3 -D
DPP - 1

1. If a line makes angles α, β, γ with the axes , then $\cos 2\alpha + \cos 2\beta + \cos 2\gamma =$

(A) – 2 (B) – 1 (C) 1 (D) 2

2. The perpendicular distance of an angular point of a cube of edge 'a' from the diagonal which does not pass that angular point, is

(A) $\sqrt{3}$ a (B) $\sqrt{2}$ a (C) $\sqrt{\frac{3}{2}}$ a (D) $\sqrt{\frac{2}{3}}$ a

3. How many lines through the origin make equal angles with the coordinate axes?

(A) 1 (B) 4 (C) 8 (D) 2

4. Let L_1 : $\vec{r} = \hat{i} - \hat{j} - 10\hat{k} + \lambda(2\hat{i} - 3\hat{j} + 8\hat{k})$ and L_2 : $\vec{r} = 4\hat{i} - 3\hat{j} - \hat{k} + \mu(\hat{i} - 4\hat{j} + 7\hat{k})$ represent two lines in R^3, then which one of the following is **incorrect**?

(A) L_1 is parallel to the vector $4\hat{i} - 6\hat{j} + 16\hat{k}$.

(B) L_2 is parallel to the vector $-\hat{i} + 4\hat{j} - 7\hat{k}$.

(C) L_1 and L_2 are coplanar.

(D) Angle between the lines L_1 and L_2 is $\cos^{-1}\left(\frac{70}{11\sqrt{7}}\right)$.

5. If the lines $\frac{1-x}{3} = \frac{7y-14}{2p} = \frac{z-3}{2}$ and $\frac{7-7x}{3p} = \frac{5-y}{1} = \frac{6-z}{5}$ are orthogonal to each other, then the value of p is

(A) 10 (B) $\frac{70}{11}$ (C) 7 (D) 5

6. If the lines L_1 : $x - 2y + 4z = 0$, $2x + y + z - 4 = 0$ and L_2 : $\frac{x-2}{2} = \frac{y}{1} = \frac{z-1}{2a}$ are perpendicular, then a is equal to

(A) $\frac{-1}{2}$ (B) $\frac{1}{2}$ (C) 2 (D) –2

7. A line makes the same angle θ with each of the x and z axes. If it makes the angle β with y-axis such that $2\sin^2\beta = \sin^2\theta$ then $\cos^2\theta$ equals

(A) $\frac{3}{5}$ (B) $\frac{1}{5}$ (C) $\frac{2}{5}$ (D) $\frac{2}{3}$

8. $\vec{A}$ is a vector with direction cosines, $\cos\alpha$, $\cos\beta$ & $\cos\gamma$ respectively. Assuming yz plane as a mirror the direction cosines of the reflected image of $\vec{A}$ in the yz plane is :

(A) $\cos\alpha$, $\cos\beta$, $\cos\gamma$ (B) $\cos\alpha$, $-\cos\beta$, $\cos\gamma$

(C) $-\cos\alpha$, $\cos\beta$, $\cos\gamma$ (D) $-\cos\alpha$, $-\cos\beta$, $-\cos\gamma$

Integer Type

9. The direction ratios of two lines L_1 and L_2 are $< 4, -1, 3 >$ and $< 2, -1, 2 >$ respectively. A vector $\vec{V}$ is perpendicular to L_1 and L_2 both such that $|\vec{V}| = 15$. If $\vec{V} = x_1\hat{i} + x_2\hat{j} + x_3\hat{k}$, then find the value of $|x_1 + x_2 + x_3|$.

10. Let position vectors of points A, B and C of triangle ABC respectively be $\hat{i} + \hat{j} + 2\hat{k}$, $\hat{i} + 2\hat{j} + \hat{k}$ and $2\hat{i} + \hat{j} + \hat{k}$. Let l_1, l_2, l_3 be the lengths of perpendiculars drawn from the orthocenter 'O' on the sides AB, BC and CA, then find the value of $4(l_1 + l_2 + l_3)^2$.

3 -D
DPP - 2

1. If the equation of the plane passing through (1, 2, 0) and which contains the line $\frac{x+3}{3} = \frac{y-1}{4} = \frac{z-2}{-2}$ is $6x + \lambda y + \mu z = k$, then the value of $(2\mu - 5\lambda - k)$ equals
(A) 3 (B) 4 (C) 5 (D) 6

2. If equation of the plane containing the lines $L_1 : \frac{x-1}{2} = \frac{y+1}{-1} = \frac{z-1}{3}$ and $L_2 : \frac{x-3}{-4} = \frac{y-2}{2} = \frac{z-1}{-6}$ is $9x + by + cz = d$, then $(b + c + d)$ equals
(A) −1 (B) 7 (C) − 7 (D) 1

3. If the angle between the plane $x - 3y + 2z = 1$ and the line $\frac{x-1}{2} = \frac{y-1}{1} = \frac{z-1}{-3}$ is θ, then the value of $\operatorname{cosec}\theta$ is
(A) 1 (B) 2 (C) 3 (D) 4

4. If the line contained by the planes $2x + y + z - 3 = 0$ and $x - y + 2z + 5 = 0$ is parallel to the plane $mx + 2y + 3z + 1 = 0$, then the value of m equals
(A) 1 (B) 2 (C) 3 (D) 5

5. A plane passes through (1, −2, 1) and is perpendicular to two planes $2x - 2y + z = 0$ and $x - y + 2z = 4$. The distance of the plane from the point (1, 2, 2) is
(A) 0 (B) 1 (C) $\sqrt{2}$ (D) $2\sqrt{2}$

6. If the plane $\frac{x}{2} + \frac{y}{3} + \frac{z}{4} = 1$ meets the coordinate axes at A, B, C then area of ΔABC will be
(A) 11 (B) $\sqrt{61}$ (C) $\sqrt{101}$ (D) 9

7. If the angles between the vectors $\vec{v}_1$ and $\vec{v}_2$, $\vec{v}_2$ and $\vec{v}_3$, $\vec{v}_3$ and $\vec{v}_1$ be $\frac{\pi}{3}$, $\frac{\pi}{4}$ and $\frac{\pi}{6}$ respectively, then the angle the vector $\vec{v}_1$ makes with the plane containing $\vec{v}_2$ and $\vec{v}_3$ is
(A) $\sin^{-1}\sqrt{1-\sqrt{\frac{2}{3}}}$ (B) $\sin^{-1}\sqrt{\sqrt{\frac{3}{2}}-1}$ (C) $\cos^{-1}\sqrt{1-\sqrt{\frac{2}{3}}}$ (D) $\cos^{-1}\sqrt{\sqrt{\frac{3}{2}}-1}$

8. Let A(1, 1, 1), B(2, 3, 5) and C(−1, 0, 2) be three points then equation of plane parallel to plane ABC and at distance 2 unit from origin is
(A) $2x - 3y + z + 2\sqrt{14} = 0$ (B) $2x - 3y + z - \sqrt{14} = 0$
(C) $2x - 3y + z + 2 = 0$ (D) $2x - 3y + z - 2 = 0$

Integer Type

9. If the distance between the planes represented by the equation $(x - 2y - 2z)^2 - 6(x - 2y - 2z) + 10 - k = 0$ is $\frac{4}{3}$ (where $k > 1$), then the value of k is

10. A variable plane at a distance of 1 unit from the origin cuts the co-ordinate axes at A, B and C. If the centroid D (x, y, z) of triangle ABC satisfies the relation $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = k$, then the value of k is

3 -D
DPP - 4

1. The shortest distance between the lines $x + 2 = \frac{y-3}{2} = \frac{z-5}{3}$ and $-x = \frac{y-1}{3} = \frac{z-4}{7}$ is

(A) $\frac{\sqrt{6}}{6}$ (B) $\frac{5\sqrt{6}}{6}$ (C) 5 (D) $\sqrt{6}$

2. Consider two lines in space as L_1: $\vec{r}_1 = \hat{j} + 2\hat{k} + \lambda(3\hat{i} - \hat{j} - \hat{k})$ and L_2: $\vec{r}_2 = 4\hat{i} + 3\hat{j} + 6\hat{k} + \mu(\hat{i} + 2\hat{k})$. If the shortest distance between these lines is $\sqrt{d}$ then d equals

(A) 5 (B) 6 (C) 7 (D) 8

3. The equation of line of shortest distance beween the lines

$\frac{x+4}{4} = \frac{y-2}{-2} = \frac{z-3}{0}$ and $\frac{x-5}{5} = \frac{y-3}{3} = \frac{z}{0}$ is

(A) $\frac{x+4}{0} = \frac{y-2}{0} = \frac{z-3}{1}$ (B) $\frac{x-5}{0} = \frac{y-3}{0} = \frac{z}{1}$

(C) $\frac{x}{0} = \frac{y}{0} = \frac{z-3}{1}$ (D) $\frac{x}{1} = \frac{y}{1} = \frac{z-3}{0}$

4. Consider two lines L_1 : $\frac{x-7}{3} = \frac{y-7}{2} = \frac{z-3}{1}$ and L_2 : $\frac{x-1}{2} = \frac{y+1}{4} = \frac{z+1}{3}$.

If a line L whose direction ratios are $\langle 2, 2, 1 \rangle$ intersect the lines L_1 and L_2 at A and B then the distance AB is

(A) 18 (B) 24 (C) 36 (D) 50

5. The shortest distance between the lines $2x + y + z - 1 = 0 = 3x + y + 2z - 2$ and $x = y = z$, is

(A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{2}$ (C) $\frac{3}{\sqrt{2}}$ (D) $\frac{\sqrt{3}}{2}$

6. $P(1, 7, \sqrt{2})$ be a point and line L is $2\sqrt{2}(x - 1) = y - 2$, $z = 0$. If PQ is distance of plane $\sqrt{2}x + y - z = 1$ from P measured along a line inclined at an angle of 45° with L and is minimum then PQ is

(A) 2 (B*) 3 (C) 4 (D) 5

7. Distance of the point A (2, 4, 5) from the line $\frac{x+2}{3} = \frac{y-1}{1} = \frac{z-1}{2}$ measured parallel to line $\frac{x-3}{1} = \frac{y+1}{2} = \frac{z-2}{2}$ is equal to

(A) 1 (B) 3 (C) 5 (D) 7

8. If PQ is shortest distance between the lines given by $\vec{r}=(3\hat{i}+8\hat{j}+3\hat{k})+\lambda(3\hat{i}-\hat{j}+\hat{k})$ and $\vec{r}=(-3\hat{i}-7\hat{j}+6\hat{k})+\mu(-3\hat{i}+2\hat{j}+4\hat{k})$, then equation of plane OPQ is (where O is origin)

(A) $23x + y + 9z = 0$
(B) $23x - 9y + z = 0$
(C) $19x + 13y + z = 0$
(D) $19x - y + 13z = 0$

Integer Type

9. The distance of the point (1, 0, – 3) from the plane $x - y - z - 9 = 0$ measured parallel to line $\frac{x-2}{2} = \frac{y+2}{3} = \frac{6-z}{6}$ is

10. If line L: $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{-1}$ meets the plane $x + 2y - 3z = 4$ at P then sum of the projections of vector $\overrightarrow{OP}$ on positive x, y and z axis, is (where 'O' is origin)