PRACTICE QUESTIONS FOR COMPETITIVE EXAMS
SUB: MATHEMATICS
VECTORS

Q.1 Vector $\vec{r}$ which is equally inclined to coordinate axes such that $|\vec{r}| = 15\sqrt{3}$ is

(A) $\hat{i}+\hat{j}+\hat{k}$ (B) $15(\hat{i}+\hat{j}+\hat{k})$

(C) $7(\hat{i}+\hat{j}+\hat{k})$ (D) None of these

Q.2 Let $\vec{a}$, $\vec{b}$, $\vec{c}$ be three vectors such that $|\vec{a}| = |\vec{c}| = 1$; $|\vec{b}| = 4$ and $|\vec{b}\times\vec{c}| = \sqrt{15}$. If $\vec{b} - 2\vec{c} = \lambda\vec{a}$ then a value of λ is

(A) 1 (B) -1 (C) 2 (D) -4

Q.3 For 3 vectors $\vec{u}, \vec{v}, \vec{w}$, which of the following expressions is ≠ to any remaining three.

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

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

Q.4 If 2 out of 3 vectors $\vec{a}, \vec{b}, \vec{c}$ are unit vectors, $\vec{a}+\vec{b}+\vec{c} = \vec{0}$ and $2(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a})+3 = 0$, then third vector is length-

(A) 3 (B) 1 (C) 2 (D) None of these

Q.5 If $\vec{a}+\vec{b}+\vec{c} = \vec{0}$, $|\vec{a}| = 3, |\vec{b}| = 5$ & $|\vec{c}| = 7$ then $\angle\theta$ between $\vec{a}$ and $\vec{b}$ is

(A) 40° (B) 30° (C) 150° (D) None of these

Q.6 Magnitude of projection of vector $\hat{i}+2\hat{j}+\hat{k}$ on vector $4\hat{i}+4\hat{j}+7\hat{k}$ is

(A) 3 (B) $3\sqrt{6}$ (C) $\sqrt{6}/3$ (D) None of these

Q.7 Magnitude of moment of force $-2\hat{i}+6\hat{j}-8\hat{k}$ acting at point $2\hat{i}-\hat{j}+3\hat{k}$ about point $\hat{i}+2\hat{j}-\hat{k}$

(A) $\sqrt{211}$ (B) 0 (C) $\sqrt{54}$ (D) None of these

Q.8 Let $\vec{a}+\vec{b}$ is orthogonal to $\vec{b}$ and $\vec{a}+2\vec{b}$ is orthogonal to $\vec{a}$, then

(A) $|\vec{a}|=\sqrt{2}|\vec{b}|$ (B) $|\vec{a}|=2|\vec{b}|$

(C) $|\vec{a}|=|\vec{b}|$ (D) $2|\vec{a}|=|\vec{b}|$

Q.9 If $\hat{a}$ & $\hat{b}$ are unit vectors represented by $\overline{O}A$ and OB, then unit vector along bisector of $\angle AOB$ is scalar multiple of

(A) $\hat{a}-\hat{b}$ (B) $\hat{a}\times\hat{b}$ (C) $\hat{b}\times\hat{a}$ (D) None of these

Q.10 If $[2\vec{a}+4\vec{b}\ \ \vec{c}\ \ \vec{d}]=\lambda[\vec{a}\ \ \vec{c}\ \ \vec{d}]+\mu[\vec{b}\ \ \vec{c}\ \ \vec{d}]$ then $\lambda+\mu$ =

(A) 6 (B) -6 (C) 10 (D) None of these

Q.11 Let a ,b, c be distinct non-negative numbers. If the vectors $a\hat{i} + a\hat{j} + c\hat{k}$, $\hat{i} + \hat{k}$ and $c\hat{i} + c\hat{j} + b\hat{k}$ lie in a plane, then c is ***(1993)***

(A) The Arithmetic Mean of a and b.

(B) The Geometric Mean of a and b.

(C) The Harmonic Mean of a and b.

(D) Equal to zero.

Q.12 The volume of the parallelepiped whose sides are given by $\overrightarrow{OA} = 2\hat{i} - 3\hat{j}$, $\overrightarrow{OB} = \hat{i} + \hat{j} - \hat{k}$, $\overrightarrow{OC} = 3\hat{i} - \hat{k}$, is ***(1983)***

(A) $\frac{4}{13}$ (B) 4 (C) $\frac{2}{7}$ (D) None of these

Q.13 A vector $\vec{a}$ 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 the new system, $\vec{a}$ has components p+1 and l, then ***(1986)***

(A) p = 0 (B) p=1 or $p = -\frac{1}{3}$

(C) p = -1 or p = $\frac{1}{3}$ (D) p = 1 or p = -1

Q.14 The unit 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 ***(2004)***

(A) $\frac{2\hat{i} - 6\hat{j} + \hat{k}}{\sqrt{41}}$ (B) $\frac{2\vec{i} - 3\vec{j}}{\sqrt{13}}$

(C) $\frac{3\hat{j} - \hat{k}}{\sqrt{10}}$ (D) $\frac{4\hat{i} + 3\hat{j} - 3\hat{k}}{\sqrt{34}}$

Q.15 If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar unit vectors such that $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{(\vec{b} + \vec{c})}{\sqrt{2}}$, then the angle between $\vec{a}$ and $\vec{b}$ is ***(1995)***

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

Q.16 If $\vec{a}$ and $\vec{b}$ are two unit vectors such that $\vec{a} + 2\vec{b}$ and $5\vec{a} - 4\vec{b}$ are perpendicular to each other, then the angle between $\vec{a}$ and $\vec{b}$ is ***(2002)***

(A) 45° (B) 60° (C) $\cos^{-1}\left(\frac{1}{3}\right)$ (D) $\cos^{-1}\left(\frac{2}{7}\right)$

Q.17 Let $\vec{V} = 2\vec{i} + \vec{j} - \vec{k}$ and $\vec{W} = \vec{i} + 3\vec{k}$. If $\vec{U}$ is a unit vector, then the maximum value of the scalar triple product $[\vec{U}\ \vec{V}\ \vec{W}]$ is ***(2002)***

(A) -1 (B) $\sqrt{10} + \sqrt{6}$ (C) $\sqrt{59}$ (D) $\sqrt{60}$

Q.18 ;If the vectors $\vec{a} = \hat{i} - \hat{j} + \hat{2} + \hat{4}j + \hat{k}$ and $\vec{c} = \lambda\hat{i} + \hat{j} + \mu\hat{k}$ are mutually orthogonal then (λ, μ) = ***(2010)***

(A) (2, –3) (B) (–2, 3) (C) (3, –2) (D) (–3, 2)

Q.19 : 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 λ is equal to ***(2014)***

(A) 1 (B) 3 (C) 0 (D) 1

Q.20 If the vectors $\overline{AB}=3\hat{j}+4\hat{k}$ and $\overline{AC}=2\hat{j}+4\hat{k}$ are the sides of a triangle ABC, then the length of the median through A is ***(2013)***

(A) $\sqrt{72}$ (B) $\sqrt{33}$ (C) $\sqrt{45}$ (D) $\sqrt{18}$

ANSWERS: 1(B), 2(D), 3(C), 4(B), 5(B), 6(D), 7(B), 8(A), 9(A), 10 (A), 11(B)

12(B), 13(B), 14(C), 15(A), 16(B), 17(C), 18(D), 19(A), 20(B)