1. If the resultant of two forces of magnitudes *P* and *Q* acting at a point at an angle of 60^o is $\sqrt{7}Q,$ then *P*/*Q* is

(a) 1 (b) $\frac{3}{2}$ (c) 2 (d) 4

2. *ABC* is an isosceles triangle right angled at *A*. Forces of magnitude $2\sqrt{2}, 5$ and 6 act along $\overrightarrow{BC}, \overrightarrow{CA}$ and $\overrightarrow{AB}$ respectively. The magnitude of their resultant force is

(a) 4 (b) 5 (c) $11+2\sqrt{2}$ (d) 30

3. The unit vector parallel to the resultant vector of $2\mathbf{i}+4\mathbf{j}-5\mathbf{k}$ and $\mathbf{i}+2\mathbf{j}+3\mathbf{k}$ is

(a) $\frac{1}{7}(3\mathbf{i}+6\mathbf{j}-2\mathbf{k})$ (b) $\frac{\mathbf{i}+\mathbf{j}+\mathbf{k}}{\sqrt{3}}$

(c) $\frac{\mathbf{i}+\mathbf{j}+2\mathbf{k}}{\sqrt{6}}$ (d) $\frac{1}{\sqrt{69}}(-\mathbf{i}-\mathbf{j}+8\mathbf{k})$

4. If *D, E, F* be the middle points of the sides *BC, CA* and *AB* of the triangle *ABC*, then $\overrightarrow{AD}+\overrightarrow{BE}+\overrightarrow{CF}$ is

(a) A zero vector (b) A unit vector

(c) 0 (d) None of these

5. If position vectors of a point *A* is **a** + 2**b** and **a** divides *AB* in the ratio $2:3$, then the position vector of *B* is

(a) 2**a** - **b** (b) **b** - 2**a**

(c) **a** - 3**b** (d) **b**

6. If the moduli of **a** and **b** are equal and angle between them is 120^o and $\mathbf{a}.\mathbf{b}=-8,$ then | **a** | is equal to

(a) - 5 (b) - 4 (c) 4 (d) 5

8. For any three non-zero vectors $\mathbf{r}_1, \mathbf{r}_2$ and $\mathbf{r}_3$,

$$\begin{vmatrix} \mathbf{r}_1.\mathbf{r}_1 & \mathbf{r}_1.\mathbf{r}_2 & \mathbf{r}_1.\mathbf{r}_3 \\ \mathbf{r}_2.\mathbf{r}_1 & \mathbf{r}_2.\mathbf{r}_2 & \mathbf{r}_2.\mathbf{r}_3 \\ \mathbf{r}_3.\mathbf{r}_1 & \mathbf{r}_3.\mathbf{r}_2 & \mathbf{r}_3.\mathbf{r}_3 \end{vmatrix}=0.$$

Then which of the following is false

(a) All the three vectors are parallel to one and the same plane

(b) All the three vectors are linearly dependent

(c) This system of equation has a non-trivial solution

(d) All the three vectors are perpendicular to each other

9. If **a** and **b** are unit vectors such that $\mathbf{a}\times\mathbf{b}$ is also a unit vector, then the angle between **a** and **b** is

(a) 0 (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) π

10. $(\mathbf{a}-\mathbf{b})\times(\mathbf{a}+\mathbf{b})=$

(a) $2(\mathbf{a}\times\mathbf{b})$ (b) $\mathbf{a}\times\mathbf{b}$

(c) a^2-b^2 (d) None of these

11. A unit vector which is perpendicular to $\mathbf{i}+2\mathbf{j}-2\mathbf{k}$ and $-\mathbf{i}+2\mathbf{j}+2\mathbf{k}$ is

(a) $\frac{1}{\sqrt{5}}(2\mathbf{i}-\mathbf{k})$ (b) $\frac{1}{\sqrt{5}}(-2\mathbf{i}+\mathbf{k})$

(c) $\frac{1}{\sqrt{5}}(2\mathbf{i}+\mathbf{j}+\mathbf{k})$ (d) $\frac{1}{\sqrt{5}}(2\mathbf{i}+\mathbf{k})$

12. The unit vector perpendicular to $3\mathbf{i}+2\mathbf{j}-\mathbf{k}$ and $12\mathbf{i}+5\mathbf{j}-5\mathbf{k},$ is

(a) $\frac{5\mathbf{i}-3\mathbf{j}+9\mathbf{k}}{\sqrt{115}}$ (b) $\frac{5\mathbf{i}+3\mathbf{j}-9\mathbf{k}}{\sqrt{115}}$

(c) $\frac{-5\mathbf{i}+3\mathbf{j}-9\mathbf{k}}{\sqrt{115}}$ (d) $\frac{5\mathbf{i}+3\mathbf{j}+9\mathbf{k}}{\sqrt{115}}$

13. A unit vector perpendicular to the plane determined by the points $P(1,-1,2), Q(2,0,-1)$ and $R(0,2,1)$ is

(a) $\frac{2\mathbf{i}-\mathbf{j}+\mathbf{k}}{\sqrt{6}}$ (b) $\frac{2\mathbf{i}+\mathbf{j}+\mathbf{k}}{\sqrt{6}}$

(c) $\frac{-2\mathbf{i}+\mathbf{j}+\mathbf{k}}{\sqrt{6}}$ (d) $\frac{2\mathbf{i}+\mathbf{j}-\mathbf{k}}{\sqrt{6}}$

14. If $\mathbf{a}, \mathbf{b}, \mathbf{c}$ are vectors such that $[\mathbf{a}\,\mathbf{b}\,\mathbf{c}]=4$, then $[\mathbf{a}\times\mathbf{b}\;\; \mathbf{b}\times\mathbf{c}\;\; \mathbf{c}\times\mathbf{a}]$ =

(a) 16 (b) 64 (c) 4 (d) 8

15. $[\mathbf{i}\;\mathbf{k}\;\mathbf{j}]+[\mathbf{k}\;\mathbf{j}\;\mathbf{i}]+[\mathbf{j}\;\mathbf{k}\;\mathbf{i}]$

(a) 1 (b) 3 (c) - 3 (d) - 1

16. If $\mathbf{a}=3\mathbf{i}-\mathbf{j}+2\mathbf{k}$, $\mathbf{b}=2\mathbf{i}+\mathbf{j}-\mathbf{k}$ and $\mathbf{c}=\mathbf{i}-2\mathbf{j}+2\mathbf{k}$, then $(\mathbf{a}\times\mathbf{b})\times\mathbf{c}$ is equal to

(a) $24\mathbf{i}+7\mathbf{j}-5\mathbf{k}$ (b) $7\mathbf{i}-24\mathbf{j}+5\mathbf{k}$

(c) $12\mathbf{i}+3\mathbf{j}-5\mathbf{k}$ (d) $\mathbf{i}+\mathbf{j}-7\mathbf{k}$

17. Angle between the line $\mathbf{r}=(\mathbf{i}+2\mathbf{j}-\mathbf{k})+\lambda(\mathbf{i}-\mathbf{j}+\mathbf{k})$ and the normal to the plane $\mathbf{r}.(2\mathbf{i}-\mathbf{j}+\mathbf{k})=4$ is

(a) $\sin^{-1}\left(\frac{2\sqrt{2}}{3}\right)$ (b) $\cos^{-1}\left(\frac{2\sqrt{2}}{3}\right)$

(c) $\tan^{-1}\left(\frac{2\sqrt{2}}{3}\right)$ (d) $\cot^{-1}\left(\frac{2\sqrt{2}}{3}\right)$

18. The spheres $\mathbf{r}^2+2\mathbf{u}_1.\mathbf{r}+2d_1=0$ and $\mathbf{r}^2+2\mathbf{u}_2.\mathbf{r}+2d_2=0$ cut orthogonally, if

(a) $\mathbf{u}_1.\mathbf{u}_2=0$

(b) $\mathbf{u}_1+\mathbf{u}_2=0$

(c) $\mathbf{u}_1.\mathbf{u}_2=d_1+d_2$

(d) $(\mathbf{u}_1-\mathbf{u}_2).(\mathbf{u}_1+\mathbf{u}_2)=d_1^2+d_2^2$

19. A vector $\mathbf{n}$ of magnitude 8 units is inclined to x-axis at 45^o, y-axis at 60^o and an acute angle with z axis. If a plane passes through a point $(\sqrt{2},-1,1)$ and is normal to $\mathbf{n}$, then its equation in vector form is

(a) $\mathbf{r}.(\sqrt{2}\mathbf{i}+\mathbf{j}+\mathbf{k})=4$ (b) $\mathbf{r}.(\sqrt{2}\mathbf{i}+\mathbf{j}+\mathbf{k})=2$

(c) $\mathbf{r}.(\mathbf{i}+\mathbf{j}+\mathbf{k})=4$ (d) None of these

20. The vector equation of the plane through the point (2, 1, -1) and passing through the line of intersection of the plane $\mathbf{r}.(\mathbf{i}+3\mathbf{j}-\mathbf{k})=0$ and $\mathbf{r}.(\mathbf{j}+2\mathbf{k})=0$ is

(a) $\mathbf{r}.(\mathbf{i}+9\mathbf{j}+11\mathbf{k})=0$ (b) $\mathbf{r}.(\mathbf{i}+9\mathbf{j}+11\mathbf{k})=6$

(c) $\mathbf{r}.(\mathbf{i}-3\mathbf{j}-13\mathbf{k})=0$ (d) None of these

1. The points (5, 2, 4), (6, -1, 2) and (8, -7, *k*) are collinear, if *k* is equal to
(a) -2 (b) 2 (c) 3 (d) -1

2. The angle between the lines $r = (4i - j) + s(2i + j - 3k)$ and $r = (i - j + 2k) + t(i - 3j + 2k)$ is
(a) $\frac{3\pi}{2}$ (b) $\frac{\pi}{3}$ (c) $\frac{2\pi}{3}$ (d) $\frac{\pi}{6}$

3. The co-ordinates of the foot of the perpendicular drawn from the point *A*(1, 0, 3) to the join of the points *B*(4, 7, 1) and *C*(3, 5, 3) are
(a) (5/3, 7/3, 17/3) (b) (5, 7, 17)
(c) (5/3, -7/3, 17/3) (d) (-5/3, 7/3, -17/3)

4. If A (1, 2, 3), B(6, 7, 8) C(1,2, 5) and D (3, 0, 4) are given points, then the projection of $\overleftrightarrow{AB}$ on $\overleftrightarrow{CD}$ is
(a) 1/3 (b) 4/3 (c) 25/3 (d) 5/3

5. A Plane x + 2y - 3z = 12 has point P which is at minimum distance from the line joining A(1, 0, -3) and B(2, 3, -1) then AP^2 is equal to -
(a) 0 (b) 14 (c) 28 (d) 56

6. The tangent of the angle between a diagonal of a cube and the diagonal of a face (which meets the former) is-
(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{\sqrt{2}}$ (c) $\frac{1}{3}$ (d) $\sqrt{\frac{2}{3}}$

7. If the points (0, 1, 2), (2, -1, 3) and (1, -3, 1) are the vertices of a triangle, then the triangle is
(a) Right angled (b) Isosceles right angled
(c) Equilateral (d) None of these

8. The point dividing the line joining the points $(1,\ 2,\ 3)$ and $(3,\ -5,\ 6)$ in the ratio $3:-5$ is
(a) $\left(2, \frac{-25}{2}, \frac{3}{2}\right)$ (b) $\left(-2, \frac{25}{2}, \frac{-3}{2}\right)$
(c) $\left(2, \frac{25}{2}, \frac{3}{2}\right)$ (d) None of these

9. Points (1, 1, 1), (-2, 4, 1), (-1, 5, 5) and (2, 2, 5) are the vertices of a
(a) Rectangle (b) Square
(c) Parallelogram (d) Trapezium

10. Direction ratios of two lines are a, b, c and $\frac{1}{bc}, \frac{1}{ca}, \frac{1}{ab}$. The lines are
(a) Mutually perpendicular (b) Parallel
(c) Coincident (d) None of these

11. The co-ordinates of the foot of perpendicular drawn from the origin to the line joining the points (-9, 4, 5) and (10, 0, -1) will be
(a) (- 3, 2, 1) (b) (1, 2, 2)
(c) (4, 5, 3) (d) None of these

12. Distance of the point (2,3,4) from the plane $3x - 6y + 2z + 11 = 0$ is
(a) 1 (b) 2 (c) 3 (d) 0

13. The equation of the perpendicular from the point (α, β, γ) to the plane $ax + by + cz + d = 0$ is
(a) $a(x-\alpha) + b(y-\beta) + c(z-\gamma) = 0$
(b) $\frac{x-\alpha}{a} = \frac{y-\beta}{b} = \frac{z-\gamma}{c}$
(c) $a(x-\alpha) + b(y-\beta) + c(z-\gamma) = abc$
(d) None of these

14. The length and foot of the perpendicular from the point (7, 14, 5) to the plane $2x + 4y - z = 2$, are
(a) $\sqrt{21}, (1, 2, 8)$ (b) $3\sqrt{21}, (3, 2, 8)$
(c) $21\sqrt{3}, (1, 2, 8)$ (d) $3\sqrt{21}, (1, 2, 8)$

15. A plane meets the co-ordinate axes in A, B, C and (α, β, γ) is the centered of the triangle ABC. Then the equation of the plane is

(a) $\frac{x}{\alpha}+\frac{y}{\beta}+\frac{z}{\gamma}=3$ (b) $\frac{x}{\alpha}+\frac{y}{\beta}+\frac{z}{\gamma}=1$

(c) $\frac{3x}{\alpha}+\frac{3y}{\beta}+\frac{3z}{\gamma}=1$ (d) $\alpha x+\beta y+\gamma z=1$

16. If the length of perpendicular drawn from origin on a plane is 7 units and its direction ratios are -3, 2, 6, then that plane is

(a) $-3x+2y+6z-7=0$ (b) $-3x+2y+6z-49=0$

(c) $3x-2y+6z+7=0$ (d) $-3x+2y-6z-49=0$

17. In a three dimensional xyz space the equation $x^2-5x+6=0$ represents

(a) Points (b) Plane

(c) Curves (d) Pair of straight line

18. If the points $(1,1,k)$ and $(-3,0,1)$ be equidistant from the plane $3x+4y-12z+13=0$,then k =

(a) 0 (b) 1 (c) 2 (d) None of these

19. The equation of the plane which bisects the line joining the points (-1, 2, 3) and (3, -5, 6) at right angle, is

(a) $4x-7y-3z=8$ (b) $4x+2y-3z=28$

(c) $4x-7y+3z=28$ (d) $4x-7y-3z=28$

20. The distance between the line $\frac{x-1}{3}=\frac{y+2}{-2}=\frac{z-1}{2}$ and the plane $2x+2y-z=6$ is

(a) 9 (b) 1 (c) 2 (d) 3