MATHS

BOOKS - CENGAGE

VECTORS

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1. A line in the 3 dimensiional space makes an angle $\theta \left(0 \le \theta \le \frac{\pi}{2}\right)$ both with x-axis and y-axis. A possible range of θ is

A. $\left[0, \frac{\pi}{4}\right]$

B. $\left[0, \frac{\pi}{2}\right]$

C. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

D. $\left[\frac{\pi}{6}, \frac{\pi}{3}\right]$

Answer: C

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

A. $-27, 18, 54$

B. $27, \ -18, 54$

C. $27, \ -18, 054$

D. $-7, \ -18, \ -54$

Answer: B

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3. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are position vectors of A,B, and C respectively of ΔABC and if $\left|\vec{a}-\vec{b}\right|=4, \left|\vec{b}-\vec{c}\right|=2, \left|\vec{c}-\vec{a}\right|=3$, then the distance between the centroid and incenter of $\triangle ABC$ is

A. 1

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

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

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

Answer: C

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4. Let O be an interior point of $\triangle ABC$ such that $\overrightarrow{OA} + 2\overrightarrow{OB} + 3\overrightarrow{OC} = \overrightarrow{o}$. Then find the ratio of the area of $\triangle ABC$ to the area of $\triangle BRC$ is 1 unit.

A. 2

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

C. 3

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

Answer: C

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5. In a three-dimensional coordinate system, $P, Q, andR$ are images of a point $A(a, b, c)$ in the $x-y, y-zandz-x$ planes, respectively. If G is the centroid of triangle $PQR,$ then area of triangle AOG is (O is the origin) a. 0 b. $a^2+b^2+c^2$ c. $\frac{2}{3}(a^2+b^2+c^2)$ d. none of these

A. 0

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

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

D. none of these

Answer: A

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

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

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

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

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

Answer: C

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

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

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

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

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

Answer: C

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8. If D,E and F are the mid-points of the sides BC, CA and AB respectively of a triangle ABC and λ is scalar, such that $\overrightarrow{AD}+\frac{2}{3}\overrightarrow{BE}+\frac{1}{3}\overrightarrow{CF}=\lambda\overrightarrow{AC}$, then λ is equal to

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

B. 1

C. $3/2$

D. 2

Answer: A

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9. If points (1,2,3), (0,-4,3), (2,3,5) and (1,-5,-3) are vertices of tetrahedron, then the point where lines joining the mid-points of opposite edges of concurrent is

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

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

C. (1,1,-2)

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

Answer: A

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10. The unit vector parallel to the resultant of the vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $4\hat{i} - 3\hat{j} + 2\hat{k}$ is

A. $\frac{1}{\sqrt{37}}\left(6\hat{i}+\hat{k}\right)$

B. $\frac{1}{\sqrt{37}}\left(6\hat{i}+\hat{j}\right)$

C. $\frac{1}{\sqrt{37}}\left(6\hat{i}+\hat{k}\right)$

D. none of these

Answer: A

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11. ABCDEF is a regular hexagon. Find the vector $\overrightarrow{A}B+\overrightarrow{A}C+\overrightarrow{A}D+\overrightarrow{A}E+\overrightarrow{A}F$ in terms of the vector $\overrightarrow{A}D$

A. 1

B. 2

C. 3

D. none of these

Answer: C

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12. If $\vec{a}+\vec{b}+\vec{c}=0, \left|\vec{a}\right|=3, \left|\vec{b}\right|=5, \left|\vec{c}\right|=7$ then the angle between $\vec{a}$ and $\vec{b}$ is :

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

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

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

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

Answer: B

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

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 1

D. none of these

Answer: B

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

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

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

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

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

Answer: D

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

A. $3\overrightarrow{c}$

B. $3\overrightarrow{a}$

C. $\overrightarrow{0}$

D. $3\overrightarrow{b}$

Answer: B

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16. If the position vectors of P and Q are i + 3j - 7k and 5i - 2j + 4k then the cosine of the angle between PQ and y - axis is

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

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

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

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

Answer: B

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17. The non zero vectors $\vec{a}, \vec{b}$, and $\vec{c}$ are related byi $\vec{a} = 8\vec{b} nd \vec{c} = -7\vec{b}$. Then the angle between $\vec{a}$ and $\vec{c}$ is (A) π (B) 0 (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

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

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

C. π

D. 0

Answer: C

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

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

B. $\dfrac{\overrightarrow{i}-\overrightarrow{k}}{\sqrt{2}}$

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

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

Answer: C

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19. A unit tangent vector at t=2 on the curve $x=t^2+2, y=4t-5$ and $z=2t^2-6t$ is

A. $\dfrac{1}{\sqrt{3}}\left(\overrightarrow{i}+\overrightarrow{j}+\overrightarrow{k}\right)$

B. $\dfrac{1}{3}\left(2\overrightarrow{i}+2\overrightarrow{j}+\overrightarrow{k}\right)$

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

D. $\frac{1}{3}\left(\vec{i}+\vec{j}+\vec{k}\right)$

Answer: B

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20. If $\vec{a}$ and $\vec{b}$ are position vectors of A and B respectively, then the position vector of a point C in $\overrightarrow{AB}$ produced such that $\overrightarrow{AC}$ =2015 $\overrightarrow{AB}$ is

A. $2014\vec{a}-2015\vec{b}$

B. $2014\vec{b}+2015\vec{a}$

C. $2015\vec{b}+2014\vec{a}$

D. $2015\vec{b}-2014\vec{a}$

Answer: D

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

A. $\pm 3\vec{c}$

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

C. $\pm \vec{c}$

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

Answer: C

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22. A line passes through the points whose position vectors are $\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + \hat{k}$. The position vector of a point on it at unit distance from the first point is

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

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

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

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

Answer: A

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

Which of the following is true?

A. $\overrightarrow{AC} = 2\overrightarrow{AB}$

B. $\overrightarrow{AC} = -3\overrightarrow{AB}$

C. $\overrightarrow{AC} = 3\overrightarrow{AB}$

D. None of these

Answer: C

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

Which of the following is true?

A. $2\overrightarrow{OA}-3\overrightarrow{OB}+\overrightarrow{OC}=\vec{0}$

B. $2\overrightarrow{OA}+7\overrightarrow{OB}+9\overrightarrow{OC}=\vec{0}$

C. $\overrightarrow{OA}+\overrightarrow{OB}+\overrightarrow{OC}=\vec{0}$

D. None of these

Answer: A

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

B divided AC in ratio

A. $2:1$

B. $2:3$

C. $2: \ -3$

D. $1:2$

Answer: B

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1. $\vec{a} = 2\hat{i} + \hat{j} + \hat{k}, \vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k},$

$\vec{a} \times \vec{b} = 5\hat{i} + 2\hat{j} - 12\hat{k}, \vec{a}.\vec{b} = 11$, then $b_1 + b_2 + b_3 =$

A. 3

B. 5

C. 7

D. 9

Answer: B

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2. If $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ are unit vectors such that $\vec{a}.\vec{b} = \frac{1}{2}, \vec{c}.\vec{d} = \frac{1}{2}$ and angle between $\vec{a} \times \vec{b}$ and $\vec{c} \times \vec{d}$ is $\frac{\pi}{6}$ then the value of $\left|\left[\vec{a}\vec{b}\vec{d}\right]\vec{c} - \left[\vec{a}\vec{b}\vec{c}\right]\vec{d}\right| =$

A. $3/2$

B. $3/4$

C. $3/8$

D. 2

Answer: C

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3. If $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ be vectors such that

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

and

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

Then the value of μ is

A. 0

B. 1

C. 3

D. 4

Answer: D

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4. Let $\left(\hat{p} \times \vec{q}\right) \times \left(\hat{p}.\,\vec{q}\right)\vec{q}$

$$= \left(x^2 + y^2\right)\vec{q} + (14 - 4x - 6y)\,\vec{p}$$

Where $\hat{p}$ and $\hat{q}$ are two non-collinear vectors $\overrightarrow{p}$ is unit vector and x,y are scalars. Then the value of $(x+y)$ is

A. 4

B. 5

C. 6

D. 7

Answer: B

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5. If $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ are three on-coplanar vectors such that $\overrightarrow{a} \times \overrightarrow{b} = \overrightarrow{c}, \overrightarrow{b} \times \overrightarrow{c} = \overrightarrow{a}, \overrightarrow{c} \times \overrightarrow{a} = \overrightarrow{b},$ then the value of $\left|\overrightarrow{a}\right| + \left|\overrightarrow{b}\right| + \left|\overrightarrow{c}\right|$ is

A. $1/3$

B. 1

C. 3

D. 6

Answer: C

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6. Prove that $\begin{vmatrix} 1 & x & y \\ 0 & \sin x & \sin y \\ 0 & \cos x & \cos y \end{vmatrix} = \sin(x - y)$

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7. Let $\vec{a}$ and $\vec{c}$ be unit vectors inclined at $\pi/3$ with each other. If $\left(\vec{a} \times \left(\vec{b} \times \vec{c}\right)\right).\left(\vec{a} \times \vec{c}\right) = 5$, then $\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ is equal to

A. -10

B. -5

C. -20

D. none of these

Answer: A

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8. if $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}, \vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$ and $\left|\vec{c}\right| = 1$

Such that $\left[\vec{a} \times \vec{b}\vec{b} \times \vec{c}\vec{c} \times \vec{a}\right]$ has maximum value, then the value of $\left|\left(\vec{a} \times \vec{b}\right) \times \vec{c}\right|^2$ is

A. 0

B. 1

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

D. none of these

Answer: A

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9. If the angles between the vectors $\vec{a}$ and $\vec{b}$, $\vec{b}$ and $\vec{c}$, $\vec{c}$ an $\vec{a}$ are respectively $\frac{\pi}{6}, \frac{\pi}{4}$ and $\frac{\pi}{3}$, then the angle the vector $\vec{a}$ makes with the plane containing $\vec{b}$ and $\vec{c}$, is

A. $\cos^{-1}\sqrt{1-\sqrt{2/3}}$

B. $\cos^{-1}\sqrt{2-\sqrt{3/2}}$

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

D. $\cos^{-1}\sqrt{\sqrt{2/3}}$

Answer: B

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

A. $\pi/4$

B. $\pi/6$

C. $\pi/3$

D. $\pi/2$

Answer: B

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11. If $\vec{a}, \vec{b}, \vec{c}$ are non coplanar vectors and $\vec{p}, \vec{q}, \vec{r}$ are reciprocal vectors, then

$\left(l\vec{a} + m\vec{b} + n\vec{c}\right).\left(l\vec{p} + m\vec{q} + n\vec{r}\right)$ is equal to

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

B. $lm + mn + nl$

C. 0

D. None of these

Answer: A

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12. Let $\vec{a} = \hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{B} = 6\hat{i} + 4\hat{j} - 8\hat{k}$, $\vec{C} = 5\hat{i} + 2\hat{j} + 5\hat{k}$ and a vector $\vec{R}$ satisfies $\vec{R} \times \vec{B} = \vec{C} \times \vec{B}$, $\vec{R} \cdot \vec{A} = 0$, then the value of

$$\frac{\left|\vec{B}\right|}{\left|\vec{R} - \vec{C}\right|}$$ is

A. 1

B. 2

C. 3

D. 4

Answer: B

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13. The volume of the parallelepiped whose coterminous edges are represented by the vectors $2\vec{b} \times \vec{c}$, $3\vec{c} \times \vec{a}$ and $4\vec{a} \times \vec{b}$ where

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

$\vec{b} = \sin\left(\theta + \frac{2\pi}{3}\right)\hat{i} + \cos\left(\theta + \frac{2\pi}{3}\right)\hat{j} + \sin\left(2\theta + \frac{4\pi}{3}\right)\hat{k},$

$\vec{c} = \sin\left(\theta - \frac{2\pi}{3}\right)\hat{i} + \cos\left(\theta - \frac{2\pi}{3}\right)\hat{j} + \sin\left(2\theta - \frac{4\pi}{3}\right)\hat{k}$ is 18 cubic units, then the values of θ, in the interval $\left(0, \frac{\pi}{2}\right)$, is/are

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

B. $\frac{2\pi}{9}$

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

D. $\frac{4\pi}{9}$

Answer: A::B::D

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14. Let $\vec{a}$ and $\vec{b}$ be two non- zero perpendicular vectors. A vector $\vec{r}$ satisfying the equation $\vec{r} \times \vec{b} = \vec{a}$ can be

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

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

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

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

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

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15. If $\vec{a}, \vec{b}, \vec{c}$ are three non-zero vectors, then which of the following statement(s) is/are true?

A. $\vec{a} \times \left(\vec{b} \times \vec{c}\right), \vec{b} \times \left(\vec{c} \times \vec{a}\right), \left(\vec{c} \times \vec{a}\right), \vec{c} \times \left(\vec{a} \times \vec{b}\right)$ form a right handed system

B. $\vec{c}, \left(\vec{a} \times \vec{b}\right) \times \vec{c}, \vec{a} \times \vec{b}$ from a right handed system

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

D. $\frac{\left(\vec{a} \times \vec{b}\right).\left(\vec{b} \times \vec{c}\right)}{\left(\vec{b} \times \vec{c}\right).\left(\vec{a} \times \vec{c}\right)} = -1$ if $\vec{a} + \vec{b} + \vec{c} = 0$

Answer: B::C::D

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16. Vectors $\vec{a}, \vec{b}, \vec{c}$ are three unit vectors and $\vec{c}$ is equally inclined to both $\vec{a}$ and $\vec{b}$. Let

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

$= \left(4 + x^2\right)\vec{b} - \left(4x\cos^2\theta\right)\vec{a},$

then $\vec{a}$ and $\vec{b}$ are non-collinear vectors, $x > 0$

A. $x = 2$

B. $\theta = 0^\circ$

C. $\theta = x$

D. $x = 4$

Answer: A::B::C

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17. If $\vec{a}$ and $\vec{b}$ are unequal unit vectors such that $\left(\vec{a}-\vec{b}\right)\times\left[\left(\vec{b}+\vec{a}\right)\times\left(2\vec{a}+\vec{b}\right)\right]=\vec{a}+\vec{b}$ then angle θ between $\vec{a}$ and $\vec{b}$ is

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

B. 0

C. π

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

Answer: A::C

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18. $\vec{a}=2\hat{i}+\hat{j}+2\hat{k}$, $\vec{b}=\hat{i}-\hat{j}+\hat{k}$ and non zero vector $\vec{c}$ are such that $\left(\vec{a}\times\vec{b}\right)\times\vec{c}=\vec{a}\times\left(\vec{b}\times\vec{c}\right)$.

Then vector $\vec{c}$ may be given as

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

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

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

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

Answer: A

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19. The area of a parallelogram whose adjacent sides are represented by the vectors $a = -\hat{i} - 2\hat{j} - 3\hat{k}$ and $b = -\hat{i} + 2\hat{j} - 3\hat{k}$ is

A. $\sqrt{14}$

B. $\sqrt{6}$

C. $4\sqrt{10}$

D. 36

Answer: D

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20. A vector along the bisector of angle between the vectors $\vec{b}$ and $\vec{c}$ is,

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

B. $(2+\sqrt{3})\hat{i}+(1-\sqrt{3})\hat{j}-(2+\sqrt{3})\hat{k}$

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

D. $(2+\sqrt{3})\hat{i}-(1-\sqrt{3})\hat{j}+(2+\sqrt{3})\hat{k}$

Answer: A

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Question Bank

1. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are mutually perpendicular unit vectors such that $x\bar{a}-y\vec{b}+\vec{c}-2\hat{i}=\vec{0}$, $x, y \in R$, then the value of x^2+y^2 is

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2. Let $\vec{a}$ and $\vec{b}$ be two vectors such that $\left|\vec{a}\right| = 1$ and $\vec{a}.\left(\vec{b} \times \left(\vec{a} \times \bar{b}\right)\right) = 8$. If the angle between $\vec{a}$ and $\vec{b}$ is $\cos ec^{-1}\sqrt{2}$, then magnitude of $\vec{b}$ is

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3. Given $f^2(x) + g^2(x) + h^2(x) \leq 9$ and $U(x) = 3f(x) + 4g(x) + 10h(x)$, where $f(x), g(x)$ and $h(x)$ are continuous $\forall x \in R$. If maximum value of $U(x)$ is $\sqrt{N}$, then find N.

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4. Vectors $\vec{a}$ and $\vec{b}$ are inclined at an angle $\theta = 120^\circ$. If $\left|\vec{a}\right| = 1, \left|\vec{b}\right| = 2$, then $\left[\left(\vec{a} + 3\vec{b}\right) \times \left(3\vec{a} - \vec{b}\right)\right]^2$ is equal to

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5. If $\bar{a}$ and $\vec{b}$ are non zero, non collinear vectors, and the linear combination $(2x-y)\vec{a}+4\vec{b}=5\vec{a}+(x-2y)\vec{b}$ holds for real x and y then $x+y$ has the value equal to

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6. Let $\vec{u}, \vec{v} and \vec{w}$ be such that $|\vec{u}|=1, |\vec{v}|=2 and |\vec{w}|=3.$ 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 $|\vec{u}-\vec{v}+\vec{w}|$ equals a. 2 b. $\sqrt{7}$ c. $\sqrt{14}$ d. 14

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7. Given three vectors e $\vec{a}, \vec{b}$ and $\vec{c}$ two of which are non-collinear. Futrther if $\left(\vec{a}+\vec{b}\right)$ is collinear with $\vec{c}$, $\left(\vec{b}+\vec{c}\right)$ is collinear with $\vec{a}$, $|\vec{a}|=|\vec{b}|=|\vec{c}|=\sqrt{2}$ find the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$

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8. 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 $\overrightarrow{u}.\widehat{n} = 0$ and $\overrightarrow{v}.\widehat{n} = 0$ then find the value of $\left|\overrightarrow{w}.\widehat{n}\right|$

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9. If the three points with posifion vectors $(1, a, b)$, $(a, 2, b)$ and $(a, b, 3)$ are collinear in space, then the value of $a + b$ is

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10. The number of vectors of unit length perpendicular to vectors $\overrightarrow{a} = (1, 1, 0) and \overrightarrow{b} = (0, 1, 1)$ is a. one b. two c. three d. infinite

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11. If $\bar{a}, \overrightarrow{b}$ are any two perpendicular vectors of equal magnitude and $\left|3\overrightarrow{a} + 4\overrightarrow{b}\right| + \left|4\overrightarrow{a} - 3\overrightarrow{b}\right| = 20$, then $\left|\overrightarrow{a}\right|$ equals

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12. The perpendicular distance of the point whose position vector is $(1, 3, 5)$ from the line $\bar{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$ is equal to

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13. If two sides of a triangle ABC are represented by vectors $\vec{a}$ and $\left(\vec{a} \times \vec{b}\right) \times \vec{a}$ then maximum value of $(\sin 2A + \sin 2B + \sin 2C)$, is

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14. If $\left|\vec{a}\right| = \left|\vec{b}\right| = \left|\vec{c}\right| = 2$ and $\vec{a}\,.\,\vec{b} = \vec{b}\,.\,\vec{c} = \vec{c} \times \vec{a} = 2$, then $\left[\vec{a}\,\vec{b}\,\vec{c}\right]\cos 45^\circ$ is equal to

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15. Let $\vec{a} = -\hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} + \hat{k}$ and vector $\vec{c}$ satisfying conditions

(i) $\left[\vec{a}\,\vec{b}\,\vec{c}\right] = 0$

(ii). $\vec{b}\,.\,\vec{c} = 0$

(iii) $\vec{a}\,.\,\vec{c} = 7$

Then the value of $\frac{2}{7}|\bar{c}|^2$ is equal to

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16. If three points $\left(2\vec{p} - \vec{q} + 3\vec{r}\right), \left(\vec{p} - 2\vec{q} + \alpha\vec{r}\right)$ and $\left(\beta\vec{p} - 5\vec{q}\right)$ (where $\vec{p}, \bar{q}, \vec{r}$ are non-coplanar vectors) are collinear, then the value of $\frac{1}{\alpha + \beta}$ is

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17. If $\left|\vec{\alpha}\right| = \left|\vec{\beta}\right| = \left|\vec{\alpha} + \vec{\beta}\right| = 4$, then the value of $\left|\vec{\alpha} - \vec{\beta}\right|$ is

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18. Let a, b, c in R and alpha, beta are the real roots of the equation ax2 + bx + c = 0 and if a + b + c > 0, a – b + c >0 and c < 0 then [alpha] + [beta] is equal to (where [.] denotes the greatest integer function.)

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19. Let $\vec{a}$ and $\vec{b}$ be two unit vectors then maximum value of $\dfrac{\left|\vec{a}+\vec{b}\right|^2-\left|\vec{a}-\vec{b}\right|^2}{\left|\vec{a}+\vec{b}\right|^2+\left|\vec{a}-\bar{b}\right|^2}$ is equal to

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20. If the vectors $(1-x)\hat{i}+\hat{j}+\hat{k}, \hat{i}+(I-y)\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}+(1-z)\hat{k}$ are coplanar vectors, then value of $\dfrac{1}{x}+\dfrac{1}{y}+\dfrac{1}{z}$ is $(x, y, z$ are non zero numbers)

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21. If $\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}, \hat{b} = \hat{i} - \hat{j} + \hat{k}, \overrightarrow{c} = \hat{i} + 2\hat{j} - \hat{k}$, then find the value of $\begin{vmatrix} \overrightarrow{a}.\overrightarrow{a} & \overrightarrow{a}.\overrightarrow{b} & \overrightarrow{a}.\overrightarrow{c} \\ \overrightarrow{b}.\overrightarrow{a} & \overrightarrow{b}.\overrightarrow{b} & \overrightarrow{b}.\overrightarrow{c} \\ \overrightarrow{c}.\overrightarrow{a} & \overrightarrow{c}.\overrightarrow{b} & \overrightarrow{c}.\overrightarrow{c} \end{vmatrix}$

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22. The sum of all possible real values of ' a ' for which vectors $\overrightarrow{r}_1 = \ln|a|\hat{i} + a\hat{j} - \hat{k}$ and $\overrightarrow{r}_2 = (1 + a^2)\hat{i} - \hat{j} \quad (a - 1)\hat{k}$ are orthogonal is

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23. If $\bar{a} = 3\hat{i} - \hat{j} + \hat{k}, \overrightarrow{b} = 2\hat{i} - 3\hat{j} - \hat{k}, \overrightarrow{c}$ and $\overrightarrow{d} = 2\hat{j} + \hat{k}$, then the value of $\overrightarrow{d}.\left(\overrightarrow{a} \times \overrightarrow{b} \times \left(\overrightarrow{c} \times \overrightarrow{d}\right)\right)$ equals

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