



# **BOOKS - CENGAGE MATHS (HINGLISH)**

MATHS

# THREE DIMENSIONAL GEOMETRY

Solved Examples And Exercises

**1.** Find the angle between the line whose direction cosines are given by

$$l+m+n=0 and 2l^2+2m^2-n^2-0.$$

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**2.** A line makes angles  $lpha, eta, \gamma and \delta$  with the diagonals of a cube. Show

that 
$$\cos^2lpha+\cos^2eta+\cos^2\gamma+\cos^2\delta=4/3.$$

**3.** *ABC* is a triangle and A=(2,3,5),B=(-1,3,2) and C=  $(\lambda, 5, \mu)$ . If the median through *A* is equally inclined to the axes, then find the value of  $(\lambda, \mu)$ 

A. (10, 7)

B.(7,5)

C.(7, 10)

D. (5, 7)

Answer: C

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**4.** A line OP through origin O is inclined at  $30^0 and 45^0 
ightarrow OX and OY,$ 

respectivley. Then find the angle at which it is inclined to  $OZ_{-}$ 

5. If  $\alpha$ ,  $\beta$ , and  $\gamma$  are the an gles which a directed line makes with the positive directions of the co-ordinates axes, then find the value of  $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma$ .



**6.** If the sum of the squares of the distance of a point from the three coordinate axes is 36, then find its distance from the origin.

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7. If A(3, 2, -4), B(5, 4, -6) and C(9, 8, -10) are three collinear

points, then find the ratio in which point C divides AB.



**8.** Find the ratio in which the y - z plane divides the join of the points

$$(-2,4,7) and (3,\,-5,8) \cdot$$

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**9.** A line passes through the points (6, -7, -1) and (2, -3, 1). Find te direction cosines off the line if the line makes an acute angle with the positive direction of the x-axis.

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**10.** Find the angle between the lines whose direction cosines are connected by the relations l + m + n = 0 and 2lm + 2nl - mn = 0.

**11.** Find the point where line which passes through point (1, 2, 3) and is parallel to line  $\overrightarrow{r} = \hat{i} + \hat{j} + 2\hat{k} + \lambda(\hat{i} - 2\hat{j} + 3\hat{k})$  meets the xy-plane.

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12. Find the equation of the line passing through the points (1, 2, 3) and (-1, 0, 4).

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13. Find the equation of the line passing through the point (-1, 2, 3)

and perpendicular to the lines  $\frac{x}{2} = \frac{y-1}{-3} = \frac{z+2}{-2}$  and  $\frac{x+3}{-1} = \frac{y+3}{2} = \frac{z-1}{3}$ .

**14.** The line joining the points (-2, 1, -8) and (a, b, c) is parallel to the line whose direction ratios are 6, 2, and 3. Find the values of a, b and c

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**15.** A parallelepiped is formed by planes drawn through the points P(6, 8, 10) and (3, 4, 8) parallel to the coordinate planes. Find the length of edges and diagonal of the parallelepiped.

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**16.** Find the angle between any two diagonals of a cube.



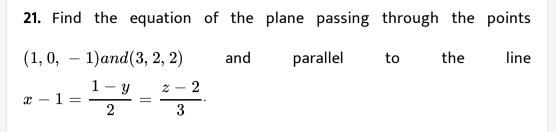
17. Direction ratios of two lines are a, b, cand1/bc, 1/ca, 1/ab. Then the

lines are \_\_\_\_\_.



18. Find the equation of the line passing through the intersection of  $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$  and  $\frac{x-4}{5} = \frac{y-1}{2} = z$  and also through the point (2, 1, -2). Watch Video Solution **19.** The straight line  $\frac{x-3}{3} = \frac{y-2}{1} = \frac{z-1}{0}$  is (a)Parallel to x-axis (b)Parallel to the y-axis (c)Parallel to the z-axis (d)Perpendicular to the zaxis Watch Video Solution

20. Find the equation of the plane containing the lines
$$\frac{x-5}{4} = \frac{y-7}{4} = \frac{z+3}{-5} and \frac{x-8}{7} = \frac{y-4}{1} = \frac{z-5}{3}.$$



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**22.** Find the equation of the sphere described on the joint of points AandB having position vectors  $2\hat{i} + 6\hat{j} - 7\hat{k}and - 2\hat{i} + 4\hat{j} - 3\hat{k}$ , respectively, as the diameter. Find the center and the radius of the sphere.

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23. Find the radius of the circular section in which the sphere  $\left| \overrightarrow{r} \right| = 5$  is cut by the plane  $\overrightarrow{r} \hat{i} + \dot{\hat{j}} + \hat{k} = 3\sqrt{3.}$ 



**24.** Find the equation of a sphere which passes through (1, 0, 0)(0, 1, 0) and (0, 0, 1), and has radius as small as possible.



**25.** Find the locus of appoint which moves such that the sum of the squares of its distance from the points A(1, 2, 3), B(2, -3, 5) and C(0, 7, 4) is 120.

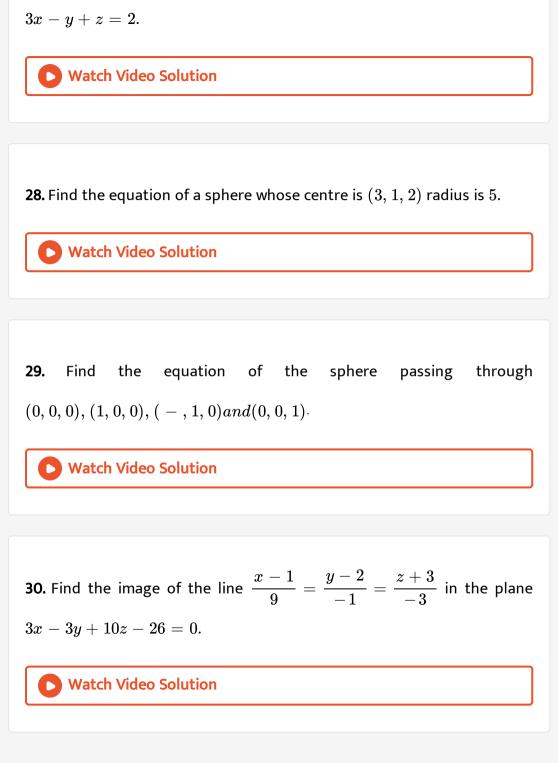
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26. Find the equation of the sphere which has centre at the origin and

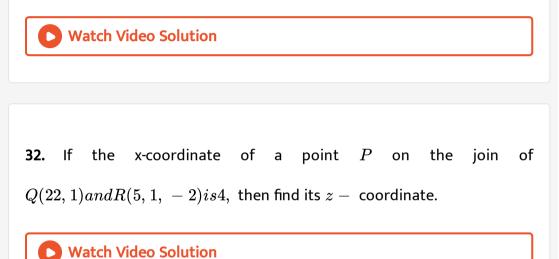
touches the line 2(x + 1) = 2 - y = z + 3.

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**27.** Find the equation of the sphere which passes through (10, 0), (0, 1, 0) and (0, 0, 1) and whose centre lies on the plane



**31.** Find the equations of the bisectors of the angles between the planes 2x - y + 2z + 3 = 0 and 3x - 2y + 6z + 8 = 0 and specify the plane which bisects the acute angle and the plane which bisects the obtuse angle.



**33.** A sphere of constant radius k, passes through the origin and meets the axes at A, BandC. Prove that the centroid of triangle ABC lies on the sphere  $9(x^2 + y^2 + z^2) = 4k^2$ .

**34.** A variable plane passes through a fixed point (a, b, c) and cuts the coordinate axes at points A, B, andC. Show that eh locus of the centre of the sphere  $OABCis \frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$ .

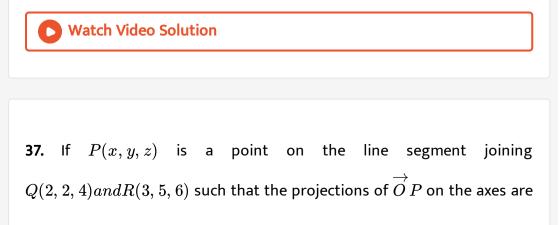
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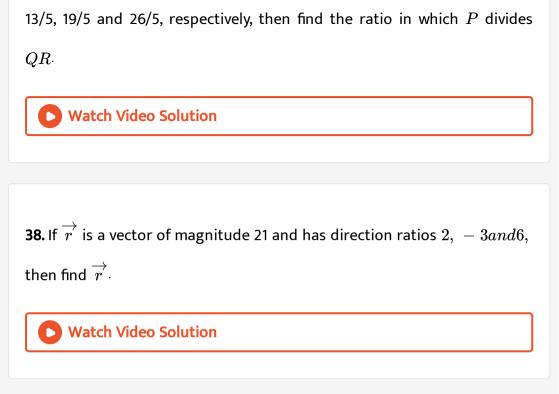
**35.** Show that the plane 2x - 2y + z + 12 = 0 touches the sphere  $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0.$ 

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**36.** If O is the origin, OP = 3 with direction ratios -1, 2, and -2, then

find the coordinates of P.



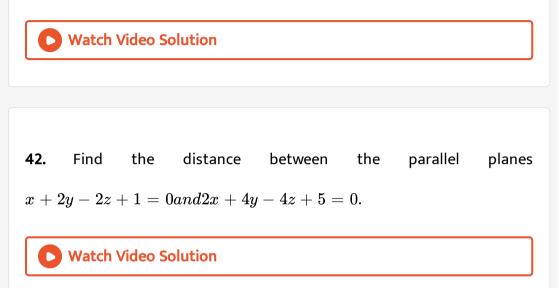


**39.** Find the distance of the point P(a, b, c) from the x-axis.

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**40.** A line makes angles  $lpha, eta and \gamma$  with the coordinate axes. If  $lpha+eta=90^0,$  then find  $\gamma$ .

**41.** If a line makes angles  $\alpha$ ,  $\beta and\gamma$  with threew-dimensional coordinate axes, respectively, then find the value of  $\cos 2\alpha + \cos 2\beta + \cos 2\gamma$ .



43. A ray of light passing through the point A(1,2,3) , strikews the plane xy+z=12atB and on reflection passes through point C(3,5,9). Find the coordinate so point B.



**44.** The plane ax + by = 0 is rotated through an angle  $\alpha$  about its line of intersection with the plane z = 0. Show that he equation to the plane in the new position is  $aby \pm z\sqrt{a^2 + b^2} and\alpha = 0$ .



**45.** Find the equation of a plane containing the line of intersection of the planes x + y + z - 6 = 0 and 2x + 3y + 4z + 5 = 0 passing through (1, 1, 1).

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46. Find the locus of a point, the sum of squares of whose distance from

the planes x-z=0, x-2y+z=0 and x+y+z=0 is 36

**47.** Find the length and the foot of the perpendicular from the point (7, 14, 5) to the plane 2x + 4y - z = 2. Also, the find image of the point *P* in the plane.

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**48.** Find the angle between the line  $\overrightarrow{r} = \hat{i} + 2\hat{j} - \hat{k} + \lambda(\hat{i} - \hat{j} + \hat{k})$ and the plane  $\overrightarrow{r} 2\hat{i} - \hat{j} + \hat{k} = 4$ .

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**49.** Find the equation of the projection of the line  $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z-3}{4}$  on the plane x + 2y + z = 9. **Watch Video Solution**  **50.** Find the equation the plane which contain the line of intersection of the planes  $\vec{r} \cdot \hat{i} + 2\hat{j} + 3\hat{k} - 4 = 0$  and  $\vec{r} \cdot 2\hat{i} + \hat{j} - \hat{k} + 5 = 0$  and which is perpendicular to the plane  $\vec{r} \left(5\hat{i} + 3\hat{j} - 6\hat{k}\right) + 8 = 0$ .

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**51.** Find the vector equation of the line passing through (1, 2, 3) and parallel to the planes  $\rightarrow r\hat{i} - \hat{j} + 2\hat{k} = 5$  and  $\rightarrow r3\hat{i} + \hat{j} + \hat{k} = 6$ .

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52. Find the distance of the point P(3, 8, 2) from the line  $\frac{1}{2}(x-1) = \frac{1}{4}(y-3) = \frac{1}{3}(z-2)$  measured parallel to the plane 3x + 2y - 2z + 15 = 0.

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

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54. Show that ax + by + r = 0, by + cz + p = 0 and cz + ax + q = 0are perpendicular to x - y, y - z and z - x planes, respectively.

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**55.** Reduce the equation of line x - y + 2z = 5adn3x + y + z = 6 in symmetrical form. Or Find the line of intersection of planes x - y + 2z = 5and3x + y + z = 6.



56. Find
 the
 angle
 between
 the
 lines

 
$$x - 3y - 4 = 0, 4y - z + 5 = 0$$
 $0 + 3y - 11 = 0, 2y = z + 6 = 0.$ 

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**57.** If the line x = y = z intersect the line  $s \in A\dot{x} + s \in B\dot{y} + s \in C\dot{z} = 2d^2, s \in 2A\dot{x} + s \in 2B\dot{y} + s \in 2C\dot{z} = d^2$ , then find the value of  $\frac{\sin A}{2} \frac{\sin B}{2} \frac{\sin C}{2}$  where A, B, C are the angles of a triangle.

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58. The point of intersecting of the line passing through (0, 0, 1) and

intersecting the lines  $x+2y+z=1,\ -x+y-2z=2$  and  $x+y=2,\ x+z=2$  with xy-

plane is

59. A horizontal plane 4x - 3y + 7z = 0 is given. Find a line of greatest slope passes through the point (2, 1, 1) in the plane 2x + y - 5z = 0.

**60.** Find the equation of the plane passing through the points (-1, 1, 1) and (1, -1, 1) and perpendicular to the plane x + 2y + 2z = 5.

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**61.** Find ten equation of the plane passing through the point (0, 7, -7)and containing the line  $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ . Watch Video Solution **62.** If a plane meets the equations axes at A, BandC such that the centroid of the triangle is (1, 2, 4), then find the equation of the plane.

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**63.** Find the equation of the plane which is parallel to the lines  $\vec{r} = \hat{i} + \hat{j} + \lambda \left(2\hat{i} + \hat{j} + 4\hat{k}\right) and \frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$  and is

passing through the point (0, 1, -1).

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64. Prove that the plane  $\overrightarrow{r}=\left(\hat{i}+2\hat{j}-\hat{k}
ight)=3$  contains the line  $\overrightarrow{r}=\hat{i}+\hat{j}+\lambda\Big(2\hat{i}+\hat{j}+4\hat{k}\Big)\cdot$ 

65. Find the vector equation of the following planes in Cartesian form:

$$\overrightarrow{r} = \hat{i} - \hat{j} + \lambda ig( \hat{i} + \hat{j} + \hat{k} ig) + \mu ig( \hat{i} - 2\hat{j} + 3\hat{k} ig) \cdot$$

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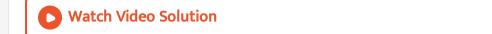
**66.** Show that the line of intersection of the planes  $\vec{r} \,\hat{i} + 2\dot{\hat{j}} + 3\hat{k} = 0$  and  $\vec{r} = (3\hat{i} + 2\hat{j} + \hat{k}) = 0$  is equally inclined to

iandk· Also find the angle it makes with j·

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**67.** Find the equation of the plane passing through A(2, 2, -1), B(3, 4, -1)

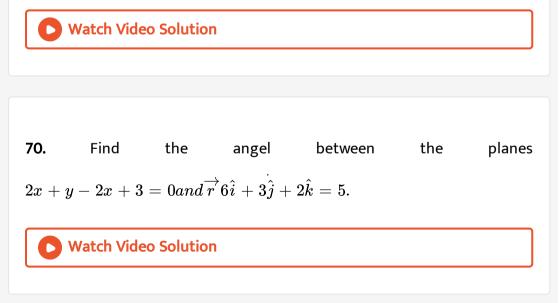
2)andC(7, 0, 6). Also find a unit vector perpendicular to this plane.



**68.** Find the equation of the plane such that image of point (1, 2, 3) in it is (-1, 0, 1).



**69.** The foot of the perpendicular drawn from the origin to a plane is (1, 2, -3). Find the equation of the plane. or If O is the origin and the coordinates of P is (1, 2, -3), then find the equation of the plane passing through P and perpendicular to OP.



**71.** Find the equation of the plane passing through (3, 4, -1), which is parallel to the plane  $\overrightarrow{r}2\hat{i} - 3\hat{j} + 5\hat{k} + 7 = 0$ .

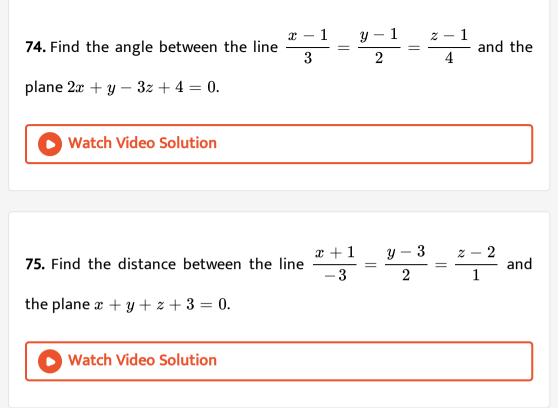
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72. Find the distance of the point (-1, -5, -10) from the point of intersection of the line  $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$  and plane x - y + z = 5.

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73. Find the equation of the plane passing through the point (-1, 3, 2)

and perpendicular to each of the planes x + 2y + 3z = 5and3x + 3y + z = 0.



**76.** The extremities of a diameter of a sphere lie on the positive y- and positive z-axes at distance 2 and 4, respectively. Show that the sphere passes through the origin and find the radius of the sphere.



77. A plane passes through a fixed point (a, b, c). Show that the locus of the foot of the perpendicular to it from the origin is the sphere  $x^2 + y^2 + z^2 - ax - by - cz = 0.$ 

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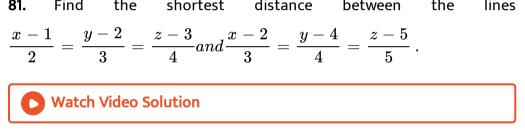
78. Find the radius of the circular section of the sphere  $\left| \overrightarrow{r} \right| = 5$  by the plane  $\overrightarrow{r}\hat{i} + 2\dot{j} - \hat{k} = 4\sqrt{3}$ .

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**79.** A point P(x, y, z) is such that 3PA = 2PB, where AandB are the point (1, 3, 4)and(1, -2, -1), irrespectivley. Find the equation to the locus of the point P and verify that the locus is a sphere.

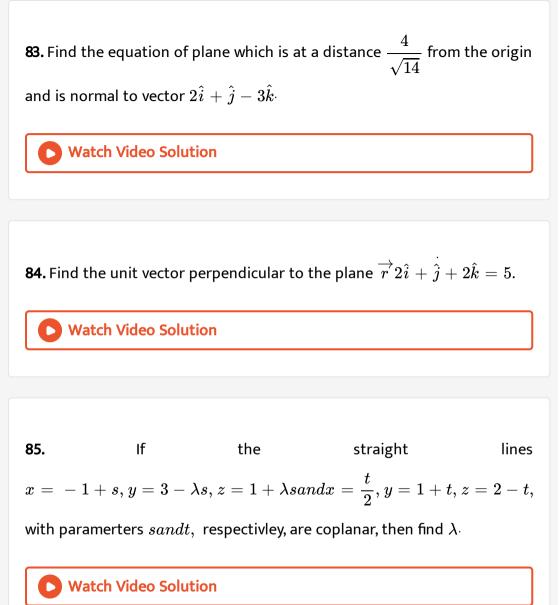
**80.** Find the shortest distance between lines  

$$\vec{r} = (\hat{i} + 2\hat{j} + \hat{k}) + \lambda (2\hat{i} + \hat{j} + 2\hat{k}) and \vec{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu (2\hat{i} + \hat{j} + \hat{k})$$
  
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82. Determine whether the following pair of lines intersect or not. (1)

$$\vec{r} = \hat{i} - 5\hat{j} + \lambda \left(2\hat{i} + \hat{k}\right); \ \vec{r} = 2\hat{i} - \hat{j} + \mu \left(\hat{i} + \hat{j} - \hat{k}\right)$$
(2)  
$$\vec{r} = \hat{i} + \hat{j} - \hat{k} + \lambda \left(3\hat{i} - \hat{j}\right); \ \vec{r} = 4\hat{i} - \hat{k} + \mu \left(2\hat{i} + 3\hat{k}\right)$$



**86.** Find the equation of a line which passes through the point (1, 1, 1)

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} and \frac{x+2}{1} = \frac{y-3}{2} = \frac{z+1}{4}.$$
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**87.** Find the vector equation of a line passing through  $3\hat{i} - 5\hat{j} + 7\hat{k}$  and

perpendicular to the plane 3x - 4y + 5z = 8.

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**88.** Find the equation of the plane passing through the point (2, 3, 1)

having (5, 3, 2) as the direction ratio is of the normal to the plane.

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**89.** Find the equation of the plane through the points (23, 1) and (4, -5, 3) and parallel to the x-axis.

**90.** Find the equation of the image of the plane x - 2y + 2z - 3 = 0 in plane x + y + z - 1 = 0.



**91.** Find the equation of a plane which passes through the point (1, 2, 3)and which is equally inclined to the planes x - 2y + 2z - 3 = 0 and 8x - 4y + z - 7 = 0.

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**92.** Find the equation of a plane which is parallel to the plane

x-2y+2z=5 and whose distance from the point (1,2,3) is 1.

**93.** Find the direction ratios of orthogonal projection of line  $\frac{x-1}{1} = \frac{y+1}{-2} = \frac{z-2}{3}$  in the plane x - y + 2z - 3 = 0. also find the direction ratios of the image of the line in the plane.

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**94.** Find the equation of the plane which passes through the point (1, 2, 3) and which is at the minimum distance from the point (-1, 0, 2).

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**95.** Find the angle between the line  

$$\overrightarrow{r} = \left(\overrightarrow{i} + 2\overrightarrow{j} - \overrightarrow{k}\right) + \lambda\left(\overrightarrow{i} - \overrightarrow{j} + \overrightarrow{k}\right)$$
 and the normal to the  
plane  $\overrightarrow{r}\left(2\overrightarrow{i} - \overrightarrow{j} + \overrightarrow{k}\right) = 4.$ 

**96.** Find the equation of the plane passing through the line  $\frac{x-1}{5} = \frac{y+2}{6} = \frac{z-3}{4}$  and point (4, 3, 7).

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**97.** Find the equation of the plane perpendicular to the line  $\frac{x-1}{2} = \frac{y-3}{-1} = \frac{z-4}{2}$  and passing through the origin.

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**98.** Find the equation of the plane passing through the straight line  $\frac{x-1}{2} = \frac{y+2}{-3} = \frac{z}{5}$  and perpendicular to the plane x - y + z + 2 = 0.

99. Find the equation of the line drawn through point (1, 0, 2) to meet the

line 
$$\frac{x+1}{3} = \frac{y-2}{-2} = \frac{z1}{-1}$$
 at right angles.

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100. If 
$$\overrightarrow{r} = \left(\hat{i} + 2\hat{j} + 3\hat{k}\right) + \lambda\left(\hat{i} - \hat{j} + \hat{k}\right)$$
 and

 $\overrightarrow{r}=\left(\hat{i}+2\hat{j}+3\hat{k}
ight)+\mu\Bigl(\hat{i}+\hat{j}-\hat{k}\Bigr)$  are two lines, then the equation

of acute angle bisector of two lines is

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101. Find the coordinates of a point on the  $\frac{x-1}{2} = \frac{y+1}{-3} = z$  atg a distance  $4\sqrt{14}$  from the point (1, -1, 0).

**102.** Line  $L_1$  is parallel to vector  $\overrightarrow{\alpha} = -3\hat{i} + 2\hat{j} + 4\hat{k}$  and passes through a point A(7, 6, 2) and line  $L_2$  is parallel vector  $\overrightarrow{\beta} = 2\hat{i} + \hat{j} + 3\hat{k}$  and point B(5, 3, 4). Now a line  $L_3$  parallel to a vector  $\overrightarrow{r} = 2\hat{i} - 2\hat{j} - \hat{k}$  intersects the lines  $L_1$  and  $L_2$  at points C and D, respectively, then find  $\left|\overrightarrow{C}D\right|$ .

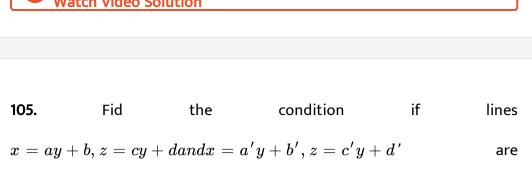
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**103.** Find the values 
$$p$$
 so that line  
 $\frac{1-x}{3} = \frac{7y-14}{2p} = \frac{z-3}{2} and \frac{7-7x}{3p} = \frac{y-5}{1} = \frac{6-z}{5}$  are at

right angles.

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104. Find the angel between the following pair of lines:  $\overrightarrow{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \lambda \left(3\hat{i} + 2\hat{j} + 6\hat{k}\right) and \overrightarrow{r} = 7\hat{i} - 6\hat{k} + \mu \left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$   $\frac{x}{2} = \frac{y}{2} = \frac{z}{1}and\frac{x-5}{4} = \frac{y-2}{1} = \frac{z-3}{8}$ 



perpendicular.

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**106.** Find the acute angle between the lines 
$$\frac{x-1}{l} = \frac{y+1}{m} = \frac{1}{n}and = \frac{x+1}{m} = \frac{y-3}{n} = \frac{z-1}{l}wherel > m > n$$
, are the roots of the cubic equation  $x^3 + x^2 - 4x = 4$ .

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**107.** Find the length of the perpendicular drawn from point (2, 3, 4) to

line 
$$\frac{4-x}{2} = \frac{y}{6} = \frac{1-z}{3}$$

**108.** Find the coordinates of the foot of the perpendicular drawn from point A(1, 0, 3) to the join of points B(4, 7, 1) and C(3, 5, 3).



**109.** Find the vector equation of the line passing through (1, 2, 3) and parallel to the planes  $\vec{r} \cdot \hat{i} - \hat{j} + 2\hat{k}and\vec{r}\cdot 3\hat{i} + \hat{j} + \hat{k} = 6.$ 

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110. Find the value of m for which the straight line 3x - 2y + z + 3 = 0 = 4x + 3y + 4z + 1 is parallel to the plane 2x - y + mz - 2 = 0.

**111.** Show that the lines 
$$\frac{x-a+d}{\alpha-\delta} = \frac{y-a}{\alpha} = \frac{z-a-d}{\alpha+\delta}$$
 and  $\frac{x-b+c}{\beta-\gamma} = \frac{y-b}{\beta} = \frac{z-b-c}{\beta+\gamma}$  are coplanar.

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112. Find the equation of line x + y - z - 3 = 0 = 2x + 3y + z + 4 in symmetric form. Find the direction of the line.

113. Find the vector equation of line passing through the point  

$$(1, 2, -4)$$
 and perpendicular to the two lines:  
 $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$  and  $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$   
A.  $\overrightarrow{r} = (\hat{i} + 2\hat{j} - 4\hat{k}) + \lambda(2\hat{i} + 3\hat{j} + 6\hat{k})$   
B.  $\overrightarrow{r} = (\hat{i} + 2\hat{j} + 4\hat{k}) + \lambda(2\hat{i} + 3\hat{j} + 6\hat{k})$   
C.  $\overrightarrow{r} = (\hat{i} - 2\hat{j} + 4\hat{k}) + \lambda(2\hat{i} + 3\hat{j} + 6\hat{k})$ 

D. 
$$\overrightarrow{r} = \left( \hat{i} + 2\hat{j} + 4\hat{k} 
ight) + \lambda \Big( 2\hat{i} - 3\hat{j} - 6\hat{k} \Big)$$

#### Answer: A



114. Find the vector equation of line passing through A(3, 4-7) and B(1, -1, 6). Also find its Cartesian equations.

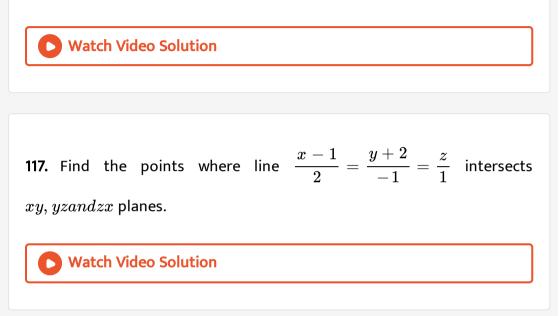
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115. Find Cartesian and vector equation of the line which passes through

the point (-2, 4, -5) and parallel to the line given by  $\frac{x+3}{3} = \frac{y-4}{5} = \frac{z+8}{6}$ .

**116.** Find the equation of a line which passes through the point (2, 3, 4)

and which has equal intercepts on the axes.



**118.** A mirror and source of light are situated at the origin O and a point on OX respectively. A ray of light from the source strikes the mirror and is reflected. If the DRs of the normal to the plane of mirror are 1, -1, 1, then DCs for the reflacted ray are :



119. The Cartesian equation of a line is  $\frac{x-3}{2} = \frac{y+1}{-2} = \frac{z-3}{5}$ . Find the vector equation of the line. Watch Video Solution

120. The Cartesian equations of a line are 6x - 2 = 3y + 1 = 2z - 2.

Find its direction ratios and also find a vector equation of the line.

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**121.** A line passes through the point with position vector  $2\hat{i} - 3\hat{j} + 4\hat{k}$ and is in the direction of  $3\hat{i} + 4\hat{j} - 5\hat{k}$ . Find the equations of the line in vector and Cartesian forms.

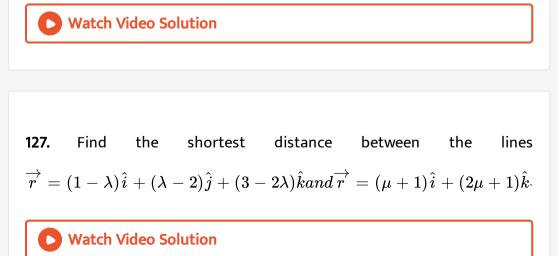


122. Find the plane of the intersection of 
$$x^2 + y^2 + z^2 + 2x + 2y + 2 = 0$$
 and  $4x^2 + 4y^2 + 4z^2 + 4x + 4y + 4z - 1$   
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123. If the lines  $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{-2}$  and  $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$  are at right angle, then find the value of k.
  
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124. Find the angel between the lines  $2x = 3y = -z$  and  $6x = -y = -4z$ .
  
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125. Find the length of the perpendicular drawn from the point (5, 4, -1) to the line  $\overrightarrow{r} = \hat{i} + \lambda \left(2\hat{i} + 9\hat{j} + 5\hat{k}\right)$ , wher  $\lambda$  is a parameter.

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126. The equations of motion of a rocket are x = 2t, y = -4tandz = 4t, where timet is given in seconds, and the coordinates of a moving points in kilometers. What is the path of the rocket? At what distance will be the rocket from the starting point O(0, 0, 0) in 10s?



**128.** Find the image of the point (1, 2, 3) in the line  $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$ .

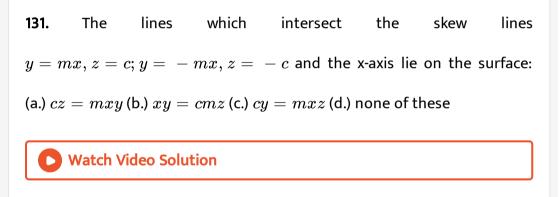
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**129.** If the lines 
$$\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$$
 and  $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$  intersect, then find the value of  $k$ .

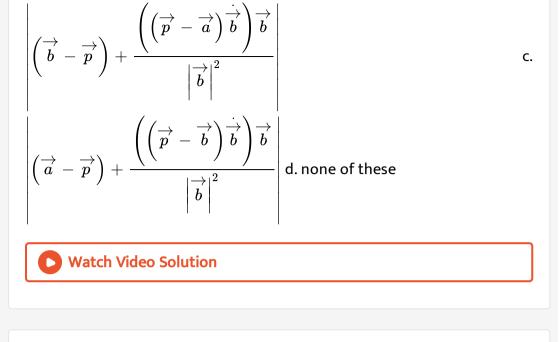
A. 
$$\frac{3}{2}$$
  
B.  $\frac{9}{2}$   
C.  $-\frac{2}{9}$   
D.  $-\frac{3}{2}$ 

# Answer: b

130. Find the shortest distance between the z-axis and the line, x+y+2z-3=0, 2x+3y+4z-4=0.



**132.** Distance of the point  $P(\overrightarrow{p})$  from the line  $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$  is a.  $\left| \left( \overrightarrow{a} - \overrightarrow{p} \right) + \frac{\left( \left( \overrightarrow{p} - \overrightarrow{a} \right) \overrightarrow{b} \right) \overrightarrow{b}}{\left| \overrightarrow{b} \right|^2} \right|$ b.



**133.** The direction ratios of a normal to the plane through (1, 0, 0)and(0, 1, 0), which makes and angle of  $\frac{\pi}{4}$  with the plane x + y = 3, are a.  $\langle 1, \sqrt{2}, 1 \rangle$  b.  $\langle 1, 1, \sqrt{2} \rangle$  c.  $\langle 1, 1, 2 \rangle$  d.  $\langle \sqrt{2}, 1, 1 \rangle$ 

**134.** The centre of the circle given by  
$$\overrightarrow{r}\hat{i} + 2\dot{\hat{j}} + 2\hat{k} = 15$$
 and  $\left|\overrightarrow{r} - (\hat{j} + 2\hat{k})\right| = 4$  is a.  $(0, 1, 2)$  b.  $(1, 3, 5)$  c.  
 $(-1, 3, 4)$  d. none of these

135. Two systems of rectangular axes have the same origin. If a plane cuts

them at distance a, b, c and a', b', c' from the origin, then a.

$$rac{1}{a^2}+rac{1}{b^2}+rac{1}{c^2}+rac{1}{a^{\,'2}}+rac{1}{b^{\,'2}}+rac{1}{c^{\,'2}}=0$$
 b.

$$rac{1}{a^2} - rac{1}{b^2} - rac{1}{c^2} + rac{1}{a^{\,'2}} - rac{1}{b^{\,'2}} - rac{1}{c^{\,'2}} = 0$$
 c.

$$\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} - \frac{1}{a^{\prime 2}} - \frac{1}{b^{\prime 2}} - \frac{1}{c^{\prime 2}} = 0 \qquad d.$$

$$\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} + \frac{1}{a^{\prime 2}} + \frac{1}{b^{\prime 2}} + \frac{1}{c^{\prime 2}} = 0$$

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**136.** The plane which passes through the point (3, 2, 0) and the line  $\frac{x-3}{1} = \frac{y-6}{5} = \frac{z-4}{4}$  is a. x - y + z = 1 b. x + y + z = 5 c. x + 2y - z = 1 d. 2x - y + z = 5

**137.** The lines  $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-k}$  and  $\frac{x-1}{k} = \frac{y-4}{2} = \frac{z-5}{1}$ are coplanar if a. k = 1 or -1 b. k = 0 or -3 c. k = 3 or -3 d. k = 0 or -1

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**138.** The point of intersection of the lines 
$$\frac{x-5}{3} = \frac{y-7}{-1} = \frac{z+2}{1}$$
 and  $\frac{x+3}{-36} = \frac{y-3}{2} = \frac{z-6}{4}$  is (A)  $\left(21, \frac{5}{3}, \frac{10}{3}\right)$  (B)  $(2, 10, 4)$  (C)  $(-3, 3, 6)$  (D)  $(5, 7, -2)$ 

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**139.** A tetrahedron has vertices P(1, 2, 1), Q(2, 1, 3), R(-1, 1, 2) and O(0, 0, 0). The angle beween the faces OPQ and PQR is :

140. The radius of the circle in which the sphere  $x^2 + y^2 + z^2 + 2z - 2y - 4z - 19 = 0$  is cut by the plane x + 2y + 2z + 7 = 0 is a. 2 b. 3 c. 4 d. 1

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141. A sphere of constant radius 2k passes through the origin and meets the axes in A, B, andC. The locus of a centroid of the tetrahedron OABC is a.  $x^2 + y^2 + z^2 = 4k^2$  b.  $x^2 + y^2 + z^2 = k^2$  c.  $2(k^2 + y^2 + z)^2 = k^2$  d. none of these

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**142.** A plane passes through a fixed point (a, b, c). The locus of the foot of the perpendicular to it from the origin is a sphere of radius a.  $\frac{1}{2}\sqrt{a^2 + b^2 + c^2}$  b.  $\sqrt{a^2 + b^2 + c^2}$  c.  $a^2 + b^2 + c^2$  d.  $\frac{1}{2}(a^2 + b^2 + c^2)$ 

**143.** Equation of the plane containing the straight line  $\frac{x}{2} = \frac{y}{3} = \frac{z}{4}$  and perpendicular to the plane containing the straight lines  $\frac{x}{2} = \frac{y}{4} = \frac{z}{2}$  and  $\frac{x}{4} = \frac{y}{2} = \frac{z}{3}$  is

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144. The equation of the plane through the intersection of the planes x + 2y + 3z - 4 = 0 and 4x + 3y + 2z + 1 = 0 and passing through the origin is (a) 17x + 14y + 11z = 0 (b) 7x + 4y + z = 0 (c) x + 14 + 11z = 0 (d) 17x + y + z = 0

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145. The plane 4x + 7y + 4z + 81 = 0 is rotated through a right angle about its line of intersection with the plane 5x + 3y + 10z = 25. The equation of the plane in its new position is a. x - 4y + 6z = 106 b. x - 8y + 13z = 103 c. x - 4y + 6z = 110 d. x - 8y + 13z = 105 146. The vector equation of the plane passing through the origin and the

line of intersection of the planes  $\overrightarrow{r} \overrightarrow{a} = \lambda and \overrightarrow{r} \overrightarrow{b} = \mu$  is a.  $\overrightarrow{r} \lambda \overrightarrow{a} - \mu \overrightarrow{b} = 0$  b.  $\overrightarrow{r} \lambda \overrightarrow{b} - \mu \overrightarrow{a} = 0$  c.  $\overrightarrow{r} \lambda \overrightarrow{a} + \mu \overrightarrow{b} = 0$  d.  $\overrightarrow{r} \lambda \overrightarrow{b} + \mu \overrightarrow{a} = 0$ 

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**147.** The lines 
$$\overrightarrow{r} = \overrightarrow{a} + \lambda \left(\overrightarrow{b} \times \overrightarrow{c}\right) and \overrightarrow{r} = \overrightarrow{b} + \mu \left(\overrightarrow{c} \times \overrightarrow{a}\right)$$
 will intersect if a.  $\overrightarrow{a} \times \overrightarrow{c} = \overrightarrow{b} \times \overrightarrow{c}$  b.  $\overrightarrow{a} \overrightarrow{c} = \overrightarrow{b} \overrightarrow{c}$  c.  $b \times \overrightarrow{a} = \overrightarrow{c} \times \overrightarrow{a}$  d.

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**148.** The projection of the line  $\frac{x+1}{-1} = \frac{y}{2} = \frac{z-1}{3}$  on the plane x - 2y + z = 6 is the line of intersection of this plane with the plane a. 2x + y + 2 = 0 b. 3x + y - z = 2 c. 2x - 3y + 8z = 3 d. none of these **149.** The direction cosines of a line satisfy the relations  $\lambda(l+m) = nandmn + nl + lm = 0$ . The value of  $\lambda$ , for which the two lines are perpendicular to each other, is a. 1 b. 2 c. 1/2 d. none of these

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**150.** The intercepts made on the axes by the plane the which bisects the line joining the points (1, 2, 3) and (-3, 4, 5) at right angles are a.  $\left(-\frac{9}{2}, 9, 9\right)$  b.  $\left(\frac{9}{2}, 9, 9\right)$  c.  $\left(9, -\frac{9}{2}, 9\right)$  d.  $\left(9, \frac{9}{2}, 9, 9\right)$ 

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**151.** The pair of lines whose direction cosines are given by the equations 3l + m + 5n = 0 and 6mn - 2nl + 5lm = 0 are a. parallel b. perpendicular c. inclined at  $\cos^{-1}\left(\frac{1}{6}\right)$  d. none of these



**152.** If the distance of the point P(1, -2, 1) from the plane  $x + 2y - 2z = \alpha$ , where  $\alpha > 0$ , is 5, then the foot of the perpendicular from P to the place is a.  $\left(\frac{8}{3}, \frac{4}{3}, -\frac{7}{3}\right)$  b.  $\left(\frac{4}{3}, -\frac{4}{3}, \frac{1}{3}\right)$  c.  $\left(\frac{1}{3}, \frac{2}{3}, \frac{10}{3}\right)$  d.  $\left(\frac{2}{3}, -\frac{1}{3}, -\frac{5}{3}\right)$ 

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**153.** A line with positive direction cosines passes through the point P(2, -1, 2) and makes equal angles with the coordinate axes. The line meets the plane 2x + y + z = 9 at point Q. The length of the line segment PQ equals

154. The value of k such that  $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$  lies in the plane 2x - 4y + z = 7 is (A) 7 (B) -7 (C) no real value (D) 4

**155.** The equation of the plane passing through lines  $\frac{x-4}{1} = \frac{y-3}{1} = \frac{z-2}{2} and \frac{x-3}{2} = \frac{y-2}{-4} = \frac{z}{5}$  is a. 11x - y - 3z = 35b. 11x + y - 3z = 35c. 11x - y + 3z = 35d. none of these

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156. The line through 
$$\hat{i} + 3\hat{j} + 2\hat{k}$$
 and  $\perp$  to the line  
 $\overrightarrow{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda(2\hat{i} + \hat{j} + \hat{k})$  and  $\overrightarrow{r} = (2\hat{i} + 6\hat{j} + \hat{k}) + \mu(\hat{i} + 2\hat{j})$   
is a.  $\overrightarrow{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda(-\hat{i} + 5\hat{j} - 3\hat{k})$  b.  
 $\overrightarrow{r} = \hat{i} + 3\hat{j} + 2\hat{k} + \lambda(\hat{i} - 5\hat{j} + 3\hat{k})$  c.  
 $\overrightarrow{r} = \hat{i} + 3\hat{j} + 2\hat{k} + \lambda(\hat{i} + 5\hat{j} + 3\hat{k})$  d.  
 $\overrightarrow{r} = \hat{i} + 3\hat{j} + 2\hat{k} + \lambda(-\hat{i} - 5\hat{j} - 3\hat{k})$ 

157. The equation of the plane through the line of intersection of the planes ax + by + cz + d = 0 and a'x + b'y + c'z + d' = 0 parallel to the line y = 0 and z = 0 is



**158.** The three planes 4y + 6z = 5, 2x + 3y + 5z = 5 and 6x + 5y + 9z = 10 (a) meet in a point (b) have a line in common (c) form a triangular prism (d) none of these

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**159.** Given  $\overrightarrow{\alpha} = 3\hat{i} + \hat{j} + 2\hat{k}$  and  $\overrightarrow{\beta} = \hat{i} - 2\hat{j} - 4\hat{k}$  are the position vectors of the points A and B Then the distance of the point  $\hat{i} + \hat{j} + \hat{k}$  from the plane passing through B and perpendicular to AB is (a) 5 (b) 10 (c)15 (d) 20

160. The shortest distance between the lines  

$$\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1} and \frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$$
 is a.  $\sqrt{30}$  b.  
 $2\sqrt{30}$  c.  $5\sqrt{30}$  d.  $3\sqrt{30}$ 

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161.  $L_1 and L_2$  and two lines whose vector equations are  $L_1: \overrightarrow{r} = \lambda \left( \left( \cos \theta + \sqrt{3} \right) \hat{i} \left( \sqrt{2} \sin \theta \right) \hat{j} + \left( \cos \theta - \sqrt{3} \right) \hat{k} \right)$   $L_2: \overrightarrow{r} = \mu \left( a \hat{i} + b \hat{j} + c \hat{k} \right)$ , where  $\lambda and \mu$  are scalars and  $\alpha$  is the acute angel between  $L_1 and L_2$ . If the angel  $\alpha$  is independent of  $\theta$ , then the value of  $\alpha$  is a.  $\frac{\pi}{6}$  b.  $\frac{\pi}{4}$  c.  $\frac{\pi}{3}$  d.  $\frac{\pi}{2}$ 

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**162.** Value of  $\lambda$  such that the line  $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-1}{\lambda}$  is  $\perp$  to normal to the plane  $\overrightarrow{r} 2 \overrightarrow{i} + 3 \overrightarrow{j} + 4 \overrightarrow{k} = 0$  is a.  $-\frac{13}{4}$  b.  $-\frac{17}{4}$  c. 4 d. none of these

163. Equation of the pane passing through the points (2, 2, 1)and(9, 3, 6),  $and \perp$  to the plane 2x + 6y + 6z - 1 = 0 is a. 3x + 4y + 5z = 9 b. 3x + 4y - 5z = 9 c. 3x + 4y - 5z = 9 d. none of these

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164. The equation of the plane which passes through the point of intersection of lines  $\frac{x-1}{3} = \frac{y-2}{1} = \frac{z-3}{2}$ , and  $\frac{x-3}{1} = \frac{y-1}{2} = \frac{z-2}{3}$  and at greatest distance from point (0, 0, 0) is a. 4x + 3y + 5z = 25 b. 4x + 3y = 5z = 50 c. 3x + 4y + 5z = 49 d. x + 7y - 5z = 2

165. If the foot of the perpendicular from the origin to plane is P(a,b,c) ,

the equation of the plane is a.  $rac{x}{a}=rac{y}{b}=rac{z}{c}=3$  b. ax+by+cz=3 c.  $ax+by+cz=a^2+b^2+c^2$  d. ax+by+cz=a+b+c

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**166.** Equation of a line in the plane  $\pi = 2x - y + z - 4 = 0$  which is perpendicular to the line *l* whose equation is  $\frac{x-2}{1} = \frac{y-2}{-1} = \frac{z-3}{-2}$ 

and which passes through the point of intersection of l and  $\pi$  is (A)

$$\frac{x-2}{1} = \frac{y-1}{5} = \frac{z-1}{-1} \quad (B) \quad \frac{x-1}{3} = \frac{y-3}{5} = \frac{z-5}{-1} \quad (C)$$
$$\frac{x+2}{2} = \frac{y+1}{-1} = \frac{z+1}{1} \quad (D) \quad \frac{x-2}{2} = \frac{y-1}{-1} = \frac{z-1}{1}$$

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**167.** The intercept made by the plane  $\overrightarrow{r n} = q$  on the x-axis is a.  $\frac{q}{\hat{i} \cdot \vec{n}}$  b.

$$rac{\hat{i}\overrightarrow{n}}{q}$$
 c.  $rac{\hat{i}\overrightarrow{n}}{q}$  d.  $rac{q}{\left|\overrightarrow{n}
ight|}$ 

**168.** The coordinates o the foot of the perpendicular drawn from the origin to the line joining the point (-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

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169. The point on the line  $\frac{x-2}{1} = \frac{y+3}{-2} = \frac{z+5}{-2}$  at a distance of 6 from the point (2, -3, -5) is a. (3, -5, -3) b. (4, -7, -9) c. 0, 2, -1 d. none of these

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**170.** Let A(1, 1, 1), B(2, 3, 5) and C(-1, 0, 2) be three points, then equation of a plane parallel to the plane ABC which is at distance 2 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 = 0 171. Let  $A(\overrightarrow{a})andB(\overrightarrow{b})$  be points on two skew lines  $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{p}and\overrightarrow{r} = \overrightarrow{b} + u\overrightarrow{q}$  and the shortest distance between the skew lines is 1,  $where\overrightarrow{p}and\overrightarrow{q}$  are unit vectors forming adjacent sides of a parallelogram enclosing an area of 1/2 units. If angle between AB and the line of shortest distance is  $60^{\circ}$ , then AB = a.  $\frac{1}{2}$  b. 2 c. 1 d.  $\lambda R = \{10\}$ 

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**172.** Consider three planes  $P_1: x - y + z = 1$ ,  $P_2: x + y - z = -1$  and  $P_3: x - 3y + 3z = 2$  Let  $L_1$ ,  $L_2$  and  $L_3$  be the lines of intersection of the planes  $P_2$  and  $P_3$ ,  $P_3$  and  $P_1$  and  $P_1$  and  $P_2$  respectively. Statement 1: At least two of the lines  $L_1$ ,  $L_2$  and  $L_3$  are non-parallel. The three planes do not have a common point

Consider the planes 3x - 6y - 2z - 15 = 0 and 173. 2x + y - 2z - 5 = 0 Statement 1:The parametric equations of the line intersection of the given planes are x = 3 + 14t, y = 2t, z = 15t. Statement 2: The vector  $14\hat{i}+2\hat{j}+15\hat{k}$  is parallel to the line of intersection of the given planes.



174. The length of projection of the line segment joining the points  $(1,\,0,\,-1) and (\,-1,\,2,\,2)$  on the plane x+3y-5z=6 is equal to a. 2b.  $\sqrt{\frac{271}{53}}$  c.  $\sqrt{\frac{472}{31}}$  d.  $\sqrt{\frac{474}{35}}$ Watch Video Solution  $\mathsf{lf} \qquad P_1 \colon \overrightarrow{r} . \ \overrightarrow{n}_1 - d_1 = 0 \qquad P_2 \colon \overrightarrow{r} . \ \overrightarrow{n}_2 - d_2 = 0$ 

 $P_3 \colon \overrightarrow{r} . \ \overrightarrow{n}_3 - d_3 = 0$  are three non-coplanar vectors, then three lines  $P_1 = 0, P_2 = 0; P_2 = 0, P_3 = 0; P_3 = 0 P_1 = 0$  are

and

175.

176. Perpendiculars are drawn from points on the line  $\frac{x+2}{2} = \frac{y+1}{-1} = \frac{z}{3}$ to the plane x + y + z = 3 The feet of perpendiculars lie on the line (a)  $\frac{x}{5} = \frac{y-1}{8} = \frac{z-2}{-13}$  (b)  $\frac{x}{2} = \frac{y-1}{3} = \frac{z-2}{-5}$  (c)  $\frac{x}{4} = \frac{y-1}{3} = \frac{z-2}{-7}$  (d)  $\frac{x}{2} = \frac{y-1}{-7} = \frac{z-2}{5}$ 

**177.** The point P is the intersection of the straight line joining the points Q(2, 3, 5) and R(1, -1, 4) with the plane 5x - 4y - z = 1. If S is the foot of the perpendicular drawn from the point T(2, 1, 4) to QR, then the length of the line segment PS is (A)  $\frac{1}{\sqrt{2}}$  (B)  $\sqrt{2}$  (C) 2 (D)  $2\sqrt{2}$ 

**178.** A line l passing through the origin is perpendicular to the lines  $l_1: (3+t)\hat{i} + (-1+2t)\hat{j} + (4+2t)\hat{k}, \infty < t < \infty, l_2: (3+s)\hat{i} + (3+2t)\hat{k}$  then the coordinates of the point on  $l_2$  at a distance of  $\sqrt{17}$  from the point of intersection of  $l\& l_1$  is/are:

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179. Two lines 
$$L_1\colon x=5, rac{y}{3-lpha}=rac{z}{-2}$$
 and  $L_2\colon x=lpha, rac{y}{-1}=rac{z}{2-lpha}$ 

are coplanar. Then lpha can take value (s) a. 1 b. 2 c. 3 d. 4

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**180.** The projection of point  $P(\overrightarrow{p})$  on the plane  $\overrightarrow{r} \cdot \overrightarrow{n} = q$  is  $(\overrightarrow{s})$ , then a.  $\overrightarrow{s} = \frac{\left(q - \overrightarrow{p} \cdot \overrightarrow{n}\right) \overrightarrow{n}}{\left|\overrightarrow{n}\right|^2}$  b.  $\overrightarrow{s} = p + \frac{\left(q - \overrightarrow{p} \cdot \overrightarrow{n}\right) \overrightarrow{n}}{\left|\overrightarrow{n}\right|^2}$  c.  $\overrightarrow{s} = p - \frac{\left(\overrightarrow{p} \cdot \overrightarrow{n}\right) \overrightarrow{n}}{\left|\overrightarrow{n}\right|^2}$  d.  $\overrightarrow{s} = p - \frac{\left(q - \overrightarrow{p} \cdot \overrightarrow{n}\right) \overrightarrow{n}}{\left|\overrightarrow{n}\right|^2}$ 



**181.** The angle between i line of the intersection of the plane  $\overrightarrow{r}\hat{i} + 2\hat{j} + 3\hat{k} = 0$  and  $\overrightarrow{r}3\hat{i} + 3\hat{j} + \hat{k} = 0$  is a.  $\cos^{-1}\left(\frac{1}{3}\right)$  b.  $c0s^{-1}\left(\frac{1}{\sqrt{3}}\right)$  c.  $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$  d. none of these

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**182.** From the point P(a, b, c), let perpendicualars PLandPM be drawn to YOZandZOX planes, respectively. Then the equation of the plane OLM is a.  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 0$  b.  $\frac{x}{a} + \frac{y}{b} - \frac{z}{c} = 0$  c.  $\frac{x}{a} - \frac{y}{b} - \frac{z}{c} = 0$  d.  $\frac{x}{a} - \frac{y}{b} + \frac{z}{c} = 0$ 

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**183.** The plane  $\overrightarrow{r} \overrightarrow{n} = q$  will contain the line  $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$ , if a.  $b. n \neq 0, a. n \neq q$  b.  $b. n = , a. n \neq q$  c. b. n = 0, a. n = q d.  $b.\ n 
eq 0, a.\ n = q$ 



**184.** Consider triangle AOB in the x - y plane, where  $A \equiv (1, 0, 0), B \equiv (0, 2, 0) and O \equiv (0, 0, 0)$ . The new position of O, when triangle is rotated about side AB by  $90^0$  can be a.  $\left(\frac{4}{5}, \frac{3}{5}, \frac{2}{\sqrt{5}}\right)$ b.  $\left(\frac{-3}{5}, \frac{\sqrt{2}}{5}, \frac{2}{\sqrt{5}}\right)$  c.  $\left(\frac{4}{5}, \frac{2}{5}, \frac{2}{\sqrt{5}}\right)$  d.  $\left(\frac{4}{5}, \frac{2}{5}, \frac{1}{\sqrt{5}}\right)$ Watch Video Solution

**185.** Let  $\overrightarrow{a} = \hat{i} + \hat{j}and \overrightarrow{b} = 2\hat{i} - \hat{k}$ , then the point of intersection of the lines  $\overrightarrow{r} \times \overrightarrow{a} = \overrightarrow{b} \times \overrightarrow{a}$  and  $\overrightarrow{r} \times \overrightarrow{b} = \overrightarrow{a} \times \overrightarrow{b}$  is a. (3, -1, 1) b. (3, 1, -1) c. (-3, 1, 1) d. (-3, -1, -1)

**186.** The line  $\frac{x+6}{5} = \frac{y+10}{3} = \frac{z+14}{8}$  is the hypotenuse of an isosceles right-angled triangle whose opposite vertex is (7, 2, 4). Then which of the following in not the side of the triangle? a.  $\frac{x-7}{2} = \frac{y-2}{-3} = \frac{z-4}{6}$  b.  $\frac{x-7}{3} = \frac{y-2}{6} = \frac{z-4}{2}$  c.  $\frac{x-7}{3} = \frac{y-2}{5} = \frac{z-4}{-1}$  d. none of these **Watch Video Solution 187.** The equation of the plane which passes through the line of

intersection of planes  $\overrightarrow{r} \stackrel{\cdot}{\overrightarrow{n}}_1 = , q_1, \overrightarrow{r} \stackrel{\cdot}{\overrightarrow{n}}_2 = q_2$  and the is parallel to the line of intersection of planers  $\overrightarrow{r} \stackrel{\cdot}{\overrightarrow{n}}_3 = q_3 and \overrightarrow{r} \stackrel{\cdot}{\overrightarrow{n}}_4 - q_4$  is

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**188.** The coordinates of the point P on the line  $\overrightarrow{r} = (\hat{i} + \hat{j} + \hat{k}) + \lambda (-\hat{i} + \hat{j} - \hat{k})$  which is nearest to the origin is a.  $(\frac{2}{4}, \frac{4}{3}, \frac{2}{3})$  b.  $(-\frac{2}{3}, -\frac{4}{3}, \frac{2}{3})$  c.  $(\frac{2}{3}, -\frac{4}{3}, \frac{2}{3})$  d. none of these **189.** The ratio in which the line segment joining the points whose position vectors are  $2\hat{i} - 4\hat{j} - 7\hat{k}and - 3\hat{i} + 5\hat{j} - 8\hat{k}$  is divided by the plane whose equation is  $\hat{r}\hat{i} - 2\hat{j} + 3\hat{k} = 13$  is a. 13:12 internally b. 12:25 externally c. 13:25 internally d. 37:25 internally

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**190.** The number of planes that are equidistant from four non-coplanar points is a. 3 b. 4 c. 7 d. 9

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**191.** In a three-dimensional coordinate system, P, Q, and Rare images of a point A(a, b, c) in the x - y, y - z and z - x planes, respectively. If Gis the centroid of triangle PQR, then area of triangle AOG is (O is the origin) (A) 0 (B)  $a^2 + b^2 + c^2$  (C)  $\frac{2}{3}(a^2 + b^2 + c^2)$  (D) none of these **192.** A plane passing through (1, 1, 1) cuts positive direction of coordinates axes at A, BandC, then the volume of tetrahedron OABC satisfies a.  $V \leq \frac{9}{2}$  b.  $V \geq \frac{9}{2}$  c.  $V = \frac{9}{2}$  d. none of these

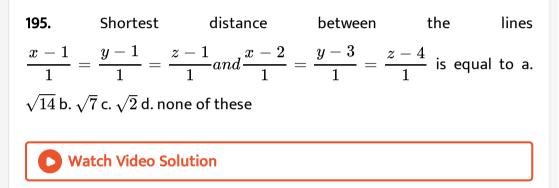
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**193.** If lines  $x = y = zandx = \frac{y}{2} = \frac{z}{3}$  and third line passing through (1, 1, 1) form a triangle of area  $\sqrt{6}$  units, then the point of intersection of third line with the second line will be a. (1, 2, 3) b. 2, 4, 6 c.  $\frac{4}{3}, \frac{6}{3}, \frac{12}{3}$  d. none of these

**194.** The point of intersection of the line passing through (0,0,1) and intersecting the lines  $x+2y+z=1,\ -x+y-2z=2$  and

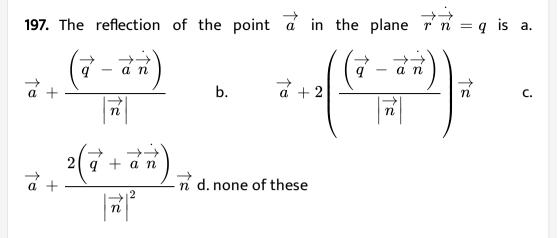
x + y = 2, x + z = 2 with xy plane is a.  $\left(\frac{5}{3}, -\frac{1}{3}, 0\right)$  b. (1, 1, 0) c.  $\left(\frac{2}{3}, \frac{1}{3}, 0\right)$  d.  $\left(-\frac{5}{3}, \frac{1}{3}, 0\right)$ 

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**196.** Distance of point 
$$P(\overrightarrow{p})$$
 from the plane  $\overrightarrow{r} \stackrel{\cdot}{\overrightarrow{n}} = 0$  is a.  $\left|\overrightarrow{p} \stackrel{\cdot}{\overrightarrow{n}}\right|$  b.

$$\frac{\left|\overrightarrow{p}\times\overrightarrow{n}\right|}{\left|\overrightarrow{n}\right|} \text{ c. } \frac{\left|\overrightarrow{p}\overrightarrow{n}\right|}{\left|\overrightarrow{n}\right|} \text{ d. none of these}$$





**198.** Line 
$$\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$$
 will not meet the plane  $\overrightarrow{r} \overrightarrow{n} = q$ , if a.  
 $\overrightarrow{b} \overrightarrow{n} = 0, \ \overrightarrow{a} \overrightarrow{n} = q$  b.  $\overrightarrow{b} \overrightarrow{n} \neq 0, \ \overrightarrow{a} \overrightarrow{n} \neq q$  c.  $\overrightarrow{b} \overrightarrow{n} = 0, \ \overrightarrow{a} \overrightarrow{n} \neq q$  d.  
 $\overrightarrow{b} \overrightarrow{n} \neq 0, \ \overrightarrow{a} \overrightarrow{n} = q$ 

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**199.** If a line makes an angle of  $\frac{\pi}{4}$  with the positive direction of each of xaxis and y-axis, then the angel that the line makes with the positive direction of the z-axis is a.  $\frac{\pi}{3}$  b.  $\frac{\pi}{4}$  c.  $\frac{\pi}{2}$  d.  $\frac{\pi}{6}$  **200.** A parallelepiped S has base points A, B, CandD and upper face points A', B', C', andD'. The parallelepiped is compressed by upper face A'B'C'D' to form a new parallepiped T having upper face points A,B, CandD. The volume of parallelepiped T is 90 percent of the volume of parallelepiped S. Prove that the locus of A is a plane.

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**201.** Find the equation of the plane containing the lines 2x-y+z-3=0,3x+y+z=5 and a t a distance of  $\frac{1}{\sqrt{6}}$  from the point (2,1,-1).



**202.** A plane which prependicular to two planes 2x - 2y + z = 0 and x - y + 2z = 4 passes through the point (1, -2, 1) is:

**203.** Let P(3, 2, 6) be a point in space and Q be a point on line  $\overrightarrow{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(-3\hat{i} + \hat{j} + 5\hat{k})$ . Then the value of  $\mu$  for which the vector  $\overrightarrow{P}Q$  is parallel to the plane x - 4y + 3z = 1 is a. 1/4 b. -1/4 c. 1/8 d. -1/8

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**204.** If the lines 
$$\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$$
 and  $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$  intersect, then k is equal to (1)  $-1$  (2)  $\frac{2}{9}$  (3)  $\frac{9}{2}$  (4) 0

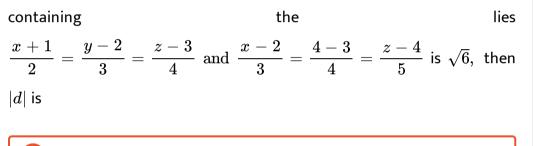
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**205.** Statement 1: A plane passes through the point A(2, 1, -3). If distance of this plane from origin is maximum, then its equation is 2x + y - 3z = 14. Statement 2: If the plane passing through the point

 $A\left(\overrightarrow{a}
ight)$  is at maximum distance from origin, then normal to the plane is vector  $\overrightarrow{a}$ .



**206.** If the distance between the plane Ax - 2y + z = d. and the plane



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207. Prove that the volume of tetrahedron bounded by the planes  $ec{r}\hat{r}\hat{m}\hat{j}+n\hat{k}=0, ec{r}\hat{n}\hat{k}+l\hat{i}=0, ec{r}l\hat{i}+m\hat{j}=0, ec{r}l\hat{i}+m\hat{j}+n\hat{k}=\pi srac{2p}{3lm}$ 

**208.** If a variable plane forms a tetrahedron of constant volume  $64k^3$  with the co-ordinate planes, then the locus of the centroid of the tetrahedron is:

**209.** Prove that for all values of 
$$\lambda and\mu$$
, the planes
$$\frac{2x}{a} + \frac{y}{b} + \frac{2z}{c} - 1 + \lambda \left(\frac{x}{a} - \frac{2y}{b} - \frac{z}{c} - 2\right) = 0$$
and
$$\frac{4x}{a} + \frac{3y}{b} - 5 + \mu \left(\frac{5y}{b} - \frac{4z}{c} + 3\right) = 0$$
intersect on the same line.

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210. If P is any point on the plane lx+my+nz=pandQ is a point on the line OP such that  $OP\dot{O}Q=p^2$  , then find the locus of the point Q.

**211.** A variable plane lx + my + nz = p(wherel, m, n are direction cosines of normal) intersects the coordinate axes at points <math>A, BandC, respectively. Show that the foot of the normal on the plane from the origin is the orthocenter of triangle ABC and hence find the coordinate of the circumcentre of triangle ABC.

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**212.** P is a point and PMandPN are the perpendicular form  $P \rightarrow z - xandx - y$  planes. If OP makes angles  $\theta, \alpha, \beta and\gamma$  with the plane OMN and the x - y, y - zandz - x planes, respectively, then prove that  $\cos ec^2\theta = \cos ec^2\alpha + \cos ec^2\beta + \cos ec^2\gamma$ .

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**213.** Let a plane ax + by + cz + 1 = 0, wherea, b, c are parameters, make an angle  $60^0$  with the line x = y = z,  $45^0$  with the line x = y - z = 0 and $\theta$  with the plane x = 0. The distance of the plane from point (2, 1, 1) is 3 units. Find the value of  $\theta$  and the equation of the plane.



#### 214.

Let

 $x-y\sinlpha-zs\ineta=0, xs\inlpha=zs\in\gamma-y=0$ and $x\sineta+y\sin\gamma+z$ 

be the equations of the planes such that  $\alpha + \beta + \gamma = \pi/2(where\alpha, \beta and \gamma \neq 0)$ . Then show that there is a common line of intersection of the three given planes.

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**215.** The position vectors of the four angular points of a tetrahedron OABC are (0, 0, 0); (0, 0, 2), (0, 4, 0) and (6, 0, 0) respectively. A point P inside the tetrahedron is at the same distance r from the four plane faces of the tetrahedron. Find the value of r

**216.** Find the distance of the point  $(-2, 3, \setminus -4)$  from the line  $\frac{x+2}{3} = \frac{2y+3}{4} = \frac{3z+4}{5}$  measured parallel to the plane 4x + 12y - 3z + 1 = 0.

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217. The plane 4x + 7y + 4z + 81 = 0 is rotated through a right angle about its line of intersection with the plane 5x + 3y + 10z = 25. The equation of the plane in its new position is a. x - 4y + 6z = 106 b. x - 8y + 13z = 103 c. x - 4y + 6z = 110 d. x - 8y + 13z = 105

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**218.** If (a, b, c) is a point on the plane 3x + 2y + z = 7, then find the least value of vector method.  $a^2 + b^2 + c^2$ , using vector method.

**219.** Let the equation of the plane containing the line x - y - z - 4 = 0 = x + y + 2z - 4 and is parallel to the line of intersection of the planes 2x + 3y + z = 1 and x + 3y + 2z = 2 be x + Ay + Bz + C = 0 Compute the value of |A + B + C|.

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**220.** Let  $a_1, a_2, a_3, \dots$  be in A. P. and  $h_1, h_2, h_3, \dots$  in H. P. If

 $a_1 = 2 = h_1$ , and  $a_{30} = 25 = h_{30}$  then  $a_7h_{24} + a_{14} + a_{17} =$ 

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**221.** If the angle between the plane x - 3y + 2z = 1 and the line  $\frac{x-1}{2} = \frac{y-1}{1} = \frac{z-1}{-3}is\theta$ , then the find the value of  $\cos ec\theta$ .

**222.** The length of projection of the line segment joining the points (1, 0, -1)and(-1, 2, 2) on the plane x + 3y - 5z = 6 is equal to a. 2 b.  $\sqrt{\frac{271}{53}}$  c.  $\sqrt{\frac{472}{31}}$  d.  $\sqrt{\frac{474}{35}}$ 

**223.** Find the equation of a plane passing through (1, 1, 1) and parallel to the lines  $L_1$  and  $L_2$  direction ratios (1, 0,-1) and (1,-1, 0) respectively. Find the volume of the tetrahedron formed by origin and the points where this plane intersects the coordinate axes.



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**224.** Find the equation of the plane passing through the points (2, 1, 0), (5, 0, 1) and (4, 1, 1) If P is the point (2, 1, 6) then find point Q such that PQ is perpendicular to the above plane and the mid point of PQ lies on it.



**225.** For the line  $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ , which one of the following is incorrect? a. it lies in the plane x - 2y + z = 0 b. it is same as line  $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$  c. it passes through (2, 3, 5) d. it is parallel t the plane x - 2y + z - 6 = 0

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226. The value of m for which straight lein 3x - 2y + z + 3 = 0 = 4x - 3y + 4z + 1 is parallel to the plane 2x - y + mz - 2 = 0 is a. -2 b. 8 c. -18 d. 11

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227. Let the equations of a line and plane be $rac{x+3}{2}=rac{y-4}{3}=rac{z+5}{2}$  and 4x-2y-z=1, respectively, then a. the

line is parallel to the plane b. the line is perpendicular to the plane c. the

line lies in the plane d. none of these



228. The length of the perpendicular form the origin to the plane passing through the point a and containing the line  $\overrightarrow{r} = \overrightarrow{b} + \lambda \overrightarrow{c}$  is a.  $\frac{\left[\overrightarrow{a} \overrightarrow{b} \overrightarrow{c}\right]}{\left|\overrightarrow{a} \times \overrightarrow{b} + \overrightarrow{b} \times \overrightarrow{c} + \overrightarrow{c} \times \overrightarrow{a}\right|}$  b.  $\frac{\left[\overrightarrow{a} \overrightarrow{b} \overrightarrow{c}\right]}{\left|\overrightarrow{a} \times \overrightarrow{b} + \overrightarrow{b} \times \overrightarrow{c}\right|}$  c.  $\frac{\left[\overrightarrow{a} \overrightarrow{b} \overrightarrow{c}\right]}{\left|\overrightarrow{b} \times \overrightarrow{c} + \overrightarrow{c} \times \overrightarrow{a}\right|}$  d.  $\frac{\left[\overrightarrow{a} \overrightarrow{b} \overrightarrow{c}\right]}{\left|\overrightarrow{c} \times \overrightarrow{a} + \overrightarrow{a} \times \overrightarrow{b}\right|}$ 

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**229.** In a three-dimensional xyz space , the equation  $x^2 - 5x + 6 = 0$  represents a. Points b. planes c. curves d. pair of straight lines



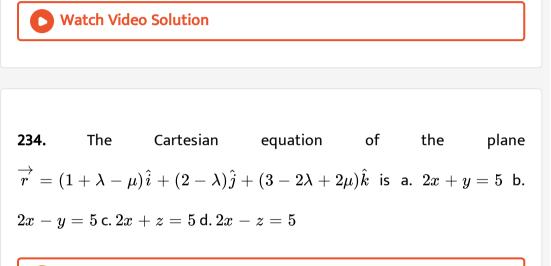
**230.** The line  $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{-1}$  intersects the curve  $xy = c^2, z = 0$  if c is equal to a.  $\pm 1$  b.  $\pm 1/3$  c.  $\pm \sqrt{5}$  d. none of these

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**231.** A unit vector parallel to the intersection of the planes  $\vec{r} \cdot \hat{i} - \hat{j} + \hat{k} = 5and \vec{r} \cdot 2\hat{i} + \hat{j} - 3\hat{k} = 4$  a.  $\frac{2\hat{i} + 5\hat{j} - 3\hat{k}}{\sqrt{38}}$  b.  $\frac{-2\hat{i} + 5\hat{j} - 3\hat{k}}{\sqrt{38}}$  c.  $\frac{2\hat{i} + 5\hat{j} - 3\hat{k}}{\sqrt{38}}$  d.  $\frac{-2\hat{i} - 5\hat{j} - 3\hat{k}}{\sqrt{38}}$ 

**232.** Let  $L_1$  be the line  $\overrightarrow{r}_1 = 2\hat{i} + \hat{j} - \hat{k} + \lambda(i+2\hat{k})$  and let  $L_2$  be the line  $\overrightarrow{r}_2 = 3\hat{i} + \hat{j} + \mu(i+\hat{j}-\hat{k})$ . Let  $\pi$  be the plane which contains the line  $L_1$  and is parallel to  $L_2$ . The distance of the plane  $\pi$  from the origin is a.  $\sqrt{6}$  b. 1/7 c.  $\sqrt{2/7}$  d. none of these

233. The distance of point A(-2, 3, 1) from the line PQ through P(-3, 5, 2), which makes equal angles with the axes is a.  $2/\sqrt{3}$  b.  $14/\sqrt{3}$  c.  $16/\sqrt{3}$  d.  $5/\sqrt{3}$ 



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**235.** Statement 1: there exists a unique sphere which passes through the three non-collinear points and which has the least radius. Statement 2: The centre of such a sphere lies on the plane determined by the given three points.

**236.** Statement 1: There exist two points on the  $\frac{x-1}{1} = \frac{y}{-1} = \frac{z+2}{2}$ which are at a distance of 2 units from point (1, 2, -4). Statement 2: Perpendicular distance of point (1, 2, -4) form the line  $\frac{x-1}{1} = \frac{y}{-1} = \frac{z+2}{2}$  is 1 unit.

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237. Statement 1: The shortest distance between the lines
$$\frac{x}{-3} = \frac{y-1}{1} = \frac{z+1}{-1} and \frac{x-2}{1} = \frac{y-3}{2} = \left(\frac{z+(13/7)}{-1}\right)$$
is zero.

Statement 2: The given lines are perpendicular.

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**238.** Find the number of sphere of radius r touching the coordinate axes.



**239.** Find the distance of the z-axis from the image of the point M(2-3,3) in the plane x-2y-z+1=0.



**240.** A line with direction cosines proportional to 1, -5, and - 2 meets lines x = y + 5 = z + 1andx + 5 = 3y = 2z. The coordinates of each of the points of the intersection are given by a. (2, -3, 1) b. (1, 2, 3) c. (0, 5/3, 5/2) d. (3, -2, 2)

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241. If the planes $\overrightarrow{r}\hat{i}+\dot{\hat{j}}+\hat{k}=q_1, \overrightarrow{r}\hat{i}+2a\hat{j}+\hat{k}=q_2and\overrightarrow{r}a\hat{i}+a^2\hat{j}+\hat{k}=q_3$ 

intersect in a line, then the value of a is a. 1 b. 1/2 c. 2 d. 0

**242.** The equation of a line passing through the point  $\overrightarrow{a}$  parallel to the plane  $\overrightarrow{r} \overrightarrow{n} = q$  and perpendicular to the line  $\overrightarrow{r} = \overrightarrow{b} + t\overrightarrow{c}$  is a.  $\overrightarrow{r} = \overrightarrow{a} + \lambda \left(\overrightarrow{n} \times \overrightarrow{c}\right)$  b.  $\left(\overrightarrow{r} - \overrightarrow{a}\right) \times \left(\overrightarrow{n} \times \overrightarrow{c}\right)$  c.  $\overrightarrow{r} = \overrightarrow{b} + \lambda \left(\overrightarrow{n} \times \overrightarrow{c}\right)$  d. none of these

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**243.** A straight line L on the xy-plane bisects the angle between OXandOY. What are the direction cosines of L? a.  $\langle (1/\sqrt{2}), (1/\sqrt{2}), 0 \rangle$  b.  $\langle (1/2), (\sqrt{3}/2), 0 \rangle$  c.  $\langle 0, 0, 1 \rangle$  d.  $\langle 2/3 \\ 2/3 \\ 1/3 \rangle$ 

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**244.** Statement 1: Vector  $\overrightarrow{c} = 5\hat{i} + 7\hat{j} + 2\hat{k}$  is along the bisector of angel between  $\overrightarrow{a} = \hat{i} + 2\hat{j} + 2\hat{k}$  and  $\overrightarrow{b} = -8\hat{i} + \hat{j} - 4\hat{k}$ . Statement 2:  $\overrightarrow{c}$  is equally inclined to  $\overrightarrow{a}$  and  $\overrightarrow{b}$ .

**245.** The equation of the line x + y + z - 1 = 0, 4x + y - 2z + 2 = 0 written in the symmetrical form is

**246.** The equation of two straight lines are  $\frac{x-1}{2} = \frac{y+3}{1} = \frac{z-2}{-3} and \frac{x-2}{1} = \frac{y-1}{-3} = \frac{z+3}{2}$ . Statement 1: the given lines are coplanar. Statement 2: The equations  $2x_1 - y_1 = 1, x_1 + 3y_1 = 4and 3x - 1 + 2y_1 = 5 \text{ are consistent.}$ 

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247. Statement 1: Lines  

$$\overrightarrow{r} = \hat{i} + \hat{j} - \hat{k} + \lambda (3\hat{i} - \hat{j}) and \overrightarrow{r} = 4\hat{i} - \hat{k} + \mu (2\hat{i} + + 3\hat{k})$$
  
intersect. Statement 2:  $\overrightarrow{b} \times \overrightarrow{d} = 0$  , then lines  
 $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b} and \overrightarrow{r} = \overrightarrow{c} + \lambda \overrightarrow{d}$  do not intersect.

**248.** Statement 1: Line  $\frac{x-1}{1} = \frac{y-0}{2} = \frac{z^2}{-1}$  lies in the plane 2x - 3y - 4z - 10 = 0. Statement 2: if line  $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$  lies in the plane  $\overrightarrow{r} \cdot \overrightarrow{c} = n(wheren \text{ is scalar}), then \overrightarrow{b} \cdot \overrightarrow{c} = 0.$ 

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249. What is the equation of the plane which passes through the z-axis

and is perpendicular to the line  $\frac{x-a}{\cos\theta} = \frac{y+2}{\sin\theta} = \frac{z-3}{0}$ ? (A)  $x + y \tan \theta = 0$  (B)  $y + x \tan \theta = 0$  (C)  $x \cos \theta - y \sin \theta = 0$  (D)  $x \sin \theta - y \cos \theta = 0$ 

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**250.** Statement 1: let  $A\left(\overrightarrow{i} + \overrightarrow{j} + \overrightarrow{k}\right) and B\left(\overrightarrow{i} - \overrightarrow{j} + \overrightarrow{k}\right)$  be two points. Then point  $P\left(2\overrightarrow{i} + 3\overrightarrow{j} + \overrightarrow{k}\right)$  lies exterior to the sphere with AB as its diameter. Statement 2: If AandB are any two points and P is a

point in space such that  $\overrightarrow{P}A\overrightarrow{P}B>0$  , then point P lies exterior to the

sphere with AB as its diameter.

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**251.** Statement 1: Let  $\theta$  be the angle between the line  $\frac{x-2}{2} = \frac{y-1}{-3} = \frac{z+2}{-2}$  and the plane x + y - z = 5. Then  $\theta = \sin^{-1}(1/\sqrt{51})$ . Statement 2: The angle between a straight line and a plane is the complement of the angle between the line and the normal to the plane.

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**252.** If the volume of tetrahedron ABCD is 1 cubic units, where A(0, 1, 2), B(-1, 2, 1) and C(1, 2, 1), then the locus of point D is a. x + y - z = 3 b. y + z = 6 c. y + z = 0 d. y + z = -3

**253.** The equation of the plane which is equally inclined to the lines  $\frac{x-1}{2} = \frac{y}{-2} = \frac{z+2}{-1}$  and  $= \frac{x+3}{8} = \frac{y-4}{1} = \frac{z}{-4}$  and passing through the origin is/are a. 14x - 5y - 7z = 0 b. 2x + 7y - z = 0 c. 3x - 4y - z = 0 d. x + 2y - 5z = 0

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**254.** Which of the following lines lie on the plane x + 2y - z + 4 = 0? a.

$$rac{x-1}{1}=rac{y}{-1}=rac{z-5}{1}$$
 b.  $x-y+z=2x+y-z=0$  c.  $\hat{r}=2\hat{i}-\hat{j}+4\hat{k}+\lambda\Big(3\hat{i}+\hat{j}+5\hat{k}\Big)$  d. none of these

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**255.** The equations of the plane which passes through (0, 0, 0) and which

is equally inclined to the planes x - y + z - 3 = 0 and x + y = z + 4 = 0 is/are a. y = 0 b. x = 0 c. x + y = 0 d. x + z = 0

256. The x-y plane is rotated about its line of intersection with the y-z plane by  $45^0$  , then the equation of the new plane is/are a. z+x=0 b.

z-y=0 c. x+y+z=0 d. z-x=0

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**257.** Consider the planes 3x - 6y + 2z + 5 = 0 and 4x - 12 + 3z = 3. The plane 67x - 162y + 47z + 44 = 0 bisects the angel between the given planes which a contains origin b. is acute c. is obtuse d. none of these

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**258.** A variable plane  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$  at a unit distance from origin cuts the coordinate axes at A, B and C. Centroid (x, y, z) satisfies the equation  $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = K$ . The value of K is (A) 9 (B) 3 (C)  $\frac{1}{9}$  (D)  $\frac{1}{3}$ 

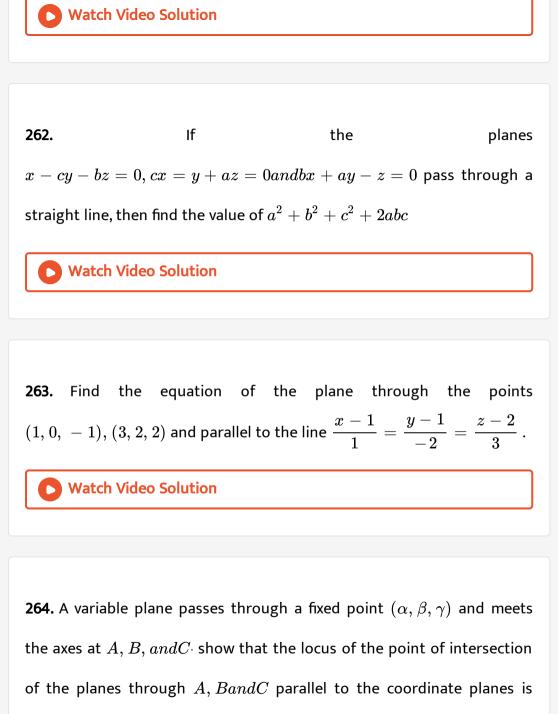
**259.** Let P = 0 be the equation of a plane passing through the line of intersection of the planes 2x - y = 0 and 3z - y = 0 and perpendicular to the plane 4x + 5y - 3z = 8. Then the points which lie on the plane P = 0 is/are a. (0, 9, 17) b. (1/7, 21/9) c. (1, 3, -4) d. (1/2, 1, 1/3)

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**260.** The equation of the line x + y + z - 1 = 0, 4x + y - 2z + 2 = 0written in the symmetrical form is

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**261.** A point P moves on a plane  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ . A plane through P and perpendicular to OP meets the coordinate axes at A, BandC. If the planes through A, BandC parallel to the planes x = 0, y = 0andz = 0, respectively, intersect at Q, find the locus of Q.



$$lpha x^{-1} + eta y^{-1} + \gamma z^{-1} = 1$$

265. Show that the straight lines whose direction cosines are given by the

equations al+bm+cn=0 and  $ul^2+zm^2=vn^2+wn^2=0$  are parallel or perpendicular as  $rac{a^2}{u}+rac{b^2}{v}+rac{c^2}{w}=0$  or  $a^2(v+w)+b^2(w+u)+c^2(u+v)=0$ 

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**266.** The perpendicular distance of a corner of uni cube from a diagonal not passing through it is

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**267.** If the direction cosines of a variable line in two adjacent points be  $l, M, n \text{ and } l + \delta l, m + \delta m + n + \delta n$  the small angle  $\delta \theta$ as between the two positions is given by

**268.** The image of the point (-1, 3, 4) in the plane x - 2y = 0 is a.

$$\begin{pmatrix} -\frac{17}{3}, -\frac{19}{3}, 4 \end{pmatrix}$$
 b.  $(15, 11, 4)$  c.  $\begin{pmatrix} -\frac{17}{3}, -\frac{19}{3}, 1 \end{pmatrix}$  d.  $\begin{pmatrix} \frac{9}{5}, \frac{-13}{5}, 4 \end{pmatrix}$ 

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**269.** The ratio in which the plane  $\overrightarrow{r} \cdot \overrightarrow{i} - 2\overrightarrow{j} + 3\overrightarrow{k} = 17$  divides the line joining the points  $-2\overrightarrow{i} + 4\overrightarrow{j} + 7\overrightarrow{k}$  and  $3\overrightarrow{i} - 5\overrightarrow{j} + 8\overrightarrow{k}$  is a. 1:5 b. 1:10 c. 3:5 d. 3:10

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**270.** Let L be the line of intersection of the planes 2x + 3y + z = 1 and x + 3y + 2z = 2. If L makes an angle  $\alpha$  with the positive x-axis, then  $\cos \alpha$  equals a.  $\frac{1}{2}$  b. 1 c.  $\frac{1}{\sqrt{2}}$  d.  $\frac{1}{\sqrt{3}}$ 

**271.** The distance between the line  $\overrightarrow{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and the plane  $\overrightarrow{r}\hat{i} + 5\hat{j} + \hat{k} = 5$  is a.  $\frac{10}{3\sqrt{3}}$  b.  $\frac{10}{9}$  c.  $\frac{10}{3}$  d.  $\frac{3}{10}$ 

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272. If angle  $\theta$  bertween the line  $\frac{x+1}{1} = \frac{y-1}{2} = \frac{z-2}{2}$  and the plane  $2x - y + \sqrt{\lambda}z + 4 = 0$  is such that  $s \int h\eta = 1/3$ , the value of  $\lambda$  is a.  $-\frac{3}{5}$  b.  $\frac{5}{3}$  c.  $-\frac{4}{3}$  d.  $\frac{3}{4}$ 

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**273.** The length of the perpendicular drawn from (1, 2, 3) to the line  $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$  is a. 4 b. 5 c. 6 d. 7

# **274.** A plane makes intercepts OA, OBandOC whose measurements are a, b and c on the OX, OYandOZ axes. The area of triangle ABC is a. $\frac{1}{2}(ab + bc + ca)$ b. $\frac{1}{2}abc(a + b + c)$ c. $\frac{1}{2}(a^2b^2 + b^2c^2 + c^2a^2)^{1/2}$ d. $\frac{1}{2}(a + b + c)^2$

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275. The intersection of the spheres 
$$x^2 + y^2 + z^2 + 7x - 2y - z = 13andx^2 + y^2 + z^2 - 3x + 3y + 4z = 8$$
 is the same as the intersection of one of the spheres and the plane a.  $x - y - z = 1$  b.  $x - 2y - z = 1$  c.  $x - y - 2z = 1$  d.  $2x - y - z = 1$ 

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**276.** The shortest distance from the plane 12x + 4y + 3z = 327 to the sphere  $x^2 + y^2 + z^2 + 4x - 2y - 6z = 155$  is a. 39 b. 26 c.  $41 - \frac{4}{13}$  d. 13

**277.** A line makes an angel  $\theta$  with each of the x-and z-axes. If the angel  $\beta$ ,

which it makes with the y-axis, is such that  $\sin^2eta=3\sin^2 heta$ ,then  $\cos^2 heta$ 

equals a. 
$$rac{2}{3}$$
 b.  $rac{1}{5}$  c.  $rac{3}{5}$  d.  $rac{2}{5}$ 

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**278.** Find the equation of a straight line in the plane  $\overrightarrow{r} \cdot \overrightarrow{n} = d$  which is parallel to  $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$  and passes through the foot of the perpendicular drawn from point

$$P\left(\overrightarrow{a}
ight) 
ightarrow \overrightarrow{r} \overrightarrow{n} = d\left(where \overrightarrow{n} \overrightarrow{b} = 0
ight)$$
 a.

$$\overrightarrow{r} = \overrightarrow{a} + \left( rac{d - \overrightarrow{a} \cdot \overrightarrow{n}}{n^2} 
ight) n + \lambda \overrightarrow{b}$$
 b.

$$\overrightarrow{r} = \overrightarrow{a} + \left( rac{d - \overrightarrow{a} \cdot \overrightarrow{n}}{n} 
ight) n + \lambda \, \overrightarrow{b}$$
 c.

$$\overrightarrow{r} = \overrightarrow{a} + \left( \frac{\overrightarrow{a} \cdot \overrightarrow{n} - d}{n^2} \right) n + \lambda \overrightarrow{b}$$
 d.

$$\overrightarrow{r} = \overrightarrow{a} + igg( \overline{\overrightarrow{a'} \cdot \overrightarrow{n'} - d} {n} igg) n + \lambda \, \overrightarrow{b}$$

**279.** What is the nature of the intersection of the set of planes x + ay + (b + c)z + d = 0, x + by + (a + a)z + d = 0 and x + cy + (a + a)a a. they meet at a point b. the form a triangular prism c. the pass through a line d. they are at equal distance from the origin

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**280.** Let  $P_1$  denote the equation of a plane to which the vector  $(\hat{i} + \hat{j})$  is normal and which contais the line whose equation is  $\vec{r} = \hat{i} + \hat{j} + \hat{k} + \lambda (\hat{i} - \hat{j} - \hat{k}) and P_2$  denote the equation of the plane containing the line L and a point with position vector  $\hat{j}$ . Which of the following holds good? a. The equation of  $P_1$  is x+y=2. b. The equation of  $P_2$  is  $\vec{r}$ . (i - 2j + k) = 2 c. The acute angle between  $P_1$  and  $P_2$  is  $\cot^{-1}\sqrt{3}$  d. The angle between plane  $P_2$  and the line L is  $\tan^{-1}\sqrt{3}$ 

**281.** Let PM be the perpendicular from the point P(1, 2, 3) to the x - yplane. If  $\overrightarrow{O}P$  makes an angle  $\theta$  with the positive direction of the z - axis and  $\overrightarrow{O}M$  makes an angle  $\phi$  with the positive direction of x - axis, where O is the origin and  $\theta and \phi$  are acute angels, then a.  $\cos \theta \cos \phi = 1/\sqrt{14}$  b.  $\sin \theta \sin \phi = 2/\sqrt{14}$  c.  $\tan \phi = 2$  d.  $\tan \theta = \sqrt{5}/3$ 

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**282.** If the plane  $\frac{x}{2} + \frac{y}{3} + \frac{z}{6} = 1$  cuts the axes of coordinates at points, A, B, andC, then find the area of the triangle ABC a. 18sq unit b. 36squnit c.  $3\sqrt{14}sq$  unit d.  $2\sqrt{14}sq$  unit

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**283.** For what value (s) of a will the two points (1, a, 1) and (-3, 0, a)

lie on opposite sides of the plane 3x + 4y - 12z + 13 = 0?

#### **Question Bank**

1. Let the line  $L_1: \frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$  and  $L_2: \frac{x-2}{1} = \frac{y-3}{2} = \frac{z-k}{4}$  intersect at *P*.The least distance of *P* from the plane 3x - 4y - 12z + 4 = 0, equals

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2. 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

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

**4.** Line drawn perpendicular to plane x + 2y - 3z = 21 at point A meets plane 2x + ky + 5z = 8 at point B. If mid point of AB is (1, -1, 2), then k is equal to

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5. The equation of the plane which has the property that the point Q(5, 4, 5) is the reflection of point P(1, 2, 3) through that plane, is ax + by + cz = d where  $a, b, c, d \in N$ . Find the least value of (a + b + c + d).

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6. Consider a plane  $\Pi: \overrightarrow{r}\left(2\hat{i}+\hat{j}-\hat{k}\right)=5$ , a line  $L_1:vecr=3\hat{i}-\hat{j}+2\hat{k}+\lambda\left(2\hat{i}-3\hat{j}-\hat{k}\right)$  where  $\lambda\in R$  and a point  $A(3,\ -4,1).$  The line  $L_1$  intersects plane  $\Pi$  at Q and xy plane at R. If

the volume of tetrahedron OAQR(O is origin) is  $\frac{m}{n}$  where m and n are relatively prime positive integers, then find (3m - 5n).

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7. If  $L: x - \frac{2}{a} = y - \frac{0}{b} = z - \frac{p}{c}$  where  $a, b \in I$  is a line parallel to the line of intersection of the plane x + y = 2 and the x - y plane whose distance from the origin is  $3\sqrt{2}$  units (z-coordinate is positive of every point on the line), then find least value of |a + b + c + p|

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8. If the angle between the plane x - 3y + 2z = 1 and the line  $x - \frac{1}{2} = y - \frac{1}{1} = z - \frac{1}{-3}$  is  $\theta$ , then the value of  $\cos ec\theta$  is View Text Solution **9.** Aplane P is perpendicular to the vector A = 2i + 3j + 6k and contains the terminal point of 'the vector  $\overrightarrow{B} = \hat{i} + 5\hat{j} + 3\hat{k}$ . The distance from the origin to the plane P, is



10. The intersection of the planes 2x - y - 3z = 8 and x + 2y - 4z = 14 is the line *L*. The value of *a* ' for which the line *L* is perpendicular to the line through (a, 2, 2) and (6, 11, -1) is

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11. Let Q be the foot of perpendicular from the origin to the plane 4x - 3y + z + 13 = 0 and R be a point (-1, 1, -6) on the plane. The length QR is

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12. If a line passing through A(1, 2, 3) and B(-1, 3, 5) meets the plane

x + 3y + 5z - 3 = 0 'at C, then BC is equal to

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13. If direction ratios of the normal of the plane which contains the lines

 $x-rac{2}{3}=y-rac{4}{2}=z-rac{1}{1}$  and  $x-rac{6}{3}=y+rac{2}{2}=z-rac{2}{1}$  are  $(a,1,\ -26),$  then a is equal to

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14. The point of intersection of the plane  $\overrightarrow{r}$ .  $(2\hat{i} - \hat{j} + 3\hat{k}) = 6$  with the straight line passing through origin and perpendicular to the plane 2x + y + z = 0 is (p, q, r). Then the value of (2p - 3q + r)

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15. Shortest distance between  $ar{z}$  -axis and the line x+y+2z-3=0=2x+3y+4z-4 is



**16.** If the plane 2x.  $+y + 2zharp\infty ns9$  intersects the co-ordinate axes in A, B and C and the co-ordinates of orthocentre of triangle ABC be  $(\alpha, \beta, \gamma)$ , then the value of  $\alpha + \beta + \gamma$  is

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17. If the plane 2x-2y-z-11=0 makes an angle  $\sin^{-1}(\lambda)$  with x -

axis, then  $\lambda$  is equal to



18. The vector  $\overline{A}B=3\hat{i}+4\hat{k}$  and  $ove
ightarrow owAC=5\hat{i}-2\hat{j}+4\hat{k}$  are the

sides of a triangle ABC. The length of the median through A is

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19. The distance of the point (-1, -5, -10) from the point of intersection of the line  $\frac{x-2}{2} = \frac{y+1}{4} = \frac{z-2}{12}$  and the plane x-y+z=5 is

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

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