

MATHS

BOOKS - ARIHANT MATHS

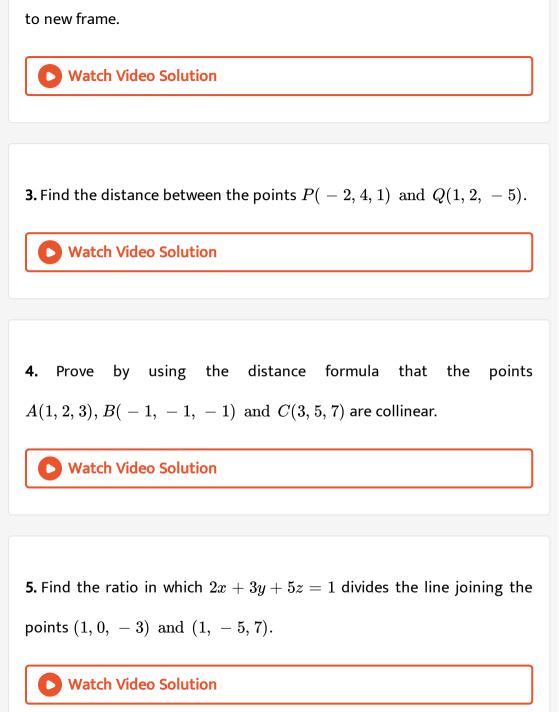
THREE DIMENSIONAL COORDINATE SYSTEM

Examples

1. Planes are drawn parallel to the coordinate planes through the points (1, 2, 3) and (3, -4, -5). Find th lengths of the edges of the parallelopiped so formed.

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2. If the origin is shifted (1, 2, -3) without changing the directions of the axis, then find the new coordinates of the point (0, 4, 5) with respect



6. Given that p(3,2,-4), Q (5,4, -6) and R (9,8,-10) are collinear find the ratio

in which Q divides PR



7. Show that the plane ax + by + cz + d = 0 divides the line joining (x_1, y_1, z_1) and (x_2, y_2, z_2) in the ratio of $\left(-\frac{ax_1 + ay_1 + cz_1 + d}{ax_2 + by_2 + cz_2 + d}\right)$

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8. Find the ratio in which the join the A(2, 1, 5) and B(3, 4, 3) is divided by the plane 2x + 2y - 2z = 1. Also, find the coordinates of the point of division.

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9. What are the direction cosines ?

10. If a line makes anles α, β, γ with the coordinate axes, porve that

 $\sin^2lpha+\sin^2eta+\sin^2\gamma=2$

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11. 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_{\cdot}

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12. A person crosses a 600 m long street in 5 second. What is his speed?



13. If the points $(0, 1, -2), (3, \lambda, -1)$ and $(\mu, -3, -4)$ are collinear, verify whether the point (12, 9, 2) is also on the same line.



14. A vector \overrightarrow{r} has length 21 and its direction ratios are proportional to 2, -3, 6. Find the direction cosines and components of \overrightarrow{r} , is given that \overrightarrow{r} Makes an acute angle with `x-axis

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15. Find the angle between the lines whose direction cosines are

$$-\frac{\sqrt{3}}{4}, \frac{1}{4}, -\frac{\sqrt{3}}{2}$$
 and $\left(-\frac{\sqrt{3}}{4}, \frac{1}{4}, \frac{\sqrt{3}}{2}\right)$.

16. Find the angle bewteen the lines whose direction ratios are 1, 2, 3 and -

3,2,1



17. The angle between the lines whose direction cosines are given by the equatios $l^2+m^2-n^2=0, m+n+l=0$ is

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18. The direction cosines of the lines bisecting the angle between the line whose direction cosines are l_1, m_1, n_1 and l_2, m_2, n_2 and the angle between these lines is θ , are



19. If l_1 , m_1 , n_1 and l_2 , m_2 , n_2 are the direction cosines of two mutually perpendicular lines, show that the direction cosines of the line perpendicular to both of these are $m_1n_2 - m_2n_1$, $n_1l_2 - n_2l_1$, $l_1m_2 - l_2m_1$.

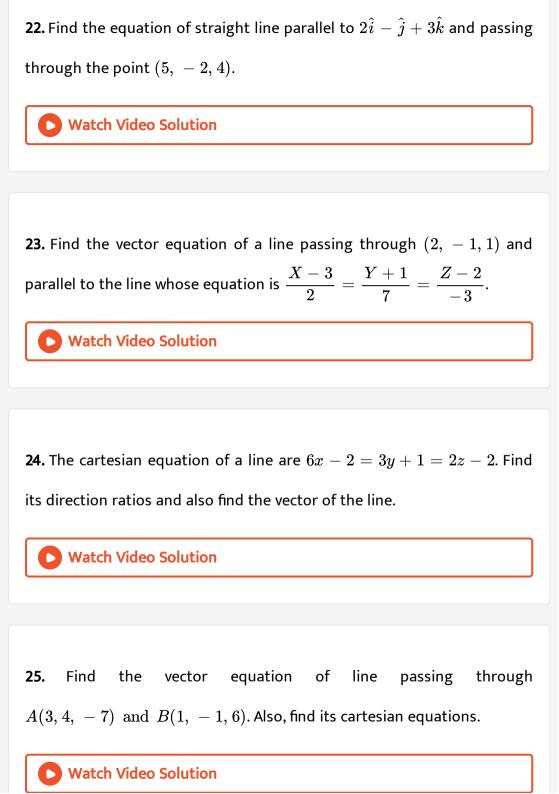
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20. Find the direction cosines of the line which is perpendicular to the lines with direction cosines proportional to 1, -2, -2 and 0, 2, 1

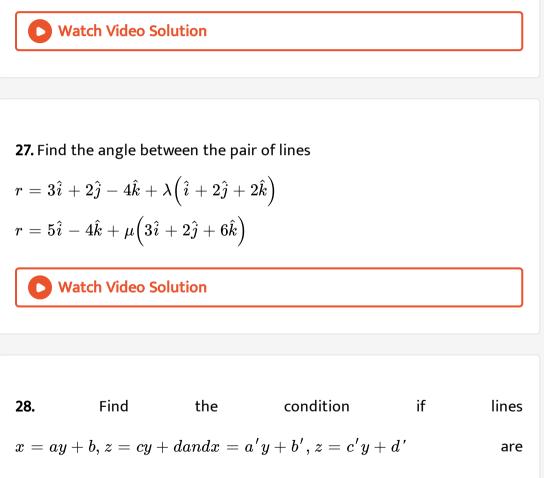


21. Let A(-1, 2, 1) and B(4, 3, 5) be two given points. Find the projection of AB on a line which makes angle 120° and 135° with Yand Z-axes respectively, and an acute angle with X-axis.





26. Find the equation of a line which passes through the point (2, 3, 4) and which has equal intercepts on the axes.

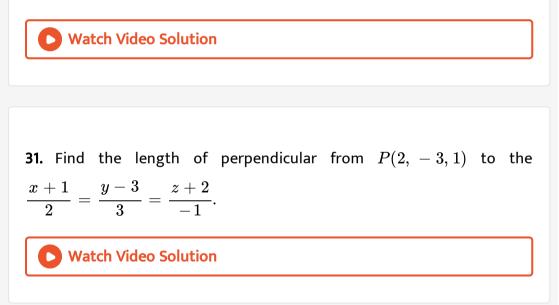


perpendicular.

29. If
$$a=2\hat{i}+3\hat{j}-\hat{k}$$
 then $\left|\overrightarrow{a}\right|$ is :

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30. 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).



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

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

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

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34. Find the coordinates of those point on the line $\frac{x-1}{2} = \frac{y+2}{3} = \frac{z-3}{6}$ which are at a distance of 3 units from points (1, -2, 3).

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35. Show that the two lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ intersect each other . Find also the point of intersection.

36. Find the shortest distance between the lines

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

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37. Find shortest distance between lines
$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$$
 and $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$
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38. Find the shortest distance and the vector equation of the line of shortest distance between the lines given by $r = \left(3\hat{i} + 8\hat{j} + 3\hat{k}\right) + \lambda\left(3\hat{i} - \hat{j} + \hat{k}\right)$ and $r = \left(-3\hat{i} - 7\hat{j} + 6\hat{k}\right) + \mu\left(-3\hat{i} - 3\hat{j} + 6\hat{k}\right)$

39. Find the shortest distance between lines

$$\vec{r} = (\hat{i} + 2\hat{j} + \hat{k}) + \lambda(2\hat{i} + \hat{j} + 2\hat{k}) \text{ and}$$

$$\vec{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu(2\hat{i} + \hat{j} + 2\hat{k}).$$
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40. Find the equation of a line which passes through the point (1, 1, 1)
and intersects the lines

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \text{ and } \frac{x+2}{1} = \frac{y-3}{2} = \frac{z+1}{4}.$$
(Natch Video Solution

41. If the straight lines
$$x = -1 + s, y = 3 - \lambda s, z = 1 + \lambda sandx = \frac{t}{2}, y = 1 + t, z = 2 - t,$$

with parametters $sandt, \;$ respectivley, are coplanar, then find λ_{\cdot}

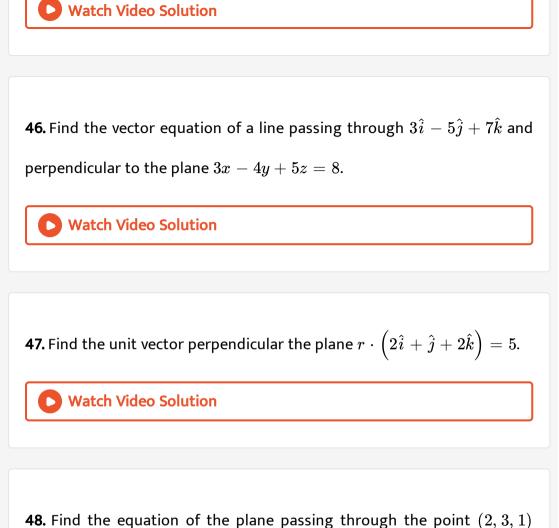
42. Show that the four point $(0, \ -1, \ -1), (4, 5, 1), (3, 9, 4) and (-4, 4, 4)$ are coplanar and find the equation of the common plane. Watch Video Solution 43. Find the vector equation of a plane which is at a distance of 8 units from the origin and which is normal to the vector $2\hat{i}+\hat{j}+2\hat{k}$ Watch Video Solution **44.** Reduce the equation $\overrightarrow{r}\left(3\hat{i}-4\hat{j}+12\hat{k}
ight)=5$ to normal form and

hence find the length of perpendicular from the origin to the plane.

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45. Find the distance of the plane 2x - 3y + 4z - 6 = 0 from the origin.





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



49. In the following case, find the coordinates of the foot of the perpendicular drawn from the origin: 5y + 8 = 0



50. A vector \overrightarrow{n} f magnitude 8 units is inclined to x-axis at 45^0 , y-axis at 60^0 and an acute angle with z-axis. If a plane passes through a point $(\sqrt{2}, -1, 1)$ and is normal to \overrightarrow{n} , find its equation in vector form.

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

52. Find the equation of the plane passing through A(2, 2, -1), B(3, 4, 2) and C(7, 0, 6). Also find a unit vector perpendicular to this plane.

53. Find equation of plane passing through the points P(1, 1, 1), Q(3, -1, 2) and R(-3, 5, -4).

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

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

55. A plane meets the coordinate axes in A, B, C such that the centroid of triangle ABC is the point (p, q, r). Show that the equation of the plane is $\frac{x}{p} + \frac{y}{q} + \frac{z}{r} = 3$. Watch Video Solution

56. A variable plane moves so that the sum of reciprocals of its intercepts on the three coordinate axes is constant, show that it passes through a fixed point.

57. Find the angle between the two planes 3x - 6y + 2z = 7 and

$$2x + 2y - 2z = 5$$

58. 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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59. Find the equation of the plane through the point (1,4,-2) and parallel

to the plane 2x - y + 3z + 7 = 0.

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60. Find the equation of the plane passing through (a, b, c) and parallel to

the plane
$$\overrightarrow{r}\cdot\left(\hat{i}+\hat{j}+\hat{k}
ight)=2$$

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



62. Find the planes passing through the intersection of plane $r \cdot (2\hat{i} - 3\hat{j} + 4\hat{k}) = 1$ and $r \cdot (\hat{i} - \hat{j}) + 4 = 0$ and perpendicular to planes $r \cdot (2\hat{i} - \hat{j} + \hat{k}) = -8$

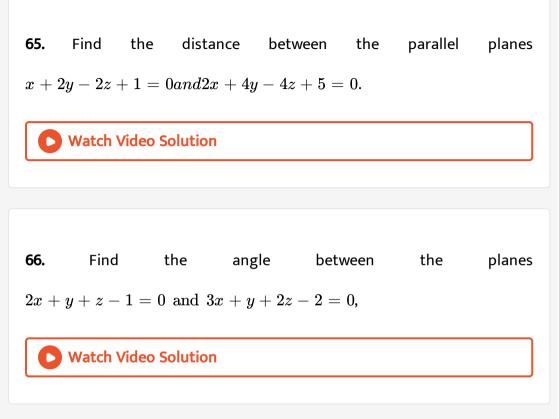
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63. Find the interval of α for which $(\alpha, \alpha^2, \alpha)$ and (3, 2, 1) lies on same

side of x + y - 4z + 2 = 0.

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64. Find the distance of the point (2, 1, 0) from the plane 2x + y + 2z + 5 = 0.



67. 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.

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

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69. Find the distance of the point (-3 -4, -5) from the point of Intersection

of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane x - y + z=5.

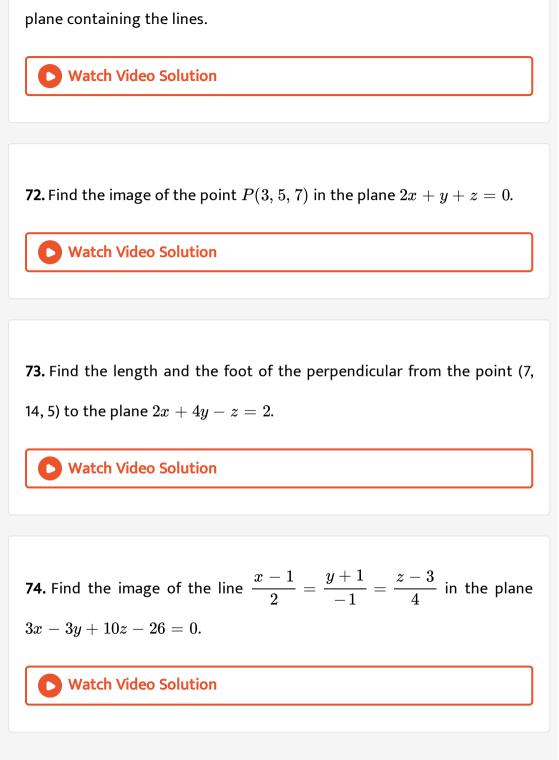
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70. Find the equation of the plane passing through the point (0, 7, -7)

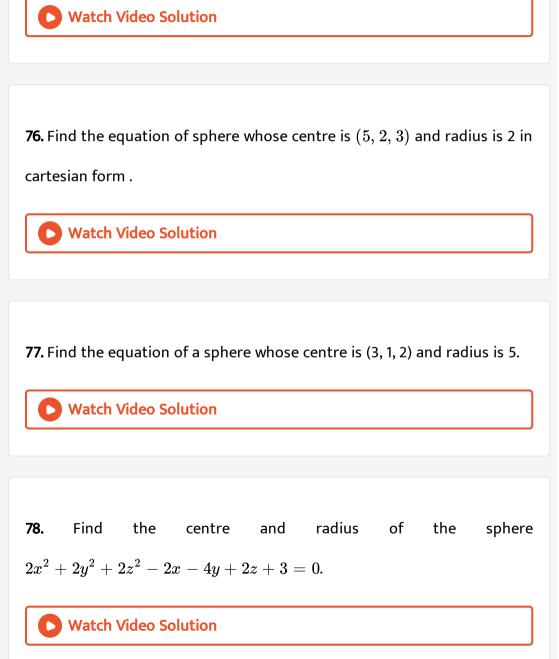
and containing the line
$$rac{x+1}{-3}=rac{y-3}{2}=rac{z+2}{1}$$

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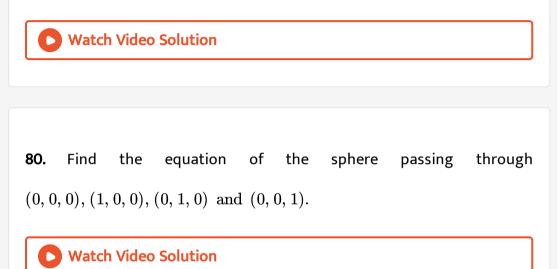
71. Show that the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ are coplanar. Also find the equation of the



75. Find the vector equation of a sphere with centre having the position vector $\hat{i} + \hat{j} + \hat{k}$ and $\sqrt{3}$.



79. Find the equation of the sphere passing through (0, 0, 0), (1, 0, 0) and (0, 0, 1).



81. 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.

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

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83. Find the shortest distance between the lines given by the equations

$$ec{r}=ig(\hat{i}+2\hat{j}+3\hat{k}+\lambdaig(2\hat{i}+3\hat{j}+4\hat{k}ig),\ ec{r}=ig(2\hat{i}-4\hat{j}+5\hat{k}+\muig(3\hat{i}-4\hat{j}+5\hat{k}ig).$$

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84. Find the value of λ for which the plane $x+y+z=\sqrt{3}\lambda$ touches the

sphere $x^2 + y^2 + z^2 - 2x - 2y - 2z = 6$.

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85. Find the equation of the sphere whose centre has the position vector $3\hat{i} + 6\hat{j} - 4\hat{k}$ and which touches the plane $r\cdot\left(2\hat{i} - 2\hat{j} - \hat{k}\right) = 10.$

86. A variable plane which remains at a constant distance p from the origin cuts the coordinate axes in A, B, C. The locus of the centroid of the tetrahedron OABC is $x^2y^2 + y^2z^2 + z^2x^2 = \frac{k}{p^2}x^2y^2z^2$, then $\sqrt[5]{2k}$ is

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87. A variable plane is at a distance, k from the origin and meets the coordinates axis in A, B , C. Then, the locus of the centroid of riangle ABC is

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88. If α , β , γ be the angles which a line makes with the coordinates axes, then

A. A.
$$\cos(2lpha)+\cos(2eta)+\cos(2\gamma)-1=0$$

B. B.
$$\cos(2lpha)+\cos(2eta)+\cos(2\gamma)-2=0$$

C. C.
$$\cos(2lpha)+\cos(2eta)+\cos(2\gamma)+1=0$$

D. D.
$$\cos(2lpha)+\cos(2eta)+\cos(2\gamma)+2=0$$

Answer: (c)



89. The points
$$(5, -5, 2), (4, -3, 1), (7, -6, 4)$$
 and $(8, -7, 5)$ are

the vertices of

A. a rectangle

B. a square

C. a parallelogram

D. None of these

Answer: (c)

90. In $\triangle ABC$ the mid points of the sides AB, BC and CA are (l, 0, 0), (0, m, 0) and (0, 0, n) respectively. Then, $\frac{AB^2 + BC^2 + CA^2}{l^2 + m^2 + n^2}$ is equal to

A. 2

B.4

C. 8

D. 16

Answer: (c)

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91. The angle between a line with direction ratios < 2, 2, 1 > and a line joining the points (3, 1, 4) and (7, 2, 12) is

A.
$$\cos^{-1}\left(\frac{2}{3}\right)$$

B. $\cos^{-1}\left(\frac{-2}{3}\right)$

$$\mathsf{C}.\tan^{-1}\left(\frac{2}{3}\right)$$

D. None of these

Answer: (a)



92. The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$
is
A. (a) 30°
B. (b) 45°
C. (c) 60°
D. (d) 90°
Answer: (d)

93. A line makes the same angle θ with X-axis and Z-axis. If the angle β , which it makes with Y-axis, is such that $\sin^2(\beta) = 3\sin^2\theta$, then the value of $\cos^2\theta$ is

A. (a)
$$\frac{1}{5}$$

B. (b) $\frac{2}{5}$
C. (c) $\frac{3}{5}$
D. (d) $\frac{2}{3}$

Answer: (c)

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94. The projection of a line segment on the axis 2, 3, 6 respectively. Then

find the length of line segment.

A. 7

B. 5

C. 1

D. 11

Answer: (a)

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95. The equation of the straight line through the origin and parallel to

line

the

$$(b+c)x + (c+a)y + (a+b)z = k = (b-c)x + (c-a)y + (a-b)z$$

are

A.
$$\frac{x}{b^2 - c^2} = \frac{y}{c^2 - a^2} = \frac{z}{a^2 - b^2}$$

B.
$$\frac{x}{b} = \frac{y}{b} = \frac{z}{a}$$

C.
$$\frac{x}{a^2 - bc} = \frac{y}{b^2 - ca} = \frac{z}{c^2 - ab}$$

D. None of these

Answer: (c)



96. 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).

A.
$$\left(\frac{5}{3}, \frac{7}{3}, \frac{17}{3}\right)$$

B. $\left(5 \ 7 \ 17\right)$
C. $\left(\frac{5}{7}, \frac{-7}{3}, \frac{17}{3}\right)$
D. $\left(\frac{-5}{3}, \frac{7}{3}, \frac{-17}{3}\right)$

Answer: (a)

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97. A mirror and a source of light are situated at the origin O and at a point on OX, respectively. A ray of light from the sources strikes the mirror and is reflected. If the direction ratios of the normal to the plane are 1, -1, 1, then find the DCs of the reflected ray.

A.
$$\frac{1}{3}$$
, $\frac{2}{3}$, $\frac{2}{3}$
B. $\frac{1}{3}$, $\frac{2}{3}$, $\frac{2}{3}$
C. $-\frac{1}{3}$, $-\frac{2}{3}$, $-\frac{2}{3}$
D. $-\frac{1}{3}$, $-\frac{2}{3}$, $\frac{2}{3}$

Answer: (d)



98. Find the equation of the plane through the points (2, 2, 1) and (9, 3, 6) and perpendicualr to the plane 2x + 6y + 6z = 1.

A. 3x + 4y + 5z = 9

B.
$$3x + 4y - 5z + 9 = 0$$

C.
$$3x + 4y - 5z - 9 = 0$$

D. None of these

Answer: (c)

99. If the position vectors of the point A and B are $3\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} - 2\hat{j} - 4\hat{k}$ respectively. Then the eqaution of the plane through B and perpendicular to AB is

A.
$$2x + 3y + 6z + 28 = 0$$

B.
$$2x + 3y + 6z = 28$$

C.
$$2x - 3y + 6z + 28 = 0$$

D.
$$3x - 2y + 6z = 28$$

Answer: (a)

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100. A straight line L cuts the lines AB, ACandAD of a parallelogram

ABCD at points $B_1, C_1 and D_1$, respectively. If

$$\left(\overrightarrow{A}B\right)_1 = \lambda_1 \overrightarrow{A}B, \left(\overrightarrow{A}D\right)_1 = \lambda_2 \overrightarrow{A}Dand\left(\overrightarrow{A}C\right)_1 = \lambda_3 \overrightarrow{A}C,$$
 then

1/(lambda_3).

A. $\frac{1}{\lambda_1} + \frac{1}{\lambda_2}$ B. $\frac{1}{\lambda_1} - \frac{1}{\lambda_2}$ C. $-(\lambda_1) + (\lambda_2)$ D. $(\lambda_1) + (\lambda_2)$

Answer: (a)

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101. the acute angle between two lines such that the direction cosines I, m, n of each of them satisfy the equations l+m+n=0 and $l^2+m^2-n^2=0$ is

A. ϕ B. $\frac{\phi}{3}$

C.
$$\frac{\phi}{4}$$

D. $\frac{\phi}{6}$

Answer: (b)

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102. Find the equation of the plane passing through the points : (3, -1, 2),

- (5, 2, 4), (-1, -1, 6)
 - A. x + y + z = 9
 - $\mathsf{B.}\,x+y+z=\,-\,9$
 - C. 2x + 3y + 4z = 9
 - D. 2x + 3y + 4z = -9

Answer: (a)

103. Equation of the plane that contains the lines $r = (\hat{i} + \hat{j}) + \lambda (\hat{i} + 2\hat{j} - \hat{k})$ and $r = (\hat{i} + \hat{j}) + \mu (-\hat{i} + \hat{j} - 2\hat{k})$ is

A.
$$r\cdot\left(2\hat{i}+\hat{j}-3\hat{k}
ight)=-4$$

B. $ightarrow\left(-\hat{i}+\hat{j}+\hat{k}
ight)=0$
C. $r\cdot\left(-\hat{i}+\hat{j}+\hat{k}
ight)=0$

D. None of these

Answer: (c)

104. 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. ± 1

$$\mathsf{B.}\pm\frac{1}{3}$$

 $C.\pm\sqrt{5}$

D. None of these

Answer: (c)

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105. The distance between the line $r=2\hat{i}-2\hat{j}+3\hat{k}+\lambda\Big(\hat{i}-\hat{j}+4\hat{k}\Big)$ and the plane $r\cdot\Big(\hat{i}+5\hat{j}+\hat{k}\Big)=5,$ is

A.
$$\frac{10}{9}$$

B. $\frac{10}{3\sqrt{3}}$
C. $\frac{10}{3}$

D. None of these

Answer: (b)

106. If the plane $\frac{x}{2} + \frac{y}{3} + \frac{z}{4} = 1$ cuts the coordinate axes in A, B, C, then the area of triangle ABC is

A. $\sqrt{19}$ sq, units

B. $\sqrt{41}$ sq. units

C. $\sqrt{61}$ sq. units

D. None of these

Answer: (c)

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107. Find the distance of the point (1, - 2, 3) from the plane x - y + z = 5, measured parallel to the line $\frac{x}{2} = \frac{y}{2} = \frac{z}{-6}$

A. (a) 1

B. (b) 2

C. (c) 4

D. (d) None of these

Answer: (a)

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108. The length of the perpendicular from the origin to the plane passing through the point \overrightarrow{a} and containing the line $\overrightarrow{r} = \overrightarrow{b} + \lambda \overrightarrow{c}$

A.
$$\frac{[abc]}{|a \times b + b \times c + c \times a|}$$

B.
$$\frac{[abc]}{|a \times b + b \times c|}$$

C.
$$\frac{[abc]}{|a \times b + c \times a|}$$

D.
$$\frac{[abc]}{|b \times c + c \times a|}$$

Answer: (c)

109. If P = (0, 1, 0) and Q = (0, 0, 1) then the projection of PQ on the plane x + y + z = 3 is A. 2 B. 3 C. $\sqrt{2}$

D. $\sqrt{3}$

Answer: (c)

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110. The equation of the plane through the intersection of the planes x + y + z = 1 and 2x + 3y - z + 4 = 0 and parallel to x-axis is

A. y - 3z + 6 = 0

B. 3y - z + 6 = 0

C. y + 3z + 6 = 0

D.
$$3y - 2z + 6 = 0$$

Answer: (a)



111. A plane II passes through the point (1,1,1). If b, c, a are the direction ratios of a normal to the plane where a, b, c(a < b < c) are the prime factors of 2001, then the equation of the plane II is

- A. 29x + 31y + 3z = 63
- B. 23x + 29y 29z = 23
- C. 23x + 29y + 3z = 55
- D. 31x + 37y + 3z = 71

Answer: (c)

112. The dr's of two lines are given by a+b+c=0, 2ab+2ac-bc=0.

Then the angle between the lines is

A. π B. $\frac{2\pi}{3}$ C. $\frac{\pi}{2}$ D. $\frac{\pi}{3}$

Answer: (b)

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113. If |a+b| > |a-b| , then the angle between a and b is

A.
$$90^{\circ}$$

$$B. \cos^{-1}\left(\frac{19}{35}\right)$$
$$C. \cos^{-1}\left(\frac{17}{31}\right)$$

D. 30°

Answer: (b)

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114. The vector equation of the plane through the point (2, 1, -1) and passing through the line of intersection of the plane $r \cdot (\hat{i} + 3\hat{j} - \hat{k}) = 0$ and $r \cdot (\hat{j} + 2\hat{k}) = 0$, is A. $r \cdot (\hat{i} + 9\hat{j} + 11\hat{k}) = 0$ B. $r \cdot (\hat{i} + 9\hat{j} + 11\hat{k}) = 6$ C. $\hat{r} \cdot (\hat{i} - 3\hat{k} - 13\hat{k}) = 0$

D. None of these

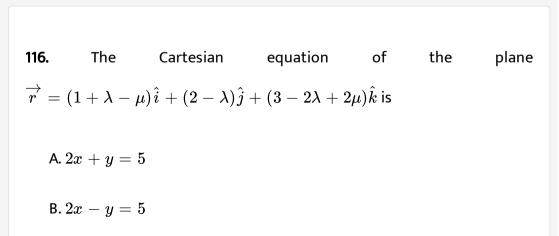
Answer: (a)

115. The vector equation of the plane through the point
$$\hat{i} + 2\hat{j} - \hat{k}$$
 and
perpendicular to the line of intersection of the plane
 $r \cdot (3\hat{i} - \hat{j} + \hat{k}) = 1$ and $r \cdot (\hat{i} + 4\hat{j} - 2\hat{k}) = 2$, is
A. A. $r \cdot (2\hat{i} + \hat{j} - 13\hat{k}) = -1$
B. B. $r \cdot (2\hat{i} - 7\hat{j} - 13\hat{k}) = 1$
C. C. $r \cdot (2\hat{i} + 7\hat{j} + 13\hat{k}) = 0$

D. D. None of these

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Answer: (b)



 $\mathsf{C.}\,2x+z=5$

D. 2x - z = 5

Answer: (c)

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117. A variable plane is at a distance k from the origin and meets the coordinates axes is A,B,C. Then the locus of the centroid of ΔABC is

A.
$$x^{-2} + y^{-2} + z^{-2} = k^{-2}$$

B. $x^{-2} + y^{-2} + z^{-2} = 4k^{-2}$
C. $x^{-2} + y^{-2} + z^{-2} = 16k^{-2}$
D. $x^{-2} + y^{-2} + z^{-2} = 9k^{-2}$

Answer: (d)

118. The direction ratios of the line x-y+z-5 = 0 = x-3y-6 are

A. 3, 1, -2
B. 2, -4, 1
C.
$$\frac{3}{\sqrt{14}}, \frac{1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}$$

D. $\frac{2}{\sqrt{21}}, \frac{-4}{\sqrt{21}}, \frac{1}{\sqrt{21}}$

Answer: (a, c)



119. The equation of the lines
$$x + y + z - 1 = 0$$
 and $4x + y - 2z + 2 = 0$ written in the symmetrical

form is

A.
$$\frac{x+1}{1} = \frac{y-2}{-2} = \frac{z-0}{1}$$

B. $\frac{x}{1} = \frac{y}{-2} = \frac{z-1}{1}$
C. $\frac{\frac{x+1}{2}}{1} = \frac{y-1}{-2} = \frac{\frac{z-1}{2}}{1}$

D.
$$rac{x-1}{2} = rac{y+2}{-1} = rac{z-2}{2}$$

Answer: (a, b, c, d)

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120. Find
$$rac{dy}{dx}$$
 if $y=x^x$

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121. Consider the planes 3x - 6y + 2z + 5 = 0 and 4x - 12 + 3z = 3. The plane 67x - 162y + 47z + 44 = 0 bisects the angle between the given planes which

A. contains origin

B. is acute

C. is obtuse

D. None of these

Answer: (a, b)



122. Consider the equation of line AB is $\frac{x}{2} = \frac{y}{-3} = \frac{z}{6}$. Through a point P(1, 2, 5) line PN is drawn perendicular to AB and line PQ is drawn parallel to the plane 3x + 4y + 5z = 0 to meet AB is Q. Then,

A. coordinate of N are
$$\left(\frac{52}{49}, -\frac{78}{49}, \frac{156}{49}\right)$$

B. the coordinate of Q are $\left(3, -\frac{9}{2}, 9\right)$
C. the equation of PN is $\frac{x-1}{3} = \frac{y-2}{-176} = \frac{z-5}{-89}$
D. coordinate of N are $\left(\frac{156}{49}, \frac{52}{49}, -\frac{78}{49}\right)$

Answer: (a, b, c)

123. The equation of a plane is 2x - y - 3z = 5 and A(1, 1, 1), B(2, 1, -3), C(1, -2, -2) and D(-3) are four points. Which of the following line segments are intersects by the plane? (A) AD (B) AB (C) AC (D) BC

A. AD

B. AB

C. AC

D. BC

Answer: (b, c)

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124. The coordinates of a point on the line $\frac{x-1}{2} = \frac{y+1}{-3} = z$ at a distance $4\sqrt{14}$ from the point (1, -1, 0) are

A. (9, -13, 4)

B.
$$(8\sqrt{14} + 1, -12\sqrt{14} - 1, 4\sqrt{14})$$

C. $(-7, 11, -4)$
D. $(-8\sqrt{14} + 1, 12\sqrt{14} - 1, -4\sqrt{14})$

Answer: (a, c)

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125. The line whose vector equation are

$$r = 2\hat{i} - 3\hat{j} + 7\hat{k} + \lambda(2\hat{i} + p\hat{j} + 5\hat{k})$$
 and
 $r = \hat{i} + 2\hat{j} + 3\hat{k} + \mu(3\hat{i} - p\hat{j} + p\hat{k})$ are perpendicular for all values of
 λ and μ if p equals to

 $\mathsf{A.}-1$

 $\mathsf{B}.\,2$

C. 5

D. 6

Answer: (a, d)



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

A. 2x - y + z - 3 = 0

- B. 3x + y + z 5 = 0
- C.62x + 29y + 19z 105 = 0

D. x + 2y - 2 = 0

Answer: ((a, c))

127. The plane passing through the point (-2, -2, 2) and containing the line joining the points (1, 1, 1) and (1, -1, 2) makes intercepts of length a, b, c respectively the axes of x, y and z respectively, then

A.
$$a=3b$$

B. $b=2c$
C. $a+b+c=12$

D. a + 2b + 2c = 0

Answer: (a, b, c)

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128. Statement-1 A line L is perpendicular to the plane 3x - 4y + 5z = 10

Statement-2 Direction cosines of L be
$$\ < rac{3}{5\sqrt{2}}, \ -rac{4}{5\sqrt{2}}, rac{1}{\sqrt{2}} >$$

A. Statement 1 is true, Statement 2 is also true, Statement-2 is the

correct explanation of Statement-1.

B. Statement 1 is true, Statement 2 is also true, Statement-2 is not the

correct explanation of Statement-1.

C. Statement 1 is true, Statement 2 is false.

D. Statement 1 is false, Statement 2 is true

Answer: (a)

Watch Video Solution

129. 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 $2x_1 - y_1 = 1, x_1 + 3y_1 = 4$ and $3x - 1 + 2y_1 = 5$ are consistent.

A. Statement 1 is true, Statement 2 is also true, Statement-2 is the

correct explanation of Statement-1.

B. Statement 1 is true, Statement 2 is also true, Statement-2 is not the

correct explanation of Statement-1.

C. Statement 1 is true, Statement 2 is false.

D. Statement 1 is false, Statement 2 is true

Answer: (a)

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130. Statement-1 The distance between the planes 4x - 5y + 3z = 5 and 4x - 5y + 3z + 2 = 0 is $\frac{3}{5\sqrt{2}}$. Statement-2 The distance between $ax + by + cz + d_1 = 0$ and $ax + by + cz + d_2 = 0$ is $\left|\frac{d_1 - d_2}{\sqrt{a^2 + b^2 + c^2}}\right|$.

A. Statement 1 is true, Statement 2 is also true, Statement-2 is the

correct explanation of Statement-1.

B. Statement 1 is true, Statement 2 is also true, Statement-2 is not the

correct explanation of Statement-1.

C. Statement 1 is true, Statement 2 is false.

D. Statement 1 is false, Statement 2 is true

Answer: (d)

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131. Given the line L: $\frac{x-1}{3}=\frac{y+1}{2}=\frac{z-3}{-1}$ and the plane $\phi:x-2y-z=0.$

Statement-1 L lies in ϕ .

Statement-2 L is parallel to ϕ .

A. Statement 1 is true, Statement 2 is also true, Statement-2 is the

correct explanation of Statement-1.

B. Statement 1 is true, Statement 2 is also true, Statement-2 is not the

correct explanation of Statement-1.

C. Statement 1 is true, Statement 2 is false.

D. Statement 1 is false, Statement 2 is true

Answer: (c)

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132. Statement-1 line
$$\frac{x-1}{3} = \frac{y-2}{11} = \frac{z+1}{11}$$
 lies in the plane $11x - 3z - 14 = 0$.

Statement-2 A straight line lies in a plane, if the line is parallel to plane and a point of the line in the plane.

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133. Two line whose are
$$\frac{x-3}{2} = \frac{y-2}{3} = \frac{z-1}{\lambda}$$
 and $\frac{x-2}{3} = \frac{y-3}{2} = \frac{z-2}{3}$ lie in the

same plane, then,

Q. The value of $\sin^{-1}\sin\lambda$ is equal to

A. 3

B. $\phi-3$

C. 4

D. $\phi - 4$

Answer: (d)

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134. Show that the two lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ intersect each other . Find also the point of intersection.

A. 3x + y + z = 20

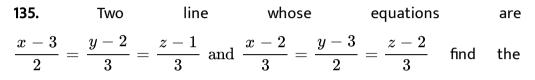
B. 2x + y + z = 25

C. 3x + 2y + z = 24

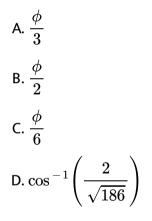
 $\mathsf{D}.\, x=y=z$

Answer: (d)





angle between them



Answer: (b)

136. Let $a_1x + b_1y + c_1z + d_1 = 0$ and $a_2x + b_2y + c_2z + d_2 = 0$ be two planes, where $d_1, d_2 > 0$. Then, origin lies in acute angle, If $a_1a_2 + b_1b_2 + c_1c_2 < 0$ and origin lies in obtuse angle if $a_1a_2 + b_1b_2 + c_1c_2 > 0.$ Further point (x_1, y_1, z_1) and origin both lie either in acute angle or in obtuse angle. If ($a_1x_1+b_1y_1+c_1z_1+d_1)(a_2x_1+b_2y_1+c_2z_1+d_2)>0.$ one of (x_1, y_1, z_1) and origin in lie in acute and the other in obtuse angle,If ($a_1x_1 + b_1y_1 + c_1z_1 + d_1)(a_2x_1 + b_2y_1 + c_2z_1 + d_2) < 0$ Q. Given that planes 2x + 3y - 4z + 7 = 0 and x - 2y + 3z - 5 = 0. If a point P(1, -2, 3), then a. O and P both lie in acute angle between the planes b.O and P both lies in obtuse angle c.O lies in acute angle, P lies in obtuse angle d. O lies in obtuse angle, P lies in acute angle

A. O and P both lie in acute angle between the planes

B. O and P both lies in obtuse angle

C. O lies in acute angle, P lies in obtuse angle

D. O lies in obtuse angle, P lies in acute angle

Answer: B

D Watch Video Solution

137. If
$$\sin y + 2x = e^x$$
 then find $rac{dy}{dx}$

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138. Let $a_1x + b_1y + c_1z + d_1 = 0$ and $a_2x + b_2y + c_2z + d_2 = 0$ be two planes, where $d_1, d_2 > 0$. Then, origin lies in acute angle, If $a_1a_2 + b_1b_2 + c_1c_2 < 0$ and origin lies in obtuse angle if $a_1a_2 + b_1b_2 + c_1c_2 > 0$.

Further point (x_1, y_1, z_1) and origin both lie either in acute angle or in obtuse angle. If ($a_1x_1+b_1y_1+c_1z_1+d_1$) $(a_2x_1+b_2y_1+c_2z_1+d_2)>0$.

one of (x_1, y_1, z_1) and origin in lie in acute and the other in obtuse angle, If $(a_1x_1 + b_1y_1 + c_1z_1 + d_1)(a_2x_1 + b_2y_1 + c_2z_1 + d_2) < 0$ Q. Given that planes 2x + 3y - 4z + 7 = 0 and x - 2y + 3z - 5 = 0. If a point P(1, -2, 3), then a. O and P both lie in acute angle between the planes b.O and P both lies in obtuse angle c.O lies in acute angle, P lies in obtuse angle d. O lies in obtuse angle, P lies in acute angle

A. O and P both lie in acute angle between the planes

B. O and P both lies in obtuse angle

C. O lies in acute angle, P lies in obtuse angle

D. O lies in obtuse angle, P lies in acute angle

Answer: A

139. In a parallelogram OABC vectors a,b,c respectively, THE POSITION VECTORS OF VERTICES A,B,C with reference to O as origin. A point E is taken on the side BC which divides it in the ratio of 2:1 also, the line segment AE intersects the line bisecting the angle $\angle AOC$ internally at point P. if CP when extended meets AB in points F, then

Q. The position vector of point P is

A.
$$\hat{i} + \hat{j}$$

B. $\frac{2}{3} (\hat{i} + \hat{j})$
C. $\frac{13}{3} (\hat{i} + \hat{j})$
D. $\frac{21}{5} (\hat{i} + \hat{j})$

Answer: (d)



140. In a parallelogram OABC vectors a,b,c respectively, THE POSITION VECTORS OF VERTICES A,B,C with reference to O as origin. A point E is

taken on the side BC which divides it in the ratio of 2:1 also, the line segment AE intersects the line bisecting the angle $\angle AOC$ internally at point P. if CP when extended meets AB in points F, then

Q. The position vector of point P is

A.
$$\frac{x-2}{1} = \frac{y-3}{5}, z = 4$$

B. $\frac{x-2}{1} = \frac{y-3}{6}, z = 4$
C. $\frac{x-2}{2} = \frac{y-2}{5}, z = 3$
D. $\frac{x-2}{3} = \frac{y-3}{5}, z = 3$

Answer: (b)

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141. In a parallelogram OABC vectors a,b,c respectively, THE POSITION VECTORS OF VERTICES A,B,C with reference to O as origin. A point E is taken on the side BC which divides it in the ratio of 2:1 also, the line segment AE intersects the line bisecting the angle $\angle AOC$ internally at

point P. if CP when extended meets AB in points F, then

Q. The position vector of point P is

A.
$$r \cdot \left(\hat{i} + \hat{j}
ight) = 7$$

B. $r \cdot \left(\hat{i} - \hat{j}
ight) = 7$
C. $r \cdot \left(2\hat{i} - \hat{j}
ight) = 7$
D. $r \cdot \left(3\hat{i} + 4\hat{j}
ight) = 7$

Answer: (a)

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142. The ray of light comes along the lines L=0 and strikes the plane mirror kept along the plane P=0 at B. A(2, 1, 6) is a point on the line L=0 whose image about P=0 is A'. It is given that L=0 is $\frac{x-2}{3} = \frac{y-1}{4} = \frac{z-6}{5}$ and P = 0isx + y - 2z = 3.

Q. The coordinates of B are

A.(6, 5, 2)

B. (6, 5, -2)

 $\mathsf{C}.\,(6,\ -5,2)$

D. None of these

Answer: (b)

Watch Video Solution

143. A ray of light comes light comes along the line L = 0 and strikes the plane mirror kept along the plane P = 0 at B. A(2, 1, 6) is a point on the line L = 0 whose image about P = 0 is A'. It is given that L = 0 is $\frac{x-2}{3} = \frac{y-1}{4} = \frac{z-6}{5}$ and P = 0 is x + y - 2z = 3.

The coordinates of B are

A. (5, 10, 6)B. (10, 15, 11)C. (-10, -15, -14)

D. None of these

Answer: (c)



144. The ray of light comes along the lines L=0 and strikes the plane mirror kept along the plane P=0 at B. A(2, 1, 6) is a point on the line L=0 whose image about P=0 is A'. It is given that L=0 is $\frac{x-2}{3} = \frac{y-1}{4} = \frac{z-6}{5}$ and P = 0isx + y - 2z = 3.

Q. The coordinates of B are

A.
$$\frac{x+10}{4} = \frac{y-5}{4} = \frac{z+2}{3}$$

B. $\frac{x+10}{3} = \frac{y+15}{5} = \frac{z+14}{5}$
C. $\frac{x+10}{4} = \frac{y+15}{5} = \frac{z+14}{3}$

D. None of these

Answer: (c)

145. 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.

A.
$$\frac{3}{\sqrt{11}}$$
, $-\frac{1}{\sqrt{11}}$, $\frac{1}{\sqrt{11}}$
B. $\frac{3}{\sqrt{11}}$, $\frac{1}{\sqrt{11}}$, $-\frac{1}{\sqrt{11}}$
C. $-\frac{3}{\sqrt{11}}$, $\frac{1}{\sqrt{11}}$, $\frac{1}{\sqrt{11}}$

D. None of these

Answer: (a)



146. The line of greatest slope on an inclined plane P_1 is that line in the plane which is perpendicular to the line of intersection of plane P_1 and a horiontal plane P_2 .

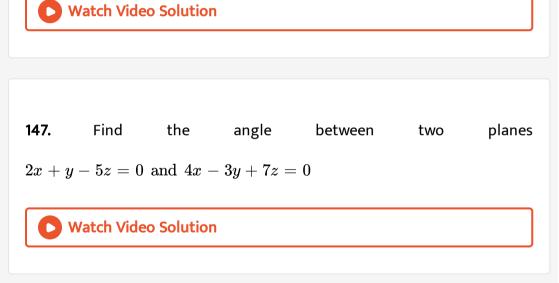
Q. The coordinate of a point on the plane $2x + y - 5z = 0, 2\sqrt{11}$ unit away from the line of intersection of given two planes are

A.
$$\frac{x}{3} = \frac{y}{1} = \frac{z}{-1}$$

B.
$$\frac{x}{3} = \frac{y}{-1} = \frac{z}{1}$$

C. $\frac{x}{-3} = \frac{y}{1} = \frac{z}{1}$
D. $\frac{x}{1} = \frac{y}{3} = \frac{z}{-1}$

Answer: (b)

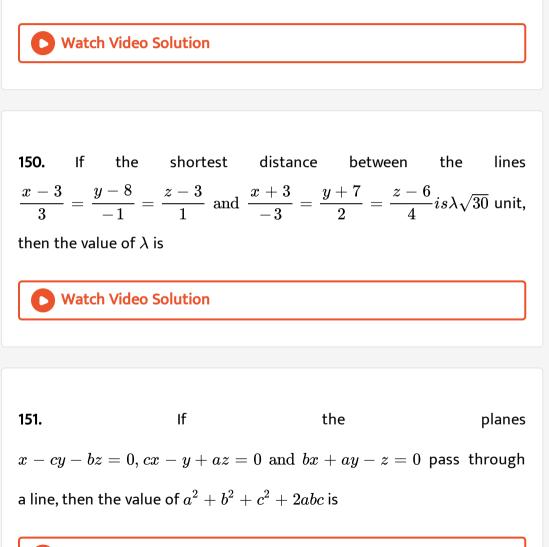


148. If the perpendicular distance of the point (6, 5, 8) from the Y-axis is

 5λ units, then λ is equal to



149. A parallelopied is formed by planes drawn through the points (2, 4, 5) and (5, 9, 7) parallel to the coordinate planes. The length of the diagonal of parallelopiped is



152. If the line $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$ lies exactly on the plane 2x - 4y + z = 7, the value of k is

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

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154. Write the equation of a tangent to the curve $x = t, y = t^2$ and $z = t^3$ at its point M(1, 1, 1) : (t = 1).

155. 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 .

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

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157. The line of greatest slope on an inclined plane P_1 is the line in the plane P_1 which is perpendicular to the line of intersection of the plane P_1 and a horizontal plane P_2 .

Q. Assuming the plane 4x - 3y + 7z = 0 to be horizontal, the direction cosines of the line of greatest slope in the plane 2x + y - 5z = 0 are

158. Does
$$\frac{a}{x-y} + \frac{b}{y-z} + \frac{c}{z-x} = 0$$
 represents a pair of planes?

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159. If the straight line
$$\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$$
 intersect the curve $ax^2 + by^2 = 1, z = 0,$ then prove that $a(\alpha n - \gamma l)^2 + b(\beta n - \gamma m)^2 = n^2$

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160. Prove that the three lines from O with direction cosines $l_1, m_1, n_1: l_2, m_2, n_2: l_3, m_3, n_3$ are coplanar, if $l_1(m_2n_3 - n_2m_3) + m_1(n_2l_3 - l_2n_3) + n_1(l_2m_3 - l_3m_2) = 0$

161. A line makes angles $\alpha, \beta, \gamma, \delta$ with the diagonals of a cube, prove that

$$\cos^2lpha+\cos^2eta+\cos^2\gamma+\cos^2\delta=rac{4}{3}$$

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162. Let PM be the perpendicular from the point P(1, 2, 3) to XY-plane. If OP makes an angle θ with the positive direction of the Z-axies and OM makes an angle Φ with the positive direction of X-axis, where O is the origin, θ and Φ are acute angles, then



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

164. Find the equation of the plane which passes through the line of

intersection of the planes

$$a_1x + b_1y + c_1z + d_1 = 0$$
 and $a_2x + b_2y + c_2z + d_2 = 0$ and which is
parallel to the line $\frac{x - \alpha}{l} = \frac{y - \beta}{m} = \frac{z - \gamma}{n}$
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165. What is 14% Equals to

A. 0.14

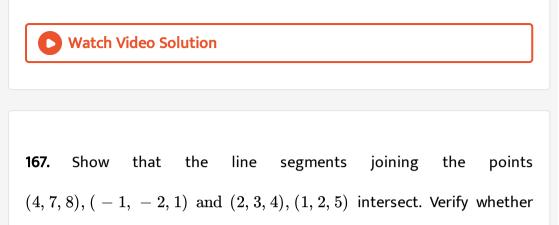
B. 1.4

C. 0.014

D. 0.0014

Answer: $6k^3$

166. Write the solution set of the equation 3x - 4=0 in roster form.



the four points concyclic.

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168. If P is any point on the plane lx + my + nz = pandQ is a point on

the line OP such that OP. $OQ=p^2$, then find the locus of the point Q_{\cdot}

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169. Find the reflection of the plane a'x + b'y + c'z + d' = 0in the

plane ax + by + cz + d = 0

170. 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, B and C.If the parallel to the planes x=0,y=0 and z=0, respectively, intersect at Q, find the locus of Q.

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171. Prove that the shortest distance between any two opposite edges of

a tetrahedron formed by the planes

 $y+z=0, x+z=0, x+y=0, x+y+z=\sqrt{3}a$ is $\sqrt{2}a.$

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JEE Type Solved Examples : Matching Type Questions

1. Expand $\begin{vmatrix} 1 & 2 \\ 4 & 2 \end{vmatrix}$

2. Evaluate
$$\int 3^x dx$$

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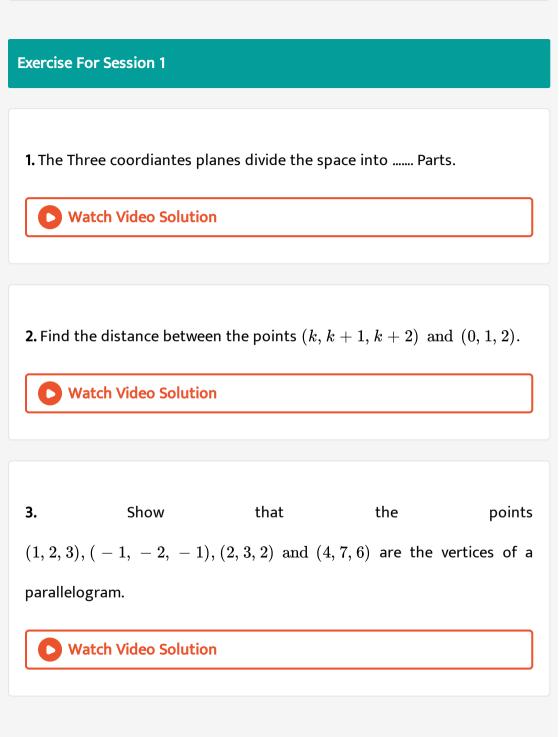
3. Find
$$rac{dy}{dx}$$
 if $e^x = \log y$

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4. Find
$$rac{dy}{dx}$$
 if $y=\sin x+\tan y$

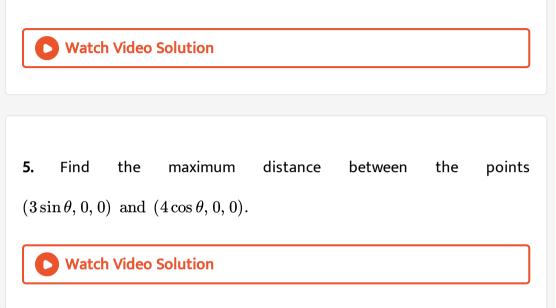
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5. if equation of the plane is $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ convert this in vector equation of the plane Watch Video Solution



4. The mid-points of the sides of a triangle are (1, 5, -1),(0,4,-2) and (2, 3, 4).

Find its vertices.



6. If A = (1, 2, 3), B = (4, 5, 6), C = (7, 8, 9) and D, E, F are the mid

points of the triangle ABC, then find the centroid of the triangle DEF.



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



8. If α , β and γ are angles made by the line with positive direction of Xaxis, Y-axis and Z-axis respectively, then find the value of $\cos 2\alpha + \cos 2\beta + \cos 2\gamma$.

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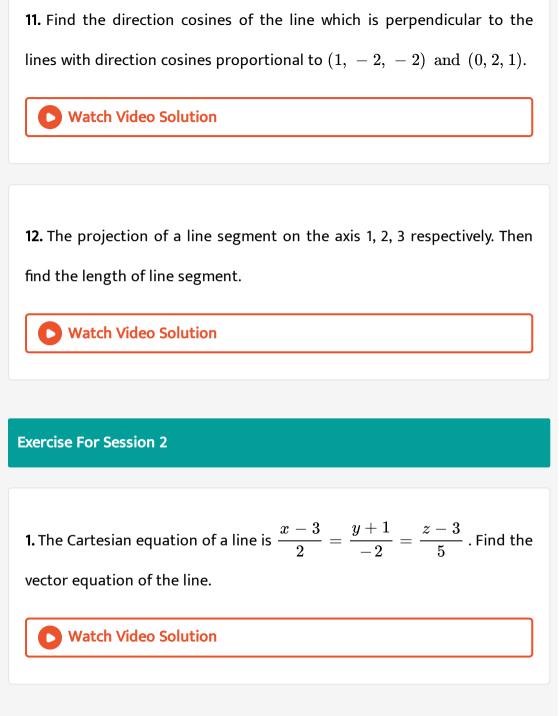
9. If $\cos \alpha$, $\cos \beta$ and $\cos \gamma$ are the direction cosine of a line, then find the

value of $\cos^2 lpha + (\cos eta + \sin \gamma) (\cos eta - \sin^2 \gamma).$

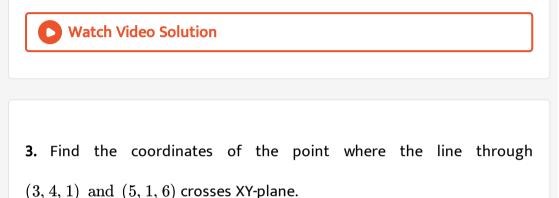
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10. A line makes angles $lpha, eta, \gamma, \delta$ with the diagonals of a cube, prove that

$$\cos^2lpha+\cos^2eta+\cos^2\gamma+\cos^2\delta=rac{4}{3}$$



2. 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 equations of the line in vector and Cartesian form.



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4. Find the angle between the pairs of line $r=3\hat{i}+2\hat{j}-4\hat{k}+\lambda\Big(\hat{i}+2\hat{j}+2\hat{k}\Big) ext{ and } \hat{r}=5\hat{i}-2\hat{j}+\mu\Big(3\hat{i}+2\hat{j}+6\hat{k}\Big)$

5. Show that the two lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ intersect each other . Find also the point of intersection.

6. Find the magnitude of the shortest distance between the lines

$$\frac{x}{2} = \frac{y}{-3} = \frac{z}{1} \text{ and } \frac{x-2}{3} = \frac{y-1}{-5} = \frac{z+2}{2}.$$
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7. Find the perpendicular distance of the point (1, 1, 1) from the line

$$\frac{x-2}{2} = \frac{y+3}{2} = \frac{z}{-1}.$$

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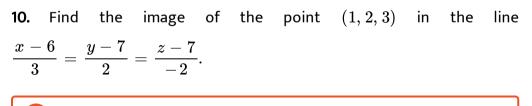
8. Find the equation of the line drawn through the point (1, 0, 2) to meet

at right angles to the line
$$rac{x+1}{3} = rac{y-2}{-2} = rac{z+1}{-1}.$$

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9. Find the equation of line through (1, 2, -1) and perpendicular to each of the lines $\frac{x}{1} = \frac{y}{0} = \frac{z}{-1}$ and $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$.

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Exercise For Session 3

1. Find the equation of plane passing through the point (1, 2, 3) and having the vector $r=2\hat{i}-\hat{j}+3\hat{k}$ normal to it.



2. Find a unit vector normal to the plane through the points (1, 1, 1), (-1, 2, 3) and (2, -1, 3).

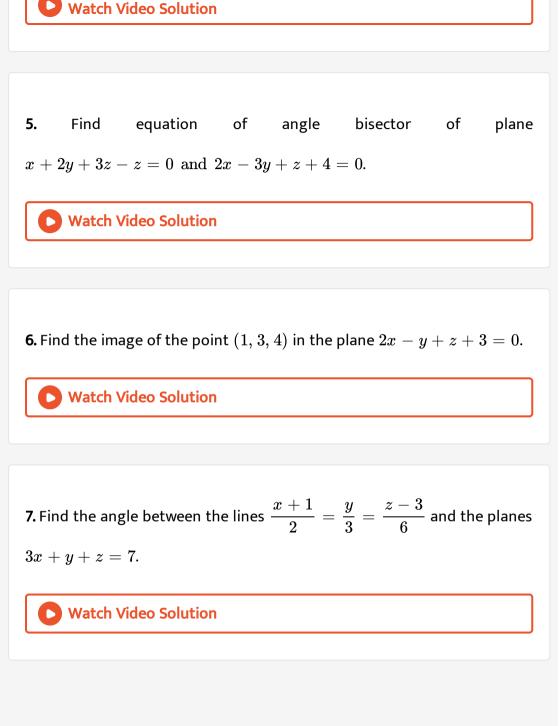
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3. Show that the four points S(0,-1,0), B(2,1,-1), C(1,1,1) and D(3,3,0) are coplanar. Find the equation of the plane containing them.



4. Find the equation of plane passing through the line of intersection of planes 3x + 4y - 4 = 0 and x + 7y + 3z = 0 and also through origin.





8. Find the equation of plane which passes through the point (1, 2, 0)and which is perpendicular to the plane x - y + z = 3 and 2x + y - z + 4 = 0.

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9. Find the distance of the point (-1, -5, -10) from the point of intersection

of the $rac{x-2}{3}=rac{y+1}{4}=rac{z-2}{12}$ and the plane x-y + z= 5.

10. 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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11. Find the equation of the plane which passes through the point (3, 4, -5) and contains the lines $\frac{x+1}{2} = \frac{y-1}{3} = \frac{z+2}{-1}$

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12. Find the equations of the planes parallel to the plane x - 2y + 2z - 3 = 0 which is at a unit distance from the point (1, 2, 3).

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13. Find the equation of the bisector planes 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 planes which bisects the obtuse angle.

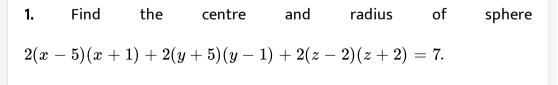
14. Find the equation of the image of the plane x - 2y + 2z - 3 = 0 in plane x + y + z - 1 = 0.



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

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Exercise For Session 4



2. Obtain the equation of the sphere with the points (1, -1, 1) and (3, -3, 3) as the extremities of a diametre and find the coordinate of its centre.

3. Find the equation of sphere which passes through (1, 0, 0) and has its centre on the positive direction of Y-axis and has radius 2.

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4. Find the equation of the sphere whose centre has the position vector

 $3\hat{i}+6\hat{j}-4\hat{k}$ and which touches the plane $r\cdot\left(2\hat{i}-2\hat{j}-\hat{k}
ight)=10.$

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5. Find the value of λ for which the plane $x+y+z=\sqrt{3}\lambda$ touches the

sphere $x^2 + y^2 + z^2 - 2x - 2y - 2z = 6$.

6. Find the equation the equation of sphere concentric with sphere $2x^2 + 2y^2 + 2z^2 - 6x + 2y - 4z = 1$ but double its radius.

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7. A sphere has the equation
$$|r-a|^2+|r-b|^2=72, wherea=\hat{i}+3\hat{j}-6\hat{k} ext{ and } b=2\hat{i}+4\hat{j}+2\hat{k}$$

Find

- (i) The centre of sphere
- (ii) The radius of sphere

(iii) Perpendicular distance from the centre of the sphere to the plane

$$r\cdot\left(2\hat{i}+2\hat{j}-\hat{k}
ight)+3=0.$$

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Exercise (Single Option Correct Type Questions)

1. The xy-plane divided the line joining the points(-1, 3, 4) and (2, -5, 6). a. Internally in the ratio 2:3 b. Internally in the ratio 3:2 c. externally in the ratio 2:3 d. externally in the ratio 3:2

A. Internally in the ratio 2:3

B. externally in the ratio 2:3

C. internally in the ratio 3:2

D. externally in the ratio 3:2

Answer: (b)

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2. Ratio in which the zx-plane divides the join of (1, 2, 3) and (4, 2, 1).

A. 1:1 internally

B. 1:1 externally

C. 2:1 internally

D. 2:1 externally

Answer: (b)



3. Given that p(3,2,-4) , Q (5,4, -6) and R (9,8,-10) are collinear find the ratio

in which Q divides PR

A. 3:2 internally

B. 3:1 externally

C. 2:1 internally

D. 2:1 externally

Answer: (b)

4. The points A(4, 5, 10), B(2, 3, 4) and C(1, 2, -1) are three vertices of a parallelogram ABCD. Find the vector equations of side AB and BC and also find the coordinates of point D.

A.
$$\left(\frac{19}{8}, \frac{57}{16}, \frac{17}{16}\right)$$

B. $\left(\frac{-19}{8}, \frac{57}{16}, \frac{17}{16}\right)$
C. $\left(\frac{19}{8}, -\frac{57}{16}, \frac{17}{16}\right)$

D. None of these

Answer: (a)

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

A.
$$\frac{2}{3}, -\frac{2}{3}, -\frac{1}{3}$$

B.
$$-\frac{2}{3}, \frac{2}{3}, \frac{1}{3}$$

C. $\frac{2}{3}, -\frac{2}{3}, \frac{1}{3}$
D. $\frac{2}{3}, \frac{2}{3}, \frac{1}{3}$

Answer: (a)

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6. If P is a point in space such that OP is inclined to OX at $45^{\,\circ}$ and OY to

 $60^{\,\circ}\,$ then OP inclined to ZO at

A. $75^{\,\circ}$

 ${\tt B.\,60}^{\,\circ}\,$ and $\,120^{\,\circ}\,$

C. $75^{\,\circ}\,$ and $\,105^{\,\circ}\,$

D. $255^{\,\circ}$

Answer: (b)

7. The direction cosines of the lines bisecting the angle between the line whose direction cosines are l_1, m_1, n_1 and l_2, m_2, n_2 and the angle between these lines is θ , are

$$\begin{array}{l} \mathsf{A.} \; \displaystyle \frac{l_1+l_2}{2\sin\left(\frac{\theta}{2}\right)}, \; \displaystyle \frac{m_1+m_2}{2\sin\left(\frac{\theta}{2}\right)}, \; \displaystyle \frac{n_1+n_2}{2\sin\left(\frac{\theta}{2}\right)} \\ \mathsf{B.} \; \displaystyle \frac{l_1+l_2}{2\cos\left(\frac{\theta}{2}\right)}, \; \displaystyle \frac{m_1+m_2}{2\cos\left(\frac{\theta}{2}\right)}, \; \displaystyle \frac{n_1+n_2}{2\cos\left(\frac{\theta}{2}\right)} \\ \mathsf{C.} \; \displaystyle \frac{l_1-l_2}{2\sin\left(\frac{\theta}{2}\right)}, \; \displaystyle \frac{m_1-m_2}{2\sin\left(\frac{\theta}{2}\right)}, \; \displaystyle \frac{n_1-n_2}{2\sin\left(\frac{\theta}{2}\right)} \\ \mathsf{D.} \; \displaystyle \frac{l_1-l_2}{2\cos\left(\frac{\theta}{2}\right)}, \; \displaystyle \frac{m_1-m_2}{2\cos\left(\frac{\theta}{2}\right)}, \; \displaystyle \frac{n_1-n_2}{2\cos\left(\frac{\theta}{2}\right)} \end{array}$$

Answer: (b)



8. The equation of the plane perpendicular to the line $\frac{x-1}{1}, \frac{y-2}{-1}, \frac{z+1}{2}$ and passing through the point (2, 3, 1). Is

A.
$$r\cdot\left(\hat{i}+\hat{j}+2\hat{k}
ight)=1$$

B. $r\cdot\left(\hat{i}-\hat{j}+2\hat{k}
ight)=1$
C. $r\cdot\left(\hat{i}-\hat{j}+2\hat{k}
ight)=7$

D. None of these

Answer: (b)



9. The locus of a point which moves so that the difference of the squares

of its distance from two given points is constant, is a

A. a) straight line

B. b) plane

C. c) sphere

D. d) None of these

Answer: (b)

10. The position vectors of points a and b are $\hat{i} - \hat{j} + 3\hat{k}$ and $3\hat{i} + 3\hat{j} + 3\hat{k}$ respectively. The equation of plane is $r \cdot (5\hat{i} + 2\hat{j} - 7\hat{k}) + 9 = 0$. The points a and b

A. (a) lie on the plane

B. (b) are on the same side of the plane

C. (c) are on the opposite side of the plane

D. (d) None of these

Answer: (c)

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11. The vector equation of the plane through the point $2\hat{i}-\hat{j}-4\hat{k}$ and parallel to the plane $r\cdot\left(4\hat{i}-12\hat{j}-3\hat{k}
ight)-7=0$ is

A.
$$r\cdot\left(4\hat{i}-12\hat{j}-3\hat{k}
ight)=0$$

B. $r\cdot\left(4\hat{i}-12\hat{j}-3\hat{k}
ight)=32$
C. $r\cdot\left(4\hat{i}-12\hat{j}-3\hat{k}
ight)=12$

D. None of these

Answer: (b)



12. Let vector be the $2\hat{i}+\hat{j}-\hat{k}$ then find the unit vector in the direction

of a vector

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13. 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

A. it lie in the plane x - y + z = 0

B. it is same as line
$$\displaystyle rac{x}{1} = \displaystyle rac{y}{2} = \displaystyle rac{z}{3}$$

C. it passes through (2, 3, 5)

D. it is parallel to the plane x - 2y + z - 6 = 0

Answer: (c)

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14. 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.

A. -2

B. 8

C. - 18

D. 11

Answer: (a)



15. 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



B.
$$\sqrt{\frac{271}{53}}$$

C. $\sqrt{\frac{472}{31}}$
D. $\sqrt{\frac{474}{35}}$

Answer: (d)



16. The number of planes that are equidistant from four non-coplanar

points is

 $\mathsf{B.4}$

 $\mathsf{C}.9$

D. 7

Answer: (c)

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17. In a three-dimensional coordinate system, P ,Q ,and R are images of a point A(a, b, c) in the xy, yz and zx planes, respectively. If G is the centroid of triangle PQR, then area of triangle AOG is (O is the origin)

A. (a) 0

B. (b)
$$a^2 + b^2 + c^2$$

C. (c) $rac{2}{3} ig(a^2 + b^2 + c^2 ig)$

D. (d) None of these

Answer: (a)



18. 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 A. $V \leq \frac{9}{2}$ B. $V \geq \frac{9}{2}$ C. $V = \frac{9}{2}$ D. None of these

Answer: (b)

19. The equation of the line passing through (1, 1, 1) and perpendicular to the line of intersection of the planes x + 2y - 4z = 0 and 2x - y + 2z = 0 is A. (1, 2, 3)B. (2, 4, 6)C. $\left(\frac{4}{3}, \frac{8}{3}, \frac{12}{3}\right)$ D. None of these

Answer: (b)

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20. The equation of the plane through the intersection of the planes x+y+z=1 and 2x+3y-z+4=0 and parallel to X-axis 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. $\left(-\frac{5}{3}, \frac{1}{3}, 0\right)$

Answer: (a)

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21. Two system 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.
$$\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} + \frac{1}{a'^2} + \frac{1}{b'^2} + \frac{1}{c'^2} = 0$$

B. $\frac{1}{a^2} - \frac{1}{b^2} - \frac{1}{c^2} - \frac{1}{a'^2} - \frac{1}{b'^2} - \frac{1}{c'^2} = 0$
C. $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} - \frac{1}{a'^2} - \frac{1}{b'^2} - \frac{1}{c'^2} = 0$
D. $\frac{1}{a^2} - \frac{1}{b^2} + \frac{1}{c^2} - \frac{1}{a'^2} + \frac{1}{b'^2} - \frac{1}{c'^2} = 0$

Answer: (c)

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

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

Answer: (c)

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23. Consider the following 3lines in space

$$egin{aligned} &L_1\!:\!r=3\hat{i}-\hat{j}+\hat{k}+\lambda\Big(2\hat{i}+4\hat{j}-\hat{k}\Big)\ &L_2\!:\!r=\hat{i}+\hat{j}-3\hat{k}+\mu\Big(4\hat{i}+2\hat{j}+4\hat{k}\Big)\ &L_3\!:=3\hat{i}+2\hat{j}-2\hat{k}+t\Big(2\hat{i}+\hat{j}+2\hat{k}\Big) \end{aligned}$$

Then, which one of the following part(s) is/ are in the same plane?

A. Only L_1L_2

B. Only L_2L_3

C. Only L_1L_3

D. L_1L_2 and L_2L_3

Answer: (d)

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24. Find the angle between the pair of lines $r = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$ $r = 5\hat{i} - 4\hat{k} + \mu(3\hat{i} + 2\hat{j} + 6\hat{k})$ A. $\hat{i} + 2\hat{j} + \hat{k}$ B. $2\hat{i} + \hat{j} + \hat{k}$ C. $\hat{i} + \hat{j} + 2\hat{k}$

D. None of these

Answer: (a)



25. Find the shortest distance between the lines given by the equations

$$egin{aligned} \overrightarrow{r} &= \left(\hat{i} - \hat{j} + 2\hat{k} + \lambda \left(2\hat{i} + \hat{j} + 4\hat{k}
ight), \ \overrightarrow{r} &= \left(2\hat{i} - 4\hat{j} + \hat{k}
ight) + \mu \left(3\hat{i} + \hat{j} - 5\hat{k}
ight). \end{aligned}$$
A. $rac{\phi}{6}$
B. $rac{\phi}{4}$
C. $rac{\phi}{3}$
D. $rac{\phi}{2}$

Answer: (a)

26. Find the angle between the line $r = \hat{i} + 2\hat{j} - \hat{k} + \lambda(\hat{i} - \hat{j} + \hat{k})$ and the plane $r \cdot (2\hat{i} - \hat{j} + \hat{k}) = 4$. A. II and IV B. I and IV C. Only IV D. III and IV

Answer: (b)

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27. Consider three vectors p = i + j + k, q = 2i + 4j - k and r = i + j + 3k. If p, q and r denotes the position vector of three non-collinear points, then the equation of the plane containing these points is

A. (a)
$$2x - 3y + 1 = 0$$

B. (b)
$$x - 3y + 2z = 0$$

C. (c)
$$3x - y + z - 3 = 0$$

D. (d)
$$3x - y - 2 = 0$$

Answer: (d)

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28. Find the equation of the plane with intercept 3 on the y-axis and parallel to ZOX plane.

A.
$$\frac{q}{r \cdot n}$$

B. $\frac{i \cdot n}{q}$
C. $(r \cdot n)q$
D. $\frac{q}{|n|}$

Answer: (a)

29.	If	the	distance	between	the	planes		
			4x + 6y - 7z			in the		
form ·	$\frac{1}{\sqrt{N}}$, wh	ere N is na	tural, then the	value of $\frac{N(N)}{N}$	$\frac{1}{2}$ + 1) is			
A.	4950							
В.	5050							
C.	5150							
D.	5151							
Answer: (d)								
0	Watch V	ideo Solut	ion					

30. A plane passes through the points P(4, 0, 0) and Q(0, 0, 4) and is parallel to the Y-axis. The distance of the plane from the origin is

B.4

 ${\rm C.}\,\sqrt{2}$

D. $2\sqrt{2}$

Answer: (d)

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31. What is 15% Equals to

A. 0.15

B. 1.5

C. 0.015

D. 0.0015

Answer: (a)

32. The plane XOZ divides the join of (1, -1, 5) and (2, 3, 4)in the ratio

of λ : 1, then λ is

A. -3B. $-\frac{1}{3}$ C. 3 D. $\frac{1}{3}$

Answer: (d)

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33. Find the value of x Equation is x + 7 = 6



34. Let a,b,c are three vectors of which every pair is non-collinear, if the vectors a+b and b+c are collinear with c annd a respectively, then find

a+b+c.

A. $5\sqrt{2}$

 $\mathsf{B.5}$

C.
$$\frac{5}{\sqrt{2}}$$

D.
$$\frac{5}{2}$$

Answer: (a)

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35. Equations of the line which passe through the point with position vector (2, 1, 0) and perpendicular to the plane containing the vectors i + j and j + k is

A.
$$r = (2, 1, 0) + t(1, -1, 1)$$

B. $r = (2, 1, 0) + t(-1, 1, 1)$
C. $r = (2, 1, 0) + t(1, 1, -1)$

D.
$$r = (2, 1, 0) + t(1, 1, 1)$$

Answer: (a)



36. Which of the following pairs of linear equations are consistent ? Obtain solution in such cases graphically :- 2x-3y=5 , 6x-4y=3 .

A. (a) P_2 and P_3

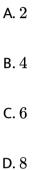
B. (b) P_2 and P_4

C. (c) P_1 and P_3

D. (d) P_1 and P_4

Answer: (c)

37. A parallelopiped is formed by planes drawn through the points (1, 2, 3) and (9, 8, 5) parallel to the coordinate planes, then which of the following Is not length of an edge of this rectangular parallelopiped?



Answer: (b)



38. Vector equation of the plane
$$r = \hat{i} - \hat{j} + \lambda \Big(\hat{i} + \hat{j} + \hat{k} \Big) + \mu \Big(\hat{i} - 2\hat{j} + 3\hat{k} \Big)$$
 in the scalar dot product form is

A.
$$r\cdot(5i-2j+3k)=7$$

B.
$$r \cdot (5i2j-3k) = 7$$

C.
$$r\cdot(5i-2j-3k)=7$$

D.
$$r \cdot (5i+2j+3k) = 7$$

Answer: (c)

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39. Find the shortest distance between the lines whose equations are :

$$ec{r}=2\hat{i}+3\hat{j}+\hat{k}+\lambda\Big(2\hat{i}-\hat{j}+3\hat{k}\Big)$$
 and $ec{r}=7\hat{i}+5\hat{j}+6\hat{k}+\mu\Big(\hat{i}+3\hat{j}+5\hat{k}\Big)$

A. skew lines all $p \in R$

B. intersecting for all $p \in R$ and the point of intersection is

$$(-1, 3, 4)$$

C. intersecting lines for $p=\ -2$

D. intersecting for all real $p \in R$

Answer: (c)



40. Consider the plane
$$(x, y, z) = (0, 1, 1) + \lambda(1, -1, 1) + \mu(2, -1, 0)$$
 The distance of this plane from the origin is

A. a)
$$\frac{1}{3}$$

B. b) $\frac{\sqrt{3}}{2}$
C. c) $\sqrt{\frac{3}{2}}$
D. d) $\frac{2}{\sqrt{3}}$

Answer: (c)

41.	The	value	of	а	for	which	th th	e lines
$rac{x-2}{1}$	$\frac{2}{2} = \frac{y-2}{2}$	$\frac{9}{2} = \frac{z-3}{3}$	$\frac{13}{}$ and	$\frac{x-a}{-1}$	$\frac{x}{x} = \frac{y}{x}$	$\frac{1-7}{2} =$	$rac{z+2}{-3}$ i	ntersect, is
A.	-5							
В.	-2							
C.	5							
D.	-3							

Answer: (d)

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42. 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

A. It lie 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 to the plane x - 2y + z - 6 = 0.

Answer: (c)

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43. Given planes $P_1: cy + bz = x$ $P_2: az + cx = y$ $P_3: bx + ay = z$ P_1, P_2 and P_3 pass through one line, if A. $a^2 + b^2 + c^2 = ab + bc + ca$ B. $a^2 + b^2 + c^2 + 2abc = 1$ C. $a^2 + b^2 + c^2 = 1$

D. $a^2 + b^2 + c^2 + 2ab + 2bc + 2ca + 2abc = 1$

Answer: (c)



44. 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.
$$k = 0$$
 and $k = -1$

B. k = 1 or -1

C. k = 0 or -3

D.
$$k = 3$$
 or -3

Answer: (c)

45. 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. ± 1

$$\mathsf{B.}\pmrac{1}{3}$$

 $C.\pm\sqrt{5}$

D. None of these

Answer: (c)

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46. The line which contains all points (x, y, z) which are of the form $(x, y, z) = (2, -2, 5) + \lambda(1, -3, 2)$ intersects the plane 2x - 3y + 4z = 163 at P and intersects the YZ-plane at Q. If the distance PQ is $a\sqrt{b}$, where $a, b \in N$ and a > 3, then (a + b) is equalto

A. (a)23

B. (b)95

C. (c)27

D. (d)None of these

Answer: (a)



47. If the position vectors of the points A,B and C be $\hat{i} + \hat{j}, \hat{i} - \hat{j}$ and $a\hat{i} + b\hat{j} + c\hat{k}$ respectively, then the points A,B and C are collinear, if

A. 1

 $\mathsf{B.}\,2$

C. 0

D. - 1

Answer: (b)



48. Find the equation of plane passing through the line of intersection of

planes 3x + 4y - 4 = 0 and x + 7y + 3z = 0 and also through origin.

A.
$$[n_2n_3n_4](r\cdot n_1-q_1)=[n_1n_3n_4](r\cdot n_2-q_2)$$

B.
$$[n_1n_2n_3](r\cdot n_4-q_4)=[n_4n_3n_1](r\cdot n_2-q_2)$$

C.
$$[n_4n_3n_1](r\cdot n_4-q_4)=[n_1n_2n_3](r\cdot n_2-q_2)$$

D. None of these

Answer: (a)

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49. A straight line is given by r = (1+t)i + 3tj + (1-t)k, where $t \in R$

. If this line lies in th plane x+y+cz=d , then the value of $\left(c+d
ight)$ is

A. (a) -1

B. (b) 1

C. (c) 7

D. (d) 9

Answer: (d)

50. Find the distance of the point (-1, -5, -10) from the point of intersection

of the
$$rac{x-2}{3}=rac{y+1}{4}=rac{z-2}{12}$$
 and the plane x-y + z= 5.
A. $2\sqrt{11}$
B. $\sqrt{126}$

C. 13

 $\mathsf{D}.\,14$

Answer: (c)

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51. What is the Next Prime Number after 7 ?

52. The three vectors $\hat{i} + \hat{j}$, $\hat{j} + \hat{k}$, $\hat{k} + \hat{i}$ taken two at a time form three planes, The three unit vectors drawn perpendicular to these planes form a parallelopiped of volume:

A.
$$\frac{1}{3}$$

B. 4
C. $3\frac{\sqrt{3}}{4}$
D. $\frac{4}{3\sqrt{3}}$

Answer: (d)



53. The orthogonal projection A' of the point A with position vector (1, 2, 3) on the plane 3x - y + 4z = 0 is

A.
$$(-1, 3, -1)$$

B. $\left(-\frac{1}{2}, \frac{5}{2}, 1\right)$
C. $\left(\frac{1}{2}, -\frac{5}{2}, -1\right)$

D.
$$(6, -7, -5)$$

Answer: (b)

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54. The equation of the line passing through (1, 1, 1) and perpendicular to the line of intersection of the planes x + 2y - 4z = 0 and 2x - y + 2z = 0 is

A.
$$\frac{x-1}{5} = \frac{1-y}{1} = \frac{z-1}{2}$$

B. $\frac{x-1}{-5} = \frac{1-y}{1} = \frac{z-1}{2}$
C. $\frac{x-1}{0} = \frac{1-y}{-10} = \frac{z-1}{-5}$
D. $\frac{x-1}{-10} = \frac{y+2}{0} = \frac{z-2}{-5}$

Answer: (a)

55. Find the value of x Equation is x + 7 = 4



56. The angle between the lines AB and CD, where A(0, 0, 0), B(1, 1, 1), C(-1, -1, -1) and D(0, 1, 0) is given by

$$A. \cos(\theta) = \frac{1}{\sqrt{3}}$$
$$B. \cos(\theta) = \frac{4}{3\sqrt{2}}$$
$$C. \cos(\theta) = \frac{1}{\sqrt{5}}$$
$$D. \cos(\theta) = \frac{1}{2\sqrt{2}}$$

Answer: (b)



57. The shortest distance of a point (1, 2, -3) from a plane making

intercepts 1, 2 and 3 units on position X, Y and Z-axes respectively, is

A. 2

B. 0 C. $\frac{13}{12}$ D. $\frac{12}{7}$

Answer: (b)



O(0, 0, 0), A(1, 2, 1), B(2, 1, 3) and C(-1, 1, 2). Then, the angle between the faces OAB and ABC will be

A.
$$\cos^{-1}\left(\frac{19}{35}\right)$$

B. $\cos^{-1}\left(\frac{17}{31}\right)$

C. 30°

D. 90°

Answer: (a)



59. The direction ratios of the line I_1 passing through P(1, 3, 4) and perpendicular to line $I_2\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ (where I_1 and I_2 are coplanar) is

A. 14, 8, 1

- B. -14, 8, -1
- C. 14, -8, -1
- D. 14, 8, 1

Answer: (c)

60. Equation of the plane through three points A, B and C with position vectors -6i + 3j + 2k, 3i - 2j + 4k and 5i + 7j + 3k is equal to

A.
$$r\cdot(i-j-7k)+23=0$$

$$\mathsf{B.}\,r\cdot(i+j+7k)=23$$

C.
$$r\cdot(i+j-7k)+23=0$$

D.
$$r \cdot (i-j-7k) = 23$$

Answer: (a)

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61. OABC is a tetrahedron. The position vectors of A, B and C are i, i + j and j + k, respectively. O is origin. The height of the tetrahedron (taking ABC as base) is

A.
$$\frac{1}{2}$$

B. $\frac{1}{\sqrt{2}}$

$$\mathsf{C}.\,\frac{1}{2\sqrt{2}}$$

D. None of these

Answer: (b)

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62. The plane x - y - z = 4 is rotated through an angle 90° about its line of intersection with the plane x + y + 2z = 4. Then the equation of the plane in its new position is

A.
$$x + y + 4z = 20$$

B. x + 5y + 4z = 20

C.
$$x + y - 4z = 20$$

D. 5x + y + 4z = 20

Answer: (d)

63. A_{xy}, A_{yz}, A_{zx} be the area of projections of an area on the xy,yz and zx and planes resepctively, then $A^2 = A_{xy}^2 + A_{yz}^2 + A_{zx}^2$

A.
$$A_{xy}^2 + A_{yz}^2 + A_{zx}^2$$

B. $\sqrt{A_{xy}^2 + A_{yz}^2 + A_{zx}^2}$
C. $A_{xy} + A_{yz} + A_{zx}$
D. $\sqrt{A_{xy} + A_{yz} + A_{zx}}$

Answer: (a)



64. Through a point P(h, k, l) a plane is drawn at righat angle to OP to

meet the coordinate axes in A, B and C. If OP = p show that the area of

$$riangle ABC$$
 is $rac{p^5}{2hkl}$

2

A.
$$\frac{p^3}{2hkl}$$

B.
$$\frac{p^3}{hkl}$$

C. $\frac{p^3}{2hkl}$
D. $\frac{p^3}{hkl}$

Answer: (a)

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65. The volume of the tetrahedron included between the plane

3x+4y-5z-60=0 and the co-odinate planes is

A. 60

 $B.\,600$

C. 720

 $\mathsf{D.}\,400$

Answer: (b)

66. Find the angle between the lines whose direction cosine are given by the equation: l+m+n=0 and $l^2+m^2-n^2=0$

A.
$$\cos^{-1}(2\sqrt{3})$$

B. $\cos^{-1}\sqrt{3}$
C. $\frac{\pi}{3}$
D. $\frac{\pi}{2}$

Answer: (c)

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67. The distance between the line $r=2\hat{i}-2\hat{j}+3\hat{k}+\lambda\Big(\hat{i}-\hat{j}+4\hat{k}\Big)$ and the plane $r\cdot\Big(\hat{i}+5\hat{j}+\hat{k}\Big)=5$, is

A.
$$\frac{10}{3\sqrt{3}}$$

B. $\frac{10}{3}$

C.
$$\frac{10}{9}$$

D. $\frac{10}{\sqrt{3}}$

Answer: (a)

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68. Differentiate x^5 with respect to x.

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69. 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 μ for which the vector \overrightarrow{PQ} is parallel to the plane x - 4y + 3z = 1 is

A.
$$\frac{1}{4}$$

B. $-\frac{1}{4}$
C. $\frac{1}{8}$

$$\mathsf{D.}-\frac{1}{8}$$

Answer: (a)



70. A plane makes intercepts OA, OB and OC whose measurements are b and c on the OX, OY and OZ axes. The area of $\triangle ABC$ is

A.
$$\frac{1}{2}(ab + bc + ac)$$

B. $\frac{1}{2}abc(a + b + c)$
C. $\frac{1}{2}(a^{2}b^{2} + b^{2}c^{2} + c^{2}a^{2})^{\frac{1}{2}}$
D. $\frac{1}{2}(a + b + c)^{2}$

Answer: (c)

71.	The	radius	of	the	circle	in	whi	ch	the	sphere
x^2 =	$= y^2 + z^2$	$z^{2} + 2z -$	2y -	4z - 1	19=0	is	cut	by	the	plane
x +	2y + 2z	z + 7 = 0	is							
۵	. 2									
В	. 3									
C	. 4									
D	0.1									

Answer: (b)

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72. 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)

Answer: (b)



73. 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. $(\frac{2}{3}, \frac{4}{3}, \frac{2}{3})$
B. $(-\frac{2}{3}, -\frac{4}{3}, \frac{2}{3})$
C. $(\frac{2}{3}, \frac{4}{3}, -\frac{2}{3})$
D. None of these

Answer: (a)

74. Find 3-dimensional vectors
$$\overrightarrow{v}_1, \overrightarrow{v}_2, \overrightarrow{v}_3$$
 satisfying
 $\overrightarrow{v}_1 \cdot \overrightarrow{v}_1 = 4, \overrightarrow{v}_1 \cdot \overrightarrow{v}_2 = -2, \overrightarrow{v}_1 \cdot \overrightarrow{v}_3 = 6,$
 $\overrightarrow{v}_2 \cdot \overrightarrow{v}_2 = 2, \overrightarrow{v}_2 \cdot \overrightarrow{v}_3 = -5, \overrightarrow{v}_3 \cdot \overrightarrow{v}_3 = 29$
A. (a) $\overrightarrow{v}_3 = -3\hat{i} + 2\hat{j} \pm 4\hat{k}$
B. (b) $\overrightarrow{v}_3 = 3\hat{i} - 2\hat{j} \pm 4\hat{k}$
C. (c) $\overrightarrow{v}_3 = -2\hat{i} + 3\hat{j} \pm 4\hat{K}$
D. (d) $\overrightarrow{v}_3 = 2\hat{i} + 3\hat{j} \pm 4\hat{k}$

Answer: (b)

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75. The position vectors of points a and b are $\hat{i} - \hat{j} + 3\hat{k}$ and $3\hat{i} + 3\hat{j} + 3\hat{k}$ respectively. The equation of plane is $r \cdot (5\hat{i} + 2\hat{j} - 7\hat{k}) + 9 = 0$. The points a and b

A. on the same sides of the plane

B. parallel of the plane

C. on the opposite sides of the plane

D. None of these

Answer: (c)

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76. A, B, C and D are four points in space. Using vector methods, prove that $AC^2 + BD^2 + AC^2 + BC^2 \ge AB^2 + CD^2$ what is the implication of the sign of equality.

A.
$$AB^2 + CD^2$$

B. $rac{1}{AB^2} - rac{1}{CD^2}$
C. $rac{1}{CD^2} - rac{1}{AB^2}$

D. None of these

Answer: (a)



77. Find the value of x Equation is `x+2=9

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78. If the three planes $r\cdot n_1=p_1, r\cdot n_2=p_2$ and $r\cdot n_3=p_3$ have a

common line of intersection, then $p_1(n_2 imes n_3) + p_2(n_3 imes n_1) + p_3(n_1 imes n_2)$ is equal to

$$\begin{array}{l} \mathsf{A.} \ \displaystyle \frac{1}{[n_1n_2n_3]} [q_3(n_1 \times n_2) + q_1(n_2 \times n_3) + q_2(n_3 \times n_1)] \\ \mathsf{B.} \ \displaystyle \frac{1}{[n_1n_2n_3]} [q_1(n_1 \times n_2) + q_1(n_2 \times n_3) + q_3(n_3 \times n_1)] \\ \mathsf{C.} \ \displaystyle - \frac{1}{[n_1n_2n_3]} [q_1(n_1 \times n_2) + q_1(n_2 \times n_3) + q_3(n_3 \times n_1)] \end{array}$$

D. None of these

Answer: (a)

79. A pentagon is formed by cutting a triangular corner from a rectangular piece of paper. The five sides of the pentagon have length 13, 19, 20, 25 and 31 not necessarily in that order. The area of the pentagon is

A. 459 sq. units

B. 600 sq. units

C. 680 sq. units

D. 745 sq. units

Answer: (d)

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80. In a three-dimensional coordinate system, P, Q, andR are images of a point A(a, b, c) in the x - y, y - zandz - x planes, respectively. If G is 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

A. 0

B.
$$a^2 + b^2 + c^2$$

C. $rac{2}{3} ig(a^2 + b^2 + c^2 ig)$

)

D. None of these

Answer: (a)

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81. A plane 2x + 3y + 5z = 1 has a point P which is at minimum distance from line joining A(1, 0, -3), B(1, -5, 7), then distance AP is equal

to

A. $3\sqrt{5}$

B. $2\sqrt{5}$

C. $4\sqrt{4}$

D. None of these

Answer: (b)



82. Evaluate
$$\int x^5 dx$$

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83. A cube $C = \{(x, y, z) \mid o \le x, y, z \le 1\}$ is cut by a sharp knife along the plane x = y, y = z, z = x. If no piece is moved until all three cuts are made, the number of pieces is

A. 6

B. 7

C. 8

D. 27

Answer: (a)

84. A ray of light is sent through the point P(1,2,3) and is reflected on the XY plane. If the reflected ray passes through the point Q(3,2,5) then the equation of the reflected ray is

A.
$$\frac{x-3}{1} = \frac{y-2}{0} = \frac{z-5}{1}$$

B. $\frac{x-3}{1} = \frac{y-2}{0} = \frac{z-5}{-4}$
C. $\frac{x-3}{1} = \frac{y-2}{0} = \frac{z-5}{4}$
D. $\frac{x-1}{1} = \frac{y-2}{0} = \frac{z-5}{4}$

Answer: (c)

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85. Find
$$rac{dy}{dx}$$
 if $2x - 3\sin x = 2y$

86. The shortest distance between any two opposite edges of the tetrahedron formed planes by x + y = 0, y + z = 0, z + x = 0, x + y + z = a is constant, equal to A. 2a $\mathsf{B}.\,\frac{2a}{\sqrt{6}}$ $\mathsf{C}.\,\frac{a}{\sqrt{6}}$ D. $\frac{2a}{\sqrt{3}}$ Answer: (b) Watch Video Solution

87. The angle between the pair of planes represented by equation $2x^2 - 2y^2 + 4z^2 + 6xz + 2yz + 3xy = 0$ is

A.
$$\cos^{-1}\left(\frac{1}{3}\right)$$

B. $\cos^{-1}\left(\frac{4}{21}\right)$

$$\mathsf{C.}\cos^{-1}\left(\frac{4}{9}\right)$$
$$\mathsf{D.}\cos^{-1}\left(\frac{7}{\sqrt{84}}\right)$$

Answer: (c)

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88. Find the value of x Equation is x + 1 = 1

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89. The four lines drawing from the vertices of any tetrahedron to the centroid to the centroid of the opposite faces meet in a point whose distance from each vertex is 'k' times the distance from each vertex to the opposite face, where k is

A.
$$\frac{1}{3}$$

B. $\frac{1}{2}$

C.
$$\frac{3}{4}$$

D. $\frac{5}{4}$

Answer: (c)

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90. The shorteast distance from (1, 1, 1) to the line of intersection of the

pair of planes $xy + yz + zx + y^2 = 0$ is

A.
$$\sqrt{\frac{8}{7}}$$

B. $\frac{2}{\sqrt{3}}$
C. $\frac{1}{\sqrt{3}}$
D. $\frac{2}{3}$

Answer: (a)

91. The shortest distance between the two lines $L_1: x = k_1, y = k_2$ and $L_2: x = k_3, y = k_4$ is equal to

A.
$$\left|\sqrt{k_1^2 + k_2^2} - \sqrt{k_3^2 + k_4^2}\right|$$

B. $\sqrt{k_1k_3 + k_3k_4}$
C. $\sqrt{(k_1 + k_3)^2 + (k_2 + k_4)^2}$
D. $\sqrt{(k_1 - k_3)^2 + (k_2 - k_4)^2}$

Answer: (d)

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92.
$$A = \begin{bmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{bmatrix}$$
 and $B = \begin{bmatrix} p_1 & q_1 & r_1 \\ p_2 & q_2 & r_2 \\ p_3 & q_3 & r_3 \end{bmatrix}$

Where p_i , q_i , r_i are the co-factors of the elements l_i , m_i , n_i for i = 1, 2, 3. If (l_1, m_1, n_1) , (l_2, m_2, n_2) and (l_3, m_3, n_3) are the direction cosines of three mutually perpendicular lines then (p_1, q_1, r_1) , (p_2, q_2, r_2) and (p_3, q, r_3) are A. the direction cosines of three mutually perpendicular lines

B. the direction ratios of three mutually perpendicular lines which are

not direction cosines

C. the direction cosines of three lines which need be perpendicular

D. the direction ratios but not the direction cosines of three lines

which need not be perpendicular

Answer: (a)

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93. ABCD is a tetrahedron such that each of the $\ riangle ABC$, $\ riangle ABD$ and

riangle ACD has a right angle at A. If $ar(riangle ABC) = k_1. \ Ar(riangle ABD) = k_2, \ ar(riangle BCD) = k_3$ then ar(riangle ACD) is

A.
$$\sqrt{k_1^2+k_2^2+k_3^2}$$

B. $\sqrt{rac{k_1k_2k_3}{k_1^2+k_2^2+k_3^2}}$

C.
$$\sqrt{\left|\left(k_1^2+k_2^2-k_3^2
ight)
ight|}$$

D. $\sqrt{\left|\left(k_1^2-k_2^2-k_3^2
ight)
ight|}$

Answer: (c)

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94. What is 13% Equals to

A. 0.13

B. 1.3

C. 0.013

D. 0.0013

Answer: (a)

95. A variable plane makes intercepts on X, Y and Z-axes and it makes a tetrahedron of volume 64cu. Units. The locus of foot of perpendicular from origin on this plane is

A. (a)
$$\left(x^2+y^2+z^2
ight)=384xyz$$

B. (b)xyz = 681

C. (c)
$$(x+y+z)igg(rac{1}{x}+rac{1}{y}+rac{1}{z}igg)^2=16$$

D. (d)
$$xyz(x+y+z)=81$$

Answer: (a)

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96. Find the multiplication of 225 imes 0

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Exercise (More Than One Correct Option Type Questions)

1. Given the equation of the line 3x - y + z + 1 = 0 and 5x + y + 3z = 0. Then, which of the following is correct?

A. Symmetrical form of the equation of line is $rac{x}{2}=rac{y-rac{1}{8}}{-1}=rac{z+rac{5}{8}}{1}.$

B. Symmetrical form of the equation of line is

$$\frac{x+\frac{1}{8}}{1} = \frac{y-\frac{5}{8}}{-1} = \frac{z}{-2}$$

C. Equation of the through (2, 1, 4) and perpendular to the given lines

is
$$2x-y+z-7=0.$$

D. Equation of the plane through (2, 1, 4) and perpendicular to the

given lines is x + y - 2z + 5 = 0.

Answer: (b, d)

2. Form the differential equation of the family of circles in the second quadrant and touching the coordinate axes.

A. Each member of this family is equally inclined with coordinate axes.

B.
$$\sin^2(lpha)+\sin^2(\gamma)+\sin^2(eta)=1$$

 $\mathsf{C}.\cos^2(lpha)+\cos^2(eta)+\cos^2(\gamma)=2$

D. For c=3 area of the $\triangle PQRis3\sqrt{3}$ sq. units.

Answer: (a, b, c)

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1

3. Find the angle between the planes

$$2x + y + z - 1 = 0$$
 and $3x + y + 2z - 2 = 0$,
A. $x - 1 = 0$, $7x + 17y - 3z - 134 = 0$
B. $x - 1 = 0$, $9x + 15y - 5z - 19 = 0$
C. $x = 1 - 0$, $\frac{y - 1}{2} - \frac{z - 1}{2}$

3

D.
$$x - 2y + 2z - 1 = 0$$
, $9x + 15y - 5z - 19 = 0$

Answer: (b,c)

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4. Through the point P(h, k, l) a plane is drawn at right angles to OP to meet co-ordinate axes at A, B and C. If OP=p, $A_x y$ is area of projetion of \triangle (*ABC*) on xy-plane. $A_z y$ is area of projection of \triangle (*ABC*) on yz-plane, then

$$\begin{array}{l} \mathsf{A. (a)} \bigtriangleup &= \left| \frac{p^5}{hkl} \right| \\ \mathsf{B. (b)} \bigtriangleup &= \left| \frac{p^5}{2hkl} \right| \\ \mathsf{C. (c)} \frac{A_x y}{A_y z} = \left| \frac{1}{h} \right| \\ \mathsf{D. (d)} \frac{A_x y}{A_y z} = \left| \frac{h}{l} \right| \end{array}$$

Answer: (b, e)

5. Which of the following statements is/are correct?

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6. Which of the following is/are correct about a tetrahedron?

A. (a)Centroid of a tetrahedron lies on lines joining any vertex to the

center of opposite faces.

B. (b)Centroid of the a tetrahedron lies on lines joining the mid point

of the opposite faces.

C. (c)Distance of centroid from all the vertices are equal.

D. (d)None of these

Answer: (a, b)

7. A variable plane is at a distance, k from the origin and meets the coordinates axis in A, B , C. Then, the locus of the centroid of $\triangle ABC$ is

A.
$$x^{-2} + y^{-2} + z^{-2} = (16)$$

B. $x^{-2} + y^{-2} + z^{-2} = 9$
C. $\frac{1}{9} \left(\frac{1}{x^2 + \frac{1}{y^2} + \frac{1}{z^2}} \right) = 0$
D. $X + Y = 0$

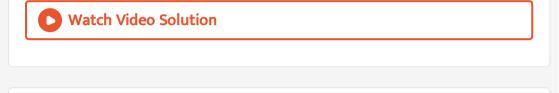
Answer: (b,c)

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8. Find the equation of the plane containing the line : $\frac{x+1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ and perpendicular to the plane 3x - 2y - z = 4. A. $\frac{A}{a} = \frac{B}{b} = \frac{C}{c}$ is true for the line to be perpendicular to the plane. B. A(a+3) + B(b-1) + C(c-2) = 0 $\mathsf{C.}\,2aA+3bB+4cC=0$

 $\mathsf{D}.\,Aa + Bb + Cc = 0$

Answer: (a, d)



9. The line
$$rac{x-2}{3}=rac{y+1}{2}=rac{z-1}{-1}$$
 intersects the curve $x^2+y^2=r^2, z=0,$ then

A. Equation of the following through (0, 0, 0) perpendicular to the

given line is 3x + 2y - z = 0

B. $r=\sqrt{26}$

 $\mathsf{C.}\,r=6$

 $\mathsf{D.}\,r=7$

Answer: (a, b)

10. A vector equally inclined to the vectors $\hat{i} - \hat{j} + \hat{k} \, ext{ and } \, \hat{i} + \hat{j} - \hat{k}$ then

the plane containing them is

A.
$$rac{\hat{i}+\hat{j}-\hat{k}}{\sqrt{3}}$$

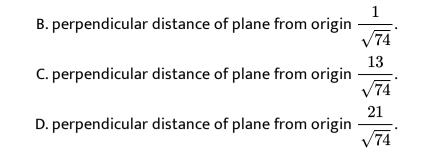
B. $\hat{j}-\hat{k}$
C. $2\hat{i}$
D. \hat{i}

Answer: (c, d)



11. Find the equations of the line through the point (1, -2, -3) and parallel to the vector $2\hat{i} + 3\hat{j} + 4\hat{k}$ in Cartesian form.

A. The equation of the plane through the given point is 3x - 4y + 7z + 13 = 0.



Answer: (a,c)

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12. A plane passes through a fixed point (a, b, c) and direction ratios of

the normal to the plane are (2, 3, 4) find the equation of the plane

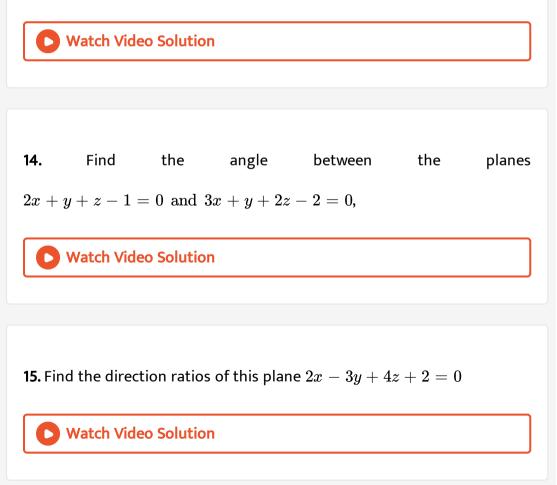


13. Let A be vector parallel to line of intersection of planes P_1 and P_2 . Plane P_1 is parallel to the vectors $2\hat{j} + 3\hat{k}$ and $4\hat{j} - 3\hat{k}$ and that P_2 is parallel to $\hat{j} - \hat{k}$ and $3\hat{i} + 3\hat{j}$, then the angle between vector A and a given vector $2\hat{i} + \hat{j} - 2\hat{k}$ is

A.
$$\frac{\phi}{2}$$

B. $\frac{\phi}{4}$
C. $\frac{\phi}{6}$
D. $\frac{3\phi}{4}$

Answer: (b, d)



16. A line segment has length 63 and direction ratios are 3, -2 and 6. The components of line vector are

A. -27, 18, 54B. 27, -18, -54C. 27, -18, 54

 ${\rm D.}-27,\,18,\ -54$

Answer: (c, d)

17. 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. a) $k = 0$
B. b) $k = -1$
C. c) $k = 2$

D. d) k = -3

Answer: (a, d)

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18. The points A(4, 5, 10), B(2, 3, 4) and C(1, 2, -1) are three vertices of a parallelogram ABCD. Find the vector equations of side AB and BC and also find the coordinates of point D.

A. Vector equation of AB is
$$2i + 3j + 4k + \lambda(i + j + 3k)$$

B. Cartesian equation of BC is $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-5}$
C. Coordinate of D are $(3, 4, 5)$

D. ABCD is a rectangle.

Answer: (a,b, c)

19. The lines x=y=z meets the plane x+y+z=1 at the point P and the sphere $x^2+y^2+z^2=1$ at the point R and S, then

A. (a)
$$PR + PS = 2$$

B. (b)
$$PR imes PS=rac{2}{3}$$

C. (c)
$$PR = PS$$

D. (d)
$$PR + PS = RS$$

Answer: (a, b, d)

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20. Evaluate
$$\int 4x^5 dx$$

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21. Consider the planes 2x + y + z + 4 = 0, and y - z + 4 = 0 Find

the angle between them



22. The volume of a right triangular prism $ABCA_1B_1C_1$ is equal to 3 cubic unit. Then the co-ordinates of the vertex A_1 , if the co-ordinates of the base vertices of the prism are A(1,0,1), B(2,0,0) and C(0,1,0), are

A. (-2, 0, 2)

B. (0, -2, 0)

C.(0, 2, 0)

D.(2, 2, 2)

Answer: (b, d)

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23. Find the multiplication of 34 imes 0

24. Let OABC be a regular tetrahedron with side length unity, then its volume (in cubic units) is

A. the length of perpendicular from one vertex to opposite face is

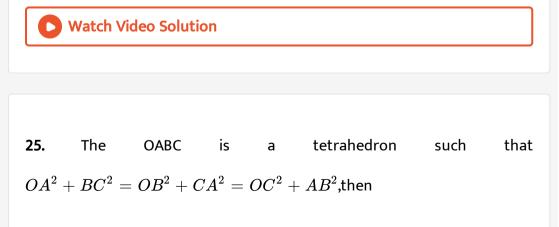
 $\sqrt{\frac{2}{3}}$

B. the perpendicular distance from mid-point \overline{OA} to the plane ABC is



- C. the angle between two skew edges to $\frac{\phi}{2}$
- D. the distance of centroid of the tetrahedron form any vertex is $\sqrt{\frac{3}{8}}$.

Answer: (a, b, c, d)



A. $OA\perp BC$

 $\mathbf{B}.\,OB\perp AC$

 $\mathsf{C}.\mathit{OC}\perp AB$

D. $AB \perp AC$

Answer: (a, b, c)

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26. If the line $rac{x}{1}=rac{y}{2}=rac{z}{3}$ then convert this in a vector form

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27. Let PM be the perpendicular form the point P(1,2,3) to the x-y plnae. If \overrightarrow{OP} makes an $\angle \theta$ with the positive driection of the z-axis and \overrightarrow{OM} makes an $\angle \phi$ with the positive direction of x-axis, where O is the origin and θ and ϕ are acute angles, then

A.
$$an(heta)=rac{\sqrt{5}}{3}$$

$$\begin{array}{l} \texttt{B.} \sin(\theta) \sin(\phi) = \frac{2}{\sqrt{14}} \\ \texttt{C.} \tan(\theta) = 2 \\ \texttt{D.} \cos(\theta) \cos(\phi) = \frac{1}{\sqrt{14}} \end{array}$$

Answer: (a, b, c)

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28. Find
$$rac{dy}{dx}$$
 if $y = \log(\log x)$

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Exercise (Statement I And Ii Type Questions)

1. let
$$\overrightarrow{a} = \left(\hat{i} + \hat{j} + \hat{k}
ight)$$
 then find the unit vector along this vector

2. Find
$$\overrightarrow{a} + \overrightarrow{b}$$
 if $\overrightarrow{a} = \hat{i} - \hat{j}$ and $\overrightarrow{b} = 2\hat{i}$

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3. Statement 1 : Let θ 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.

- A. Statement I is true, Statement II is also true, Statement-II is the correct explanation of Statement-I.
- B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (a)

4. Statement-I A point on the straight line 2x + 3y - 4z = 5 and 3x - 2y + 4z = 7 can be determined by taking x=k and then solving the two for equation for y and z, where k is any real number.

Statement-II If $c' \neq kc$, then the straight line ax + by + cz + d = 0, Kax + Kby + c'z + d' = o does not intersect the plane $z = \alpha$, where α is any real number.

A. Statement I is true, Statement II is also true, Statement-II is the correct explanation of Statement-I.

B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (b)

5. Let the line L having equation $\frac{x-1}{3} = \frac{y-3}{5} = \frac{z-1}{3}$ intersects the plane P, having equation x - y + z = 5 at the point A. Find the point

А

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6. Given lines
$$\frac{x-4}{2} = \frac{y+5}{4} = \frac{z-1}{-3}$$
 and $\frac{x-2}{1} = \frac{y+1}{3} = \frac{z}{2}$

Statement-I The lines intersect.

Statement-II They are not parallel.

A. a) Statement I is true, Statement II is also true, Statement-II is the

correct explanation of Statement-I.

B. b) Statement-I is true, Statement-II is also true, Statement-II is not

the correct explanation of Statement-I.

C. c) Statement-I is true, Statement-II is false.

D. d) Statement-I is false, Statement -II is true.

Answer: (d)

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7. Consider the lines $L_1: r = a + \lambda b$ and $L_2: r = b + \mu a$, where a and b are non zero and non collinear vectors.

Statement-I L_1 and L_2 are coplanar and the plane containing these lines passes through origin.

Statement-II $(a - b) \cdot (a \times b) = 0$ and the plane containing L_1 and L_2 is [r a b]=0 which passe through origin.

A. Statement-I is true, Statement II is also true, Statement-II is the

correct explanation of Statement-I.

B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (a)



8. P is a point (a, b, c). Let A, B, C be images of P in y - z, z - x and x - y planes respectively, then the equation of the plane ABC is

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9. Statement-I If the vectors a and c are non collinear then the lines $r = 6a - c + \lambda(2c - a)$ and $r = a - c + \mu(a + 3c)$ are coplanar. Statement-II There exist λ and μ such that the two values of r in Statement-I becomes same.

A. Statement-I is true, Statement II is also true, Statement-II is the

correct explanation of Statement-I.

B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (a)

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10. Statement 1: The lines $\frac{x-1}{1} = \frac{y}{-1} = \frac{z+1}{1}$ and $\frac{x-2}{2} = \frac{y+1}{2} = \frac{z}{3}$ are coplanar and the equation of the plnae containing them is 5x + 2y - 3z - 8 = 0Statement 2: The line $\frac{x-2}{1} = \frac{y+1}{2} = \frac{z}{3}$ is perpendicular to the plane 3x + 5y + 9z - 8 = 0 and parallel to the plane x + y - z = 0

A. Statement-I is true, Statement II is also true, Statement-II is the correct explanation of Statement-I.

B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (a)

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11. 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 $2x_1 - y_1 = 1, x_1 + 3y_1 = 4and 3x - 1 + 2y_1 = 5$ are consistent.

- A. Statement-I is true, Statement II is also true, Statement-II is the correct explanation of Statement-I.
- B. Statement-I is true, Statement-II is also true, Statement-II is not the correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (b)

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

A. Statement-I is true, Statement II is also true, Statement-II is the correct explanation of Statement-I.

B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (a)



13. Consider three planes

 $P_1: x - y + z = 1$,

- $P_2\colon x+y-z=\ -1$ and
- $P_3 \colon x 3y + 3z = 2$

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.

Statement 2: The three planes do not have a common point

A. Statement-I is true, Statement II is also true, Statement-II is the

correct explanation of Statement-I.

B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (a)

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14. Statemen-I The locus of a point which is equidistant from the point whose position vectors are $3\hat{i} - 2\hat{j} + 5\hat{k}$ and $(\hat{i} + 2\hat{j} - \hat{k})$ is $r(\hat{i} - 2\hat{j} + 3\hat{k}) = 8.$

Statement-II The locus of a point which is equidistant from the points whose position vectors are a and b is $\left|r - \frac{a+b}{2}\right| \cdot (a-b) = 0.$

A. Statement-I is true, Statement II is also true, Statement-II is the

correct explanation of Statement-I.

B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (a)

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Exercise (Passage Based Questions)

1. Let A(1, 2, 3), B(0, 0, 1) and C(-1, 1, 1) are the vertices of $\triangle ABC$.

Q. The equation of internal angle bisector through A to side BC is

$$\begin{array}{l} \mathsf{A.}\,r=\,\hat{i}+2\hat{j}+3\hat{k}+\mu\Big(3\hat{i}+2\hat{j}+3\hat{k}\Big)\\\\ \mathsf{B.}\,r=\,\hat{i}+2\hat{j}+3\hat{k}+\mu\Big(3\hat{i}+4\hat{j}+3\hat{k}\Big)\\\\ \mathsf{C.}\,r=\,\hat{i}+2\hat{j}+3\hat{k}+\mu\Big(3\hat{i}+3\hat{j}+2\hat{k}\Big)\\\\ \mathsf{D.}\,r=\,\hat{i}+2\hat{j}+3\hat{k}+\mu\Big(3\hat{i}+3\hat{j}+4\hat{k}\Big)\end{array}$$

Answer: (d)



2. Let A(1, 2, 3), B(0, 0, 1) and C(-1, 1, 1) are the vertices of $\triangle ABC$.

The equation of altitude through B to side AC is

$$egin{aligned} \mathsf{A}.\,r &= k + t \Big(7 \hat{i} - 10 \hat{j} + 2 \hat{k} \Big) \ \mathsf{B}.\,r &= k + t \Big(0 \hat{i} + 3 \hat{j} + 2 \hat{k} \Big) \ \mathsf{C}.\,r &= k + t \Big(7 \hat{i} - 10 \hat{j} - 2 \hat{k} \Big) \ \mathsf{D}.\,r &= k + t \Big(7 \hat{i} + 10 \hat{j} + 2 \hat{k} \Big) \end{aligned}$$

Answer: (b)

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3. Let A(1,2,3), B(0,0,1) and C(-1,1,1) are the vertices of $\triangle ABC$.

The equation of altitude through B to side AC is

$$egin{aligned} \mathsf{A}.\,r &= \,-\,\hat{i}\,+\,\hat{j}\,+\,\hat{k}\,+\,pig(3\hat{i}\,-\,2\hat{k}ig) \ \mathsf{B}.\,r &=\,\,-\,\hat{i}\,+\,\hat{j}\,+\,\hat{k}\,+\,pig(3\hat{i}\,+\,2\hat{k}ig) \ \mathsf{C}.\,r &=\,\,-\,\hat{i}\,+\,\hat{j}\,+\,\hat{k}\,+\,pig(\,-\,3\hat{i}\,+\,2\hat{k}ig) \ \mathsf{D}.\,r &=\,\,-\,\hat{i}\,+\,\hat{j}\,+\,\hat{k}\,+\,pig(3\hat{i}\,+\,2\hat{k}ig) \end{aligned}$$

Answer: (b)



- 4. Let A(1,2,3), B(0,0,1) and C(-1,1,1) are the vertices of $\triangle ABC$.
- Q. The area of (riangle ABC) is equal to

A.
$$\frac{9}{2}$$

B. $\frac{\sqrt{17}}{2}$
C. $\frac{17}{2}$
D. $\frac{7}{2}$

Answer: (b)



5. Consider a plane x + y - z = 1 and point A(1, 2, -3). A line L has

the equation x = 1 + 3r, y = 2 - r and z = 3 + 4r.

The coordinate of a point B of line L such that AB is parallel to the plane is

A. (10, -1, 15)B. (-5, 4, -5)C. (4, 1, 7)D. (-8, 5, -9)

Answer: (d)

6. Find the image of point (1, 2, -1) in the plane 2x + y - z = 10.

A. x - 3y + 5 = 0B. x + 3y - 7 = 0C. 3x - y - 1 = 0D. 3x + y - 5 = 0

Answer: (b)

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7. Consider a triangular pyramid ABCD the position vectors of whone agular points are A(3, 0, 1), B(-1, 4, 1), C(5, 3, 2) and D(0, -5, 4)Let G be the point of intersection of the medians of the triangle BCT. The length of the vector \overline{AG} is

A. $(\sqrt{17})$ B. $\frac{\sqrt{51}}{3}$

$$\mathsf{C}.\,\frac{\sqrt{51}}{9}$$
$$\mathsf{D}.\,\frac{\sqrt{59}}{4}$$

Answer: (b)

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8. Consider a triangular pyramid ABCD the position vectors of whose angular points are A(3, 0, 1), B(-1, 4, 1), C(5, 2, 3) and D(0, -5, 4). Let G be the point of intersection of the medians of triangle BCD. Q. Area of triangle ABC in sq. units is

 $\mathsf{A.}\,24$

B. $8\sqrt{6}$

 $\mathsf{C.}\,4\sqrt{6}$

D. None of these

Answer: (c)



9. Consider a triangular pyramid ABCD the position vectors of whone agular points are A(3, 0, 1), B(-1, 4, 1), C(5, 3, 2) and D(0, -5, 4) Let G be the point of intersection of the medians of the triangle BCD. The length of AG is

A. (a)
$$\frac{\sqrt{51}}{3}$$

B. (b) $\sqrt{17}$

C. (c) $\sqrt{5}$

D. (d) None of these

Answer: (a)



10. Consider a triangular pyramid ABCD the position vectors of whone agular points are A(3, 0, 1), B(-1, 4, 1), C(5, 3, 2) and D(0, -5, 4)

Let G be the point of intersection of the medians of the triangle BCD. The length of AG is

A. x + y + 2z = 5B. x - y - 2z = 1C. 2x + y - 2z = 4D. x + y - 2z = 1

Answer: (d)

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11. A line L_1 passes through the point 3i and parallel to the vector – i + j +

k and another line L_2 passes through the point i + j and parallel to the

vector i + k then point of intersection of the lines is

12. A line L_1 passing through a point with position vector p = i + 2h + 3k and parallel a = i + 2j + 3k, Another line L_2 passing through a point with position vector to b = 3i + j + 2k. Q. The minimum distance of origin from the plane passing through the

point with position vector p and perpendicular to the line L_2 , is

A. a.
$$\frac{x-2}{2} = \frac{y-3}{-1}, \frac{z-2}{1}$$

B. b. $\frac{x-2}{2} = y+3 = z-2$
C. c. $\frac{x-2}{-4} = \frac{y+3}{3}, \frac{z-5}{2}$
D. d. $\frac{x+2}{4} = \frac{y+3}{3}, \frac{z-2}{-5}$

Answer: (c)



13. A line L_1 passing through a point with position vector p = i + 2h + 3k and parallel a = i + 2j + 3k, Another line L_2 passing through a point with direction vector to b = 3i + j + 2k. Q. The

minimum distance of origin from the plane passing through the point with position vector p and perpendicular to the line L_2 , is

A. (a) $\sqrt{14}$

B. (b)
$$\frac{7}{\sqrt{14}}$$

C. (c) $\frac{11}{\sqrt{14}}$

D. (d)None of these

Answer: (b)

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14. For positive I, m and n, if the points x = ny + mz, y = lz + nx, z = mx + ly intersect in a straight line, when Q. $\cos e^{-1}(l) + \cos^{-1}(m) + \cos^{-1}(n)$ is equal to A. $l^2 + m^2 + n^2 = 2$

B.
$$l^2 + m^2 + n^2 + 2m \ln = 1$$

$$\mathsf{C.}\, l^2 + m^2 + n^2 = 1$$

D. None of these

Answer: (b)

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15. For positive I, m and n, if the points x = ny + mz, y = lz + nx, z = mx + ly intersect in a straight line, when

Q. l, m and n satisfy the equation

A. (l)²⁺(m)²⁺(n)²⁼²

B. (l)²+(M)²+(n)²+2mln=1

C. (I)²+(M)²+(n)²=1

D. None of these

Answer: (c)



16. If
$$a=6\hat{i}+7\hat{j}+7\hat{k}, b=3\hat{i}+2\hat{j}-2\hat{k}, P(1,2,3)$$

Q. The position vector of L, the foot of the perpendicular from P on the line $r=a+\lambda b$ is

A. $6\hat{i} + 7\hat{j} + 7\hat{k}$ B. $3\hat{i} - 2\hat{j} - 2\hat{k}$ C. $3\hat{i} + 5\hat{j} + 9\hat{k}$ D. $9\hat{i} + 9\hat{j} + 9\hat{k}$

Answer: (c)

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17. lf $a=6\hat{i}+7\hat{j}+7\hat{k}, b=3\hat{i}+2\hat{j}-2\hat{k}, P(1,2,3)$

Q. The position vector of L, the foot of the perpendicular from P on the line $r=a+\lambda b$ is

A. (11, 12, 11)

- B. (5, 2, -7)
- C.(5, 8, 15)
- D. (17, 16, 7)

Answer: (c)

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18. If $\overrightarrow{a} = 6\hat{i} + 7\hat{j} + 7\hat{k}$, find the unit vector along with this vector

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19. If A(-2, 2, 3) and B(13, -3, 13) are two points. Find the locus of a point P which moves in such a way that 3PA = 2PB.

A.
$$x^2 + y^2 + z^2 + 28x - 12y + 10z - 247 = 0$$

B. $x^2 + y^2 + z^2 - 28x + 12y + 10z - 247 = 0$

C.
$$x^2 + y^2 + z^2 + 28x - 12y - 10z - 247 = 0$$

D.
$$x^2 + y^2 + z^2 - 28x + 12y - 10z - 247 = 0$$

Answer: (a)

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20. A(-2,2,3) and B(13, -3,13) and L is a line through A.

Q. Coordinate of the line point P which divides the join of A and B in the

ratio 2:3 internally are

A. $\left(\frac{33}{5}, -\frac{2}{5}, 9\right)$ B. (4, 0, 7)C. $\left(\frac{32}{5}, -\frac{12}{5}, \frac{17}{5}\right)$ D. (20, 0, 35)

Answer: (b)

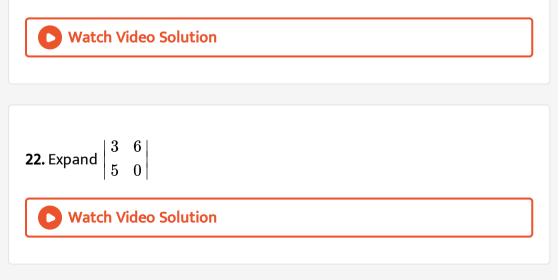
21. A(-2,2,3) and B(13, -3, 13) and L is a line through A.

Q. Equation of a line L, perpendicular to the line AB is

A.
$$\frac{x+2}{15} = \frac{y-2}{-5} = \frac{z-3}{10}$$

B. $\frac{x-2}{3} = \frac{y+2}{13} = \frac{z+3}{2}$
C. $\frac{x+2}{3} = \frac{y-2}{13} = \frac{z-3}{2}$
D. $\frac{x-2}{15} = \frac{y+2}{-5} = \frac{z+3}{10}$

Answer: (c)



23. If b be the foot of perpendicular from A to the plane $r\cdot \widehat{n}=d$, then b

must be

A.
$$a+(d-a\cdot\widehat{n})\widehat{n}$$

B. $a-(d-a\widehat{n})\widehat{n}$
C. $a+a\cdot\widehat{n}$

D. $a-a\cdot \widehat{n}$

Answer: (a)

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24. What is vector equation of the line



25. A circle is the locus of a point in a plane such that its distance from a

fixed point in the plane is constant. Anologously, a sphere is the locus of a

point in space such that its distance from a fixed point in space in constant. The fixed point is called the centre and the constant distance is called the radius of the circle/sphere. In anology with the equation of the circle |z-c|=a, the equation of a sphere of radius is |r-c|=a, where c is the position vector of the centre and r is the position vector of any point on the surface of the sphere. In Cartesian system, the equation sphere, with centre at (-g, -f, -h)the is of $x^2+y^2+z^2+2gx+2fy+2hz+c=0$ and its radius is $\sqrt{f^2+g^2+h^2-c}$. Q. Radius of the sphere, with (2, -3, 4) and (-5, 6, -7) as xtremities of a diameter, is

A. (a)
$$\sqrt{\frac{251}{2}}$$

B. (b) $\sqrt{\frac{251}{3}}$
C. (c) $\sqrt{\frac{251}{4}}$
D. (d) $\sqrt{\frac{251}{5}}$

Answer: (c)

26. A circle is the locus of a point in a plane such that its distance from a fixed point in the plane is constant. Anologously, a sphere is the locus of a point in space such that its distance from a fixed point in space in constant. The fixed point is called the centre and the constant distance is called the radius of the circle/sphere. In anology with the equation of the circle |z-c|=a, the equation of a sphere of radius is |r-c|=a, where c is the position vector of the centre and r is the position vector of any point on the surface of the sphere. In Cartesian system, the equation sphere, with centre at (-g, -f, -h)the of is $x^2+y^2+z^2+2gx+2fy+2hz+c=0$ and its radius is $\sqrt{f^2+g^2+h^2-c}$. Q. The centre of the sphere $(x-4)(x+4) + (y-3)(y+3) + z^2 = 0$ is

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27. A circle is the locus of a point in a plane such that its distance from a fixed point in the plane is constant. Anologously, a sphere is the locus of a point in space such that its distance from a fixed point in space in

constant. The fixed point is called the centre and the constant distance is called the radius of the circle/sphere. In anology with the equation of the circle |z-c|=a, the equation of a sphere of radius a is |r-c|=a, where c is the position vector of the centre and r is the position vector of any point on the surface of the sphere. In Cartesian system, the equation sphere, with centre at (-g, -f, -h)the of is $x^2+y^2+z^2+2gx+2fy+2hz+c=0$ and its radius is $\sqrt{f^2+g^2+h^2-c}$. Q. Equation of the sphere having centre at $(3,\,6,\,-4)$ and touching the plane $r\cdot\left(2\hat{i}-2\hat{j}-\hat{k}
ight)=10$ is $\left(x-3
ight)^2+\left(y-6
ight)^2+\left(z+4
ight)^2=k^2$, where k is equal to

A. 3

B.4

C. 6

D. $\sqrt{17}$

Answer: (b)

28. Let $A(2, 3, 5), B(-1, 3, 2), C(\lambda, 5, \mu)$ are the vertices of a triangle and its median through A(I.e.,) AD is equally inclined to the coordinates axes.

Q. On the basis of the above information answer the following

Q. The value of $2\lambda-\mu$ is equal to

A. 13

 $\mathsf{B.4}$

C. 3

D. None of these

Answer: (b)

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29. let $\overrightarrow{a} = 2\hat{i} + 3\hat{j}$ and $\overrightarrow{b} = \hat{i} + 4\hat{j}$ then find projection of \overrightarrow{a} on \overrightarrow{b}

30. Assuming the plane 4x - 3y + 7z = 0 to be horizontal, the direction

cosines of line greatest slope in the plane 2x + y - 5z = 0 are

$$A. \left(\frac{3}{\sqrt{11}}, -\frac{1}{\sqrt{11}}, \frac{1}{\sqrt{11}}\right) \\B. \left(\frac{3}{\sqrt{11}}, \frac{1}{\sqrt{11}}, -\frac{1}{\sqrt{11}}\right) \\C. \left(-\frac{3}{\sqrt{11}}, \frac{1}{\sqrt{11}}, \frac{1}{\sqrt{11}}\right) \\D. \left(\frac{1}{\sqrt{11}}, -\frac{3}{\sqrt{11}}, -\frac{1}{\sqrt{11}}\right) \\D. \left(\frac{1}{\sqrt{11}}, -\frac{1}{\sqrt{11}}, -\frac{1}{\sqrt{11}}\right) \\D. \left(\frac{1}{\sqrt{11}}, -\frac{1}{\sqrt{11}}\right)$$

Answer: (a)



31. Assuming the plane 4x - 3y + 7z = 0 to be horizontal, the direction

cosines of line greatest slope in the plane 2x + y - 5z = 0 are

32. The line of greatest slope on an inclined plane P_1 is the line in the plane P_1 which is perpendicular to the line of intersection of the plane P_1 and a horizontal plane P_2 .

Q. The coordinate of a point on the plane $2x + y - 5z = 0, 2\sqrt{11}$ unit away from the line of intersection of 2x + y - 5z = 0 and 4x - 3y + 7z = 0 are

A. (3, 1, -1)

B. (6, 2, -2)

- $\mathsf{C}.\,(6,\ -2,2)$
- D. (1, 3, -1)

Answer: (c)

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33. Given four points A(2, 1, 0), B(1, 0, 1), C(3, 0, 1) and D(0, 0, 2).

Point D lies on a line L orthogonal to the plane determined by the points

A, B and C.

A. x + y + z - 3 = 0B. y + z - 1 = 0C. x + z - 1 = 0D. 2x + z - 1 = 0

Answer: (b)

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34. Given four points A(2, 1, 0), B(1, 0, 1), C(3, 0, 1) and D(0, 0, 2). Point D lies on a line L orthogonal to the plane determined by the points A, B and C.

Q. The equation of the plane ABC is

A.
$$r=2\hat{k}+\lambdaig(\hat{i}+\hat{k}ig)$$

B. $r=2\hat{k}+\lambdaig(2\hat{j}+\hat{k}ig)$
C. $r=2\hat{k}+\lambdaig(\hat{j}+\hat{k}ig)$

D. None of these

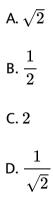
Answer: (c)



35. Given four points A(2, 1, 0), B(1, 0, 1), C(3, 0, 1) and D(0, 0, 2). Point D lies on a line L orthogonal to the plane determined by the points

A, B and C.

Q. The equation of the plane ABC is



Answer: (d)

Three Dimensional Coordinate System Exercise 9 : Match Type Questions

1. Find
$$rac{dy}{dx}$$
 if $x-\sin y=\cos y$

2.
$$P(0, 3, -2), Q(3, 7, -1)$$
 and $R(1, -3, -1)$ are 3 given points.
Find \overrightarrow{PQ}

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3. Find
$$\frac{dy}{dx}$$
 if $2x - y = \sin x$

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4. Find
$$rac{dy}{dx}$$
 if $x+3y-5=0$

5. Find
$$rac{dy}{dx}$$
 if $4x^2-y=\sin x$

6. Find
$$rac{dy}{dx}$$
 if $y=x-\sin y$

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7. Find
$$rac{dy}{dx}$$
 if $3x^2-4y=\cos x$

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Exercise (Single Integer Answer Type Questions)

1. In a tetrahedron OABC, if
$$OA = \hat{i}, OB = \hat{i} + \hat{j}$$
 and $OC = \hat{i} + 2\hat{j} + \hat{k}$, if shortest distance

between egdes OA and BC is m, then $\sqrt{2}m$ is equal to ...(where O is the origin).

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2. A parallelopiped is formed by planes drawn through the points (2, 3, 5) and (5, 9, 7) parallel to the coordinate planes. The length of the diagonal of the parallelopiped is

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3. If the perpendicular distance of the point (65,8) from the *y*-axis is 5λ

units, then λ is equal to ___

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4. If the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}is\lambda\sqrt{30}$ unit,

then the value of λ is

A. a. $\sqrt{30}$

B. b. $2\sqrt{30}$

C. c. $5\sqrt{30}$

D. d. $3\sqrt{30}$

Answer: (3)

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5. If the planes x - cy - bz = 0, cx - y + az = 0 and bx + ay - z = 0

pass through a line, then the value of $a^2+b^2+c^2+2abc$ is

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6. If xz-plane divide the join of point (2, 3, 4) and (1, -1, 5) in the ratio

 λ : 1, then the integer λ should be equal to

7. If the triangle ABC whose vertices are A(-1, 1, 1), B(1, -1, 1) and C(1, 1, -1) is projected on xy-plane, then the area of the projection triangles is.....

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8. The equation of a plane which bisects the line joining (1, 5, 7) and (-3, 1, -1) is $x + y + 2z = \lambda$, then find λ .

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9. The shortest distance between origin and a point on the space curve

$$x=2\sin t, y=2\cos t, z=3t$$
 is....

10. Show that the plane2x-2y+a+12=0 touches the sphere $x^2+y^2+z^2-2x-4y+2z-3=0.$

11. If the centroid of tetrahedron OABC where A,B,C are given by (a,2,3), (1,b,2) and (2,1,c) respectively is (1,2,-2), then distance of P(a,b,c) from origin is

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12. If the circumcentre of the triangle whose vertices are (3, 2, -5),

(- 3, 8, - 5) and (- 3, 2, 1) is (- 1, $\lambda,$ - 3) the integer λ must be

equal to.....

13. If $\overline{P_1P_2}$ is perpendicular to $\overline{P_2P_3}$, then the value of k is, where $P_1(k, 1, -1), P_2(2k, 0, 2)$ and $P_3(2 + 2k, k, 1)$ is

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

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15. Let P(a, b, c) be any on the plane 3x + 2y + z = 7, then find the least value of $2(a^2 + b^2 + c^2)$.

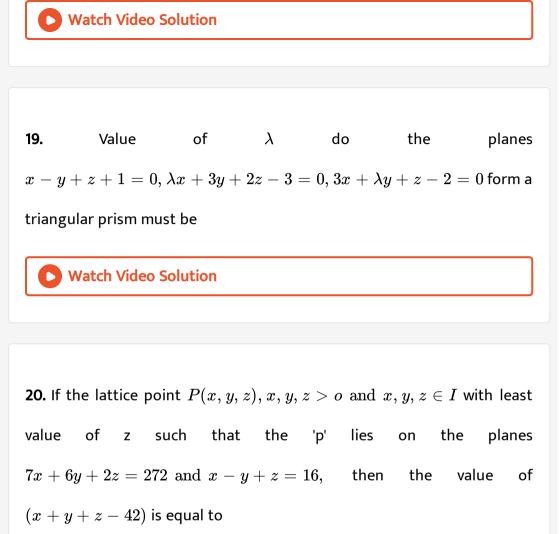
16. The plane denoted by $P_1: 4x + 7y + 4z + 81 = 0$ is rotated through a right angle about its line of intersection with plane $P_2: 5x + 3y + 10z = 25$. If the plane in its new position be denoted by P, and the distance of this plane from the origin is d, then the value of $\left[\frac{k}{2}\right]$ (where[.] represents greatest integer less than or equal to k) is....

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17. The distance of the point P(-2, 3, -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 is d, then find the value of (2d - 8), is......

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18. 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. Then, the value of 9r is.....



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21. If the line x=y=z intersect the lines $x\sin A+y\sin B+z\sin C-2d^2=0,$ $x\sin(2A)+y\sin(2B)+z\sin(2C)-d^2=0$ where A,B,C are the internal angles of a triangle and $\sin \frac{A}{2} \sin \frac{B}{2} \sin \frac{C}{2} = k$ then the value of

64k is equal to



22. The number of real values of k for which the lines $\frac{x}{1} = \frac{y-1}{k} = \frac{z}{-1}$ and $\frac{x-k}{2k} = \frac{y-k}{3k-1} = \frac{z-2}{k}$ are coplanar, is

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23. Let G_1 , G(2) and G_3 be the centroid of the triangular faces OBC, OCA and OAB of a tetrahedron OABC. If V_1 denotes the volume of tetrahedron OABC and V_2 that of the parallelepiped with OG_1 , OG_2 and OG_3 as three concurrent edges, then the value of $\frac{4V_1}{V_2}$ is (where O is the origin



24. A variable plane which remains at a constant distance p from the origin cuts the coordinate axes in A, B, C. The locus of the centroid of the tetrahedron OABC is $x^2y^2 + y^2z^2 + z^2x^2 = \frac{k}{p^2}x^2y^2z^2$, then $\sqrt[5]{2k}$ is

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25. If
$$(l_1, m_1, n_1), (l_2, m_2, n_2)$$
 are D.C's of two lines, then
 $(l_1m_2 - l_2m_1)^2 + (m_1n_2 - n_1m_2)^2 + (n_1l_2 - n_2l_1)^2 + (l_1l_2 + m_1m_2 + n_1m_2)^2$

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26. Find
$$rac{dy}{dx}$$
 if $3x^5-y= an y$

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Exercise (Subjective Type Questions)

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

$$l+m+n=0 \,\, {
m and} \,\, 2l^2+2m^2-n^2=0.$$

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2. 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 $\frac{a^2}{u} + \frac{b^2}{v} + \frac{c^2}{w} = 0$ or $a^2(v + w) + b^2(w + u) + c^2(u + v) = 0$. Watch Video Solution

3. Find the point on the line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ at a distance of $3\sqrt{2}$ from the point (1, 2, 3).

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4. A line passes through $(1,\ -1,3)$ and is perpendicular to the lines

$$\overrightarrow{r}=ig(\hat{i}+\hat{j}-\hat{k}ig)+\lambdaig(2\hat{i}-2\hat{j}+\hat{k}ig)$$
 and

$$\overrightarrow{r}=\left(2\hat{i}-\hat{j}-3\hat{k}
ight)+\mu\Big(\hat{i}+2\hat{j}+2\hat{k}\Big).$$
 Obtain its equation.

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5. Find the equations of the two lines through the origin which intersect

the line
$$\frac{x-3}{2} = \frac{y-3}{1} = \frac{z}{1}$$
 at angle of $\frac{\pi}{3}$ each.

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6. Vertices BandC of ABC lie along the line $\frac{x+2}{2} = \frac{y-1}{1} = \frac{z-0}{4}$. Find the area of the triangle given that A has coordinates (1, -1, 2) and line segment BC has length 5.



of the line
$$\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$$
 and the plane x - y + z=5.

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8. Find the equation of the plane through the intersection of the planes x + 3y + 6 = 0 and 3x - y - 4z = 0, whose perpendicular distance from the origin is unity.

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9. Find the equation of the image of the plane x - 2y + 2z = 3 in the

plane x + y + z = 1.



Three Dimensional Coordinate System Exercise 11 : Subjective Type Questions

1. 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 in A, B and C. If the planes throught A, B and C parallel to the planes x = 0, y = 0 and z = 0 intersect in Q, then find the locus of Q.

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Exercise (Questions Asked In Previous 13 Years Exam)

1. Consider a pyramid OPQRS located in the first octant $(x \ge 0, y \ge 0, z \ge 0)$ with O as origin and OP and OR along the X-axis and the Y-axis , respectively. The base OPQRS of the pyramid is a square with OP=3. The point S is directly above the mid point T of diagonal OQ such that TS=3. Then,

A. the acute angle between OQ and OS is $\frac{\pi}{3}$

B. the equation of the plane containing ht $\ riangle OQS$ is x-y=0

C. the length of perpendicular from P to the plane containing the

$$riangle \ OQS$$
 is $rac{2}{\sqrt{3}}$

D. the perpendicular distance from O to the straight line containing

RS is
$$\sqrt{\frac{15}{2}}$$

Answer: (b, c, d)



2. Let P be the image of the point (3,1,7) with respect to the plane x-y+z=3. then the equation o the plane passing through P and containing the straight line $\frac{x}{1} = \frac{y}{2} = \frac{z}{1}$ A. x + y - 3z = 0

B.
$$3x + z = 0$$

$$\mathsf{C.}\,x - 4y + 7z = 0$$

D.
$$2x - y = 0$$

Answer: (c)



3. From a point $P(\lambda, \lambda, \lambda)$, perpendicular PQ and PR are drawn respectively on the lines y = x, z = 1 and y = -x, z = -1. If P is such tthat $\angle QPR$ is a right angle, then the possible value(s) of λ is (are)

A. (a) $\sqrt{2}$

- B. (b)1
- C. (c)-1
- D. (d) $-\sqrt{2}$

Answer: (c)

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4. Two lines $L_1: x = 5$, $\frac{y}{3-\alpha} = \frac{z}{-2}$ and $L_2: x = \alpha$, $\frac{y}{-1} = \frac{z}{2-\alpha}$ are coplanar. Then, α can take value(s)

A. 1

 $\mathsf{B.}\,2$

C. 3

D. 4

Answer: (a, d)

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5. A line I passing through the origin is perpendicular to the lines $l_1: (3+t)\hat{i} + (-1+2t)\hat{j} + (4+2t)\hat{k} - \infty < t < \infty$ and $l_-(2): (3+2s)\hat{i} + (3+2s)\hat{i} + (3+2s)\hat{j} + (2+s)\hat{k}, -\infty < s < \infty$ Then the coordinate(s) of the point(s) on l_2 at a distance of $\sqrt{17}$ from the point of intersection of I and l_1 is (are)

A.
$$\left(\frac{7}{3}, \frac{7}{3}, \frac{5}{3}\right)$$

B. $(-1, -1, 0)$
C. $(1, 1, 1)$
D. $\left(\frac{7}{9}, \frac{7}{9}, \frac{8}{9}\right)$

Answer: (b, d)

6. Perpendicular are drawn from points on the line $rac{x+2}{2} = rac{y+1}{-1} = rac{z}{3}$

to the plane x+y+z=3. The feet of perpendiculars lie on the line.

A.
$$\frac{x}{5} = \frac{y-1}{8} = \frac{z}{3}$$

B. $\frac{x}{3} = \frac{y-1}{3} = \frac{z-2}{8}$
C. $\frac{x}{4} = \frac{y-1}{3} = \frac{z-2}{-7}$
D. $\frac{x}{2} = \frac{y-1}{-7} = \frac{z-2}{5}$

Answer: (d)

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7. If the straight lines
$$\frac{x-1}{2} = \frac{y+1}{k} = \frac{z}{2}$$
 and $\frac{x+1}{5} = \frac{y+1}{2} = \frac{z}{k}$

are coplanar, then the plane(s) containing these two lines is/are

A. y + 2z = -1

B. y + z = -1

- C. y z = -1
- D. y 2z = -1

Answer: (b, c)

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

containing the lies
$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$$
 and $\frac{x-2}{3} = \frac{4-3}{4} = \frac{z-4}{5}$ is $\sqrt{6}$, then $|d|$ is

9. Read the following passage and answer the questions. Consider the

lines

$$L_1\colon rac{x+1}{3} = rac{y+2}{1} = rac{z+1}{2} \ L_2\colon rac{x-2}{1} = rac{y+2}{2} = rac{z-3}{3}$$

Q. The distance of the point (1, 1, 1) from the plane passing through the point (-1, -2, -1) and whose normal is perpendicular to both the lines L_1 and L_2 , is

A.
$$\frac{2}{\sqrt{75}}$$
 unit
B. $\frac{7}{\sqrt{75}}$ units
C. $\frac{13}{\sqrt{75}}$ unit
D. $\frac{23}{\sqrt{75}}$ units

Answer: (c)

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10. Read the following passage and answer the questions. Consider the

lines

$$L_1\colon rac{x+1}{3} = rac{y+2}{1} = rac{z+1}{2} \ L_2\colon rac{x-2}{1} = rac{y+2}{2} = rac{z-3}{3}$$

Q. The shortest distance between L_1 and L_2 is

A. 0 unit

B.
$$\frac{17}{\sqrt{3}}$$
 units
C. $\frac{41}{5\sqrt{3}}$ units
D. $\frac{17}{5\sqrt{3}}$ units

Answer: (d)



11. Consider the line
$$L_1: \frac{x+1}{3} = \frac{y+2}{1} = \frac{z+1}{2}L_2: \frac{x-2}{1} = \frac{y+2}{2} = \frac{z-3}{3}$$
 The unit vector perpendicular to both L_1 and L_2 lines is

A.
$$\frac{-\hat{i} + 7\hat{j} + 7\hat{k}}{\sqrt{75}}$$
B.
$$\frac{-\hat{i} - 7\hat{j} + 5\hat{k}}{\sqrt{75}}$$
C.
$$\frac{-\hat{i} + 7\hat{j} + 5\hat{k}}{\sqrt{75}}$$
D.
$$\frac{7\hat{i} - 7\hat{j} - \hat{k}}{\sqrt{75}}$$

Answer: (b)



12. Consider three planes

- $P_1: x y + z = 1$,
- $P_2\!:\!x+y-z=\,-1$ and

 $P_3 \colon x - 3y + 3z = 2$

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 .

Statement 2: The three planes do not have a common point

A. Statement-I is true, Statement II is also true, Statement-II is the

correct explanation of Statement-I.

B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (d)

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13. Consider the planes 3x - 6y - 2z = 15 and 2x + y - 2z = 5. find

the angle between these planes



14. If the image of the point P(1, -2, 3) in the plane, 2x + 3y - 4z + 22 = 0 measured parallel to the line, $\frac{x}{1} = \frac{y}{4} = \frac{z}{5}$ is Q, then PQ is equal to : $\sqrt{42}$ (2) $6\sqrt{5}$ (3) $3\sqrt{5}$ (4) $3\sqrt{42}$

A. $3\sqrt{5}$

B. $2\sqrt{42}$

 $\mathsf{C}.\sqrt{42}$

D. $6\sqrt{5}$

Answer: (b)

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15. The distance of the point (1, 3, -7) from the plane passing through the point (1, -1, -1) having normal perpendicular to both the lines $\frac{x-1}{1} = \frac{y+2}{-2} = \frac{z-4}{3}$ and $\frac{x-2}{2} = \frac{y+1}{-1} = \frac{z+7}{-1}$ is A. $\frac{20}{\sqrt{74}}$ units

B.
$$\frac{10}{\sqrt{83}}$$
 units
C. $\frac{5}{\sqrt{83}}$ units
D. $\frac{10}{\sqrt{74}}$ units

Answer: (b)

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16. The distance of the point $(1,\ -5,9)$ from the plane x-y+z=5

measured along the line x = y = z is

A. $3\sqrt{10}$

B. $10\sqrt{3}$

C.
$$\frac{10}{\sqrt{3}}$$

D. $\frac{20}{3}$

Answer: (b)

17. If the line, $\frac{x-3}{2} = \frac{y+2}{-1} = \frac{z+4}{3}$ lies in the place, lx + my - z = 9, then $l^2 + m^2$ is equal to: A. 26 B. 18 C. 5 D. 2

Answer: (d)



18. The disatance of the point (1, 0, 2) from the point of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane x - y + z = 16, is A. $2\sqrt{14}$

B. 8

C. $3\sqrt{21}$

D. 13

Answer: (d)

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19. The equation of the plane containing the line 2x - 5y + z = 3; x + y + 4z = 5, and parallel to the plane, x + 3y + 6z = 1, is : (1) 2x + 6y + 12z = 13 (2) x + 3y + 6z = -7 (3) x + 3y + 6z = 7 (4) 2x + 6y + 12z = -13A. 2x + 6y + 12z = 13

B. x + 3y + 6z = -7

C. x + 3y + 6z = 7

D. 2x + 6y + 12z = -7

Answer: (c)



20. The angle between the lines whose direction cosines satisfy the equations l+m+n=0 and $l^2=m^2+n^2$ is

A.
$$\frac{\pi}{3}$$

B. $\frac{\pi}{4}$
C. $\frac{\pi}{6}$
D. $\frac{\pi}{2}$

Answer: (a)

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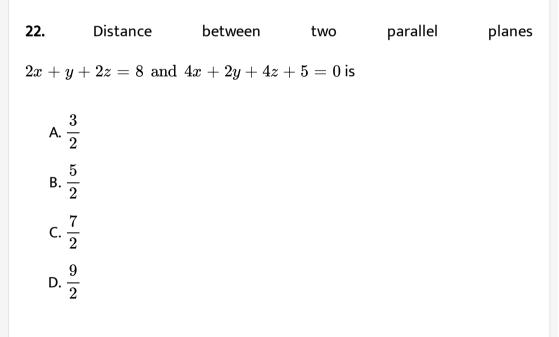
21. The image of the line
$$\frac{x-1}{3} = \frac{y-3}{1} = \frac{z-4}{-5}$$
 in the plane $2x - y + z + 3 = 0$ is the line
A. $\frac{x+3}{3} = \frac{y-5}{1} = \frac{z-2}{-5}$

B.
$$\frac{x+3}{-3} = \frac{y-5}{-1} = \frac{z+2}{5}$$

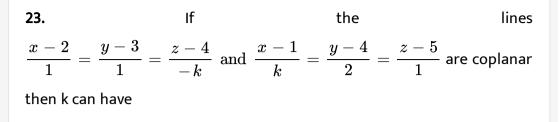
C. $\frac{x-3}{3} = \frac{y+5}{1} = \frac{z-2}{-5}$
D. $\frac{x-3}{-3} = \frac{y+5}{-1} = \frac{z-2}{5}$

Answer: (a)





Answer: (c)



A. any value

B. exactly one value

C. exactly two value

D. exactly tree value

Answer: (c)

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24. An equation of a plane parallel to the plane x - 2y + 2z - 5 = 0 and

at a unit distance from the origin is

A. x - 2y + 2z - 3 = 0

B.
$$x - 2y + 2z + 1 = 0$$

C.
$$x - 2y + 2z - 1 = 0$$

D.
$$x - 2y + 2z + 5 = 0$$

Answer: (a)

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25. If the line
$$\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$$
 and $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$

intersect, then k is equal to

A. a) -1

B. b)
$$\frac{2}{9}$$

C. c) $\frac{9}{2}$

D. d) 0

Answer: (c)

26. If the angle between the line $x = \frac{y-1}{2} = (z-3)(\lambda)$ and the plane $x + 2y + 3z = 4is\cos^{-1}\left(\sqrt{\frac{5}{14}}\right)$, then λ equals

A. (a)
$$\frac{3}{2}$$

B. (b) $\frac{2}{5}$
C. (c) $\frac{5}{3}$
D. (d) $\frac{2}{3}$

Answer: (d)

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27. Statement-I The point A(1, 0, 7) is the mirror image of the point B(1, 6, 3) in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$. Statement-II The line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ bisect the line segment joining A(1, 0, 7) and B(1, 6, 3). A. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

B. statement-I is true, Statement-II is false.

C. Statement-I is false, Statement -II is true.

D. statement-I is true, Statement II is also true, Statement-II is the

correct explanation of Statement-I.

Answer: (d)

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28. The length of the perpendicular drawn from the point (3, -1, 11) to

the line
$$\displaystyle rac{x}{2} = \displaystyle rac{y-2}{3} = \displaystyle rac{z-3}{4}$$
 is
A. $\sqrt{66}$
B. $\sqrt{29}$
C. $\sqrt{33}$

D. $\sqrt{53}$

Answer: (d)

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29. The distance of the point (1, -5, 9) from the plane x - y + z = 5measured along the line x = y = z is : (1) $3\sqrt{10}$ (2) $10\sqrt{3}$ (3) $\frac{10}{\sqrt{3}}$ (4) $\frac{20}{3}$

A. $3\sqrt{5}$

B. $10\sqrt{3}$

C. $5\sqrt{3}$

D. $3\sqrt{10}$

Answer: (b)

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30. A line AB in three-dimensional space makes angles 45° and 120° with the positive X-axis and The positive Y-axis, respectively. If AB makes an acute angle θ with the positive Z-axis, then θ equals

A. 30°

B. 45°

C. 60°

D. 75°

Answer: (c)

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31. Statement-I The point A(3, 1, 6) is the mirror image of the point B(1, 3, 4) in the plane x - y + z = 5. Statement-II The plane x - y + z = 5 bisect the line segment joining A(3, 1, 6) and B(1, 3, 4). A. Statement-I is true, Statement II is also true, Statement-II is the

correct explanation of Statement-I.

B. Statement-I is true, Statement-II is also true, Statement-II is not the

correct explanation of Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement -II is true.

Answer: (a)

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32. Let the line $\frac{x-2}{3} = \frac{y-1}{-5} = \frac{z+2}{2}$ lies in the plane $x + 3y - \alpha z + \beta = 0$. Then, (α, β) equals A. (6, -17)

B. (-6, 7)

C.(5, -15)

D.(-5,15)

Answer: (b)



33. The projection of a vector on the three coordinate axes are 6, -3, 2, respectively. The direction cosines of the vector are

A. 6, -3, 2
B.
$$\frac{6}{5}$$
, $-\frac{3}{5}$, $\frac{2}{5}$
C. $\frac{6}{7}$, $-\frac{3}{7}$, $\frac{2}{7}$
D. $-\frac{6}{7}$, $-\frac{3}{7}$, $\frac{2}{7}$

Answer: (c)

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34. The line passing through the points (5, 1, a) and (3, b, 1) crosses the YZ-plane at the point $\left(0, \frac{17}{2}, -\frac{13}{2}\right)$. Then,

A. (a)
$$a = 8, b = 2$$

- B. (b) a = 2, b = 8
- C. (c) a = 4, b = 6

D. (d)
$$a = 6, b = 4$$

Answer: (d)

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35. If the straight lines
$$\frac{x-1}{k} = \frac{y-2}{2} = \frac{z-3}{3} \text{ and } \frac{x-2}{3} = \frac{y-3}{k} = \frac{z-1}{2} \text{ intersect at}$$

a point, then the integer k is equal to

A. a) -2

B.b) -5

C. c) 5

D. d) 2

Answer: (b)

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

Answer: (a)

37. If a line makes an angle of $\frac{\pi}{4}$ with the positive directions of each of x-axis and y-axis, then the angle that the line makes with the positive direction of z-axis is

A.
$$\frac{\pi}{6}$$

B. $\frac{\pi}{4}$
C. $\frac{\pi}{3}$
D. $\frac{\pi}{2}$

Answer: (d)

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38. If (2,3,5) is one end of a diameter of the sphere $x^2 + y^2 + z^2 - 6x - 12y - 2z + 20 = 0$, then the coordinates of the other end of the diameter are

A. (4, 9, -3)

B.
$$(4, -3, 3)$$

C. $(4, 3, 5)$
D. $(4, 3, -3)$

Answer: (a)



$$x = ay + b, z = cy + d$$
 and $x = a'y + b', z = c'y + d'$ are

pendicular to each other if

A.
$$aa' + cc' = 1$$

B. $\frac{a}{a'} + \frac{c}{c'} = -1$
C. $\frac{a}{a'} + \frac{c}{c'} = -1$

D.
$$aa' + cc' = -1$$

Answer: (d)



40. the image of the point (-1, 3, 4) in the plane x - 2y = 0

A.
$$(15, 11, 4)$$

B. $\left(-\frac{17}{3}, -\frac{19}{3}, \frac{19}{3}\right)$
C. $(8, 4, 4)$
D. $\left(\frac{9}{5}, \frac{-13}{5}, 4\right)$

Answer: (d)

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41. If the plane 2ax - 3ay + 4az + 6 = 0 passes through the mid point of the line joining the centre of the spheres $x^2 + y^2 + z^2 + 6x - 8y - 2z = 13$ and $x^2 + y^2 + z^2 - 10x + 4y - 2z = 8$, then α equals A. 2

 $\mathsf{B.}-2$

C. 1

D. - 1

Answer: (b)

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42. If the angle θ between 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 $\sin \theta = \frac{1}{3}$ then the value of λ is

A.
$$-\frac{4}{3}$$

B. $\frac{3}{4}$
C. $-\frac{3}{5}$
D. $\frac{5}{3}$

Answer: (d)



43. The angle between the lines 2x = 3y = -z and 6x = -y = -4z

is

A. a) 30°

B. b) 45°

C. c) 90°

D. d) 0°

Answer: (c)



44. The plane x+2y-z=4 cuts the sphere $x^2+y^2+z^2-x+z-2=0$ in a circle of radius

A. (a) $\sqrt{2}$

B. (b)2

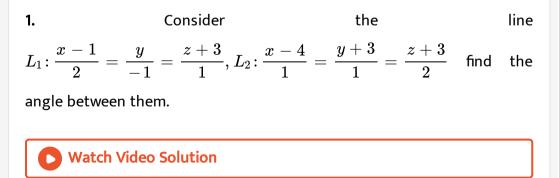
C. (c)1

D. (d)3

Answer: (c)

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Three Dimensional Coordinate System Exercise 12 : Question Asked in Previous Years Exam



2. Find
$$rac{dy}{dx}$$
 if $ax - by = \sin x$

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