MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

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 to new frame.

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3. Find the distance between the points $P(-2, 4, 1)$ and $Q(1, 2, -5)$.

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4. Prove by using distance formula that the points $P(1, 2, 3), Q(-1, -1, -1)$ and $R(3, 5, 7)$ are collinear.

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5. Find the ratio in which $2x + 3y + 5z = 1$ divides the line joining the points $(1, 0, -3)$ and $(1, -5, 7)$.

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6. If $A(3, 2, -4), B(5, 4, -6)$ and $C(9, 8, -10)$ are three collinear points, then the ratio in which point C divides AB.

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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 $\left(-\dfrac{ax_1 + ay_1 + cz_1 + d}{ax_2 + by_2 + cz_2 + d}\right)$

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8. The ratio in which the join of the points $A(2, 1, 5)$ and $B(3, 4, 3)$ is divided by the plane $2x + 2y - 2z = 1$, is

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9. What are the direction cosines of a line which is equally inclined to the axes?

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10. If a line makes anles α, β, γ with the coordinate axes, porve that $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2$

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11. A line OP through is inclined at 60^0 and 45^0 to OX and OY respectivey, where O is the origin. Find the angle at which it is inclined to OZ.

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12. Find the direction cosines of a vector r which is equally inclined to OX, OY and OZ. If |r| is given, find the total number of such vectors.

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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.

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14. A vector r has length 21 and direction ratios 2, -3, 6. Find the direction cosines and components of r, given that r makes an obtuse angle with X-axis.

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15. Find the angle between the lines whose direction cosines are $\left(-\frac{\sqrt{3}}{4}, \frac{1}{4}, -\frac{\sqrt{3}}{2}\right)$ and $\left(-\frac{\sqrt{3}}{4}, \frac{1}{4}, \frac{\sqrt{3}}{2}\right)$.

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

(ii) Find the angle between two diagonals of a cube.

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17. Find the angle between the line whose direction cosines are given by $l + m + n = 0 and 2l^2 + 2m^2 - n^2 - 0.$

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

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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

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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.

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22. Find the equation of straight line parallel to $2\hat{i} - \hat{j} + 3\hat{k}$ and passing through the point $(5, -2, 4)$.

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23. Find the vector equation of a line passing through $(2, -1, 1)$ and parallel to the line whose equation is $\frac{X-3}{2} = \frac{Y+1}{7} = \frac{Z-2}{-3}$.

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24. The cartesian equation of a line are $6x - 2 = 3y + 1 = 2z - 2$. Find its direction ratios and also find the vector of the line.

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

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

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27. Find the angle between the pair of lines

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

$r = 5\hat{i} - 4\hat{k} + \mu\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$

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28. Fid the condition if lines $x = ay + b, z = cy + dandx = a'y + b', z = c'y + d'$ are perpendicular.

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29. Find the foot of the perpendicular drawn from the point $2\hat{i} - \hat{j} + 5\hat{k}$ to the line $\vec{r} = \left(11\hat{i} - 2\hat{j} - 8\hat{k}\right) + \lambda\left(10\hat{i} - 4\hat{j} - 11\hat{k}\right)^{\cdot}$ Also find the length of the perpendicular.

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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 $B(4, 7, 1) and C(3, 5, 3)^{\cdot}$

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31. Find the length of perpendicular from $P(2, -3, 1)$ to the $\frac{x+1}{2} = \frac{y-3}{3} = \frac{z+2}{-1}$.

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

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

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33. Find the image of the point $(1, 6, 3)$ in 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 $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}nd\frac{x-4}{5}=\frac{y-1}{z}=z$ interect. Find also the point of intersection of these lines.

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36. Find the shortest distance between the lines $\vec{r} = \left(4\hat{i} - \hat{j}\right) + \lambda\left(\hat{i} + 2\hat{j} - 3\hat{k}\right) and \vec{r} = \left(\hat{i} - \hat{j} + 2\hat{k}\right) + \mu\left(2\hat{i} + 4\hat{j} - 5\hat{k}\right)$.

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37. Find the shortest distance between the 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 $r = \left(-3\hat{i} - 7\hat{j} + 6\hat{k}\right) + \mu\left(-3\hat{i} + 2\hat{j} + 4\hat{k}\right)$

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39. Find the shortest distance between lines $\vec{r}=(\hat{i}+2\hat{j}+\hat{k})+\lambda(2\hat{i}+\hat{j}+2\hat{k})and\vec{r}=2\hat{i}-\hat{j}-\hat{k}+\mu(2\hat{i}+\hat{j}+2\hat{k})$.

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40. Find the equation of a line which passes through the point $(1, 1, 1)$ and intersects the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}and\frac{x+2}{1}=\frac{y-3}{2}=\frac{z+1}{4}$.

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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 paramerters $sandt,$ respectivley, are coplanar, then find λ.

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42. Show that the point (0, -1, -1), (4 5, 1), (3, 9, 4) and (-4, 4, 4) are coplanar and find the equation of the common plane.

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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 $2\hat{i} + \hat{j} + 2\hat{k}^{\cdot}$

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44. Reduce the equation $\vec{r}3\hat{i} - 4\dot{\hat{j}} + 12\hat{k} = 5$ 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 $2x - y - 2z = 0$ from the origin.

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46. Find the vector equation of a line passing through $3\hat{i} - 5\hat{j} + 7\hat{k}$ and perpendicular to theplane $3x - 4y + 5z = 8$.

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47. Find the unit vector perpendicular the plane $r \cdot \left(2\hat{i} + \hat{j} + 2\hat{k}\right) = 5$.

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48. Find the equation of the plane passing through the point $(2, 3, 1)$ having $(5, 3, 2)$ as the direction ratio is of the normal to the plane.

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49. The coordinate of the foot of the perpendicular drawn from the origin to a plane are (12, -4, 3). Find the equation of the plane.

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50. A vector $\vec{n}$ 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 $\left(\sqrt{2}, -1, 1\right)$ and is normal to $\vec{n}$, find its equation in vector form.

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51. Find the equation of the plane such that image of point $(1, 2, 3)$ in it is $(-1, 0, 1)^{\cdot}$

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

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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: $\vec{r} = \hat{i} - \hat{j} + \lambda(\hat{i} + \hat{j} + \hat{k}) + \mu(\hat{i} - 2\hat{j} + 3\hat{k})^{\cdot}$

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

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56. A variable plane moves in such a way that the sum of the reciprocals of its intercepts on the three coordinate axes is constant. Show that the plane passes through a fixed point.

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57. Find the angel between the planes $2x + y - 2x + 3 = 0 and \vec{r} \cdot 6\hat{i} + 3\hat{j} + 2\hat{k} = 5.$

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58. Show that $ax + by + r = 0, by + cz + p = 0 and cz + ax + q = 0$ are 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 $-2x + y - 3z = 7$.

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

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

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

$r \cdot \left(2\hat{i} - \hat{j} + \hat{k}\right) = -8$

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63. Find the interval of α for which $\left(\alpha, \alpha^2, \alpha\right)$ 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 $(21, 0)$ from the plane $2x + y + 2z + 5 = 0$.

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65. Find the distance between the parallel planes $x + 2y - 2z + 1 = 0 and 2x + 4y - 4z + 5 = 0$.

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

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67. Reduce the equation of line $x - y + 2z = 5 adn 3x + y + z = 6$ in symmetrical form. Or Find the line of intersection of planes $x - y + 2z = 5 and 3x + y + z = 6$.

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68. Find the angle between the line $\vec{r} = \hat{i} + 2\hat{j} - \hat{k} + \lambda\left(\hat{i} - \hat{j} + \hat{k}\right)$ and the plane $\vec{r} \cdot 2\hat{i} - \hat{j} + \hat{k} = 4$.

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69. Find the distance between the point with position vector $\hat{i} - 5\hat{j} - 10\hat{k}$ and the point of intersection of the line $\frac{x - 2}{3} = \frac{y + 1}{4} = \frac{z - 2}{12}$ with the plane $x - y + z = 5$.

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70. Find ten equation of the plane passing through the point $(0, 7, -7)$ and containing the line $\frac{x + 1}{-3} = \frac{y - 3}{2} = \frac{z + 2}{1}$.

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71. Prove that the lines $\frac{x + 1}{3} = \frac{y + 3}{5} = \frac{z + 5}{7}$ and $\frac{x - 2}{1} = \frac{y - 4}{4} = \frac{z - 6}{7}$ are coplanar. Also, find the plane containing these two lines

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72. Find the image of the point $P(3, 5, 7)$ in the plane $2x + y + z = 0$.

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73. Find the length and the foot of the perpendicular from the point $(7, 14, 5)$ to the plane $2x + 4y - z = 2$.

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74. Find the image of the line $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z-3}{4}$ in the plane $3x - 3y + 10z - 26 = 0$.

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

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76. Find the equation of sphere whose centre is $(5, 2, 3)$ and radius is 2 in cartesian form .

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77. Find the equation of a sphere whose centre is $(3, 1, 2)$ and radius is 5.

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78. Find the centre and radius of the sphere $2x^2 + 2y^2 + 2z^2 - 2x - 4y + 2z + 3 = 0.$

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

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

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81. Find the equaiton of the sphere described on the joint of points A and B 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 centre and the radius of the sphere.

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

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83. The centre of the circle given by $\vec{r}\cdot\left(\hat{i}+2\hat{j}+2\hat{k}\right)=15$ and $\left|\vec{r}-\left(\hat{j}+2\hat{k}\right)\right|=4$ is

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

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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 $r\cdot\left(2\hat{i}-2\hat{j}-\hat{k}\right)=10.$

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

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

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

A. $\cos(2\alpha) + \cos(2\beta) + \cos(2\gamma) - 1 = 0$

B. $\cos(2\alpha) + \cos(2\beta) + \cos(2\gamma) - 2 = 0$

C. $\cos(2\alpha) + \cos(2\beta) + \cos(2\gamma) + 1 = 0$

D. $\cos(2\alpha) + \cos(2\beta) + \cos(2\gamma) + 2 = 0$

Answer: (c)

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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)

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90. In ΔABC the mid points of the sides AB, BC and CA are $(l, 0, 0), (0, m, 0)$ and $(0, 0, n)$ respectively. Then, $\dfrac{AB^2 + BC^2 + CA^2}{l^2 + m^2 + n^2}$ 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 proportional to $2, 2, 1$ and a line joining $(3, 1, 4)$ and $(7, 2, 12)$ is

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

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

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

D. None of these

Answer: (a)

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92. The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: (d)

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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. $\frac{1}{5}$

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

C. $\frac{3}{5}$

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

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

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

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

D. None of these

Answer: (c)

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96. The coordinates of the foot of the perpendicular drawn from the point $A(1, 0, 3)$ to the join of the points $B(4, 7, 1)$ and $C(3, 5, 3)$ are

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

B. $\begin{pmatrix} 5 & 7 & 17 \end{pmatrix}$

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 source 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)

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98. Equation of plane passing through the points $(2, 2, 1)(9, 3, 6)$ and perpendicular to the plane $2x + 6y + 6z - 1 = 0$ is

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

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

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

D. None of these

Answer: (c)

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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_1andD_1, respectively. If $\left(\vec{AB}\right)_1, \lambda_1\vec{AB}, \left(\vec{AD}\right)_1 = \lambda_2\vec{AD}and\left(\vec{AC}\right)_1 = \lambda_3\vec{AC}$, then prove that $\dfrac{1}{\lambda_3} = \dfrac{1}{\lambda_1} + \dfrac{1}{\lambda_2}$.

A. $\dfrac{1}{\lambda_1} + \dfrac{1}{\lambda_2}$

B. $\dfrac{1}{\lambda_1} - \dfrac{1}{\lambda_2}$

C. - $\left(\lambda_1\right) + \left(\lambda_2\right)$

D. $\left(\lambda_1\right) + \left(\lambda_2\right)$

Answer: (a)

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101. the acute angle between two lines such that the direction cosines l, 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. $\dfrac{\phi}{3}$

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

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

Answer: (b)

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102. The equation of the plane passing through the mid point of the line points $(1, 2, 3)$ and $(3, 4, 5)$ and perpendicular to it is

A. $x + y + z = 9$

B. $x + y + z = -9$

C. $2x + 3y + 4z = 9$

D. $2x + 3y + 4z = -9$

Answer: (a)

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

B. $\rtimes (-\hat{i} + \hat{j} + \hat{k}) = 0$

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

D. None of these

Answer: (c)

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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

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 $r = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda\left(\hat{i} - \hat{j} + 4\hat{k}\right)$ and the plane $r \cdot \left(\hat{i} + 5\hat{j} + \hat{k}\right) = 5$, is

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

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

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

D. None of these

Answer: (b)

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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 angled parallel to $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$.

A. 1

B. 2

C. 4

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 points $\vec{a}$ and containing the line $\vec{r} = \vec{b} + \lambda\vec{c}$ is

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

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

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

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

Answer: (c)

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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)

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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)

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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. ϕ

B. $\frac{2\phi}{3}$

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

D. $\frac{\phi}{3}$

Answer: (b)

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113. A tetrahedron has vertices $O(0, 0, 0), A(1, 2, 1), B(2, 1, 3), andC(-1, 1, 2)$, then angle between face $OABandABC$ will be a. $\cos^{-1}\left(\frac{17}{31}\right)$ b. 30^0 c. 90^0 d. $\cos^{-1}\left(\frac{19}{35}\right)$

A. 90°

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 $r \cdot \left(\hat{i} + 3\hat{j} - \hat{k}\right) = 0$ and $r \cdot \left(\hat{j} + 2\hat{k}\right) = 0,$ is

A. $r \cdot \left(\hat{i} + 9\hat{j} + 11\hat{k}\right) = 0$

B. $r \cdot \left(\hat{i} + 9\hat{j} + 11\hat{k}\right) = 6$

C. $\hat{r} \cdot \left(\hat{i} - 3\hat{k} - 13\hat{k}\right) = 0$

D. None of these

Answer: (a)

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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 $r \cdot \left(3\hat{i} - \hat{j} + \hat{k}\right) = 1$ and $r \cdot \left(\hat{i} + 4\hat{j} - 2\hat{k}\right) = 2$, is

A. $r \cdot \left(2\hat{i} + \hat{j} - 13\hat{k}\right) = -1$

B. $r \cdot \left(2\hat{i} - 7\hat{j} - 13\hat{k}\right) = 1$

C. $r \cdot \left(2\hat{i} + 7\hat{j} + 13\hat{k}\right) = 0$

D. None of these

Answer: (b)

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116. The cartesian eqaution of the plane $r = (1 + \lambda - \mu)\hat{i} + (2 - \lambda)\hat{j} + (3 - 2\lambda + 2\mu)\hat{k}$, is

A. $2x + y = 5$

B. $2x - y = 5$

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)

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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)

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119. The equation of the line $x + y + z - 1 = 0$ 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. $\frac{x-1}{2} = \frac{y+2}{-1} = \frac{z-2}{2}$

Answer: (a, b, c, d)

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120. The direction cosines of a line bisecting the angle between two perpendicular lines whose direction cosines are l_1, m_1, n_1 and l_2, m_2, n_2 are (1) $\frac{l_1 + l_2}{2}, \frac{m_1 + m_2}{2}, \frac{n_1 + n_2}{2}$ (2) $l_1 + l_2, m_1 + m_2, n_1 + n_2$ (3) $\frac{l_1 + l_2}{\sqrt{2}}, \frac{m_1 - m_2}{2}, \frac{n_1 + n_2}{\sqrt{2}}$ (4) $l_1 - l_2, m_1 - m_2, n_1 - n_2$ (5)n o n eo ft h e s e

A. $\frac{l_1 + l_2}{\cos\left(\frac{\theta}{2}\right)}, \frac{m_1 + m_2}{\cos\left(\frac{\theta}{2}\right)}, \frac{n_1 + n_2}{\cos\left(\frac{\theta}{2}\right)}$

B. $\frac{l_1 + l_2}{2\cos\left(\frac{\theta}{2}\right)}, \frac{m_1 + m_2}{2\cos\left(\frac{\theta}{2}\right)}, \frac{n_1 + n_2}{2\cos\left(\frac{\theta}{2}\right)}$

C. $\frac{l_1 + l_2}{\sin\left(\frac{\theta}{2}\right)}, \frac{m_1 + m_2}{\sin\left(\frac{\theta}{2}\right)}, \frac{n_1 + n_2}{\sin\left(\frac{\theta}{2}\right)}$

D. $\frac{l_1 + l_2}{2\sin\left(\frac{\theta}{2}\right)}, \frac{m_1 + m_2}{2\sin\left(\frac{\theta}{2}\right)}, \frac{n_1 + n_2}{2\sin\left(\frac{\theta}{2}\right)}$

Answer: (b, d)

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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 angel between the given planes which a. contains origin b. is acute c. is obtuse d. none of these

A. contains origin

B. is acute

C. is obtuse

D. None of these

Answer: (a, b)

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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)

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123. the equationof a plane is $2x - y - 3z = 5$ and $A(1, 1, 1), B(2, 1, -3), C(1, -2, -2)$ and $D(-3, 1, 2)$ 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. $\left(8\sqrt{14}+1, -12\sqrt{14}-1, 4\sqrt{14}\right)$

C. $(-7, 11, -4)$

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

Answer: (a, c)

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125. The line whose vector equation are $r = 2\hat{i} - 3\hat{j} + 7\hat{k} + \lambda\left(2\hat{i} + p\hat{j} + 5\hat{k}\right)$ and $r = \hat{i} + 2\hat{j} + 3\hat{k} + \mu\left(3\hat{i} - p\hat{j} + p\hat{k}\right)$ are perpendicular for all values of λ and μ if p eqauls to

A. -1

B. 2

C. 5

D. 6

Answer: (a, d)

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126. Equation of a plane passing through the lines $2x - y + z = 3$ and $3x + y + z = 5$ and which is at a distance of $\frac{1}{\sqrt{6}}$ from the point(2, 1, -1) is

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))

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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 $< \frac{3}{5\sqrt{2}}, - \frac{4}{5\sqrt{2}}, \frac{1}{\sqrt{2}} >$

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)

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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 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.

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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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. 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. Point of intersection of the lines lies on

A. $3x+y+z=20$

B. $2x+y+z=25$

C. $3x+2y+z=24$

D. $x=y=z$

Answer: (d)

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135. 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. Angle between the plane containing both the lines and the plane $4x+y+2z=0$ is equal to

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

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

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

D. $\cos^{-1}\left(\frac{2}{\sqrt{186}}\right)$

Answer: (b)

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

one of $\left(x_1, y_1, z_1\right)$ and origin in lie in acute and the other in obtuse angle,If ($a_1x_1 + b_1y_1 + c_1z_1 + d_1\Big)\Big(a_2x_1 + b_2y_1 + c_2z_1 + d_2\Big) < 0$

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

Answer: B

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137. 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 ($a_1x_1 + b_1y_1 + c_1z_1 + d_1\big)\big(a_2x_1 + b_2y_1 + c_2z_1 + d_2\big) > 0$.

one of (x_1, y_1, z_1) and origin in lie in acute and the other in obtuse angle,If ($a_1x_1 + b_1y_1 + c_1z_1 + d_1\big)\big(a_2x_1 + b_2y_1 + c_2z_1 + d_2\big) < 0$

Q. Given the planes $x + 2y - 3z + 5 = 0$ and $2x + y + 3z + 1 = 0$. If a point P(2, -1, 2). 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

Answer: (c)

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

one of $\left(x_1, y_1, z_1\right)$ and origin in lie in acute and the other in obtuse angle,If ($a_1x_1 + b_1y_1 + c_1z_1 + d_1\big)\left(a_2x_1 + b_2y_1 + c_2z_1 + d_2\right) < 0$

Q. Given the planes $x + 2y - 3z + 2 = 0$ and $x - 2y + 3z + 7 = 0$. If a point P(1, 2, 2), 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

Answer: A

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139. In a parallelogram OABC with position vectors of A is $3\hat{i} + 4\hat{j}$ and $Cis4\hat{i} + 3\hat{j}$ with reference to O as origin. A point E is taken on the side BC which divides it in the the ratio of $2:1$. Also, the line segment AE intersects the line bisecting the $\angle AOC$ internally at P. CP when extended meets AB at F.

Q. The position vector of P is

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

B. $\frac{2}{3}\left(\hat{i}+\hat{j}\right)$

C. $\frac{13}{3}\left(\hat{i}+\hat{j}\right)$

D. $\frac{21}{5}\left(\hat{i}+\hat{j}\right)$

Answer: (d)

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140. In a parallelogram OABC with position vectors of A is $3\hat{i}+4\hat{j}$ and $Cis4\hat{i}+3\hat{j}$ with reference to O as origin. A point E is taken on the side BC which divides it in the the ratio of $2:1$. Also, the line segment AE intersects the line bisecting the $\angle AOC$ internally at P. CP when extended meets AB at F.

Q. The equation of line parallel of CP and passing through $(2, 3, 4)$ 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 with position vectors of A is $3\hat{i} + 4\hat{j}$ and $Cis4\hat{i} + 3\hat{j}$ with reference to O as origin. A point E is taken on the side BC which divides it in the the ratio of $2:1$. Also, the line segment AE intersects the line bisecting the $\angle AOC$ internally at P. CP when extended meets AB at F.

Q. The equation of plane containing line AC and at a macimum distance from B is

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

B. $r \cdot \left(\hat{i} - \hat{j}\right) = 7$

C. $r \cdot \left(2\hat{i} - \hat{j}\right) = 7$

D. $r \cdot \left(3\hat{i} + 4\hat{j}\right) = 7$

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 $P = 0 isx + y - 2z = 3.$

Q. The coordinates of A' are

A. $(6, 5, 2)$

B. $(6, 5, -2)$

C. $(6, -5, 2)$

D. None of these

Answer: (b)

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143. 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 $P=0 is x+y-2z=3.$

Q. The coordinates of B are

A. $(5, 10, 6)$

B. $(10, 15, 11)$

C. $(-10, -15, -14)$

D. None of these

Answer: (c)

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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 $P = 0 is x + y - 2z = 3$.

Q.

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)

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145. 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. 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. $\frac{3}{\sqrt{11}}, -\frac{1}{\sqrt{11}}, \frac{1}{\sqrt{11}}$

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)

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

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)

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147. 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 planeP_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. $(6, 2, -2)$

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

C. $(6, -2, 2)$

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

Answer: (c)

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148. If the perpendicular distance of the point $(6, 5, 8)$ from the Y-axis is 5λ units, then λ is equal to

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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

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150. 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

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151. 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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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 equation of motion of rockets are $x = 2t, y = -4t, z = 4t$ where the time 't' is given in second and the coordinate of a moving point in kilometres. What is the path of the rockets? At what distance will the rocket be from the starting point $O(0, 0, 0)$ in 10s.

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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 $M(1, 1, 1) : (t = 1)$.

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155. Find the locus of a point, the sum of squares of whose distances 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. 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 $2x + y - 5z = 0$.

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

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159. If the straight line $\dfrac{x - \alpha}{l} = \dfrac{y - \beta}{m} = \dfrac{z - \gamma}{n}$ 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 $l_1\left(m_2n_3 - n_2m_3\right) + m_1\left(n_2l_3 - l_2n_3\right) + n_1\left(l_2m_3 - l_3m_2\right) = 0$

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161. एक रेखा, एक घन के विकर्णों के साथ $\alpha, \beta, \gamma, \delta,$ कोण बनती है तो सिद्ध कीजिए कि

$$\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \frac{4}{3}$$

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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, then find θ and Φ.

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

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164. Find the equation of the plane whch passes through the line $a_1x + b_1y + c_1y + c_1z + d_1 = 0a_2x + b_2y + c_2z + d_2 = 0$ and which is parallel to the line $\frac{x - \alpha}{l} = \frac{y - \beta}{m} = \frac{z - \gamma}{n}$

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

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166. A variable plane forms a tetrahedron of constant volume $64k^3$ with the coordinate planes and the origin, then locus of the centroid of the tetrahedron is

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167. Show that the line segments joining the points $(4, 7, 8), (-1, -2, 1)$ and $(2, 3, 4), (1, 2, 5)$ intersect. Verify whether the four points concyclic.

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168. If P be a point on the lane $lx + my + nz = p$ and Q be a point on the OP such that $OP. OQ = p^2 showt\hat{h}elocusofthep\oint Qis$ p(lx+my+nz)=x^2+y^2+z^2`.

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

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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 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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171. Prove that the shortest distance between any two opposite edges of a tetrahedron formed by the planes $y + z = 0, x + z = 0, x + y = 0, x + y + z = \sqrt{3}ais\sqrt{2}a.$

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Exercise For Session 1

1. The Three coordiantes planes divide the space into .... Parts.

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2. Find the distance between the points $(k, k+1, k+2)$ and $(0, 1, 2)$.

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3. Show that the points $(1, 2, 3), (-1, -2, -1), (2, 3, 2)$ and $(4, 7, 6)$ are the vertices of a parallelogram.

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4. The mid points of the sides of a triangles are `(1,5,-1),(0,4,-2) and (2,3,4). Find its vertices.

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5. Find the maximum distance between the points $(3\sin\theta, 0, 0)$ and $(4\cos\theta, 0, 0)$.

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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.

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7. A line marks angles α, β and γ with the coordinate axes. If $(\alpha + \beta) = 90^\circ$, then find$\gamma$.

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8. If α, β and γ are angles made by the line with positive direction direction of X-axis, 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 $\cos^2\alpha + (\cos\beta + \sin\gamma)(\cos\beta - \sin\gamma)$.

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10. A line makes angles $\alpha, \beta, \gamma and \delta$ with the diagonals of a cube. Show that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = 4/3$.

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11. Find the direction cosine of line which is perpendicular to the lines with direction ratio $[1, -2, -2]$ and $[0, 2, 1]$.

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12. The projection of a line segment on the axis 1, 2, 3 respectively. Then find the length of line segment.

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Exercise For Session 2

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

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2. A line passes through the point with position vector $2\hat{i}-3\hat{j}+4\hat{k}$ and is in the diretion of $3\hat{i}+4\hat{j}-5\hat{k}$. Find the equation of the line is vector and cartesian forms.

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3. Find the coordinates of the point where the line through $(3, 4, 1)$ and $(5, 1, 6)$ crosses XY-plane.

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

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

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6. Find the magnitude of the shortest distance between the lines $\frac{x}{2} = \frac{y}{-3} = \frac{z}{1}$ 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 the line $\frac{x+1}{3} = \frac{y-2}{-2} = \frac{z+1}{-1}$.

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

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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.

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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(2,1,01), C(1,1,1) and D(3,3,0) are coplanar. Find the equation of the plane containing them.

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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.

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5. Find equation of angle bisector of plane $x + 2y + 3z - z = 0$ and $2x - 3y + z + 4 = 0$.

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6. Find image of point $(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$.

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7. Find the angle between the lines $\frac{x + 1}{2} = \frac{y}{3} = \frac{z - 3}{6}$ and the planes $3x + y + z = 7$.

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

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10. Find the equation of 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 equation of the planes parallel to the planes $x - 2y + 2z = 3$ 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 $2x - y + 2z - 19 = 0$ and $4x - 3y + 12z + 3 = 0$ and specify the plane which bisects the acute angle and the planes which bisects the obtuse angle.

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

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15. Find the equation of a 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

1. Find the centre and radius of sphere $2(x - 5)(x + 1) + 2(y + 5)(y - 1) + 2(z - 2)(z + 2) = 7$.

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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.

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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 sphere if it touches the plane $r \cdot \left(2\hat{i} - 2\hat{j} - \hat{k}\right) = 0$ and the position vector of its centre is $3\hat{i} + 6\hat{j} - \hat{k}$.

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5. Find the value of λ for which the plane $x + y + z = \sqrt{3}\lambda$ touches the sphere $x^2 + y^2 + z^2 - 2x - 2y - 2z = 6$.

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

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7. A sphere has the equation $|r - a|^2 + |r - b|^2 = 72, wherea = \hat{i} + 3\hat{j} - 6\hat{k}$ 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 $r \cdot \left(2\hat{i} + 2\hat{j} - \hat{k}\right) + 3 = 0$.

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Exercise (Single Option Correct Type Questions)

1. The xy-plane divides the line joining the points$(-1, 3, 4)$ and $(2, -5, 6)$.

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)

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3. If $P(3, 2, -4), Q(5, 4, -6)$ and $R(9, 8, -10)$ are collinear, then R divides PQ in the ratio

A. 3:2 internally

B. 3:1 externally

C. 2:1 internally

D. 2:1 externally

Answer: (b)

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4. $A(3, 2, 0), B(5, 3, 2)$ and $C(-9, 8, -10)$ are the vertices of a triangle ABC. If the bisector of $\angle ABC$ meets BC atD, then coordinates of D are

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 point $(6, -7, -1)$ and $(2, -3, 1)$. The direction cosines of the line so directed that the angle made by it with the positive direction of x-axis is acute, are

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° and OY to 60° then OP inclined to ZO at

A. 75°

B. 60° and 120°

C. 75° and 105°

D. 255°

Answer: (b)

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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

A. $\frac{l_1 + l_2}{2\sin\left(\frac{\theta}{2}\right)}, \frac{m_1 + m_2}{2\sin\left(\frac{\theta}{2}\right)}, \frac{n_1 + n_2}{2\sin\left(\frac{\theta}{2}\right)}$

B. $\frac{l_1 + l_2}{2\cos\left(\frac{\theta}{2}\right)}, \frac{m_1 + m_2}{2\cos\left(\frac{\theta}{2}\right)}, \frac{n_1 + n_2}{2\cos\left(\frac{\theta}{2}\right)}$

C. $\frac{l_1 - l_2}{2\sin\left(\frac{\theta}{2}\right)}, \frac{m_1 - m_2}{2\sin\left(\frac{\theta}{2}\right)}, \frac{n_1 - n_2}{2\sin\left(\frac{\theta}{2}\right)}$

D. $\frac{l_1 - l_2}{2\cos\left(\frac{\theta}{2}\right)}, \frac{m_1 - m_2}{2\cos\left(\frac{\theta}{2}\right)}, \frac{n_1 - n_2}{2\cos\left(\frac{\theta}{2}\right)}$

Answer: (b)

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

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

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

D. None of these

Answer: (b)

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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. straight line

B. plane

C. sphere

D. None of these

Answer: (b)

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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 $r \cdot \left(5\hat{i} + 2\hat{j} - 7\hat{k}\right) + 9 = 0$. The points a and b

A. lie on the plane

B. are on the same side of the plane

C. are on the opposite side of the plane

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 $r \cdot \left(4\hat{i} - 12\hat{j} - 3\hat{k}\right) - 7 = 0$ is

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

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

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

D. None of these

Answer: (b)

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12. Let L_1 be the line $r_1 = 2\hat{i} + \hat{j} - \hat{k} + \lambda\left(\hat{i} + 2\hat{k}\right)$ and let L_2 be the another line $r_2 = 3\hat{i} + \hat{j} + \mu\left(\hat{i} + \hat{j} - \hat{k}\right)$. Let ϕ be the plane which contains the line L_1 and is parallel to the L_2. The distance of the plane ϕ from the origin is

A. $\sqrt{\frac{2}{7}}$

B. $\frac{1}{7}$

C. $\sqrt{6}$

D. None of these

Answer: (a)

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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 lie in the plane $x-y+z=0$

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

A. -2

B. 8

C. -18

D. 11

Answer: (a)

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15. The length of projection of the line segmet joining the points $(1, 0, -1)$ and $(-1, 2, 2)$ on the plane $x + 3y - 5z = 6$ is equal to

A. 2

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

C. $\sqrt{\frac{472}{31}}$

D. $\sqrt{\frac{474}{35}}$

Answer: (d)

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

A. 3

B. 4

C. 9

D. 7

Answer: (c)

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17. In a three dimensional co-odinate , 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 origin)

A. 0

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

C. $\frac{2}{3}\left(a^2 + b^2 + c^2\right)$

D. None of these

Answer: (a)

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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)

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

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 point of intersecting of the line passing through $(0, 0, 1)$ and intersecting the lines $x + 2y + z = 1, \ -x + y - 2z = 2$ and $x + y = 2, x + z = 2$ with xy-plane is

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)

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

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

$L_1 : r = 3\hat{i} - \hat{j} + \hat{k} + \lambda\left(2\hat{i} + 4\hat{j} - \hat{k}\right)$

$L_2 : r = \hat{i} + \hat{j} - 3\hat{k} + \mu\left(4\hat{i} + 2\hat{j} + 4\hat{k}\right)$

$L_3 := 3\hat{i} + 2\hat{j} - 2\hat{k} + t\left(2\hat{i} + \hat{j} + 2\hat{k}\right)$

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. Let $r = a + \lambda l$ and $r = b + \mu m$ br be two lines in space, where $a = 5\hat{i} + \hat{j} + 2\hat{k}, b = -\hat{i} + 7\hat{j} + 8\hat{k}, l = -4\hat{i} + \hat{j} - \hat{k}$, and $m = 2\hat{i} - 5\hat{j} - 7\hat{k}$, then the position vector of a point which lies on both of these lines, is

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)

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

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

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

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

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

Answer: (a)

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26. The vector equations of two lines L_1 and L_2 are respectively $\vec{r} = 17\hat{i} - 9\hat{j} + 9\hat{k} + \lambda\left(3\hat{i} + \hat{j} + 5\hat{k}\right)$ and $\vec{r} = 15\hat{-}8\hat{j} - \hat{k} + \mu\left(4\hat{i} + 3\hat{j}\right)$ I L_1 and L_2 are skew lines II $(11, -11, -1)$ is the point of intersection of L_1 and L_2 III $(-11, 11, 1)$ is the point of intersection of L_1 and L_2. IV

$\cos^{-1}\left(\frac{3}{\sqrt{35}}\right)$ is the acute angle between $\_1$ and L_2 then , which of the following is true?

A. II abd 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. $2x - 3y + 1 = 0$

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

C. $3x - y + z - 3 = 0$

D. $3x - y - 2 = 0$

Answer: (d)

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28. Intercept made by the circle $z\bar{z} + \bar{a} + a\bar{z} + r = 0$ on the real axis on complex plane is

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

B. $\frac{i \cdot n}{q}$

C. $(r \cdot n)q$

D. $\frac{q}{|n|}$

Answer: (a)

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29. If the distance between the planes $8x + 12y - 14z = 2$ and $4x + 6y - 7z = 2$ can be expressed in the form $\frac{1}{\sqrt{N}}$, where N is natural, then the value of $\frac{N(N+1)}{2}$ is

A. 4950

B. 5050

C. 5150

D. 5151

Answer: (d)

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30. A plane passes through thee 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

A. 2

B. 4

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: (d)

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31. If from the point $P(f, g, h)$ perpendicular PL and PM be drawn to yz and zx-planes, then the equation to the plane OLM is

A. $\frac{x}{f} + \frac{y}{g} - \frac{z}{h} = 0$

B. $\frac{x}{f} + \frac{y}{g} + \frac{z}{h} = 0$

C. $\frac{x}{f} - \frac{y}{g} + \frac{z}{h} = 0$

D. $-\frac{x}{f} + \frac{y}{g} + \frac{z}{h} = 0$

Answer: (a)

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32. The plane XOZ divides the join of $(1, -1, 5)$ and $(2, 3, 4)$in the ratio of $\lambda : 1$, then λ is

A. -3

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

C. 3

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

Answer: (d)

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33. A variable plane forms a tetrahedron of constant volume $64k^3$ with the coordinate planes and the origin, then locus of the centroid of the tetrahedron is

A. $x^3 + y^3 + z^3 = 6k^3$

B. $xyz = 6k^3$

C. $x^2 + y^2 + z^2 = 4k^2$

D. $x^{-2} + y^{-2} + z^{-2} = 4k^{-2}$

Answer: (d)

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34. Let ABCD be a tetrahedron such that the edges AB, AC and AD are mutually perpendicular. Let the area of $\triangle ABC$, $\triangle ACD$ and $\triangle ABD$ be 3, 4 and5 sq. units, respectively. Then, the area of the $\triangle BCD$. Is

A. $5\sqrt{2}$

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)

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36. Which of the following planes are parallel but not identical?

$P_1 : 4x - 2y + 6z = 3$

$P_2 : 4x - 2y - 2z = 6$

$P_3: -6x + 3y - 9z = 5$

$P_4: 2x - y - z = 3$

A. P_2 and P_3

B. P_2 and P_4

C. P_1 and P_3

D. P_1 and P_4

Answer: (c)

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37. A parallelopied 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?

A. 2

B. 4

C. 6

D. 8

Answer: (b)

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38. Vector equation of the plane $r = \hat{i} - \hat{j} + \lambda\left(\hat{i} + \hat{j} + \hat{k}\right) + \mu\left(\hat{i} - 2\hat{j} + 3\hat{k}\right)$ 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. The vector equations of two lines L_1 and L_2 are respectively,

$L_1 : r = 2i + 9j + 13k + \lambda(i + 2j + 3k)$ and $L_2 : r = -3i + 7j + pk + \mu(-i + 2j - 3k)$

Then, the lines L_1 and L_2 are

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)

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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. $\frac{1}{3}$

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

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

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

Answer: (c)

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41. The value of a for which the lines $\frac{x-2}{1} = \frac{y-9}{2} = \frac{z-13}{3}$ and $\frac{x-a}{-1} = \frac{y-7}{2} = \frac{z+2}{-3}$ intersect, is

A. -5

B. -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 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)

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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)

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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

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

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. 23

B. 95

C. 27

D. None of these

Answer: (a)

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47. 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 $p_1\left(n_2 \times n_3\right) + p_2\left(n_3 \times n_1\right) + p_3\left(n_1 \times n_2\right)$ is equal to

A. 1

B. 2

C. 0

D. -1

Answer: (b)

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48. The equation of the plane which passes through the line of intersection of the planes $r \cdot n_1 = q_1, r \cdot n_2 = q_2$ and is parallel to the line of intersection of the planes $r \cdot n_3 = q_3, r \cdot n_4 = q_4$ is

A. $\left[n_2 n_3 n_4\right]\left(r \cdot n_1 - q_1\right) = \left[n_1 n_3 n_4\right]\left(r \cdot n_2 - q_2\right)$

B. $\left[n_1 n_2 n_3\right]\left(r \cdot n_4 - q_4\right) = \left[n_4 n_3 n_1\right]\left(r \cdot n_2 - q_2\right)$

C. $\left[n_4 n_3 n_1\right]\left(r \cdot n_4 - q_4\right) = \left[n_1 n_2 n_3\right]\left(r \cdot n_2 - q_2\right)$

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 $(c + d)$ is

A. -1

B. 1

C. 7

D. 9

Answer: (d)

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

A. $2\sqrt{11}$

B. $\sqrt{126}$

C. 13

D. 14

Answer: (c)

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51. $P(\vec{p})$ and $Q(\vec{q})$ are the position vectors of two fixed points and $R(\vec{r})$ is the position vectorvariable point. If R moves such that $(\vec{r} - \vec{p}) \times (\vec{r} - \vec{q}) = 0$ then the locus of R is

A. A plane containing the origin O and parallel to two non- collinear vector vector OP and OQ.

B. the surface of a sphere described on PQ as its diameter.

C. a line passing through the points P and Q.

D. a set of lines parallel to the line PQ.

Answer: (c)

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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)

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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)

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

A. 3

B. 1

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

D. 9

Answer: (d)

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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)

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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)

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58. A tetrahedron has vertices $O(0, 0, 0), A(1, 2, 1), B(2, 1, 3), and C(-1, 1, 2)$, then angle between face $OAB and ABC$ will be a. $\cos^{-1}\left(\frac{17}{31}\right)$ b. 30^0 c. 90^0 d. $\cos^{-1}\left(\frac{19}{35}\right)$

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

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

C. 30°

D. 90°

Answer: (a)

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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)

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

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

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)

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63. $A_{xy}, {}_{yz}, A_{zx}$ be the area of projections oif asn area a o the xy,yz and zx and planes resepctively, then $A^2 = A^2 \_ (xy) + A^2 \_ (yz) + a^2 \_ (zx)$

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)

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64. Through a point $P(h, k, l)$ a plane is drawn at righat angle to OP to meet the coordinaste axes in A,B and C. If OP =p show that the area of $\triangle ABis$p^5/(2hkl)`

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

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

C. $\dfrac{p^3}{2hkl}$

D. $\dfrac{p^3}{hkl}$

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

D. 400

Answer: (b)

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66. 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

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

B. $\cos^{-1}\sqrt{3}$

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

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

Answer: (c)

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67. The distance between the line $r = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and the plane $r \cdot (\hat{i} + 5\hat{j} + \hat{k}) = 5$, 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. The cartesian equations of the plane perpendicular to the line $\frac{x-1}{2} = \frac{y-3}{-1} = \frac{z-4}{2}$ and passing through the origin is

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

B. $2x + y + 2x = 0$

C. $2x - y + 2z = 0$

D. $2x - y - z = 0$

Answer: (c)

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

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

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

C. $\frac{1}{8}$

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

Answer: (a)

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70. A plane makes interceptsOA, OB and OC whose measurements are a, 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. $\frac{1}{2}\frac{\left(a^2b^2 + b^2c^2 + c^2a^2\right)^1}{2}$

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

Answer: (c)

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71. The radius of the circle in which the sphere $x^2 + y^2 + z^2 + 2x - 2y - 4z - 19 = 0$ is cut by the plane $x + 2y + 2z + 7 = 0$ is

A. 2

B. 3

C. 4

D. 1

Answer: (b)

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72. Let $\vec{a} = \hat{i} + \hat{j}$ and $\vec{b} = 2\hat{i} - \hat{k}$. The point of intersection of the lines $\vec{r} \times \vec{a} = \vec{b} \times \vec{a}$ and $\vec{r} \times \vec{b} = \vec{a} \times \vec{b}$ is

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

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

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

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

Answer: (b)

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73. The co-ordinate of the point P on the line $r = (\hat{i} + \hat{j} + \hat{k}) + \lambda(-\hat{I} + \hat{j} - \hat{k})$ which is nearest to the origin is

A. $\left(\frac{2}{3}, \frac{4}{3}, \frac{2}{3}\right)$

B. $\left(-\frac{2}{3}, -\frac{4}{3}, \frac{2}{3}\right)$

C. $\left(\frac{2}{3}, \frac{4}{3}, -\frac{2}{3}\right)$

D. None of these

Answer: (a)

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74. The 3-dimensional vectors v_1, v_2, v_3 satisfying $v_1 \cdot v_1 = 4, v_1 \cdot v_2 = -2, v_1 \cdot v_3 = 6, v_2 \cdot v_2 = 2, v_2 \cdot v_3 = -5, v_3 \cdot v_3 = 29,$ then v_3 may be

A. $-3\hat{i} + 2\hat{j} \pm 4\hat{k}$

B. $3\hat{i} - 2\hat{j} \pm 4\hat{k}$

C. $-2\hat{i} + 3\hat{j} \pm 4\hat{K}$

D. $2\hat{i} + 3\hat{j} \pm 4\hat{k}$

Answer: (b)

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75. The points $\hat{i} - \hat{j} + 3\hat{k}$ and $3\hat{i} + 3\hat{j} + 3\hat{k}$ are equidistant from the plane $r \cdot \left(5\hat{i} + 2\hat{j} - 7\hat{k}\right) + 9 = 0$, then they are

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 $AC^2 + BD^2 + AC^2 + BC^2 \geq AB^2 + CD^2$ what is the implication of the sign of equality.

A. $AB^2 + CD^2$

B. $\frac{1}{AB^2} - \frac{1}{CD^2}$

C. $\frac{1}{CD^2} - \frac{1}{AB^2}$

D. None of these

Answer: (a)

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77. Show that $x_1\hat{i} + y_1\hat{j} + z_1\hat{k}, x_2\hat{i} + y_2\hat{j} + z_2\hat{k}$ and $x_3\hat{i} + y_3\hat{j} + z_3\hat{k}$ are non-coplnar if $|x_1| > |y_1| + |z_1|, |y_2| > |x_2| + |z_2|$ and $|z_3| > |x_3| + |y_3|$.

A. perpendicular

B. collinear

C. coplanar

D. non coplanar

Answer: (d)

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78. The position vectors of points of intersection of three planes $r \cdot n_1 = q_1, r \cdot n_2 = q_2, r \cdot n_3 = q_3,$ where n_1, n_2 and n_3 are non coplanar vectors, is

A. $\frac{1}{\left[n_1 n_2 n_3\right]}\left[q_3\left(n_1 \times n_2\right) + q_1\left(n_2 \times n_3\right) + q_2\left(n_3 \times n_1\right)\right]$

B. $\frac{1}{\left[n_1 n_2 n_3\right]}\left[q_1\left(n_1 \times n_2\right) + q_1\left(n_2 \times n_3\right) + q_3\left(n_3 \times n_1\right)\right]$

C. $-\frac{1}{\left[n_1 n_2 n_3\right]}\left[q_1\left(n_1 \times n_2\right) + q_1\left(n_2 \times n_3\right) + q_3\left(n_3 \times n_1\right)\right]$

D. None of these

Answer: (a)

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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 dimensional coodinate a system P, Q and R are image of a point $A(a, b, c)$ in the XY they YZ and the ZX planes respectively. If G is the centroid of triangle PQR then area of Triangle AOG is (O is origin).

A. 0

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

C. $\frac{2}{3}\left(a^2 + b^2 + c^2\right)$

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)

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82. The locus of point which moves in such a way that its distance from the line $\frac{x}{1} = \frac{y}{1} = \frac{z}{-1}$ is twice the distance from the plane $x + y + z = 0$ is

A. $x^2 + y^2 + z^2 - 5x - 3y - 3z = 0$

B. $x^2 + y^2 + z^2 + 5x + 3y + 3z = 0$

C. $x^2 + y^2 + z^2 - 5xy - 3zy - 3zx = 0$

D. $x^2 + y^2 + z^2 + 5xy + 3zy + 3zx = 0$

Answer: (c)

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83. A cube $C = \{(x, y, z) \mid o \leq x, y, z \leq 1\}$ 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)

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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. A plane cutting the axes in P, Q, R passes through $(\alpha-\beta, \beta-\gamma, \gamma-\alpha)$. If O is the origin, then locus of centre of sphere OPQR is

A. $\alpha x+\beta y+\gamma z=4$

B. $(\alpha-\beta)x+(\beta-\gamma)y+(\gamma-\alpha)z=0$

C. $(\alpha-\beta)yz+(\beta-\gamma)zx+(\gamma-\alpha)xy=2xyz$

D. $\left(\frac{1}{\alpha^2}+\frac{1}{\beta^2}+\frac{1}{\gamma^2}\right)\left(x^2+y^2+z^2\right)=xyz$

Answer: (c)

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86. The shortest distance between any two opposite edges of the tetrahedron formed by planes $x + y = 0, y + z = 0, z + x = 0, x + y + z = a$ is constant, equal to

A. $2a$

B. $\frac{2a}{\sqrt{6}}$

C. $\frac{a}{\sqrt{6}}$

D. $\frac{2a}{\sqrt{3}}$

Answer: (b)

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

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

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

C. $\cos^{-1}\left(\frac{4}{9}\right)$

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

Answer: (c)

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88. Let (p, q, r) be a point on the plane $2x + 2y + z = 6$, then the least value of $p^2 + q^2 + r^2$ is equal ot

A. 4

B. 5

C. 6

D. 8

Answer: (a)

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89. The fout 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)

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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. $\sqrt{\left(k_1 + k_3\right)^2 + \left(k_2 + k_4\right)^2}$

D. $\sqrt{\left(k_1 - k_3\right)^2 + \left(k_2 - k_4\right)^2}$

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. If ABCD is a tetrahedron such that each $\triangle ABC$, $\triangle ABD$ and $\triangle ACD$ has a right angle at A. If $ar(\triangle(ABC)) = k_1, ar(\triangle ABD) = k_2, ar(\triangle BCD) = k_3,$ then ar(triangleACD)` is

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

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

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

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

Answer: (c)

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94. In a regular tetrahedron, if the distance between the mid points of opposite edges is unity, its volume is

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

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

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

D. $\frac{1}{6\sqrt{2}}$

Answer: (a)

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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. $\left(x^2 + y^2 + z^2\right) = 384xyz$

B. $xyz = 681$

C. $(x+y+z)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)^2=16$

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

Answer: (a)

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96. If P, Q, R, S are four coplanar points on the sides AB, BC, CD, DA of a skew quadrilateral, then $\frac{AB}{PB}\cdot\frac{BQ}{QC}\cdot\frac{CR}{RD}\cdot\frac{DS}{SA}$ equals

A. 1

B. -1

C. 3

D. -3

Answer: (a)

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

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 perpencular 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)

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2. Consider the family of planes $x + y + z = c$ where c is a parameter intersecting the coordinate axes P, Q andR and α, β and γ are the angles made by each member of this family with positive x, y and z-axes. Which of the following interpretations hold good got this family?

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

B. $\sin^2(\alpha) + \sin^2(\gamma) + \sin^2(\beta) = 1$

C. $\cos^2(\alpha) + \cos^2(\beta) + \cos^2(\gamma) = 2$

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

Answer: (a, b, c)

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3. Equation of the line through the point $(1, 1, 1)$ and intersecting the lines $2x - y - z - 2 = 0 = x + y + z - 1$ and $x - y - z - 3 = 0 = 2x + 4y - z - 4$.

A. $x - 1 = 0, 7x + 17y - 3z - 134 = 0$

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

C. $x - 1 = 0, \frac{y - 1}{1} = \frac{z - 1}{3}$

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_xy is area of projetion of $\triangle(ABC)$ on xy-plane. A_zy is area of projection of $\triangle(ABC)$ on yz-plane, then

A. $\triangle = \left|\frac{p^5}{hkl}\right|$

B. $\triangle = \left|\frac{p^5}{2hkl}\right|$

C. $\frac{A_xy}{A_yz} = \left|\frac{1}{h}\right|$

D. $\frac{A_xy}{A_yz} = \left|\frac{h}{l}\right|$

Answer: (b, e)

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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. Centroid of a tetrahedron lies on lines joining any vertex to the center of opposite faces.

B. Centroid of the a tetrahedron lies on lines joining the mid point of the opposite faces.

C. Distance of centroid from all the vertices are equal.

D. None of these

Answer: (a, b)

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7. A variable plane cutting coordinate axes in A, B, C is at a constant distance from the origin. Then the locus of centroid of the $\triangle ABC$ 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. Equation of any plane containing the line $\frac{x - x_1}{a} = \frac{y - y_1}{b} = \frac{z - z_1}{c}$ is $A\left(x - x_1\right) + B\left(y - y_1\right) + C\left(z - z_1\right) = 0$ then pick correct alternatives

A. $\frac{A}{a} = \frac{B}{b} = \frac{C}{c}$ is true for the line to be perpendicular to the plane.

B. $A(a + 3) + B(b - 1) + C(c - 2) = 0$

C. $2aA + 3bB + 4cC = 0$

D. $Aa + Bb + Cc = 0$

Answer: (a, d)

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9. The line $\frac{x - 2}{3} = \frac{y + 1}{2} = \frac{z - 1}{-1}$ 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. $r = \sqrt{26}$

C. $r = 6$

D. $r = 7$

Answer: (a, b)

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10. A vector equally inclined to the vectors $\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + \hat{j} - \hat{k}$ then the plane containing them is

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

B. $\hat{j} - \hat{k}$

C. $2\hat{i}$

D. $\hat{i}$

Answer: (c, d)

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11. Consider the plane through $(2, 3, -1)$ and at right angles to the vector $3\hat{i} - 4\hat{j} + 7\hat{k}$ from the origin is

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

B. perpendicular distance of plane from origin $\frac{1}{\sqrt{74}}$.

C. perpendicular distance of plane from origin $\frac{13}{\sqrt{74}}$.

D. perpendicular distance of plane from origin $\frac{21}{\sqrt{74}}$.

Answer: (b,c)

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12. A plane passes through a fixed point (a, b, c) and cuts the axes in A, B, C. The locus of a point equidistant from origin A, B, C must be

A. $ayz + bzx + czy = 2xyz$

B. $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 1$

C. $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$

D. $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 3$

Answer: (a, c)

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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)

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14. Consider the lines $x = y = z$ and line $2x + y + z - 1 = 0 = 3x + y + 2z - 2$, then

A. the shortest distance between the two lines is $\frac{1}{\sqrt{2}}$

B. The shortest distance between the two lines is $\sqrt{2}$

C. plane containing 2nd line parallel to 1st line is $y - z + 1 = 0$

D. the shortest distance between the two lines $\frac{\sqrt{3}}{2}$

Answer: (a, c)

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15. If p_1, p_2, p_3 denote the perpendicular distance of the plane $2x - 3y + 4z + 2 = 0$ from the parallel planes.

A. $p_1 + 8p_2 - p_3 = 0$

B. $p_3 = 16p_2$

C. $8p_2 = p_1$

D. $p_1 + 2p_2 + 3p_3 = \sqrt{29}$

Answer: (a, b, c, d)

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16. A line segment has length 63 and direction ratios are 3, -26. The components of the line vectors are

A. $-27, 18, 54$

B. $27, -18, -54$

C. $27, -18, 54$

D. $-27, 18, -54$

Answer: (c, d)

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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. $k=0$

B. $k=-1$

C. $k=2$

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, then

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)

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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. $PR + PS = 2$

B. $PR \times PS = \frac{2}{3}$

C. $PR = PS$

D. $PR + PS = RS$

Answer: (a, b, d)

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20. A rod of length 2units whose one end is $(1, 0, -1)$ and other end touches the plane $x - 2y + 2z + 4 = 0$, then

A. The rod sweeps the figure whose volume is ϕ cubic units.

B. The area of the region which the rod traces on the plane is 2ϕ.

C. The length of projection of the rod on the plane is $\sqrt{3}$ units.

D. The centre of the region which the rod traces on the plane is $\left(\frac{2}{3}, \frac{2}{3}, -\frac{5}{3}\right)$.

Answer: (a, c, d)

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21. Consider the planes $p_1 : 2x + y + z + 4 = 0, p_2 : y - z + 4 = 0$ and $p_3 : 3x + 2y + z + 8 = 0$

Let L_1, L_2, L_3 be the lines of intersection of the planes p_2 and p_3, p_3 and p_1, p_1 and p_2 respectively. Then.

A. at least two of the line L_1, L_2 and L_3 are non parallel.

B. at least two of the lines L_1, L_2 and L_3 are parallel

C. the three planes intersect in the line.

D. the three planes form a triangular prism.

Answer: (b, c)

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22. The volume of a tetrahedron prism $ABCA_1B_1C_1$ is equal to 3. Find the coordinates of the vertex A_1, if the coordinate of the base vertices of the prism are $A(1, 0, 1), B(2, 0, 0)$ and $C(0, 1, 0)$.

A. $(-2, 0, 2)$

B. $(0, -2, 0)$

C. $(0, 2, 0)$

D. $(2, 2, 2)$

Answer: (b, d)

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23. If the plane passing through the origin and parallel to the line $\frac{x-1}{2}=\frac{y+3}{-1}=\frac{z+1}{-2}$ such that the distance between them is $\frac{5}{3}$ then the equation of the plane is

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

B. $x-2y-2z=0$

C. $2x+2y+z=0$

D. $x+y+z=0$

Answer: (a, c)

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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 OA to the plane ABC is $\frac{1}{\sqrt{6}}$

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)

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25. The OABC is a tetrahedron such that $OA^2 + BC^2 = OB^2 + CA^2 = OC^2 + AB^2$,then

A. $OA \perp BC$

B. $OB \perp AC$

C. $OC \perp AB$

D. $AB \perp AC$

Answer: (a, b, c)

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26. If the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ intersects the line $3\beta^2 x + 3(1 - 2\alpha)y + z = 3 = -\frac{1}{2}\left\{\left(6\alpha^2 x + 3(1 - 2\beta)y + 2z\right)\right\}$ then point $(\alpha, \beta, 1)$ lie on the plane

A. $2x - y + z = 4$

B. $x + y - z = 2$

C. $x - 2y = 0$

D. $2x - y = 0$

Answer: (a, b, c)

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27. 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

A. $\tan(\theta) = \frac{\sqrt{5}}{3}$

B. $\sin(\theta)\sin(\phi) = \frac{2}{\sqrt{14}}$

C. $\tan(\theta) = 2$

D. $\cos(\theta)\cos(\phi) = \frac{1}{\sqrt{14}}$

Answer: (a, b, c)

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28. A variable plane which remains at a constant distance P from the origin (O) cuts the coordinate axes in A, B and C

A. Locus of centroid of tetrahedron OABC is $x^2y^2 + z^2y^2 + z^2x^2 = \frac{16}{p^2}\left(x^2y^2z^2\right)$.

B. Locus of centroid of tetrahedron OABC is $x^2y^2 + z^2y^2 + z^2x^2 = \frac{4}{p^2}\left(x^2y^2z^2\right)$.

C. Parametric equation of the centroid of the the tetrahedron is of the form

$$\left(\frac{p}{4}\sec(\alpha)\sec(\beta), \frac{p}{4}\sec(\alpha)\mathrm{cosec}(\beta), \frac{p}{4}\mathrm{cosec}(\alpha)\right)\alpha, \beta \in (0, 2\pi) - \left\{\frac{\pi}{2}, \pi, \frac{3\pi}{2}\right\}$$

.

D. None of these

Answer: (a, b)

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Exercise (Statement I And Ii Type Questions)

1. Statement 1: let $A\left(\vec{i}+\vec{j}+\vec{k}\right) and B\left(\vec{i}-\vec{j}+\vec{k}\right)$ be two points. Then point $P\left(2\vec{i}+3\vec{j}+\vec{k}\right)$ lies exterior to the sphere with AB as its diameter.

Statement 2: If $A and B$ are any two points and P is a point in space such that $\vec{P}A\vec{P}B > 0$, then point P lies exterior to the sphere with AB as its diameter.

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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2. Statement-I If $r = x\hat{i} + y\hat{j} + z\hat{k}$, then equation $\rtimes \left(2\hat{i} - \hat{j} + 3\hat{k}\right) = 3\hat{i} + \hat{k}$ repesents a straight line.

Statement-II If $r = x\hat{i} + y\hat{j} + z\hat{k}$, then equation $\rtimes \left(\hat{i} + 2\hat{j} - 3\hat{k}\right) = 3\hat{i} - \hat{j}$ repesents a straight line.

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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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 $\theta = \sin^{-1}\left(1/\sqrt{51}\right)$. 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)

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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)

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5. Let the line L having equation $\frac{x-1}{2}=\frac{y-3}{5}=\frac{z-1}{3}$ intersects the plane P, having equation $x-y+z=5$ at the point A.

Statement-I Equation of the line L' thorugh the point A, lying in the plane P and having minimum inclination with line L is $8x+y-72-4=0=x-y+z-5$

Statement-II Line L' must be projection of the line L in the plane P.

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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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. 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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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)

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

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: (c)

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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 $5x + 2y - 3z - 8 = 0$

Statement 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 line 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-I The given lines are coplanar.

Statement-II The equation $2x_1 - y_1 = 1, x_1 + 3y_1 = 4$ and $3x_1 + 2y_1 = 5$ 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 $A(\vec{a})$ is at maximum distance from origin, then normal to the plane is vector $\vec{a}$.

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)

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13. Statement-I At least two of the lines L_1, l_2 and L_3 are non parallel

Statement-II 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 $\left(\hat{i} + 2\hat{j} - \hat{k} is r \left(\hat{i} - 2\hat{j} + 3\hat{k}\right) = 8.$

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: (d)

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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

A. $r = \hat{i} + 2\hat{j} + 3\hat{k} + \mu\left(3\hat{i} + 2\hat{j} + 3\hat{k}\right)$

B. $r = \hat{i} + 2\hat{j} + 3\hat{k} + \mu\left(3\hat{i} + 4\hat{j} + 3\hat{k}\right)$

C. $r = \hat{i} + 2\hat{j} + 3\hat{k} + \mu\left(3\hat{i} + 3\hat{j} + 2\hat{k}\right)$

D. $r = \hat{i} + 2\hat{j} + 3\hat{k} + \mu\left(3\hat{i} + 3\hat{j} + 4\hat{k}\right)$

Answer: (d)

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

Q. The equation of altitude through B to side AC is

A. $r = k + t\left(7\hat{i} - 10\hat{j} + 2\hat{k}\right)$

B. $r = k + t\left(-7\hat{i} + 10\hat{j} + 2\hat{k}\right)$

C. $r = k + t\left(7\hat{i} - 10\hat{j} - 2\hat{k}\right)$

D. $r = k + t\left(7\hat{i} + 10\hat{j} + 2\hat{k}\right)$

Answer: (b)

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3. Let $A(1, 2, 3), B(0, 0, 1), C(-1, 1, 1)$ are the vertices of a ΔABC.The equation of median through C to side AB is

A. $r = -\hat{i} + \hat{j} + \hat{k} + p\left(3\hat{i} - 2\hat{k}\right)$

B. $r = -\hat{i} + \hat{j} + \hat{k} + p\left(3\hat{i} + 2\hat{k}\right)$

C. $r = -\hat{i} + \hat{j} + \hat{k} + p\left(-3\hat{i} + 2\hat{k}\right)$

D. $r = -\hat{i} + \hat{j} + \hat{k} + p\left(3\hat{i} + 2\hat{k}\right)$

Answer: (b)

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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($\triangle ABC$) is equal to

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

B. $\frac{\sqrt{17}}{2}$

C. $\frac{17}{2}$

D. $\frac{7}{2}$

Answer: (b)

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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)

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6. 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. $x - 3y + 5 = 0$

B. $x + 3y - 7 = 0$

C. $3x - y - 1 = 0$

D. $3x + y - 5 = 0$

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. $\frac{\sqrt{51}}{3}$

C. $\frac{\sqrt{51}}{9}$

D. $\frac{\sqrt{59}}{4}$

Answer: (b)

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8. Consider a triangulat pyramid ABCD the position vector 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 the $\triangle(BCD)$.

Q. Area of the $\triangle(ABC)$ (in sq. units) is

A. 24

B. $8\sqrt{6}$

C. $4\sqrt{6}$

D. None of these

Answer: (c)

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9. Consider a triangulat pyramid ABCD the position vector 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 the $\triangle (BCD)$.

Q. The length of the perpendicular from the vertex D on the opposite face is

A. $\frac{14}{\sqrt{6}}$

B. $\frac{2}{\sqrt{6}}$

C. $\frac{3}{\sqrt{6}}$

D. None of these

Answer: (a)

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10. Consider a triangulat pyramid ABCD the position vector 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 the $\triangle (BCD)$.

Q. Equation of the plane ABC is

A. $x + y + 2z = 5$

B. $x - y - 2z = 1$

C. $2x + y - 2z = 4$

D. $x + y - 2z = 1$

Answer: (d)

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11. 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. Equation of plane equidistant from line L_1 and L_2 is

A. $\hat{r} \cdot (i - 7j - 5k) = 3$

B. $\hat{r} \cdot (i + 7j + 5k) = 3$

C. $\hat{r} \cdot (i - 7j - 5k) = 9$

D. $\hat{r} \cdot (i + 7j - 5k) = 9$

Answer: (d)

View Text Solution

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. Equation of a line passing through the point $(2, -3, 2)$ and equally inclined to the line L_1 and L_2 may equal to

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

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

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

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

Answer: (c)

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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. $\sqrt{14}$

B. $\frac{7}{\sqrt{14}}$

C. $\frac{11}{\sqrt{14}}$

D. None of these

Answer: (b)

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14. For positive l, 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 satisgy the equation

A. $l^2 + m^2 + n^2 = 2$

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

C. $l^2 + m^2 + n^2 = 1$

D. None of these

Answer: (b)

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15. For positive l, 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. 90°

B. 50°

C. 180°

D. None of these

Answer: (c)

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

Q. The equation of the straight line is $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$, where the ordered traid (a, b, c) is

A. $\sqrt{1 - l^2}, \sqrt{1 - m^2}, \sqrt{1 - n^2}$

B. l, m and n

C. $\frac{1}{\sqrt{1 - l^2}}, \frac{1}{\sqrt{1 - m^2}}$ and $\frac{1}{\sqrt{1 - n^2}}$

D. None of these

Answer: (a)

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17. 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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18. 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 image of the point P in 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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19. 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. If A is the point with position vector a then area of the triangle $\triangle PLA$ is sq. units is equal to

A. $3\sqrt{6}$

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

C. $\sqrt{17}$

D. $\frac{7}{2}$

Answer: (b)

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

Q. A point P moves in the space such that $3PA = 2PB$, then the locus of P is

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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21. $A(-2, 2, 3)$ 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)

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22. $A(-2, 2, 3)$ 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)

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23. The vector equation of a plane is a relation satisfied by position vectors of all the points on the plane. If P is a plane and $\hat{n}$ is a unit vector through origin which is perpendicular to the plane P then vector equation of the plane must be $r \cdot \hat{n} = d$ where d represents perpendicular distance of plane p from origin

Q. If A is a point vector a then perendicular distance of a from the plane $r \cdot \hat{n} = d$ must be

A. $|d + a\hat{n}|$

B. $|d - a\hat{n}|$

C. $|a - d|$

D. $\left|d - \hat{a}\right|$

Answer: (b)

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24. The vector equation of a plane is a relation satisfied by position vectors of all the points on the plane. If P is a plane and $\hat{n}$ is a unit vector through origin which is perpendicular to the plane P then vector equation of the plane must be $r \cdot \hat{n} = d$ where d represents perpendicular distance of plane p from origin

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

A. $a + \left(d - a \cdot \hat{n}\right)\hat{n}$

B. $a - \left(d - a\hat{n}\right)\hat{n}$

C. $a + a \cdot \hat{n}$

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

Answer: (a)

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25. The vector equation of a plane is a relation satisfied by position vectors of all the points on the plane. If P is a plane and $\hat{n}$ is a unit vector through origin which is perpendicular to the plane P then vector equation of the plane must be $r \cdot \hat{n} = d$ where d represents perpendicular distance of plane p from origin

Q. The position vector of the image of the point a in the plane $r \cdot \hat{n} = d$ must be $(d \neq 0)$

A. $-a \cdot \hat{n}$

B. $a - 2\left(d - a\hat{n}\right)\hat{n}$

C. $a + 2\left(d - a\hat{n}\right)\hat{n}$

D. $a + d\left(- a \cdot \hat{n}\right.$

Answer: (c)

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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 of the sphere, with centre at $(-g, -f, -h)$ 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. Radius of the sphere, with $(2, -3, 4)$ and $(-5, 6, -7)$ as xtremities of a diameter, is

A. $\sqrt{\frac{251}{2}}$

B. $\sqrt{\frac{251}{3}}$

C. $\sqrt{\frac{251}{4}}$

D. $\sqrt{\frac{251}{5}}$

Answer: (c)

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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 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 of the sphere, with centre at $(-g, -f, -h)$ 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

A. $(4, 3, 0)$

B. $(-4, -3, 0))$

C. $(0, 0, 0)$

D. None of these

Answer: (c)

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28. 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 of the sphere, with centre at $(-g, -f, -h)$ 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 $r \cdot \left(2\hat{i} - 2\hat{j} - \hat{k}\right) = 10$ is $(x-3)^2 + (y-6)^2 + (z+4)^2 = k^4$, where k is equal to

A. 3

B. 4

C. 6

D. $\sqrt{17}$

Answer: (b)

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29. 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

B. 4

C. 3

D. None of these

Answer: (b)

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30. 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. Projection of AB onBC is

A. $\frac{8\sqrt{3}}{11}$

B. $\frac{-8\sqrt{3}}{11}$

C. -48

D. 48

Answer: (b)

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31. 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. 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. $\left(\frac{1}{\sqrt{11}}, -\frac{3}{\sqrt{11}}, -\frac{1}{\sqrt{11}}\right)$

Answer: (a)

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

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)

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33. 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. $(-3, 1, -1)$

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

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

Answer: (c)

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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. $x + y + z - 3 = 0$

B. $y + z - 1 = 0$

C. $x + z - 1 = 0$

D. $2x + z - 1 = 0$

Answer: (b)

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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 line L is

A. $r = 2\hat{k} + \lambda\left(\hat{i} + \hat{k}\right)$

B. $r = 2\hat{k} + \lambda\left(2\hat{j} + \hat{k}\right)$

C. $r = 2\hat{k} + \lambda\left(\hat{j} + \hat{k}\right)$

D. None of these

Answer: (c)

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36. 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 perpendicular distance of D from the plane ABC is

A. $\sqrt{2}$

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

C. 2

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

Answer: (d)

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

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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 $\lambda : 1$, then the integer λ should be equal to

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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 λ must be.....

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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....

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10. The plane $2x - 2y + z + 12 = 0$ touches the surface $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$ only at point $(-1, \lambda, -2)$. The value of λ must be

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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......

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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 $2\left(a^2 + b^2 + c^2\right)$.

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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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19. Value of λ do the planes $x - y + z + 1 = 0, \lambda x + 3y + 2z - 3 = 0, 3x + \lambda y + z - 2 = 0$ form a triangular prism must be

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20. If the lattice point $P(x, y, z), x, y, z > o$ and $x, y, z \in I$ with least value of z such that the 'p' lies on the planes $7x + 6y + 2z = 272$ and $x - y + z = 16$, then the value of $(x + y + z - 42)$ is equal to

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21. If the line $x = y = z$ intersect the line $x\sin A + y\sin B + z\sin C - 2d^2 = 0 = x\sin(2A) + y\sin(2B) + z\sin(2C) - d^2$, 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

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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

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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 $(l_1m_2 - l_2m_1)^2 + (m_1n_2 - n_1m_2)^2 + (n_1l_2 - n_2l_1)^2 + (l_1l_2 + m_1m_2 + n_1n_2)^2 =$

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26. If the coordinates (x, y, z) of the point S which is equidistant from the points $O(0, 0, 0), A(n^5, 0, 0), B(0, n^4, 0), C(0, 0, n)$ obey the relation $2(x + y + z) + 1 = 0$. If $n \in Z$, then $|n| =$ ____($|\cdot|$ is the mudulus function).

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Exercise (Subjective Type Questions)

1. Find the angle between the lines whose direction cosines has the relation $l + m + n = 0$ 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 $al + bm + cn = 0 and \hat{}\_2 + zm^2 = vn^2 + wn^2 = 0$ are parallel or perpendicular as $\frac{a^2}{u} + \frac{b^2}{v} + \frac{c^2}{w} = 0$ or $a^2(v + w) + b^2(w + u) + c^2(u + v) = 0$.

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

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7. Prove that the distance of the points of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane $x - y + z = 5$ from the point $(-1, -5. -10)$ is 13.

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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 $x - 2y + 2z - 3 = 0$ in plane $x + y + z - 1 = 0$.

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Exercise (Questions Asked In Previous 13 Years Exam)

1. Consider a pyramid OPQRS located in the first octant $(x \geq 0, y \geq 0, z \geq 0)$ 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 $\triangle OQS$ is x-y=0

C. the length of perpendicular from P to the plane containing the $\triangle OQS$ is $\frac{2}{\sqrt{3}}$

D. the perpendicular distance from O to the straight line containing RS is $\sqrt{\frac{15}{2}}$

Answer: (b, c, d)

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

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

B. $3x + z = 0$

C. $x - 4y + 7z = 0$

D. $2x - y = 0$

Answer: (c)

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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. $\sqrt{2}$

B. 1

C. -1

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

B. 2

C. 3

D. 4

Answer: (a, d)

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5. A line l passing through the origin is perpendicular to the lines

$1:(3+t)\hat{i}+(-1+2t)\hat{j}+(4+2t)\hat{k}-\infty<t<\infty$ and $1\_(2):(3+2s)\hat{i}+(3+2s)\hat{i}+$

Then the coordinate(s) of the point(s) on 1_2 at a distance of $\sqrt{17}$ from the

point of intersection of 1 and 1_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)

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6. Perpendicular are drawn from points on the line $\frac{x+2}{2}=\frac{y+1}{-1}=\frac{z}{3}$ to the plane $x+y+z=3$. The feet of perpendiculars lie on the line.

A. $\frac{x}{5} = \frac{y-1}{8} = \frac{z}{3}$

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 $\frac{z+1}{5} = \frac{y+1}{2} = \frac{z}{k}$ 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 lines $\frac{x - 1}{2} = \frac{y - 2}{3} = \frac{z - 3}{4}$ and $\frac{x - 2}{3} = \frac{y - 3}{4} = \frac{z - 4}{5}$ is $\sqrt{6}$, then |d| is equal to....

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9. Read the following passage and answer the questions. Consider the lines

$L_1 : \frac{x + 1}{3} = \frac{y + 2}{1} = \frac{z + 1}{2}$

$L_2 : \frac{x - 2}{1} = \frac{y + 2}{2} = \frac{z - 3}{3}$

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

$$L_1 : \frac{x+1}{3} = \frac{y+2}{1} = \frac{z+1}{2}$$

$$L_2 : \frac{x-2}{1} = \frac{y+2}{2} = \frac{z-3}{3}$$

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)

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11. Read the following passage and answer the questions. Consider the lines

$$L_1 : \frac{x+1}{3} = \frac{y+2}{1} = \frac{z+1}{2}$$

$$L_2 : \frac{x-2}{1} = \frac{y+2}{2} = \frac{z-3}{3}$$

Q. The unit vector perpendicular to both $L - (1)$ and L_2 is

A. $\frac{-\hat{i} + 7\hat{j} + 7\hat{k}}{\sqrt{99}}$

B. $\frac{-\hat{i} - 7\hat{j} + 5\hat{k}}{\sqrt{99}}$

C. $\frac{-\hat{i} + 7\hat{j} + 5\hat{k}}{\sqrt{99}}$

D. $\frac{7\hat{i} - 7\hat{j} - \hat{k}}{\sqrt{99}}$

Answer: (b)

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12. Consider three planes $P_1 : x - y + z = 1$

$P_2 : x + y - z = -1$

and $P_3 : x - 3y + 3z = 2$

Let L_1, L_2, L_3 be the lines of intersection of the planes P_2 and P_3, P_3 and P_1, P_1 and P_2 respectively.

Statement I Atleast two of the lines L_1, L_2 and L_3 are non-parallel.

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

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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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. $2\sqrt{42}$

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 : (1) $3\sqrt{10}$ (2) $10\sqrt{3}$ (3) $\frac{10}{\sqrt{3}}$ (4) $\frac{20}{3}$

A. $3\sqrt{10}$

B. $10\sqrt{3}$

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

D. $\frac{20}{3}$

Answer: (b)

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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: (1) 26 (2) 18 (3) 5 (4) 2

A. 26

B. 18

C. 5

D. 2

Answer: (d)

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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

A. $2x + 6y + 12z = 13$

B. $x + 3y + 6z = -7$

C. $x + 3y + 6z = 7$

D. $2x + 6y + 12z = -7$

Answer: (c)

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20. The angle between the lines whose direction cosines satisfy the equations $l + m + n = 0$ and $l^2 = m^2 + n^2$ is (1) $\frac{\pi}{3}$ (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{2}$

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

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)

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22. Distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$ is

A. $\frac{3}{2}$

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

C. $\frac{7}{2}$

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

Answer: (c)

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23. If the lines $\frac{x-2}{1}=\frac{y-3}{1}\Big)\frac{z-4}{-k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar then k can have (A) exactly two values (B) exactly thre values (C) any value (D) exactly one value

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. -1

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

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

D. 0

Answer: (c)

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26. If the angle between the line $x = \frac{y - 1}{2} = (z - 3)(\lambda)$ and the plane $x + 2y + 3z = 4 is \cos^{-1}\left(\sqrt{\frac{5}{14}}\right)$, then λ equals

A. $\frac{3}{2}$

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

C. $\frac{5}{3}$

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 $\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ 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 $x - y + z = 5$ measured 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)

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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. $a = 8, b = 2$

B. $a = 2b = 8$

C. $a = 4b = 6$

D. $a = 6b = 4$

Answer: (d)

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35. If the straight lines $\frac{x-1}{k} = \frac{y-2}{2} = \frac{z-3}{3}$ and $\frac{x-2}{3} = \frac{y-3}{k} = \frac{z-1}{2}$ intersect at a point, then the integer k is equal to

A. -2

B. -5

C. 5

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 angle α with the positive X=axis, then $\cos\alpha$ equals

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

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

C. 1

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

Answer: (a)

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37. If a line makes an angle $\frac{\pi}{4}$ with the positive directions of each of X-axis and Y-axis, then the angle that the line makes with the positive direction of the 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)

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39. The two lines $x = ay + b, z = cy + d$ and $x = a'y + b', z = c'y + d'$ are perpendicular 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)

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

A. $(15, 11, 4)$

B. $\left(-\frac{17}{3}, -\frac{19}{3}, 1\right)$

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

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 $\sin\theta = \frac{1}{3}$. The value of λ is

A. $-\frac{4}{3}$

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

C. $-\frac{3}{5}$

D. $\frac{5}{3}$

Answer: (d)

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43. The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is

A. 30°

B. 45°

C. 90°

D. 0°

Answer: (c)

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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. $\sqrt{2}$

B. 2

C. 1

D. 3

Answer: (c)

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