

- Direction cosines of the line that makes equal angles with the three axes in a space are
 (a) $\pm \frac{1}{3}, \pm \frac{1}{3}, \pm \frac{1}{3}$ (b) $\pm \frac{6}{7}, \pm \frac{2}{7}, \pm \frac{3}{7}$ (c) $\pm \frac{1}{\sqrt{3}}, \pm \frac{1}{\sqrt{3}}, \pm \frac{1}{\sqrt{3}}$ (d) $\pm \sqrt{\frac{1}{7}}, \pm \sqrt{\frac{3}{14}}, \pm \sqrt{\frac{1}{14}}$
- The co-ordinates of a point P are (3, 12, 4) w.r.t. the origin O, then the direction cosines of OP are
 (a) 3,12,4 (b) $\frac{1}{4}, \frac{1}{3}, \frac{1}{2}$ (c) $\frac{3}{\sqrt{13}}, \frac{1}{\sqrt{13}}, \frac{2}{\sqrt{13}}$ (d) $\frac{3}{13}, \frac{12}{13}, \frac{4}{13}$
- The cosines of the angle between any two diagonals of a cube is
 (a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\frac{2}{3}$ (d) $\frac{1}{\sqrt{3}}$
- The perpendicular distance of the point (2, 4, -1) from the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$ is
 (a) 3 (b) 5 (c) 7 (d) 9
- The distance between the line $\vec{r} = (\vec{i} + \vec{j} + 2\vec{k}) + \lambda(2\vec{i} + 5\vec{j} + 3\vec{k})$ and the plane $\vec{r} \cdot (2\vec{i} + \vec{j} - 3\vec{k}) = 5$ is
 (a) $\frac{5}{\sqrt{14}}$ (b) $\frac{6}{\sqrt{14}}$ (c) $\frac{7}{\sqrt{14}}$ (d) $\frac{8}{\sqrt{14}}$
- The point of intersection of the lines $\vec{r} \times \vec{a} = \vec{b} \times \vec{a}$ and $\vec{r} \times \vec{b} = \vec{a} \times \vec{b}$ is
 (a) \vec{a} (b) \vec{b} (c) $\vec{a} + \vec{b}$ (d) $\vec{a} - \vec{b}$
- The ratio in which the plane $\vec{r} \cdot (\vec{i} - 2\vec{j} + 3\vec{k}) = 17$ divides the line joining points $-2\vec{i} + 4\vec{j} + 7\vec{k}$ and $3\vec{i} - 5\vec{j} + 8\vec{k}$ is
 (a) 1 : 5 (b) 1 : 10 (c) 3 : 5 (d) 3 : 10
- The direction cosines of the normal to the plane $x + 2y - 3z + 4 = 0$ are
 (a) $\frac{1}{\sqrt{14}}, -\frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (b) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (c) $-\frac{1}{\sqrt{14}}, -\frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (d) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, -\frac{3}{\sqrt{14}}$
- The direction ratios of the diagonals of a cube which joins the origin to the opposite corner are (when the 3 concurrent edges of the cube are co-ordinate axes)
 (a) $\frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}$ (b) 1, 1, 1 (c) 2, -2, 1 (d) 1, 2, 3
- The equation of a plane which cuts equal intercepts of unit length on the axes, is
 (a) $x + y + z = 0$ (b) $x + y + z = 1$ (c) $x + y - z = 1$ (d) $\frac{x}{a} + \frac{y}{a} + \frac{z}{a} = 1$
- The equation of the plane thro' (2, 3, 4) and parallel to the plane $x + 2y + 4z = 5$ is
 (a) $x + 2y + 4z = 10$ (b) $x + 2y + 4z = 3$
 (c) $x + y + 2z = 2$ (d) $x + 2y + 4z = 24$
- The distance of the point (2, 3, 4) from the plane $3x - 6y + 2z + 11 = 0$ is
 (a) 9 (b) 10 (c) 2 (d) 1

13. The angle between two lines $\frac{x+1}{2} = \frac{y+3}{2} = \frac{z-4}{-1}$ and $\frac{x-4}{1} = \frac{y+4}{2} = \frac{z+1}{2}$ is
- (a) $\cos^{-1}\left(\frac{1}{9}\right)$ (b) $\cos^{-1}\left(\frac{2}{9}\right)$ (c) $\cos^{-1}\left(\frac{3}{9}\right)$ (d) $\cos^{-1}\left(\frac{4}{9}\right)$
14. The sine of the angle between the straight line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ and the plane $2x - 2y + z = 5$ is
- (a) $\frac{2\sqrt{3}}{5}$ (b) $\frac{\sqrt{2}}{10}$ (c) $\frac{4}{5\sqrt{2}}$ (d) $\frac{10}{6\sqrt{5}}$
15. Angle between the line $\vec{r} = (2\vec{i} - \vec{j} + \vec{k}) + \lambda(-\vec{i} + \vec{j} + \vec{k})$ and the plane $\vec{r} \cdot (3\vec{i} + 2\vec{j} - \vec{k}) = 4$ is
- (a) $\cos^{-1}\left(\frac{2}{\sqrt{42}}\right)$ (b) $\cos^{-1}\left(-\frac{2}{\sqrt{42}}\right)$ (c) $\sin^{-1}\left(\frac{2}{\sqrt{42}}\right)$ (d) $\sin^{-1}\left(-\frac{2}{\sqrt{42}}\right)$
16. Equation of the line passing thro' (1, 1, 1) and parallel to the plane $3x + 2y + z + 4 = 0$
- (a) $\frac{x-1}{-1} = \frac{y-1}{1} = \frac{z-1}{-1}$ (b) $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-1}{1}$ (c) $\frac{x-1}{3} = \frac{y-1}{2} = \frac{z-1}{1}$ (d) $\frac{x-1}{1} = \frac{y-1}{2} = \frac{z-1}{1}$
17. Equation of the line passing thro' (1, 1, 1) and perpendicular to $2x - 3y + z + 5 = 0$ is
- (a) $\frac{x-1}{-1} = \frac{y-1}{1} = \frac{z-1}{1}$ (b) $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-1}{1}$ (c) $\frac{x-1}{3} = \frac{y-1}{3} = \frac{z-1}{1}$ (d) $\frac{x-1}{1} = \frac{y-1}{3} = \frac{z-1}{2}$
18. The length of the \perp from the origin to the line $\vec{r} = (4\vec{i} + 2\vec{j} + 4\vec{k}) + \lambda(3\vec{i} + 4\vec{j} - 5\vec{k})$ is
- (a) $2\sqrt{5}$ (b) 2 (c) $5\sqrt{2}$ (d) 6
19. Given the line L : $\frac{x-1}{3} = \frac{y+1}{2} = \frac{z-3}{1}$ and the plane $\pi : x - 2y - z = 0$. Of the following assertions, the only one that is always true is :
- (a) L is parallel to π (b) L is \perp to π (c) L lies in π (d) none of these
20. The equation of the plane containing the line $\left. \begin{array}{l} 2x + z - 4 = 0 \\ 2y + z = 0 \end{array} \right\}$ and passing thro' the point (2, 1, -1) is
- (a) $x + y - z - 4 = 0$ (b) $x - y - z - 2 = 0$
 (c) $x + y + z + 2 = 0$ (d) $x + y + z - 2 = 0$
21. Spheres $x^2 + y^2 + z^2 + x + y + z - 1 = 0$ and $x^2 + y^2 + z^2 + x + y + z - 5 = 0$
- (a) intersect in a plane (b) intersect in five points (c) do not intersect (d) none of these
22. Equation of the sphere concentric with the sphere $x^2 + y^2 + z^2 - 4x - 6y - 8z - 5 = 0$ and which passes thro' point (0, 1, 0) is
- (a) $x^2 + y^2 + z^2 + 4x + 6y - 8z - 7 = 0$ (b) $x^2 + y^2 + z^2 + 4x - 6y - 8z = 0$
 (c) $x^2 + y^2 + z^2 - 4x - 6y - 8z + 5 = 0$ (d) $x^2 + y^2 + z^2 - 4x + 6y - 8z - 7 = 0$

23. The plane of intersection of $x^2 + y^2 + z^2 + 2x + 2y + 2z + 2 = 0$ and $4x^2 + 4y^2 + 4z^2 + 4x + 4y + 4z - 1 = 0$ is
 (a) $4x + 4y + 4z + 9 = 0$ (b) $x + y + z + 9 = 0$
 (c) $4x + 4y + 4z + 1 = 0$ (d) they do not intersect
24. Radius of the circle $\vec{r} + \vec{r} \cdot (2\vec{i} - 2\vec{j} - 4\vec{k}) - 19 = 0$, $\vec{r} \cdot (\vec{i} - 2\vec{j} + 2\vec{k}) + 8 = 0$ is
 (a) 2 (b) 3 (c) 4 (d) 5
25. The smallest radius of the sphere passing thro' $(1, 0, 0)$, $(0, 1, 0)$ and $(0, 0, 1)$ is
 (a) $\sqrt{\frac{3}{5}}$ (b) $\sqrt{\frac{3}{8}}$ (c) $\sqrt{\frac{2}{3}}$ (d) $\sqrt{\frac{5}{12}}$
26. The co-ordinates of the centre of the sphere $(x + 1)(x + 3) + (y - 2)(y - 4) + (z + 1)(z + 3) = 0$ are
 (a) $(1, -1, 1)$ (b) $(-1, 1, -1)$ (c) $(2, -3, 2)$ (d) $(-2, 3, -2)$
27. In order that bigger sphere (centre C_1 , radius R) may fully contain a smaller sphere (centre C_2 , radius r), the correct relationship is
 (a) $C_1C_2 < r + R$ (b) $C_1C_2 < R - r$ (c) $C_1C_2 < 2(R - r)$ (d) $C_1C_2 < \frac{1}{2}(R + r)$
28. The radius of the sphere which passes thro' the points $(0, 0, 0)$, $(1, 0, 0)$, $(0, 1, 0)$ and $(0, 0, 1)$ is
 (a) $\frac{1}{2}$ (b) 1 (c) $\sqrt{3}$ (d) $\sqrt{3}/2$
29. The radius of the circular section of the sphere $x^2 + y^2 + z^2 - 2y - 4z = 11$ by the plane $x + 2y + 2z = 15$ is
 (a) 4 (b) $\sqrt{7}$ (c) 5 (d) 7
30. The radius of the circular section of the sphere $|\vec{r}| = 5$ by the plane $\vec{r} \cdot (\vec{i} + \vec{j} + \vec{k}) = 4\sqrt{3}$ is
 (a) 2 (b) 3 (c) 4 (d) 6
31. The image (or reflection) of the point $(1, 2, -1)$ in the plane $\vec{r} \cdot (3\vec{i} - 5\vec{j} + 4\vec{k})$ is
 (a) $\left(\frac{73}{25}, \frac{-6}{5}, \frac{39}{25}\right)$ (b) $\left(\frac{73}{25}, \frac{6}{5}, \frac{39}{25}\right)$ (c) $(-1, -2, 1)$ (d) none of these
32. The distance between the line $\vec{r} = 2\vec{i} - 2\vec{j} + 3\vec{k} + \lambda(\vec{i} - \vec{j} + 4\vec{k})$ and the plane $\vec{r} \cdot (\vec{i} + 5\vec{j} + \vec{k}) = 5$ is
 (a) $\frac{10}{3\sqrt{3}}$ (b) $\frac{10}{3}$ (c) $\frac{10}{9}$ (d) none of these
33. The line of intersection of the planes $\vec{r} \cdot (3\vec{i} - \vec{j} + \vec{k}) = 1$ and $\vec{r} \cdot (\vec{i} + 4\vec{j} - 2\vec{k}) = 2$ is parallel to the vector
 (a) $-2\vec{i} + 7\vec{j} + 13\vec{k}$ (b) $2\vec{i} + 7\vec{j} - 13\vec{k}$ (c) $-2\vec{i} - 7\vec{j} + 13\vec{k}$ (d) $2\vec{i} + 7\vec{j} + 13\vec{k}$
34. The length of the perpendicular from the origin to the plane passing thro three noncollinear points $\vec{a}, \vec{b}, \vec{c}$ is
 (a) $\frac{(\vec{a} \cdot \vec{b} \cdot \vec{c})}{|\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}|}$ (b) $\frac{2(\vec{a} \cdot \vec{b} \cdot \vec{c})}{|\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}|}$ (c) $[\vec{a} \cdot \vec{b} \cdot \vec{c}]$ (d) none of these

35. The S.D. between the line $\vec{r} = (5\vec{i} + 7\vec{j} + 3\vec{k}) + \lambda (5\vec{i} - 16\vec{j} + 7\vec{k})$ and $\vec{r} = (9\vec{i} + 13\vec{j} + 15\vec{k}) + \lambda (3\vec{i} + 8\vec{j} - 5\vec{k})$ is
 (a) 10 units (b) 12 units (c) 14 units (d) none of these
36. The equation of the sphere circumscribing the tetrahedron whose faces are $x = 0, y = 0, z = 0$ and $x/a + y/b + z/c = 1$ is
 (a) $x^2 + y^2 + z^2 = a^2 + b^2 + c^2$ (b) $x^2 + y^2 + z^2 - ax - by - cz = 0$
 (c) $x^2 + y^2 + z^2 - 2ax - 2by - 2cz = 0$ (d) none of these
37. The number of spheres of radius r and touching the co-ordinate axes is
 (a) 4 (b) 6 (c) 8 (d) none of these
38. The position vector of the centre of the circle $|\vec{r}| = 5, \vec{r} \cdot (\vec{i} + \vec{j} + \vec{k}) = 3\sqrt{3}$ is
 (a) $\vec{i} + \vec{j} + \vec{k}$ (b) $3(\vec{i} + \vec{j} + \vec{k})$ (c) $\sqrt{3}(\vec{i} + \vec{j} + \vec{k})$ (d) none of these
39. The equation $|\vec{r}|^2 - \vec{r} \cdot (2\vec{i} + 4\vec{j} - 2\vec{k}) - 10 = 0$ represents a
 (a) plane (b) straight line (c) sphere (d) none of these
40. The equation $|\vec{r}|^2 - 2(\vec{r} \cdot \vec{a}) + \lambda = 0$ represents a
 (a) plane (b) straight line (c) sphere (d) none of these
41. If α, β, γ are the angles which a half ray makes with the positive directions of the axes, then $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma$ is equal to
 (a) 1 (b) 2 (c) 0 (d) -1
42. The projection of line joining (3, 4, 5) and (4, 6, 3) on the line joining (-1, 2, 4) and (1, 0, 5) is
 (a) 4/3 (b) 2/3 (c) 8/3 (d) 1/3
43. For every point (x, y, z) on xy-plane
 (a) $x = 0$ (b) $y = 0$ (c) $z = 0$ (d) $x = 0, z = 0$
44. Angle between diagonals of a cube are
 (a) $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\cos^{-1}\left(\frac{1}{3}\right)$ (d) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$
45. Two lines with direction cosines $\langle l_1, m_1, n_1 \rangle$ and $\langle l_2, m_2, n_2 \rangle$ are at right angles if
 (a) $l_1 = l_2, m_1 = m_2, n_1 = n_2$ (b) $\frac{l_1}{l_2} = \frac{m_1}{m_2} = \frac{n_1}{n_2}$
 (c) $l_1 l_2 + m_1 m_2 + n_1 n_2 = 0$ (d) $l_1 l_2 + m_1 m_2 + n_1 n_2 = 1$
46. The equations of the line thro' the point (2, 3, -5) and equally inclined to the axis are
 (a) $x - 2 = y - 3 = z + 5$ (b) $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-1}{5}$ (c) $\frac{x}{2} = \frac{y}{3} = \frac{z}{-5}$ (d) none of these
47. The curves $y = |x|^3 + |x|^2 + 2$ and $y = x^3 + 3x^2 + 2$ have the same graph for
 (a) $x > 0$ (b) $x \geq 0$ (c) all x except 0 (d) all x

48. The line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ is parallel to the plane
- (a) $2x + y - 2z = 0$ (b) $3x + 4y + 5z = 7$ (c) $x + y + z = 2$ (d) $2x + 3y + 4z = 0$
49. The angle between the lines $x = 1$, $y = 2$ and $y = -1$ and $z = 0$ is
- (a) 90° (b) 30° (c) 60° (d) 0°
50. The foot of perpendicular from (α, β, γ) on y-axis is
- (a) $(\alpha, 0, 0)$ (b) $(0, \beta, 0)$ (c) $(0, 0, \gamma)$ (d) $(0, 0, 0)$