{a} + \vec{b} + \vec{c} + \vec{d}$

B. $\vec{0}$

C. $\vec{a} + \vec{b} = \vec{c} + \vec{d}$

D. none of these

**Answer: B**

Watch Video Solution

**29.** $\left(\vec{a} \times \vec{b}\right) . \left(\vec{c} \times \vec{d}\right)$ is not equal to

A. $\vec{a} . \left\{\vec{b} \times \left(\vec{c} \times \vec{d}\right)\right\}$

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

C. $\left(\vec{d} \times \vec{c}\right) . \left(\vec{b} \times \vec{a}\right)$

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

**Answer: B**

Watch Video Solution

**30.** Let $\vec{a}=2\hat{i}+\hat{j}+\hat{k}$, and $\vec{b}=\hat{i}+\hat{j}$ if c is a vector such that $\vec{a}.\vec{c}=\left|\vec{c}\right|,\left|\vec{c}-\vec{a}\right|=2\sqrt{2}$ and the angle between $\vec{a}\times\vec{b}$ and $\vec{i}s30^{\circ}$, then $\left|\left(\vec{a}\times\vec{b}\right)\right|\times\vec{c}\Big|$ is equal to

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

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

C. $2$

D. $3$

**Answer: B**

Watch Video Solution

**31.** If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three non coplanar vectors and $\vec{r}$ is any vector in space, then

$$\left(\vec{a} \times \vec{b}\right) \times \left(\vec{r} \times \vec{c}\right) + \left(\vec{b} \times \vec{c}\right) \times \left(\vec{r} \times \vec{a}\right) + \left(\vec{c} \times \vec{a}\right) \times \left(\vec{r}\right.$$

A. $2\left[\vec{a} \ \vec{b} \ \vec{c}\right]\vec{r}$

B. $3\left[\vec{a} \ \vec{b} \ \vec{c}\right]\vec{r}$

C. $\left[\vec{a} \ \vec{b} \ \vec{c}\right]\vec{r}$

D. none of these

**Answer: A**

Watch Video Solution

**32.** The number of faces of a triangular pyramid or tetrahedron is ______.

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

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

C. $\cos^{-1}\left(\frac{2}{3}\right)$

D. none of these

**Answer: A**

Watch Video Solution

**33.** The acute angle that the vector $2\hat{i} - 2\hat{j} + \hat{k}$ makes with the plane determined by the vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $\hat{i} - \hat{j} + 2\hat{k}$ is

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

B. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

C. $\tan^{-1}(\sqrt{2})$

D. $\cot^{-1}(\sqrt{3})$

**Answer: B**

Watch Video Solution

**34.** If $\vec{a}, \vec{b}, \vec{c}$ are non-null non coplanar vectors, then

$$\left[\vec{a} - 2\vec{b} + \vec{c} \quad \vec{b} - 2\vec{c} + \vec{a} \quad \vec{c} - 2\vec{a} + \vec{b}\right] =$$

A. $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

B. $3\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

C. $0$

D. $12\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

**Answer: C**

Watch Video Solution

**35.** The three vectors $\hat{i} + \hat{j}, \hat{j} + \hat{k}, \hat{k} + \hat{i}$ taken two at a time form three planes, The three unit vectors drawn perpendicular to these planes form a parallelopiped of volume: ______________

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

B. $4$

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

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

**Answer: B**

Watch Video Solution

**36.** Let $G_1, G(2)$ and $G_3$ be the centroid of the triangular faces OBC, OCA and OAB of a tetrahedron OABC. If $V_1$ denotes the volume of tetrahedron OABC and $V_2$ that of the parallelepiped with $OG_1, OG_2$ and $OG_3$ as three concurrent edges, then the value of $\frac{4V_1}{V_2}$ is (where O is the origin

A. $4V_1 = 9V_2$

B. $9V_1 = 4V_2$

C. $3V_1 = 2V_2$

D. $3V_2 = 2V_1$

**Answer: A**

Watch Video Solution

**37.** 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 $\left|\vec{r}\times\vec{c}\right|=\left|\vec{r}\right|\vec{c}\right|$ then [a b c] is equal to

A. $-1$

B. $0$

C. $1$

D. $2$

**Answer: B**

Watch Video Solution

**38.** Let $\overrightarrow{V} = 2\hat{i} + \hat{j} - \hat{k}$ and $\overrightarrow{W} = \hat{i} + 3\hat{k}$. if $\overrightarrow{U}$ is a unit vector, then the maximum value of the scalar triple product $\left[\overrightarrow{U}\overrightarrow{V}\overrightarrow{W}\right]$ is

A. $-1$

B. $\sqrt{10} + \sqrt{6}$

C. $\sqrt{59}$

D. $\sqrt{60}$

**Answer: C**

Watch Video Solution

**39.** If a and b are unit vectors, then the vector defined as $V = (a + b) \times (a + b)$ is collinear to the vector

A. $\overrightarrow{a} + \overrightarrow{b}$

B. $\overrightarrow{a} - \overrightarrow{b}$

C. $2\overrightarrow{a} + \overrightarrow{b}$

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

**Answer: B**

Watch Video Solution

**40.** If $\vec{\alpha} = 2\hat{i} + 3\hat{j} - \hat{k}, \vec{\beta} = -\hat{i} + 2\hat{j} - 4\hat{k}, \vec{\gamma} = \hat{i} + \hat{j} + \hat{k},$ then $\left(\vec{\alpha} \times \vec{\beta}\right).\left(\vec{\alpha} \times \vec{\gamma}\right)$ is equal to

A. $-74$

B. $74$

C. $64$

D. $60$

**Answer: A**

Watch Video Solution

41. Let $\alpha = a\hat{i} + b\hat{j} + c\hat{k}, \overrightarrow{\beta} = b\hat{i} + c\hat{j} + a\hat{k}$ and $\overrightarrow{\gamma} = c\hat{i} + a\hat{j} + b\hat{k}$ be three coplanar vectors with $a \neq b$ and $\overrightarrow{v} = \hat{i} + \hat{j} + \hat{k}$ . Then $\overrightarrow{v}$ is perpendicular to

A. $\overrightarrow{\alpha}$

B. $\overrightarrow{\beta}$

C. $\overrightarrow{\gamma}$

D. all of these

**Answer: D**

Watch Video Solution

42. Given $\left|\overrightarrow{a}\right| = \left|\overrightarrow{b}\right| = 1$ and $\left|\overrightarrow{a} + \overrightarrow{b}\right| = \sqrt{3}$ if $\overrightarrow{c}$ is a vector such that $\overrightarrow{c} - \overrightarrow{a} - 2\overrightarrow{b} = 3\left(\overrightarrow{a} \times \overrightarrow{b}\right)$ then find the value of $\overrightarrow{c}.\overrightarrow{b}$.

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

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

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

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

**Answer: D**

Watch Video Solution

**43.** If $\vec{\mu}$ and $\vec{v}$ be unit vector. If $\vec{v}$ is a vector such that $\vec{v}+\left(\vec{v}\times\vec{u}\right)=\vec{v}$, then $\vec{u}\left(\vec{v}\times\vec{v}\right)$ will be equal to:

A. $1-\vec{v}\,.\,\vec{w}$

B. $1-\left|\vec{w}\right|^2$

C. $\left|\vec{w}\right|^2-\left(\vec{v}\,.\,\vec{w}\right)^2$

D. all of these

**Answer: D**

Watch Video Solution

**44.** If $\vec{a}, \vec{b}, \vec{c}$ be three vectors of magnitude $\sqrt{3}, 1, 2$ such that $\vec{a} \times \left(\vec{a} \times \vec{c}\right) + 3\vec{b} = \vec{0}$ if $\theta$ angle between $\vec{a}$ and $\vec{c}$ then $\cos^2\theta$ is equal to

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

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

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

D. none of these

**Answer: A**

Watch Video Solution

**45.** If $\vec{a} \perp \vec{b}$ then vector $\vec{v}$ in terms of $\vec{a}$ and $\vec{b}$ satisfying the equations $\vec{v}.Veca = 0nad\vec{v}.Vecb = 1$ and $\left[\vec{a}\vec{a}\vec{b}\right] = 1$ is

A. $\frac{\vec{b}}{\left|\vec{b}\right|^2} + \frac{\vec{a} \times \vec{b}}{\left|\vec{a} \times \vec{b}\right|^2}$

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

C. $\frac{\vec{b}}{|\vec{b}|^2} + \frac{\vec{a} \times \vec{b}}{|\vec{a} \times \vec{b}|}$

D. none of these

**Answer: A**

Watch Video Solution

**46.** Find the value of a so that the volume of the parallelopiped formed by vectors $\hat{i} + a\hat{j} + \hat{k}$, $\hat{j} + a\hat{k}$ and $a\hat{i} + \hat{k}$ becomes minimum.

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

B. $3$

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

D. $\sqrt{3}$

**Answer: C**

Watch Video Solution

**47.** let $\vec{a}, \vec{b}$ and $\vec{c}$ be three vectors having magnitudes 1, 1 and 2, respectively, if $\vec{a} \times \left(\vec{a} \times \vec{c}\right) + \vec{b} = \vec{0}$, then the acute angle between $\vec{a}$ and $\vec{c}$ is ______

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

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

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

D. none of these

**Answer: B**

Watch Video Solution

**48.** If $\vec{A}, \vec{B}$ and $\vec{C}$ are vectors such that $\left|\vec{B}\right| = \left|\vec{C}\right|$ prove that $\left[\left(\vec{A} + \vec{B}\right) \times \left(\vec{A} + \vec{C}\right)\right] \times \left(\vec{B} + \vec{C}\right). \left(\vec{B} + \vec{C}\right) = 0$

A. $1$

B. $-1$

C. $0$

D. none of these

**Answer: C**

Watch Video Solution

**49.** If the magnitude of the moment about the pont $\hat{j}+\hat{k}$ of a force $\hat{i}+\alpha\hat{j}-\hat{k}$ acting through the point $\hat{i}+\hat{j}$ is $\sqrt{8}$, then the value of $\alpha$ is

A. $1$

B. $2$

C. $3$

D. $4$

**Answer: B**

Watch Video Solution

**50.** If the volume of parallelopiped formed by the vectors a,b,c as three coterminous edges is 27 cu units, then the volume of the parallelopiped have $\alpha = a + 2b - c, \beta = a - b \text{ and } \gamma = a - b - c$ as three coterminous edges is

A. 27 cubic units

B. 9 cubic units

C. 81 cubic units

D. none of these

**Answer: C**

Watch Video Solution

**51.** If $\left|\vec{a}\right| = 5, \left|\vec{b}\right| = 3, \left|\vec{c}\right| = 4$ and $\vec{a}$ is perpendicular to $\vec{b}$ and $\vec{c}$ such that angle between $\vec{b}$ and $\vec{c}$ is $\frac{5\pi}{6}$, then the volume of the parallelopiped having $\vec{a}$, $\vec{b}$ and $\vec{c}$ as three coterminous edges is

A. 30 cubit units

B. 60 cubic units

C. 20 cubic units

D. none of these

**Answer: A**

Watch Video Solution

**52.** If the vectors $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ are coplanar vectors, then $\left(\vec{a} \times \vec{b}\right) \times \left(\vec{c} \times \vec{d}\right)$ is equal to

A. 1

B. $\vec{a}$

C. $\vec{b}$

D. $\vec{0}$

**Answer: D**

Watch Video Solution

**53.** Prove that

$$\left(\vec{a}.\left(\vec{b}\times\hat{i}\right)\right)\hat{i}+\left(\vec{a}.\left(\vec{b}\times\hat{j}\right)\right)\hat{j}+\left(\vec{a}.\left(\vec{b}\times\hat{k}\right)\right)\hat{k}=\vec{a}\times\vec{b}$$

A. $2\left(\vec{a}\times\vec{b}\right)$

B. $3\left(\vec{a}\times\vec{b}\right)$

C. $\vec{a}\times\vec{b}$

D. $-\left(\vec{a}\times\vec{b}\right)$

**Answer: C**

Watch Video Solution

**54.** The unit vector which is orhtogonal to the vector $3\hat{i}+2\hat{j}+6\hat{k}$ and is coplanar with vectors $2\hat{i}+\hat{j}+\hat{k}$ and $\hat{i}-\hat{j}+\hat{k}$, is

A. $\frac{1}{\sqrt{41}}\left(2\hat{i}-6\hat{j}+\hat{k}\right)$

B. $\frac{1}{\sqrt{13}}\left(2\hat{i}-3\hat{j}\right)$

C. $\frac{1}{\sqrt{10}}\left(3\hat{j}-\hat{k}\right)$

D. $\frac{1}{\sqrt{34}}\left(4\hat{i}+3\hat{j}-3\hat{k}\right)$

**Answer: C**

Watch Video Solution

**55.** Let $\vec{a}, \vec{b}$ and $\vec{c}$ be non-zero vectors such that $\left(\vec{a}\times\vec{b}\right)\times\vec{c}=\frac{1}{3}\left|\vec{b}\right|\left|\vec{c}\right|\vec{a}$. If $\theta$ is an acute angle between the vectors $\vec{b}$ and $\vec{c}$, then $\sin\theta$ is equal to:

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

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

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

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

**Answer: A**

Watch Video Solution

**56.** $\overrightarrow{p}, \overrightarrow{q}$ and $\overrightarrow{r}$ are three mutually prependicular vectors of the same magnitude . If vector $\overrightarrow{x}$ satisfies the equation $\overrightarrow{p}s \times \left(\left(\overrightarrow{x} - \overrightarrow{q}\right) \times \overrightarrow{p}\right) + \overrightarrow{q} \times \left(\left(\overrightarrow{x} - \overrightarrow{r}\right) \times \overrightarrow{q}\right) + \overrightarrow{r} \times \left(\left(\overrightarrow{x} - \overrightarrow{p}\right)$ is given by

A. $\frac{1}{2}\left(\overrightarrow{p} + \overrightarrow{q} - 2\overrightarrow{r}\right)$

B. $\frac{1}{2}\left(\overrightarrow{p} + \overrightarrow{q} + \overrightarrow{r}\right)$

C. $\frac{1}{3}\left(\overrightarrow{p} + \overrightarrow{q} + \overrightarrow{r}\right)$

D. $\frac{1}{3}\left(2\overrightarrow{p} + \overrightarrow{q} - \overrightarrow{r}\right)$

**Answer: B**

Watch Video Solution

**57.** If $\vec{a}$ and $\vec{b}$ are vectors in space given by $\vec{a} = \frac{\hat{i} - 2\hat{j}}{\sqrt{5}}$ and $\vec{b} = \frac{2\hat{i} + \hat{j} + 3\hat{k}}{\sqrt{14}}$ then find the value of $\left(2\vec{a} + \vec{b}\right).\left[\left(\vec{a} \times \vec{b}\right) \times \left(\vec{a} - 2\vec{b}\right)\right]$

A. 2

B. 3

C. 4

D. 5

**Answer: D**

Watch Video Solution

**58.** Two adjacent sides of a parallelogram $ABCD$ are given by $\vec{A}B = 2\hat{i} + 10\hat{j} + 11\hat{k} and \vec{A}D = -\hat{i} + 2\hat{j} + 2\hat{k}\cdot$ The side $AD$ is rotated by an acute angle $\alpha$ in the plane of the parallelogram so that $AD$

becomes $AD'$. If $AD'$ makes a right angle with the side $AB$, then the cosine of the angel $\alpha$ is given by a. $\frac{8}{9}$ b. $\frac{\sqrt{17}}{9}$ c. $\frac{1}{9}$ d. $\frac{4\sqrt{5}}{9}$

A. $\frac{8}{9}$

B. $\frac{\sqrt{17}}{9}$

C. $\frac{1}{9}$

D. $\frac{4\sqrt{5}}{9}$

**Answer: B**

Watch Video Solution

**59.** Let $a = \hat{j} - \hat{k}$ and $b = \hat{i} - \hat{j} - \hat{k}$. Then, the vector v satisfying $a \times b + c = 0$ and $a \cdot b = 3$, is

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

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

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

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

**Answer: C**

Watch Video Solution

**60.** The vector(s) which is /are coplanar with vectors $\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} + 2\hat{j} + \hat{k}$ and perpendicular to vector $\hat{i} + \hat{j} + \hat{k}$ , is /are

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

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

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

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

**Answer: Minimum value at $(\alpha)^{\alpha}$ ^ $(x)$ + alpha^(1-(alpha)^x)` is**

Watch Video Solution

61. Let $\vec{a} = -\hat{i} - \hat{k}$, $\vec{b} = -\hat{i} + \hat{j}$ and $\vec{c} = i + 2\hat{j} + 3\hat{k}$ be three given vectors. If $\vec{r}$ is a vector such that $\vec{r} \times \vec{b} = \vec{c} \times \vec{b}$ and $\vec{r} . \vec{a} = 0$ then find the value of $\vec{r} . \vec{b}$.

A. $4$

B. $8$

C. $6$

D. $9$

**Answer: D**

Watch Video Solution

62. $\vec{a} = \frac{1}{\sqrt{10}}\left(3\hat{i} + \hat{k}\right)$ and $\vec{b} = \frac{1}{7}\left(2\hat{i} + 3\hat{j} - 6\hat{k}\right)$, then the value of $\left(2\vec{a} - \vec{b}\right) . \left[\left(\vec{a} \times \vec{b}\right) \times \left(\vec{a} + 2\vec{b}\right)\right]$ is:

A. $-5$

B. $-3$

C. $5$

D. $3$

**Answer: A**

Watch Video Solution

**63.** If $\overrightarrow{a} = \hat{i} - 2\hat{j} + 3\hat{k}, \overrightarrow{b} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\overrightarrow{c} = r\hat{i} + \hat{j} + (2r - 1)\hat{k}$ are three vectors such that $\overrightarrow{c}$ is parallel to the plane of $\overrightarrow{a}$ and $\overrightarrow{b}$ then$r$ is equal to,

A. $1$

B. $0$

C. $2$

D. $-1$

**Answer: B**

Watch Video Solution

64. If $\vec{a}, \vec{b}$ are non zero vectors, then $\left(\left(\vec{a} \times \vec{b}\right) \times \vec{a}\right) . \left(\left(\vec{b} \times \vec{a}\right) \times \vec{b}\right)$ equals

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

B. $\left|\vec{a} \times \vec{b}\right|^2 \vec{a}^2$

C. $\left|\vec{a} \times \vec{b}\right|^2 \vec{b}^2$

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

**Answer: D**

Watch Video Solution

## Section Ii Assertion Reason Type

1. Statement 1: Let $\vec{r}$ be any vector in space. Then, $\vec{r} = \left(\vec{r} . \hat{i}\right)\hat{i} + \left(\vec{r} . \hat{j}\right)\hat{j} + \left(\vec{r} . \hat{k}\right)\hat{k}$

Statement 2: If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vectors and $\vec{r}$ is any vector in space then

$$\vec{r} = \left\{\frac{[\vec{r}\ \vec{b}\ \vec{c}]}{[\vec{a}\ \vec{b}\ \vec{c}]}\right\}\vec{a} + \left\{\frac{[\vec{r}\ \vec{c}\ \vec{a}]}{[\vec{a}\ \vec{b}\ \vec{c}]}\right\}\vec{b} + \left\{\frac{[\vec{r}\ \vec{a}\ \vec{b}]}{[\vec{a}\ \vec{b}\ \vec{c}]}\right\}$$

A. 1

B. 2

C. 3

D. 4

**Answer: A**

Watch Video Solution

**2.** Statement 1: If $\vec{a}, \vec{b}$ are non zero and non collinear vectors, then

$$\vec{a} \times \vec{b} = [\vec{a}\ \vec{b}\ \hat{i}]\hat{i} + [\vec{a}\ \vec{b}\ \hat{j}]\hat{j} + [\vec{a}\ \vec{b}\ \hat{k}]\hat{k}$$

Statement 2: For any vector $\vec{r}$

$$\vec{r} = (\vec{r}.\hat{i})\hat{i} + (\vec{r}.\hat{j})\hat{j} + (\vec{r}.\hat{k})\hat{k}$$

A. 1

B. 2

C. 3

D. 4

**Answer: A**

Watch Video Solution

**3.** Statement 1: Let $\vec{a}, \vec{b}, \vec{c}$ be three coterminous edges of a parallelopiped of volume 2 cubic units and $\vec{r}$ is any vector in space then $\left|\left(\vec{r}.\vec{a}\right)\left(\vec{b}\times\vec{c}\right)+\left(\vec{r}.\vec{b}\right)\left(\vec{c}\times\vec{a}\right)+\left(\vec{c}.\vec{c}\right)\left(\vec{a}\times\vec{b}\right| = 2\left|\vec{r}\right|$

Statement 2: Any vector in space can be written as a linear combination of three non-coplanar vectors.

A. 1. statement-1 is true, statement 2 is a correct explanation for statement -1

B. 2. statement-1 is true , statement-2 is not correct explanation for statement 1

C. 3. statement-1 is true, statement-2 is false

D. 4. Both statements are true

**Answer: A**

View Text Solution

**4.** Let $\vec{a}, \vec{b}, \vec{c}$ be any three vectors,

Statement 1: $\left[\vec{a}+\vec{b} \quad \vec{b}+\vec{c} \quad \vec{c}+\vec{a}\right]=2\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

Statement 2: $\left[\vec{a}\times\vec{b} \quad \vec{b}\times\vec{c} \quad \vec{c}\times\vec{a}\right]=\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]^2$

Watch Video Solution

**5.** Statement 1: Any vector in space can be uniquely written as the linear combination of three non-coplanar vectors.

Stetement 2: If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vectors and $\vec{r}$ is any vector in space then

$$\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]\vec{c}+\left[\vec{b} \quad \vec{c} \quad \vec{r}\right]\vec{a}+\left[\vec{c} \quad \vec{a} \quad \vec{r}\right]\vec{b}=\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]\vec{r}$$

A. 1

B. 2

C. 3

D. 4

**Answer: B**

Watch Video Solution

**6.** Statement 1: Let $\vec{a}, \vec{b}, \vec{c}$ be three coterminous edges of a parallelopiped of volume $V$. Let $V_1$ be the volume of the parallelopiped whose three coterminous edges are the diagonals of three adjacent faces of the given parallelopiped. Then $V_1 = 2V$.

Statement 2: For any three vectors, $\vec{p}, \vec{q}, \vec{r}$

$$\left[\vec{p}+\vec{q} \quad \vec{q}+\vec{r} \quad \vec{r}+\vec{p}\right] = 2\left[\vec{p} \quad \vec{q} \quad \vec{r}\right]$$

A. 1

B. 2

C. 3

D. 4

**Answer: A**

Watch Video Solution

**7.** Statement 1: Let $V_1$ be the volume of a parallelopiped ABCDEF having $\vec{a}, \vec{b}, \vec{c}$ as three coterminous edges and $V_2$ be the volume of the parallelopiped $PQRSTU$ having three coterminous edges as vectors whose magnitudes are equal to the areas of three adjacent faces of the parallelopiped $ABCDEF$. Then $V_2 = 2V_1^2$

Statement 2: For any three vectors $\vec{\alpha}, \vec{\beta}, \vec{\gamma}$

$$\left[\vec{\alpha} \times \vec{\beta}, \vec{\beta} \times \vec{\gamma}, \vec{\gamma} \times \vec{\alpha}\right] = \left[\vec{\alpha} \quad \vec{\beta} \quad \vec{\gamma}\right]^2$$

A. 1. statement -1 is true, statement -2 is a correct explanation for statement -1

B. 2. statement-1 is true, statement-2 is not correct explanation for statement - 1

C. 3. statement -1 is true , statement-2 is false

D. 4. statement-1 is false, statement-2 is correct

**Answer: D**

Watch Video Solution

**8.** Statement 1: If $V$ is the volume of a parallelopiped having three coterminous edges as $\vec{a}$, $\vec{b}$, and $\vec{c}$, then the volume of the parallelopiped having three coterminous edges as

$$\vec{\alpha} = \left(\vec{a}.\vec{a}\right)\vec{a} + \left(\vec{a}.\vec{b}\right)\vec{b} + \left(\vec{a}.\vec{c}\right)\vec{c}$$

$$\vec{\beta} = \left(\vec{a}.\vec{b}\right)\vec{a} + \left(\vec{b}.\vec{b}\right)\vec{b} + \left(\vec{b}.\vec{c}\right)\vec{c}$$

$\vec{\gamma} = \left(\vec{a}.\vec{c}\right)\vec{a} + \left(\vec{b}.\vec{c}\right)\vec{b} + \left(\vec{c}.\vec{c}\right)\vec{c}$ is $V^3$

Statement 2: For any three vectors $\vec{a}, \vec{b}, \vec{c}$

$$\begin{vmatrix} \vec{a}.\vec{a} & \vec{a}.\vec{b} & \vec{a}.\vec{c} \\ \vec{b}.\vec{a} & \vec{b}.\vec{b} & \vec{b}.\vec{c} \\ \vec{c}.\vec{a} & \vec{c}.\vec{b} & \vec{c}.\vec{c} \end{vmatrix} = \begin{bmatrix} \vec{a} & \vec{b} & \vec{c} \end{bmatrix}^3$$

A. 1

B. 2

C. 3

D. 4

**Answer: C**

View Text Solution

**9.** Statement 1: Unit vectors orthogonal to the vector $3\hat{i} + 2\hat{j} + 6\hat{k}$ and coplanar with the vectors $2\hat{i} + \hat{j} + \hat{k}$ and $\hat{i} - \hat{j} + \hat{k}$ are $\pm \frac{1}{\sqrt{10}}\left(3\hat{j} - \hat{k}\right)$.

Statement 2: For any three vectors $\vec{a}, \vec{b}$, and $\vec{c}$ vector $\vec{a} \times \left(\vec{b} \times \vec{c}\right)$ is orthogonal to $\vec{a}$ and lies in the plane of $\vec{b}$ and $\vec{c}$.

A. 1

B. 2

C. 3

D. 4

**Answer: A**

View Text Solution

**10.** If $G_1, G_2, G_3$ ar the centroids of the triangular faces OBC, OCA, OAB of a tetrahedron OABC. If $\lambda$ be the ratio of the volume of the tetrahedron to the volume of the parallelepiped with $OG_1, OG_2, OG_a$ as coterminous edges. Then the value of $2008\lambda$ must be .

A. 1

B. 2

C. 3

D. 4

**Answer: A**

Watch Video Solution

**11.** Statement 1: For any three vectors $\vec{a}, \vec{b}, \vec{c}$

$$\left[\vec{a}\times\vec{b} \quad \vec{b}\times\vec{c} \quad \vec{c}\times\vec{a}\right]=0$$

Statement 2: If $\vec{p}, \vec{q}, \vec{r}$ are linear dependent vectors then they are coplanar.

A. 1

B. 2

C. 3

D. 4

**Answer: D**

View Text Solution

**12.** 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: $\overrightarrow{PQ} \times \left(\overrightarrow{RS} + \overrightarrow{ST}\right) \neq \vec{0}$

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

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

A. 1

B. 2

C. 3

D. 4

**Answer: C**

Watch Video Solution

Exercise

**1.** For non-zero vectors $\vec{a}, \vec{b}$ and $\vec{c}$, $\left|\left(\vec{a} \times \vec{b}\right).\vec{c}\right| = \left|\vec{a}\right|\left|\vec{b}\right|\left|\vec{c}\right|$ holds if and only if

A. $\vec{a}.\vec{b} = \vec{b}.\vec{c} = \vec{a}.\vec{a} = 0$

B. $\vec{a}.\vec{b} = 0 = \vec{b}.\vec{c}$

C. $\vec{b}.\vec{c} = 0 = \vec{c}.\vec{a}$

D. $\vec{c}.\vec{a} = 0 = \vec{a}.\vec{b}$

**Answer: A**

Watch Video Solution

**2.** Let $\vec{a} = \hat{i} + \hat{j} - \hat{k}, \vec{b} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{c}$ be a unit vector perpendicular to $\vec{a}$ and coplanar with $\vec{a}$ and $\vec{b}$, then it is given by

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

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

C. $\frac{1}{\sqrt{6}}\left(\hat{i} - 2\hat{j} + \hat{k}\right)$

D. $\frac{1}{2}\left(\hat{j}-\hat{k}\right)$

**Answer: A**

Watch Video Solution

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

A. $\left[\vec{a} \ \vec{b} \ \vec{c}\right]=0$

B. $\left[\vec{a} \ \vec{b} \ \vec{c}\right]=1$

C. $\left[\vec{a} \ \vec{b} \ \vec{c}\right]=3$

D. $\left[\vec{a} \ \vec{c} \ \vec{a}\right]=1$

**Answer: A**

Watch Video Solution

**4.** The value of $\left[\vec{a}-\vec{b}\ \ \vec{b}-\vec{c}\ \ \vec{c}-\vec{a}\right]$, where $\left|\vec{a}\right|=1, \left|\vec{b}\right|=5, \left|\vec{c}\right|=3$, is

A. $0$

B. $1$

C. $6$

D. none of these

**Answer: A**

Watch Video Solution

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

A. $\pm 1$

B. $0$

C. $-2$

D. $2$

**Answer: A**

Watch Video Solution

**6.** If $\vec{r}\cdot\vec{a}=\vec{r}\cdot\vec{b}=\vec{r}\cdot\vec{c}=0$ for some non-zero vectro $\vec{r}$, then the value of $\begin{bmatrix}\vec{a} & \vec{b} & \vec{c}\end{bmatrix}$ is

A. $2$

B. $3$

C. $0$

D. none of these

**Answer: C**

Watch Video Solution

**7.** If the vectors $a\hat{i}+\hat{j}+\hat{k}, \hat{i}+b\hat{j}+\hat{k}, \hat{i}+\hat{j}+c\hat{k}(a \neq 1, b \neq 1, c \neq 1)$ are coplanar then the value of $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}$ is (A) 0 (B) 1 (C) -1 (D) 2

A. $-1$

B. $0$

C. $1$

D. none of these

**Answer: C**

Watch Video Solution

**8.** If $\widehat{a}, \hat{b}, \hat{c}$ are three units vectors such that $\hat{b}$ and $\hat{c}$ are non-parallel and $\widehat{a} \times \left(\hat{b} \times \hat{c}\right) = 1/2\hat{b}$ then the angle between $\widehat{a}$ and $\hat{c}$ is

A. $30^{\circ}$

B. $45^{\circ}$

C. $60^{\circ}$

D. $90^{\circ}$

**Answer: C**

Watch Video Solution

**9.** For any three vectors $\vec{a}, \vec{b}, \vec{c}$ the vector $\left(\vec{b} \times \vec{c}\right) \times \vec{a}$ equals

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

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

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

D. none of these

**Answer: B and C**

Watch Video Solution

**10.** for any three vectors, $\overrightarrow{a}, \overrightarrow{b}$ and $\overrightarrow{c}$, $\left(\overrightarrow{a} - \overrightarrow{b}\right).\left(\overrightarrow{b} - \overrightarrow{c}\right) \times \left(\overrightarrow{c} - \overrightarrow{a}\right)$ =

A. $\left[\overrightarrow{a} \quad \overrightarrow{b} \quad \overrightarrow{c}\right]$

B. $2\left[\overrightarrow{a} \quad \overrightarrow{b} \quad \overrightarrow{c}\right]$

C. $\left[\overrightarrow{a} \quad \overrightarrow{b} \quad \overrightarrow{c}\right]^2$

D. none of these

**Answer: D**

Watch Video Solution

**11.** For any vectors $\overrightarrow{r}$ the value of

$\hat{i} \times \left(\overrightarrow{r} \times \hat{i}\right) + \hat{j} \times \left(\overrightarrow{r} \times \hat{j}\right) + \hat{k} \times \left(\overrightarrow{r} \times \hat{k}\right)$, is

A. $\overrightarrow{0}$

B. $2\overrightarrow{r}$

C. $-2\overrightarrow{r}$

D. none of these

**Answer: B**

Watch Video Solution

**12.** If the vectors $\vec{a} = \hat{i} + a\hat{j} + a^2\hat{k}, \vec{b} = \hat{i} + b\hat{j} + b^2\hat{k}, \vec{c} = \hat{i} + c\hat{j} + c^2\hat{k}$ are three non-coplanar vectors and $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$, then the value of $abc$ is

A. 0

B. 1

C. 2

D. $-1$

**Answer: D**

Watch Video Solution

**13.** Let $\vec{a}, \vec{b}, \vec{c}$ be three noncolanar vectors and $\vec{p}, \vec{q}, \vec{r}$ are vectors defined by the relations $\vec{p} = \frac{\vec{b} \times \vec{c}}{\left[\vec{a}\vec{b}\vec{c}\right]}, \vec{q} = \frac{\vec{c} \times \vec{a}}{\left[\vec{a}\vec{b}\vec{c}\right]}, \vec{r} = \frac{\vec{a} \times \vec{b}}{\left[\vec{a}\vec{b}\vec{c}\right]}$ 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

A. 0

B. 1

C. 2

D. 3

**Answer: D**

Watch Video Solution

**14.** If $\vec{A}, \vec{B}$ and $\vec{C}$ are three non - coplanar vectors, then $\frac{\vec{A}.\vec{B}\times\vec{C}}{\vec{C}\times\vec{A}.\vec{B}}+\frac{\vec{B}.\vec{A}\times\vec{C}}{\vec{C}.\vec{A}\times\vec{B}}$=________

A. 0

B. 2

C. 1

D. none of these

**Answer: A**

Watch Video Solution

**15.** Let $\vec{a}=a_1\hat{i}+a_2\hat{j}+a_3\hat{k}, \vec{b}=b_1\hat{i}+b_2\hat{j}+b_3\hat{k}$ and $\vec{c}=c_1\hat{i}+c_2\hat{j}+c_3\hat{k}$ be 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 $\vec{b}\, is \pi/6$ then the value of $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ is

A. 0

B. 1

C. $\frac{1}{4}\left|\vec{a}\right|^2\left|\vec{b}\right|^2$

D. $\frac{3}{4}\left|\vec{a}\right|^2\left|\vec{b}\right|^2$

**Answer: C**

Watch Video Solution

**16.** If non-zero vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other, then the solution of the equation $\vec{r}\times\vec{a}=\vec{b}$ is given by

A. $\vec{r}=x\vec{a}+\frac{\vec{a}\times\vec{b}}{\left|\vec{a}\right|^2}$

B. $\vec{r}=x\vec{b}-\frac{\vec{a}\times\vec{b}}{\left|\vec{b}\right|^2}$

C. $\vec{r}=x\left(\vec{a}\times\vec{b}\right)$

D. $\vec{r}=x\left(\vec{b}\times\vec{a}\right)$

**Answer: A**

Watch Video Solution

**17.** show that $\left(\vec{a}\times\vec{b}\right)\times\vec{c}=\vec{a}\times\left(\vec{b}\times\vec{c}\right)$ if and only if $\vec{a}$ and $\vec{c}$ are collinear or $\left(\vec{a}\times\vec{c}\right)\times\vec{b}=\vec{0}$

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

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

C. $\vec{c}\times\vec{a}=\vec{a}\times\vec{b}$

D. $\vec{c}\times\vec{b}=\vec{b}\times\vec{a}$

**Answer: A**

Watch Video Solution

**18.** If $\vec{a},\vec{b},\vec{c}$ and $\vec{p},\vec{q},\vec{r}$ are reciprocal system of vectors, then $\vec{a}\times\vec{p}+\vec{b}\times\vec{q}+\vec{c}\times\vec{r}$ equals:

A. $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

B. $\left(\vec{p} + \vec{q} + \vec{r}\right)$

C. $\vec{0}$

D. $\vec{a} + \vec{b} + \vec{c}$

**Answer: C**

Watch Video Solution

19. $\vec{a} \times \left(\vec{a} \times \left(\vec{a} \times \vec{b}\right)\right)$ equals

A. $\left(\vec{a} . \vec{b}\right)\left(\vec{a} \times \vec{b}\right)$

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

C. $\left(\vec{b} . \vec{b}\right)\left(\vec{a} \times \vec{b}\right)$

D. $\left(\vec{b} . \vec{b}\right)\left(\vec{b} \times \vec{a}\right)$

**Answer: B**

Watch Video Solution

20. If $\vec{a} = \hat{i} + \hat{j}, \vec{b} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{c}$ is a unit vector $\perp$ to the vector $\vec{a}$ and coplanar with $\vec{a}$ and $\vec{b}$, then a unit vector $\vec{d}$ is perpendicular to both $\vec{a}$ and $\vec{c}$ is:

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

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

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

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

**Answer: B**

Watch Video Solution

21. If $\vec{a}, \vec{b}$ and $\vec{c}$ are non coplanar and unit vectors such that $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \frac{\vec{b} + \vec{c}}{\sqrt{2}}\Bigg)$ then the angle between $vea$ and $\vec{b}$ is

(A) $\frac{3\pi}{4}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) $\pi$

A. $3\pi/4$

B. $\pi/4$

C. $\pi/2$

D. $\pi$

**Answer: A**

Watch Video Solution

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

A. the AM of a and b

B. the GM of a and b

C. the HM of a and b

D. equal to zero

**Answer: B**

Watch Video Solution

**23.** If $\vec{a} \times \vec{b} = \vec{c}$ and $\vec{b} \times \vec{c} = \vec{a}, show t \widehat{\vec{a}}, \vec{b}, \vec{c}$ are orthogonal in pairs. Also show that |vecc|=|veca| and |vecb|=1`

A. $\left|\vec{a}\right| = 1, \vec{b} = \vec{c}$

B. $\left|\vec{c}\right| = 1, \left|\vec{a}\right| = 1$

C. $\left|\vec{b}\right| = 2, \vec{c} = 2\vec{a}$

D. $\left|\vec{b}\right| = 1, \left|\vec{c}\right| = \left|\vec{a}\right|$

**Answer: A::D**

Watch Video Solution

**24.** Let $\vec{a}, \vec{b}$ and $\vec{c}$ be vectors forming right- hand triad . Let $\vec{P} = \frac{\vec{b} \times \vec{c}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}, \vec{q}\frac{\vec{c} \times \vec{a}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}$ and $\vec{r} = \frac{\vec{a} \times \vec{b}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]} If x \cup R^{+}$ then

A. 3

B. 2

C. 1

D. 0

**Answer: A**

Watch Video Solution

**25.**

$\vec{r} \times \vec{a} = \vec{b} \times \vec{a}, \vec{r} \times \vec{b} = \vec{a} \times \vec{b}, \vec{a} \ne \vec{0}, \vec{b} \ne \vec{0}, \vec{a} \ne \lambda \vec{b}$ and $\vec{a}$ is not perpendicular to $\vec{b}$, then find $\vec{r}$ in terms of $\vec{a}$ and $\vec{b}$.

A. $\vec{a} - \vec{b}$

B. $\vec{a} + \vec{b}$

C. $\vec{a} \times \vec{b} + \vec{a}$

D. $\vec{a} \times \vec{b} + \vec{b}$

**Answer: B**

Watch Video Solution

**26.** The vector $\vec{a}$ coplanar with the vectors $\hat{i}$ and $\hat{j}$ perendicular to the vector $\vec{b} = 4\hat{i} - 3\hat{j} + 5\hat{k}$ such that $\left|\vec{a}\right| = \left|\vec{b}\right|$ is

A. $\sqrt{2}\left(3\hat{i} + 4\hat{j}\right)$ or $-\sqrt{2}\left(3\hat{i} + 4\hat{j}\right)$

B. $\sqrt{2}\left(4\hat{i} + 3\hat{j}\right)$ or $-\sqrt{2}\left(4\hat{i} + 3\hat{j}\right)$

C. $\sqrt{3}\left(4\hat{i} + 5\hat{j}\right)$ ro $-\sqrt{3}\left(4\hat{i} + 5\hat{j}\right)$

D. $\sqrt{3}\left(5\hat{i} + 4\hat{j}\right)$ or $-\sqrt{3}\left(5\hat{i} + 4\hat{j}\right)$

**Answer: A**

Watch Video Solution

**27.** 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. $\left|\vec{a}\right|^{2}\vec{b}$

B. $\left|\vec{a}\right|^{3}\vec{b}$

C. $\left|\vec{a}\right|^{4}\vec{b}$

D. none of these

**Answer: C**

Watch Video Solution

**28.** If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar non-zero vectors, then

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

is equal to

A. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]^{2}$

B. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]^{3}$

C. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]^{4}$

D. none of these

**Answer: C**

Watch Video Solution

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

A. $\pm\dfrac{\hat{i}+\hat{j}-2\hat{k}}{\sqrt{6}}$

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

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

D. $\pm\hat{k}$

**Answer: A**

Watch Video Solution

30. If the vectors $(\sec^2 A)\hat{i} + \hat{j} + \hat{k}, \hat{i} + (\sec^2 B)\hat{j} + \hat{k}, \hat{i} + \hat{j} + (\sec^2 c)\hat{k}$ are coplanar,

then the value of $\cos ec^2 A + \cos ec^2 B + \cos ec^2 C$, is

A. 1

B. 2

C. 3

D. none of these

**Answer: B**

Watch Video Solution

**31.** x and y are two mutually perpendicular unit vector, if the vectors $a\widehat{a} + a\hat{y} + c(\widehat{x} \times \hat{y}).\, x + (\widehat{x} + \hat{y})$ and $c\widehat{x} + c\hat{y} + b(\widehat{x} + \hat{y})$, lie in a plane than c is:

A. A.M is $x$ and $y$

B. G.M. of $x$ and $y$

C. H.M. of $x$ and $y$

D. equal to zero

**Answer: B**

Watch Video Solution

**32.** The three concurrent edges of a parallelopiped represent the vectors $\vec{a}, \vec{b}, \vec{c}$ such that $\begin{bmatrix}\vec{a} & \vec{b} & \vec{c}\end{bmatrix} = V$. Then the volume of the parallelopiped whose three concurrent edges are the three diagonals of three faces of the given parallelopiped is

A. $V$

B. $2V$

C. $3V$

D. none of these

**Answer: B**

Watch Video Solution

**33.** If $a = \hat{i} + \hat{j} + \hat{k}, b = \hat{i} + \hat{j}, c = \hat{i}$ and $(a \times b) \times c = \lambda a + \mu b$, then $\lambda + \mu$ is equal to

A. 0

B. 1

C. 2

D. 3

**Answer: A**

Watch Video Solution

**34.** If $\vec{a} = 2\hat{i} - 3\hat{j} + 5\hat{k}, \vec{b} = 3\hat{i} - 4\hat{j} + 5\hat{k}$ and $\vec{c} = 5\hat{i} - 3\hat{j} - 2\hat{k}$, then the volume of the parallelopiped with coterminous edges $\vec{a} + \vec{b}, \vec{b} + \vec{c}, \vec{c} + \vec{a}$ is

A. 2

B. 1

C. 16

D. 0

**Answer: C**

Watch Video Solution

**35.** If $\vec{a}, \vec{b}, \vec{c}$ are linearly independent vectors, then $\dfrac{\left(\vec{a}+2\vec{b}\right)\times\left(2\vec{b}+\vec{c}\right).\left(5\vec{c}+\vec{a}\right)}{\vec{a}.\left(\vec{b}\times\vec{c}\right)}$ is equal to

A. 10

B. 14

C. 18

D. 12

**Answer: D**

Watch Video Solution

**36.** If $\vec{a}, \vec{b}$ are non-collinear vectors, then

$$\left[\vec{a} \quad \vec{b} \quad \hat{i}\right]\hat{i} + \left[\vec{a} \quad \vec{b} \quad \hat{j}\right]\hat{j} + \left[\vec{a} \quad \vec{b} \quad \hat{k}\right]\hat{k} =$$

A. $\vec{a} + \vec{b}$

B. $\vec{a} \times \vec{b}$

C. $\vec{a} - \vec{b}$

D. $\vec{b} \times \vec{a}$

**Answer: B**

Watch Video Solution

**37.** If $\left[2\vec{a} + 4\vec{b} \quad \vec{c} \quad \vec{d}\right] = \lambda\left[\vec{a} \quad \vec{c} \quad \vec{d}\right] + \mu\left[\vec{b} \quad \vec{c} \quad \vec{d}\right]$, then $\lambda + \mu =$

A. 6

B. -6

C. 10

D. 8

**Answer: A**

Watch Video Solution

**38.** If the volume of the tetrahedron whose vertices are $(1, -6, 10), (-1, -3, 7), (5, -1, \lambda)$ and $(7, -4, 7)$ is 11 cubit units then $\lambda =$

A. 2,6

B. 3,4

C. 1,7

D. 5,6

**Answer: C**

Watch Video Solution

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

A. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]\vec{c}$

B. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]\vec{b}$

C. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]\vec{a}$

D. $a\times\left(\vec{b}\times\vec{c}\right)$

**Answer: A**

Watch Video Solution

40. When a right handed rectangular Cartesian system OXYZ is rotated about the z-axis through an angle $\frac{\pi}{4}$ in the counter-clockwise, direction it is found that a vector $\vec{a}$ has the component $2\sqrt{3}, 3\sqrt{2}$ and 4.

A. $5,\ -1, 4$

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

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

D. none of these

**Answer: D**

Watch Video Solution

**41.** Prove that vectors

$$\vec{u} = (al + a_1 l_1)\hat{i} + (am + a_1 m_1)\hat{j} + (an + a_1 n_1)\hat{k}$$

$$\vec{v} = (bl + b_1 l_1)\hat{i} + (bm + b_1 m_1)\hat{j} + (bn + b_1 n_1)\hat{k}$$

$$\vec{w} = (wl + c_1 l_1)\hat{i} + (cm + c_1 m_1)\hat{j} + (cn + c_1 n_1)\hat{k}$$

A. form an equilteral triangle

B. are coplanar

C. are collinear

D. are mutually perpendicular

**Answer: B**

Watch Video Solution

Watch Video Solution

42. If $\vec{a} \times (\vec{a} \times \vec{b}) = \vec{b} \times (\vec{b} \times \vec{c})$ and $\vec{a} . \vec{b} \neq 0,$ then $[\vec{a} \ \vec{b} \ \vec{c}] =$

A. 0

B. 1

C. 2

D. 3

**Answer: A**

Watch Video Solution

43. $[\vec{a} \ \vec{b} \ a \times \vec{b}] + (\vec{a} . \vec{b})^2 =$

A. $|\vec{a}|^2 |\vec{b}|^2$

B. $|\vec{a} + \vec{b}|^2$

C. $\left|\vec{a}\right|^2 + \left|\vec{b}\right|^2$

D. none of these

**Answer: A**

Watch Video Solution

**44.** Let $\vec{\alpha}, \vec{\beta}$ and $\vec{\gamma}$ be the unit vectors such that $\vec{\alpha}$ and $\vec{\beta}$ are mutually perpendicular and $\vec{\gamma}$ is equally inclined to $\vec{\alpha}$ and $\vec{\beta}$ at an angle $\theta$. If $\vec{\gamma} = x\vec{\alpha} + y\vec{\beta} + z\left(\vec{\alpha} \times \vec{\beta}\right)$, then which one of the folllowing is incorrect?

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

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

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

D. $x^2 + y^2 = 1$

**Answer: D**

Watch Video Solution

**45.** If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are unit coplanar vectors, then

$\left[2\vec{a} - 3\vec{b} \quad 7\vec{b} - 9\vec{c} \quad 12\vec{c} - 23\vec{a}\right]$

A. 0

B. $1/2$

C. $24$

D. $32$

**Answer: A**

Watch Video Solution

**46.** If $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right] = 3$, then the volume (in cubic units) of the parallelopiped with $2\vec{a} + \vec{b}, 2\vec{b} + \vec{c}$ and $2\vec{c} + \vec{a}$ as coterminous edges is

A. 15

B. 22

C. 25

D. 27

**Answer: D**

Watch Video Solution

**47.** If V is the volume of the parallelepiped having three coterminous edges as $\vec{a}, \vec{b}$ and $\vec{c}$, then the volume of the parallelepiped having three coterminous edges as

$\vec{\alpha} = \left(\vec{a}.\vec{a}\right)\vec{a} + \left(\vec{a}.\vec{b}\right)\vec{b} + \left(\vec{a}.\vec{c}\right)\vec{c}$,

$\vec{\beta} = \left(\vec{b}.\vec{a}\right)\vec{a} + \left(\vec{b}.\vec{b}\right) + \left(\vec{b}.\vec{c}\right)\vec{c}$

and $\vec{\lambda} = \left(\vec{c}.\vec{a}\right)\vec{a} + \left(\vec{c}.\vec{b}\right)\vec{b} + \left(\vec{c}.\vec{c}\right)\vec{c}$ is

A. $V^3$

B. $3V$

C. $V^2$

D. $2V$

**Answer: A**

Watch Video Solution

**48.** Unit vectors $\overrightarrow{a}$ and $\overrightarrow{b}$ ar perpendicular , and unit vector $\overrightarrow{c}$ is inclined at an angle $\theta$ to both $\overrightarrow{a}$ and $\overrightarrow{b}$. $If \alpha \overrightarrow{a} + \beta \overrightarrow{b} + \gamma \left( \overrightarrow{a} \times \overrightarrow{b} \right)$ then.

A. $\alpha \ne \beta$

B. $\gamma^2 = 1 - 2\alpha^2$

C. $\gamma^2 = -\cos 2\theta$

D. $\beta^2 = \dfrac{1 + \cos 2\theta}{2}$

**Answer: A**

Watch Video Solution

**49.** If vectors $\overrightarrow{A}B = -3\hat{i} + 4\hat{k} and \overrightarrow{A}C = 5\hat{i} - 2\hat{j} + 4\hat{k}$ are the sides of a $\triangle ABC$, then the length of the median through $A is$ a. $\sqrt{14}$ b. $\sqrt{18}$ c. $\sqrt{29}$ d. $\sqrt{5}$

A. $2\sqrt{26}$

B. $4\sqrt{13}$

C. $6\sqrt{13}$

D. none of these

**Answer: D**

Watch Video Solution

**50.** Let the position vectors of vertices $A, B, C$ of $\Delta ABC$ be respectively $\overrightarrow{a}, \overrightarrow{b}$ and $\overrightarrow{c}$. If $\overrightarrow{r}$ is the position vector of the mid point of the line segment joining its orthocentre and centroid then $\left(\overrightarrow{a} - \overrightarrow{r}\right) + \left(\overrightarrow{b} - \overrightarrow{r}\right) + \left(\overrightarrow{c} - \overrightarrow{r}\right) =$

A. A. 1

B. B. 2

C. C. 3

D. D. none of these

**Answer: C**

Watch Video Solution

**51.** The position vector of a point $P$ is $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ where $x, y, z \varepsilon N$ and $\vec{a} = \hat{i} + \hat{j} + \hat{k}$. If $\vec{r} . \vec{a} = 10$, then the number of possible position of $P$ is

A. 36

B. 72

C. 66

D. none of these

**Answer: A**

Watch Video Solution

**52.** $\vec{a}$ and $\vec{b}$ are two unit vectors that are mutually perpendicular. A unit vector that if equally inclined to $\vec{a}$, $\vec{b}$ and $\vec{a} \times \vec{b}$ is equal to

A. $\frac{1}{\sqrt{2}}\left(\vec{a} + \vec{b} + \vec{a} \times \vec{b}\right)$

B. $\frac{1}{2}\left(\vec{a} + \vec{b} + \vec{a} \times \vec{b}\right)$

C. $\frac{1}{\sqrt{3}}\left(\vec{a} + \vec{b} + \vec{a} \times \vec{b}\right)$

D. $\frac{1}{3}\left(\vec{a} + \vec{b} + \vec{a} \times \vec{b}\right)$

**Answer: C**

Watch Video Solution

**53.** If the vectors $2a\hat{i} + b\hat{j} + c\hat{k}, b\hat{i} + c\hat{j} + 2a\hat{k}$ and $c\hat{i} + 2a\hat{j} + b\hat{k}$ are coplanar vectors, then the straight lines $ax + by + c = 0$ will always pass through the point

A. $(1, 2)$

B. $(2, -1)$

C. $(2, 1)$

D. $(1, -2)$

**Answer: C**

Watch Video Solution

**54.** Let $\alpha = a\hat{i} + b\hat{j} + c\hat{k}, \overrightarrow{\beta} = b\hat{i} + c\hat{j} + a\hat{k}$ and $\overrightarrow{\gamma} = c\hat{i} + a\hat{j} + b\hat{k}$ be three coplanar vectors with $a \ne b$ and $\overrightarrow{v} = \hat{i} + \hat{j} + \hat{k}$. Then $\overrightarrow{v}$ is perpendicular to

A. $\overrightarrow{\alpha}$

B. $\overrightarrow{\beta}$

C. $\overrightarrow{\gamma}$

D. all of these

**Answer: D**

Watch Video Solution

**55.** Let $\vec{a}, \vec{b}, \vec{c}$ be three mutually perpendicular vectors having same magnitude and $\vec{r}$ is a vector satisfying

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

then $\vec{r}$ is equal to

A. A. $\frac{1}{3}\left(\vec{a} + \vec{b} + \vec{c}\right)$

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

C. C. $\frac{3}{2}\left(\vec{a} + \vec{b} + \vec{c}\right)$

D. D. $2\left(\vec{a} + \vec{b} + \vec{c}\right)$

**Answer: B**

Watch Video Solution

**56.** Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be the three non-coplanar vectors and $\vec{d}$ be a non zero vector which is perpendicular to $\vec{a} + \vec{b} + \vec{c}$ and is represented as $\vec{d} = x\left(\vec{a} \times \vec{b}\right) + y\left(\vec{b} \times \vec{c}\right) + z\left(\vec{c} \times \vec{a}\right)$. Then,

A. $x^3 + y^3 + z^3 = 3xyz$

B. $xy + yz + zx = 0$

C. $x = y = z$

D. $x^2 + y^2 + z^2 = xy + yz + zx$

**Answer: A**

Watch Video Solution

**57.** Let $\vec{r}$ be a unit vector satisfying $\vec{r} \times \vec{a} = \vec{b}$, where $\left|\vec{a}\right| = \sqrt{3}$ and $\left|\vec{b}\right| = \sqrt{2}$, then (a) $\vec{r} = \frac{2}{3}\left(\vec{a} + \vec{a} \times \vec{b}\right)$ (b) $\vec{r} = \frac{1}{3}\left(\vec{a} + \vec{a} \times \vec{b}\right)$ (c) $\vec{r} = \frac{2}{3}\left(\vec{a} - \vec{a} \times \vec{b}\right)$ (d) $\vec{r} = \frac{1}{3}\left(-\vec{a} + \vec{a} \times \vec{b}\right)$

A. $\frac{2}{3}\left(\vec{a} + \vec{a} \times \vec{b}\right)$

B. $\frac{1}{3}\left(\vec{a} + \vec{a} \times \vec{b}\right)$

C. $\frac{2}{3}\left(\vec{a} - \vec{a} \times \vec{b}\right)$

D. $\frac{1}{3}\left(-\vec{a} + \vec{a} \times \vec{b}\right)$

**Answer: B**

Watch Video Solution

**58.** Let $\vec{a}$ and $\vec{c}$ be unit vectors such that $\left|\vec{b}\right| = 4$ and $\vec{a} \times \vec{b} = 2\left(\vec{a} \times \vec{c}\right)$. The angle between $\vec{a}$ and $\vec{c}$ is $\cos^{-1}\left(\frac{1}{4}\right)$. If $\vec{b} - 2\vec{c} = \lambda \vec{a}$ then $\lambda =$

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

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

C. $3, -4$

D. $-3, 4$

**Answer: C**

Watch Video Solution

**59.** If $\vec{a}+2\vec{b}+3\vec{c}=0$, then $\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}=$

A. $\vec{0}$

B. $\vec{a}$

C. $\vec{b}$

D. $\vec{c}$

**Answer: A**

Watch Video Solution

**60.** If in triangle ABC, $\overrightarrow{AB}=\frac{\vec{u}}{|\vec{u}|}-\frac{\vec{v}}{|\vec{v}|}$ and $\overrightarrow{AC}=\frac{2\vec{u}}{|\vec{u}|}$, where $|\vec{u}|\neq|\vec{v}|$ , then

$(a) 1+\cos 2A+\cos 2B+\cos 2C=0$ (b)$\sin A=\cos C$ (c)projection of AC on BC is equal to BC (d) projection of AB on BC is equal to AB

A. $1+\cos 2A+\cos 2B+\cos 2C=0$

B. $1+\cos 2A+\cos 2B+\cos 2C=2$

C. both a and b

D. none of these

**Answer: A**

Watch Video Solution

**61.** Let $A\left(2\hat{i}+3\hat{j}+5\hat{k}\right), B\left(-\hat{i}+3\hat{j}+2\hat{k}\right)$ and $C\left(\lambda\hat{i}+5\hat{j}+\mu\hat{k}\right)$ are vertices of a triangle and its median through A is equally inclined to the positive directions of the axes, the value of $2\lambda-\mu$ is equal to

A. 0

B. 1

C. 4

D. 3

**Answer: C**

Watch Video Solution

**62.** A plane is parallel to the vectors $\hat{i}+\hat{j}+\hat{k}$ and $2\hat{k}$ and another plane is parallel to the vectors $\hat{i}+\hat{j}$ and $\hat{i}-\hat{k}$. The acute angle between the line of intersection of the two planes and the vector $\hat{i}-\hat{j}+\hat{k}$ is

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

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

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

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

**Answer: D**

Watch Video Solution

**63.** If A,B,C,D are four points in space, then $\left|\overrightarrow{AB} x \overrightarrow{CD} + \overrightarrow{BC} \times \overrightarrow{AD} + \overrightarrow{CA} \times \overrightarrow{BD}\right| = k(area of \triangle ABC) where k =$

(A) 5 (B) 4 (C) 2 (D) none of these

A. 2

B. 1

C. 3

D. 4

**Answer: D**

Watch Video Solution