

**MATHS****BOOKS - CENGAGE****VECTORS TRIPLE PRODUCTS, RECIPROCAL SYSTEM OF VECTORS****Dpp 2 4**

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

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

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 $\vec{a} \cdot \vec{b} = \frac{1}{2}, \vec{c} \cdot \vec{d} = \frac{1}{2}$ and angle between $\vec{a} \times \vec{b}$ and $\vec{c} \times \vec{d}$ is $\frac{\pi}{6}$ then the value of

$$\left| \left[\begin{matrix} \vec{a} & \vec{b} & \vec{d} \end{matrix} \right] \vec{c} - \left[\begin{matrix} \vec{a} & \vec{b} & \vec{c} \end{matrix} \right] \vec{d} \right| =$$

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

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

Then the value of μ is

A. 0

B. 1

C. 3

D. 4

Answer: D



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

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

Where \hat{p} and \hat{q} are two non-collinear vectors \vec{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 $\vec{a}, \vec{b}, \vec{c}$ are three on-coplanar vectors such that $\vec{a} \times \vec{b} = \vec{c}, \vec{b} \times \vec{c} = \vec{a}, \vec{c} \times \vec{a} = \vec{b}$, then the value of $|\vec{a}| + |\vec{b}| + |\vec{c}|$ 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 $(\vec{a} \times (\vec{b} \times \vec{c})) \cdot (\vec{a} \times \vec{c}) = 5$, 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 $|\vec{c}| = 1$

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} , and \vec{c} and \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

$(l\vec{a} + m\vec{b} + n\vec{c}) \cdot (l\vec{p} + m\vec{q} + n\vec{r})$ 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

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

A. 1

B. 2

C. 3

D. 4

Answer: B[View Text Solution](#)

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

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

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

$$\vec{c} = \sin\left(\theta - \frac{2\pi}{3}\right)\hat{i} + \cos\left(\theta - \frac{2\pi}{3}\right)\hat{j} + \sin\left(2\theta - \frac{4\pi}{3}\right)\hat{k} \text{ is } 18 \text{ cubic}$$

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

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

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

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

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?

$$\text{A. } \vec{a} \times (\vec{b} \times \vec{c}), \vec{b} \times (\vec{c} \times \vec{a}), (\vec{c} \times \vec{a}), \vec{c} \times (\vec{a} \times \vec{b})$$

form a right handed system

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

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

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

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

$$\begin{aligned} & \vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) \\ &= (4 + x^2) \vec{b} - (4x \cos^2 \theta) \vec{a}, \end{aligned}$$

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

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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