MATHS

BOOKS - BITSAT GUIDE

VECTOR ALGEBRA

Practice Exercise

1. If $|\alpha+\beta|=|\alpha-\beta|$, then

A. α is parallel to β

B. α is perpendicular to β

C. $|\alpha|=|\beta|$

D. None of the above

Answer: B

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2. If $\hat{a}$ and $\hat{b}$ are two unit vectors and θ is the angle between them, then $\hat{a} + \hat{b}$ is a unit vector, if

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

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

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

D. $\theta = \frac{2\pi}{3}$

Answer: D

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3. Find a unit vector $\vec{c}$ if $-\hat{i}+\hat{j}-\hat{k}$ bisects the angle between vectors $\vec{c}$ and $3\hat{i}+4\hat{j}$.

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

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

C. $-\frac{1}{15}\left(11\hat{i}-10\hat{i}-2\hat{k}\right)$

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

Answer: D

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

A. $\mu=\lambda+1$

B. $\lambda=\mu+1$

C. $\lambda + \mu = 1$

D. $\mu = 2 + \lambda$

Answer: A

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5. Let a, b and c be three non-zero vectors, no two of which are collinear and the vector a + b is collinear with c while b + c is collinear with a, then a + b + c is equal to

A. a

B. b

C. c

D. None

Answer: D

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

A. $p=0$

B. p = 1or p =-1/3

C. p = -1 or p = 1/3

D. p = 1 or p = -1

Answer: B

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7. If the sum of two unit vectors is a unit vector,then find the magnitude of their differences.

A. $\sqrt{2}$

B. $\sqrt{3}$

C. $\sqrt{5}$

D. $\sqrt{7}$

Answer: B

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

A. -7

B. 7

C. -6

D. None

Answer: C

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9. If $\hat{a}$ and $\hat{b}$ are unit vectors inclined at an angle $\alpha, \alpha, \in [0, \pi]$ to each other and $\left|\hat{a} + \hat{b}\right| < 1$ Then ,

A. $\left(\frac{\pi}{3}, \frac{2\pi}{3}\right)$

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

C. $\left(0, \frac{\pi}{3}\right)$

D. $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$

Answer: B

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

A. a + c

B. a

C. c

D. 0

Answer: D

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

(A) $\sqrt{33}$ (B) $\sqrt{45}$ (C) $\sqrt{18}$ (D) $\sqrt{720}$

A. $\sqrt{18}$

B. $\sqrt{72}$

C. $\sqrt{33}$

D. $\sqrt{45}$

Answer: C

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12. If a and b are non-collinear vectors, then the value of a for which the vectors $u = (a-2)a + b$ and $V = (2+3a)a - 3b$ are collinear, is

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

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

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

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

Answer: B

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13. If $|a| = |b| = |c| = 1$ and $a \cdot b = b \cdot c = c.\ a = \cos\theta$, then the maximum value of θ is

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

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

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

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

Answer: C

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14. If the resolved parts of the force vector $5\hat{i} + 4\hat{j} + 2\hat{k}$ along and perpendicular to the vector $3\hat{i} + 4\hat{k} - 5\hat{k}$ are α and β respectively. Then, the value of α is

A. $\frac{21}{50}\left(3\hat{i} + 4\hat{i} - 5\hat{k}\right)$

B. $\frac{21}{50}\left(3\hat{i} - 4\hat{i} + 5\hat{k}\right)$

C. $\frac{11}{50}\left(2\hat{i} - 4\hat{i} + 3\hat{k}\right)$

D. $\frac{1}{50}\left(187\hat{i} + 116\hat{i} - 205\hat{k}\right)$

Answer: A

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15. let $|a| = 2\sqrt{2}, |b| = 3$ and the angle between a and b is $\frac{\pi}{4}$. If a parallelogram is constructed with adjacent sides $2a - 3b$ and $a + b$, then its longer digonal is of length

A. 10

B. 8

C. $2\sqrt{26}$

D. 6

Answer: C

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

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

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

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

D. $2\hat{i} + \hat{j} + 5\hat{k}$

Answer: A

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

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

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

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

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

D. $\frac{\hat{i}-4\hat{j}+\hat{k}}{3}$

Answer: C

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18. If a and b are two non-collinear vectors such that $|a|=3, |b|=4$ and $a-b=\hat{i}+2\hat{j}+3\hat{k}$, then the value of $\left\{\frac{|a-b|}{|a||b|}\right\}^2$

A. $\frac{1}{24}$

B. $\frac{5}{72}$

C. $\frac{7}{72}$

D. $\frac{7}{48}$

Answer: C

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19. If the points P (a+b - c), Q(2a+ 3b) and R (b + c) are collinear, where a, b, c are three coplanar vectors, then the value of t is

A. -2

B. $-1/2$

C. $1/2$

D. 2

Answer: D

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20. If the three vectors a, b and c with magnitude 3, 4 and 5 respectively and $a+b+c=0$, then the value of a.b+b. c+c a is

A. -23

B. -25

C. 30

D. 26

Answer: B

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21. The angle between the vectors $a = 2\hat{i} + 2\hat{j} - \hat{k}$ and $b = 6\hat{i} - 3\hat{j} + 2\hat{k}$ is

A. $\cos^{-1}\frac{3}{11}$

B. $\cos^{-1}\frac{2}{11}$

C. $\cos^{-1}\frac{4}{21}$

D. $\cos^{-1}\frac{3}{22}$

Answer: C

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22. If $a = \hat{i} + 2\hat{k} + 3\hat{k}, b = -\hat{i} + 2\hat{j} = \hat{k}$ and $c = 3\hat{i} + \hat{j}$, then p such that $a + pb$ is at right angle to c will be

A. 7

B. 9

C. 3

D. 5

Answer: D

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23. Three vectors $a = \hat{i} + \hat{j} - \hat{k}, b = -\hat{i} + 2\hat{j} + \hat{k}$ and $c = -\hat{i} + 2\hat{j} - \hat{k}$, then

the unit vector perpendicular to both $a+b$ and $b+c$ is

A. $\frac{\hat{i}}{\sqrt{3}}$

B. $\hat{k}$

C. $\frac{\hat{k}}{\sqrt{3}}$

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

Answer: B

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

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

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

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

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

Answer: B

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25. A vector $\vec{r}$ is equally inclined with the vectors $\vec{a}=\cos\theta\hat{i}+\sin\theta\hat{j}$, $\vec{b}=-\sin\theta\hat{i}+\cos\theta\hat{j}$ and $\vec{c}=\hat{k}$, then the angle between $\vec{r}$ and $\vec{a}$ is

A. $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$

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

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

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

Answer: B

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26. Vectors a and b are such that $|a| = 1, |b| = 4$ and $a.b = 2$. If $c = 2a \times b - 3b$, then the angle between b and c is

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

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

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

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

Answer: B

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

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

B. 0

C. $y\hat{i}$

D. $-z\hat{i} + x\hat{k}$

Answer: A

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28. If the vectors $\vec{a} = \hat{i} - \hat{j} + 2\hat{k}$, $\vec{b} = 2\hat{i} + 4\hat{j} + \hat{k}$ and $\vec{c} = \lambda\hat{i} + \hat{j} + \mu\hat{k}$ are mutually orthogonal $then(\lambda, \mu) =$ (A) (-2,3) (B) (3,-2) (C) (-3,2) (D) (2,-3)

A. $(-3, 2)$

B. $(2, -3)$

C. $(-2, 3)$

D. $(3, -2)$

Answer: A

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

A. π

B. 0

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

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

Answer: A

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30. Let $\hat{a}$ and $\hat{b}$ two unit vectors. If the vectors $c = \hat{a} + 2\hat{b}$ and $d = 5\hat{a} - 4\hat{b}$ are perpendicular to each other , then the angle btween $\hat{a}$ and $\hat{b}$ is

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

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

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

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

Answer: C

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

A. $2\hat{i} + \hat{j} + 5\hat{k}$

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

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

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

Answer: B

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32. The vector $\left(\hat{i} \times a.\, b\right)\hat{i} + \left(\hat{j} \times a.\, b\right)\hat{j} + \left(\hat{k} \times a.\, b\right)\hat{k}$ is equal to

A. $b \times a$

B. a

C. $a \times b$

D. b

Answer: C

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33. If $\hat{a}, \hat{b}$ and $\hat{c}$ are unit vectors satsfying $\hat{a} - \sqrt{3}\hat{b} + \hat{c} = 0$ then the angle between the vectors $\hat{a}$ and $\hat{c}$ is

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

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

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

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

Answer: B

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34. If a vector r of magnitude $3\sqrt{6}$ is directed along the bisector of the angle between the vectors $a = 7\hat{i} - 4\hat{j} - 4\hat{k}$ and $b = -2\hat{i} - \hat{j} + 2\hat{k}$, then r is equal to

A. $\hat{i} - 7\hat{j} + 2\hat{k}$

B. $\hat{i} + 7\hat{j} - 2\hat{k}$

C. $\hat{i} + 7\hat{j} + 2\hat{k}$

D. $\hat{i} - 7\hat{j} - 2\hat{k}$

Answer: A

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35. The are three vectors $a = \hat{i} + \hat{j}, b = \hat{j} + \hat{k}$ and $\hat{c} = x\hat{a} + y\hat{b}$. If the vectors $\hat{i} - 2\hat{j} + \hat{k}, 3\hat{i} + 2\hat{j} - \hat{k}$ and c are coplanar, then $\frac{x}{y}$ is equal to

A. -2

B. -3

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

D. -1

Answer: B

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36. Let $\vec{b} = 4\hat{i} + 3\hat{j}$ and $\vec{c}$ be two vectors perpendicular to each other in the xy-plane. Find all vetors in te same plane having projection 1 and 2 along $\vec{b}$ and $\vec{c}$ respectively.

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

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

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

D. None

Answer: B

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

A. 3

B. -2

C. 5

D. -1

Answer: D

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38. If $\hat{a} = 2\hat{i} + \hat{j} - \hat{k}$ and $b = \hat{i} + \hat{k}$, then the vector c such that a.c = 4 and $a \times c = b$ is

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

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

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

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

Answer: A

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39. Let $a = 2\hat{i} + \hat{j} + \hat{k}, b = \hat{i} + 2\hat{j} - \hat{k}$ and a unit vector $\vec{c}$ be coplanar. If $\vec{c}$ is perpendicular to a, then $\vec{c}$ is equal to

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

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

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

D. None of these

Answer: B

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40. If $\vec{a} = \frac{1}{\sqrt{10}} \left(3\hat{i} + \hat{k} \right), \vec{b} = \frac{1}{7} \left(2\hat{i} + 3\hat{j} - 6\hat{k} \right)$, 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. -3

B. 5

C. 3

D. -5

Answer: D

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41. If $a = \hat{j} - \hat{k}$ and $c = \hat{i} - \hat{j} - \hat{k}$, Then , the vector b satisfying $a \times b + c = 0$ and $a.b = 3$ is

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

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

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

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

Answer: A

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42. Two vectors a and b are not perpendicular and c and d are two vectors satifying $b \times c = b \times d$ and $a.\, d = 0$ Then vector d is equal to

A. $c + \left(\frac{a.\, c}{a.\, b}\right) b$

B. $b + \left(\frac{b.\, c}{a.\, b}\right) c$

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

D. $b - \left(\frac{b.\, c}{a.\, b}\right) b$

Answer: C

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43. If the vectors $p\hat{i}+\hat{j}+\hat{k}, \hat{i}+q\hat{j}+\hat{k}$ 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. -2

B. 2

C. 0

D. -1

Answer: A

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44. If u, v and w are three non-coplanar vectors, then $(u+v-w).(u-v) \times (v-w)$ is equal to

A. 0

B. $u.\ v \times w$

C. $u.\ w \times v$

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

Answer: B

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45. Let $\vec{b}$ and $\vec{c}$ be non-collinear vectors. If $\vec{a}$ is a vector such that $\vec{a}.\left(\vec{b}+\vec{c}\right)=4$ and $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=\left(x^2-2x+6\right)\vec{b}+\sin y.\ \vec{c}$, then (x,y) lies on the line:

A. $x+y=0$

B. $x-y=0$

C. $x=1$

D. $y = \pi$

Answer: C

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46. 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 $\left|\vec{v}\right|$ is

A. |u|

B. $|u| + |v.\ \hat{a}|$

C. $2|v|$

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

Answer: A

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47. The value of $[(a-b).(b-c)\times(c-a)]$ is

A. 0

B. $2[a,b,c]$

C. $[a,b,c]$

D. None

Answer: A

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48. A vector c of magnitude $20\sqrt{6}$ directed along the bisector of the angle between $a=7\hat{i}-4\hat{j}-4\hat{k}$ and $b=2\hat{i}-\hat{j}+2\hat{k}$, is

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

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

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

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

Answer: D

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49. If $\hat{i},\hat{j},\hat{k}$ are the unit vectors and a is a vector such that $a\times r=\hat{j}$ then a.r is

A. -1

B. 0

C. 1

D. None

Answer: D

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50. If a makes an acute angle with b and $r \times b = c \times b,$ then r is equal to

A. $a \times \hat{i} - b$

B. $c \times a$

C. $c - \frac{c.\,a}{b.\,a}.\,b$

D. $c + \frac{c.\,a}{b.\,a}b$

Answer: C

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51. The vectors $(a, a+1, a+2)(a+3, a+4, a+5)(a+6, a+7, a+8)$ are coplanar for

A. $\forall a \in R$

B. $\forall a \not\in R$

C. $a = -\sqrt{-3}$

D. None of these

Answer: A

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52. If $a = \lambda\hat{i} + 2\hat{j} - 3\hat{k}, b = 2\hat{i} + \lambda\hat{j} - \hat{k}, c = \hat{i} + 2\hat{j} + \hat{k}$ and $[abc] = 6$, then λ is equal to

A. -8 or 3

B. -9 or 3

C. -3 or + 9

D. 8 or 5

Answer: A

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

A. 2

B. -3

C. 0

D. None

Answer: C

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54. If a is perpedicular to b and $c|a| = 2, |b| = 3|c| = 4$ and the angle between b and c is $\frac{2\pi}{3}$, then $[a, b, c]$ is equal to

A. $7\sqrt{3}$

B. $9\sqrt{3}$

C. $12\sqrt{3}$

D. $5\sqrt{3}$

Answer: C

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55. 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. $a + b$

B. $a \times b$

C. $a - b$

D. $b \times a$

Answer: B

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56. The vectors $a = 2\hat{i} + \hat{j} - 2\hat{k}, b = \hat{i} + \hat{j}$. If c is a vector such that $a.\, c = |c|$ and $|c - a| = 2\sqrt{2}$, angle between $a \times b$ and c is 45°, then $|(a \times b) \times c|$ is

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

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

C. 3

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

Answer: D

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57. The vectors $a = 2\hat{i} + \hat{j} - 2\hat{k}, b = \hat{i} + \hat{j}$. If c is a vector such that $a.\, c = |c|$ and $|c - a| = 2\sqrt{2}$, angle between $a \times b$ and c is 45°, then $|(a \times b) \times c|$ is

A. 3

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

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

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

Answer: C

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58. If the three vectors $a = \hat{i} + \hat{j} + \hat{k}, b = \hat{i} + \hat{j}$ and $c = \hat{i}$ and $(a \times b) \times c = \alpha a + \beta b$, then the value of $\alpha + \beta$ is

A. 2

B. 3

C. 0

D. None

Answer: C

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Bitsat Archives

1. The unit vector perpendicular to the vectors $\hat{i} - \hat{j}$ and $\hat{i} + \hat{j}$ forming a right handed system, is

A. $\hat{k}$

B. $-\hat{k}$

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

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

Answer: A

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2. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be non-zero vectors such that no two are collinear and

$$\left(\vec{a} \times \vec{b}\right) \times \vec{c} = \frac{1}{3}\left|\vec{b}\right|\left|\vec{c}\right|\vec{a}$$

If θ is the acute angle between the vectors $\vec{b}$ and $\vec{c}$ then $\sin\theta$ equals

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

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

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

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

Answer: A

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3. If $|a| = 2, |b| = 5$ and $|a \times b| = 8$, then |a.b| is equal to

A. 3

B. 4

C. 5

D. 6

Answer: D

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4. The work done by the force $4\hat{i} - 3\hat{j} + 2\hat{k}$ in moving a particle along a straight line from the point (3, 2, - 1) to (2-1,4) is

A. 0 units

B. 4 units

C. 15 units

D. 19 units

Answer: C

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5. If $a.(b \times c) = 0$, then the correct statement is

A. out of a, b, c, any two vectors are parallel

B. a, b, c are coplanar

C. any two are equal among a,b,c

D. atleast one statement is correct

Answer: B

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6. If $2\hat{i} + \hat{j} - \hat{k}$ & $\hat{i} - 4\hat{j} + \lambda\hat{k}$ are perpendicular to each other, then λ is equal to

A. -3

B. -2

C. -1

D. 0

Answer: B

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7. If $a.\ \hat{i} = 4$ then $\left(a \times \hat{j}\right).\ \left(2\hat{j} - 3\hat{k}\right)$ is equal to

A. 12

B. 2

C. 0

D. -12

Answer: D

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8. The vector r is equal to

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

B. $\left(a.\ \hat{j}\right)\hat{i}+\left(a.\ \hat{j}\right)\hat{j}+\left(a.\ \hat{i}\right)\hat{k}$

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

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

Answer: A

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

A. 0

B. $1/2$

C. 1

D. 2

Answer: A

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

A. 13

B. 81

C. 9

D. 5

Answer: C

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11. The position vectors of P and Q are respectively $\vec{a}$ and $\vec{b}$. If R is a point on $\overrightarrow{PQ}$ such that $\overrightarrow{PR} = 5\overrightarrow{PQ}$, then the position vector of R, is

A. $5b - 4a$

B. $5b + 4a$

C. $4b - 5a$

D. $4b + 5a$

Answer: A

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12. If the position vectors of A, B and C are respectively $2\hat{i}-\hat{j}+\hat{k}, \hat{i}-3\hat{j}-5\hat{k}$ and $3\hat{i}-4\hat{j}-4\hat{k}$, then $\cos^2$ is equal to

A. 0

B. $\frac{6}{41}$

C. $\frac{35}{41}$

D. 1

Answer: C

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

A. -1

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

C. $\sqrt{10}-\sqrt{6}$

D. $\sqrt{59}$

Answer: D

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14. the vector which is orthogonal to the vector $3\hat{i}+2\hat{j}+6\hat{k}$ and is coplanar with the vectors $2\hat{i}+\hat{j}+\hat{k}$ and $\hat{i}-\hat{j}+\hat{k}$ is

A. $\frac{2\hat{i}-6\hat{j}+\hat{k}}{\sqrt{41}}$

B. $\frac{2\hat{i}-3\hat{j}}{\sqrt{13}}$

C. $\frac{3\hat{j}-\hat{k}}{\sqrt{10}}$

D. $\frac{4\hat{i}+3\hat{j}-3\hat{k}}{\sqrt{34}}$

Answer: C

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15. Let a, b, c be three non-coplanar vectors and p, q, r be vectors defined by the relations

$$p = \frac{b \times c}{[a \quad b \quad c]}, q = \frac{c \times a}{a \quad b \quad c}, r = \frac{a \times b}{[a \quad b \quad c]}$$

Then , the value of the expression $(a + b) \times p + (b + c) \times q + (c + a).\, r$ is

A. 0

B. 1

C. 2

D. 3

Answer: D

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16. If $\hat{a}, \hat{b}$ and $\hat{c}$ are mutually perpendicular unit vectors then $\left|\hat{a}+\hat{b}+\hat{c}\right|$ is equal to

A. 3

B. $\sqrt{3}$

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

D. 1

Answer: B

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17. The projection of the vector $2\hat{i}+\hat{j}-3\hat{k}$ on the vector $\hat{i}-2\hat{j}-\hat{k}$ is

A. $-\frac{3}{\sqrt{14}}$

B. $\frac{3}{\sqrt{14}}$

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

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

Answer: C

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18. If $a = \hat{i} + 2\hat{j} - 3\hat{k}$ and $b = 3\hat{i} - \hat{j} + 2\hat{k}$ then the angle between the vectors a + b and a - b is

A. 60°

B. 90°

C. 45°

D. 55°

Answer: B

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19. If the vectors $\alpha\hat{i}+\hat{j}+\hat{k}, \hat{i}+\beta\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}+\gamma\hat{k}(\alpha, \beta, \gamma \neq 1)$ are coplanar, then the value of $\frac{1}{1-\alpha}+\frac{1}{1-\beta}+\frac{1}{1-\gamma}$ is

A. -1

B. 0

C. 1

D. $1/2$

Answer: C

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20. If a vector α lie in the plane of β and γ, then which is correct ?

A. $[\alpha, \beta, \gamma]$=0

B. $[\alpha, \beta, \gamma] = 1$

C. $[\alpha, \beta, \gamma] = 3$

D. $[\beta, \gamma, \alpha] = 1$

Answer: A

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21. 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. 47

B. 74

C. -74

D. None of these

Answer: C

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