MATHS

BOOKS - KC SINHA ENGLISH

3D - COMPETITION

Solved Examples

1. Show that the three lines drawn from the origin with direction cosines proportional to (1,-1,1),(2,-3,0) and (1,0,3) are coplanar

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2. Prove that the two lines whose direction cosines are given by the relations $pl+qm+rn=0$ and $al^2+bm^2+cn^2=0$ are perpendicular if $p^2(b+c)+q^2(c+a)+r^2(a+b)=0$ and parallel if $\frac{p^2}{a}+\frac{q^2}{b}+\frac{r^2}{c}=0$

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3. The direction cosines of two lines satisfying the

conditions $l+m+n=0$ and $3lm-5mn+2nl=0$

where l, m, n are the direction cosines.

The value of $(l-m)^2+(m-n)^2+(n-l)^2$ is

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4. If the direction cosines of two lines given by the equations $pm+qn+rl=0$ and $lm+mn+nl=0$, prove that the lines are parallel if $p^2+q^2+r^2=2(pq+qr+rp)$ and perpendicular if $pq+qr+rp=0$

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5. Prove that in a tetrahedron if two pairs of opposite edges are perpendicular, then the thrid pair is also perpendicular.

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6. If $P, Q, R, Sare(3, 6, 4), (2, 5, 2), (6, 4, 4), (0, 2, 1)$ respectively. The projection of PQ on RS is ....

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7. Find the length and direction cosines of a line segment whose projection on the coordinate axes are 6,-3,2.

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8. Show that the four points $(0, -1, 0), (2, 1, -1), (1, 1, 1) \text{ and } (3, 3, 0)$ are coplanar. Also, find equation of plane through them.

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9. findthe equationof the plane passing through the point (α, β, γ) and perpendicular to the planes $a_1x + b_1y + c_1z + d_1 = 0$ and $a_2x + b_2y + c_2z + d_2 = 0$

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10. Find the equation of the plane passing through the line of intersection of the planes $4x - 5y - 4z = 1$ and $2x + y + 2z = 8$ and the point (2,1,3).

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11. If the plane $ax + by = 0$ is rotated about its line of intersection with the plane $z = 0$ through an angle α then prove that the equation of the plane in its new position is $ax + by \pm \left(\sqrt{a^2 + b^2} \tan \alpha\right)z = 0.$

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12. 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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13. Find the distance between the parallel planes $2x - y + 3 - 4 = 0 \, and \, 6x - 3y + 13 = 0.$

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14. Find the plane which bisects the obtuse angle between the planes $4x - 3y + 12z + 13 = 0$ and $x + 2y + 2z = 9$

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15. Find the equation of the planes bisecting the angles between planes $2x + y + 2z = 9$ and $3x - 4y + 12z + 13 = 0$

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16. Find the locus of a point, the sum of squares of whose distance from the planes $x - z = 0, x - 2y + z = 0 and x + y + z = 0 is 36$.

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17. If P is any point on the plane $lx + my + nz = p and Q$ is a point on the line OP such that $OP. OQ = p^2$, then find the locus of the point Q.

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18. A variable plane passes through a fixed point (α, β, γ) and meets the axes at $A, B, and C$. show that the locus of the point of intersection of the planes through $A, BandC$ parallel to the coordinate planes is $\alpha x^{-1} + \beta y^{-1} + \gamma z^{-1} = 1.$

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19. A variable plane at constant distance p form the origin meets the coordinate axes at P,Q, and R. Find the locus of the point of intersection of planes drawn through P,Q, r and parallel to the coordinate planes.

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20. A variable plane which remains at q constant distance $3p$ from the origin cut the coordinate axes at $A,\ B,\ C\cdot$ Show that the locus o the centroid of triangle ABC is $x^{-2} + y^{-2} + z^{-2} = p^{-2}.$

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

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23. Let A_{xy}, A_{yz}, A_{xz} be the area of the projection of a plane area A on the xy, yz, zx plane respectively. Then $A^2=$

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24. Through a point $P(h, k, l)$ a plane is drawn at righat angle to OP to meet the coordinate axes in A, B and C. If $OP = p$ show that the area of $\triangle ABC$ is $\frac{p^5}{2hkl}$

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25. 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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26. Find he equation of the plane passing through (1,2,0) which contains the line $\frac{x+3}{3} = \frac{y-1}{4} = \frac{z-2}{-2}$

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27. Find the equation of the plane through the line $\frac{x-x_1}{l_1} = \frac{y-y_1}{m_1} = \frac{z-z_1}{n_1}$ and parallel to the line $\frac{x-\alpha}{l_2} = \frac{y-\beta}{m_2} = \frac{z-\gamma}{n_2}$

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28. Find the equation of the projection of the line $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z-3}{4}$ on the plane $x + 2y + z = 9$.

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29. Find the the image of the point (α, β, γ) with respect to the plane $2x + y + z = 6$.

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30. Do the lines $\frac{x+3}{-4}=\frac{y-4}{1}=\frac{z+1}{7}$ and $\frac{x+1}{-3}=\frac{y-1}{2}=\frac{z+10}{8}$ intersect? If so find the point of intersection.

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31. Show that the lines $\frac{x-3}{2}=\left(y=\frac{10}{-3}=\frac{z+2}{1}\right.$ and $\frac{x7}{-3}=\frac{y}{1}=\frac{z+7}{2}$ are coplanar. Also find the equation of the plane containing them.

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32. Are the lines $3x-2y+z+5=0=2x+3y+4z-4$ and $\frac{x+4}{3}=\frac{y+6}{5}=\frac{z-1}{-2}$ coplanar. If yes find their point of intersection and equation of the plane which they lie.

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33. 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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34. Find the equation of the line which passes thorugh the point $P(\alpha, \beta, \gamma)$ and is parallel to the line $a_1x+b_1y+c_1z+d_1=0, a_2x+b_2y+c_2z+d_2=0$

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35. Equation of line of projection of the line $3x-y+2z-1=0=x+2y-z-2$ on the plane $3x+2y+z=0$ is:

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

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37. 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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38. Find the length of the shortest distance between the lines $\frac{x-1}{2} = \frac{y-4}{3} = \frac{z+1}{-3}$ and $\frac{x-4}{1} = \frac{y-3}{3} = \frac{z-2}{2}$

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39. 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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40. Find the equation of the sphere touching the four planes $x=0, y=0, z=0$ and $x+y+z=1$ and lying in the octant bounded by positive coordinate planes.

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41. The plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ meets the coordinate axes at A,B and C respectively. Find the equation of the sphere OABC.

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42. 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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43. Find the equation of the plane passing through the points $(2, 1, 0)$, $(5, 0, 1)$ and $(4, 1, 1)$.

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44. If P is the point (2,1,6) find the point Q such that PQ is perpendicular to the plane $x + y - 2z = 3$ and the mid point of PQ lies on it.

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45. A parallelepiped S has base points A, B, C and D and upper face points A', B', C' and D'. The parallelepiped is compressed by upper face

$A'B'C'D'$ to form a new parallelepiped T having upper face points A'', B'', C'' and D''. The volume of parallelepiped T is 90 percent of the volume of parallelepiped S. Prove that the locus of A'' is a plane.

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46. A plane is parallel to two lines whose direction ratios are (1,0,-1) and (-1,1,0) and it contains the point (1,1,1).If it cuts coordinate axes at A,B,C then find the volume of the tetrahedron OABC.

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47. Two planesP_1 and P_2 pass through origin. Two lines L_1 and L_2 also passingthrough origin are such that L_1 lies on P_1 but not on P_2, L_2 lies on P_2 but not on $P_1 A, B, C$ are there points other than origin, then prove that the permutation $[A', B', C']$ of $[A, B, C]$ exists. Such that: (a) A lies on L1, B lies on P1 not on L1, C does not lie on P1 . (b) A lies on L2, B lies on P2 not on L2, C' does not lies on P2.

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48. Find the equation of the plane containing the line $2x + y + z - 1 = 0, x + 2y - z = 4$ and at a distance of $\frac{1}{\sqrt{6}}$ from the point (2,1,-1).

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49. 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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50. Two systems of rectangular axes have the same origin. If a plane cuts them at distance $a, b, candd, b', c'$ 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. $$\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}+\frac{1}{a'^2}+\frac{1}{b'^2}+\frac{1}{c'^2}=0$$

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51. The shortest distance from the plane $12x+y+3z=327$to the sphere $x^2+y^2+z^2+4x-2y-6z=155$ is

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

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53. A line with direction cosines proportional to 2,1,2 meet each of the lines $x=y+a=z$ and $x+a=2y=2z$. The coordinastes of each of the points of intersection are given by

(A) $(3a, 2a, 3a), (a, a, 2a)$

(B) $(3a, 2a, 3a), (a, a, a)$

(C) $(3a, 3a, 3a), (a, a, a)$

(D) $(2a, 3a, 3a), (2a, a, a)$

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55. 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

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

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57. The value of k for which the planes $kx+4y+z=0, 4x+ky+2z=0nd2x+2y+z=0$ intersect in a straighat line is

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58. Consider the planes $\vec{r}.\vec{n}_1=d_1$ and $\vec{r}.\vec{n}_2=d_2$ then (A) they are perpendiculat if $\vec{n}_1.\vec{n}_2=0$ (B) intersect in a line parallel to $\vec{n}_1\times\vec{n}_2$ if $\vec{n}_1$ is not parallel to $\vec{n}_2$ (C) angle between them is $\cos^{-1}\left(\frac{\vec{n}_1.n_2.}{\left|\vec{n}_1\right|\left|\vec{n}_2\right|}\right)$ (D) none of these

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59. 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.

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60. A paragraph has been given. Based upon this paragraph, 3 multiple choice question have to be answered. Each question has 4 choices a,b,c and d out of which ONLYONE is correct. Consider the $L_1 : \frac{x+1}{3} = \frac{y+2}{1} = \frac{z+1}{2}$ and $L_2 : \frac{x-2}{1} = \frac{y+2}{2} = \frac{z-3}{3}$ The unit vector perpendicular to both L_1 and L_2 is (A) $\frac{-\hat{i} + 7\hat{k} + 7\hat{k}}{\sqrt{99}}$ (B) $\frac{-\hat{i} - 7\hat{k} + 5\hat{k}}{5\sqrt{3}}$ (C) $\frac{-\hat{i} + 7\hat{k} + 7\hat{k}}{5\sqrt{3}}$ (D) $\frac{7\hat{i} - 7\hat{k} - 7k}{\sqrt{99}}$

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61. Consider the $L_1 : \frac{x+1}{3} = \frac{y+2}{1} = \frac{z+1}{2}$ and $L_2 : \frac{x-2}{1} = \frac{y+2}{2} = \frac{z-3}{3}$ The shortest distance betwen L_1 and L_2 is

(A) 0 (B) $\frac{17}{\sqrt{3}}$ (C) $\frac{41}{5(3)}$ (D) $\frac{17}{\sqrt{75}}$

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62. 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

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Exercise

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

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2. If the centroid of a triangle with vertices $(\alpha, 1, 3), (- 2, \beta, - 5)$ and $(4, 7, \gamma)$ is the origin then $\alpha\beta\gamma$ is equal to ....

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3. Show that $\left(- \frac{1}{2}, 2, 0 \right)$ is the circumacentre of the triangle whose vertices are $A(1, 1, 0), B(1, 2, 1)$ and $C(- 2, 2, - 1)$ and hence find its orthocentre.

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4. $A(3, 2, 0), B(5, 3, 2)C(-9, 6, -3)$ are three points forming a triangle. AD, the bisector of angle BAC meets BC in D. Find the coordinates of the point D.

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5. Find the coordinate of the foot of the perpendicular from $P(2, 1, 3)$ on the line joinint the points $A(1, 2, 4)$ and $B(3, 4, 5)$

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6. If O be the origin and OP makes an angle of 45^0 and 60^0 with the positive direction of x and y axes respectively and OP=12 units, find the coordinates of P.

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7. Find the angles of $\triangle ABC$ whose vetices are $A(-1, 3, 2), B(2, 3, 5) \text{ and } C(3, 5, -2)$.

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8. Find the projection of the line segment joining (2,-1,3) and (4,2,5)` on a line whidh makes equal to angle with coordinate axes.

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9. The projection of a directed line segment on the coordinate axes are $12, 4, 3$. Find its length and direction cosines.

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10. Find the direction cosines of as perpendicular from origin to the plane $\vec{r}.\left(2\hat{i} - 2\hat{j} + \hat{j}\right) + 2 = 0$

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11. Find the Cartesian equation of the plane $\overrightarrow{r}.\left(2\hat{i}-3\hat{j}+5\hat{k}\right)=1.$

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12. Find the vector equation of the plane $\overrightarrow{r}=(1+s-t)\hat{i}+(2-s)\hat{j}+(3-2s+2t)\hat{k}$ in non-parametric form.

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13. Find the angle between planes $\overrightarrow{r}.\left(\overrightarrow{i}+\overrightarrow{j}\right)=1$ and $\overrightarrow{r}.\left(\overrightarrow{i}+\overrightarrow{k}\right)=3.$

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14. Prove that the planes $12x - 15y + 16z - 28 = 0, 6x + 6y - 7z - 8 = 0$ and $2x + 35y - 39z + 12 = 0$ have a common line of intersection.

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15. Find the angle between the planes $x - y + 2z = 9 \text{ and } 2x + y + z = 7.$

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16. Show that the origin lies in the interior of the acute angle between planes x + 2y + 2z = 9 and 4x - 3y + 12z + 13 = 0. Find the equation of bisector of the acute angle.

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17. The plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ meets the co-ordinate axes in the point A, B, C respectively. Find the

area $\triangle ABC$.

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18. A (1, 0, 4), B (0, −11, 3), C (2, −3, 1) are three points and D is the foot of perpendicular form $AonBC$. Find the coordinates of D.

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20. A line with cosines proportional to $2, 7-5$ drawn to intersect the lines $\frac{x-5}{3}=\frac{y-7}{-1}=\frac{z+2}{1}; \frac{x+3}{-3}=\frac{y-3}{2}=\frac{z-6}{4}$ .Find the coordinates of the points of intersection and the length intercepted on it.

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21. Find the image of the point (2,-3,4) with respect to the plane $4x+2y-4z+3=0$

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22. Projection of line $\frac{x+1}{2}+\frac{y+1}{-1}=\frac{z+3}{4}$ on the plane $x+2y+z=6$; has equation $x+2y+z-6=0=9x-2y-5z-8$

b. $x+2y+z+6=0, 9x-2y+5z=4$ c. $\frac{x-1}{4}=\frac{y-3}{-7}=\frac{z+1}{10}$

d. $\frac{x+3}{4}=\frac{y-2}{7}=\frac{z-7}{-10}$

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23. Prove that the straight lines $\frac{x}{\alpha}=\frac{y}{\beta}=\frac{z}{\gamma}, \frac{x}{l}=\frac{y}{m}=\frac{z}{n}$ and $\frac{x}{a\alpha}=\frac{y}{b\beta}=\frac{z}{c\gamma}$ will be co planar if

$$\frac{l}{\alpha}(b-c)+\frac{m}{\beta}(c-a)+\frac{n}{\gamma}(a-b)=0$$

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24. Find the equation of the line through point $(1, 2, 3)$ and parallel to plane $x-y+2z=5, 3x+y+z=6$

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25. The shortest distance between the straighat lines through the point $A_1=(6, 2, 2)$ and $A_2=(-4, 0, -1)$ in the directions $1, -2, 2$ and $3, -2, -2$ is

(A) 6 (B) 8 (C) 12 (D) 9

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26. Find the points on the lines $\frac{x-6}{3}=\frac{y-7}{-1}=\frac{z-4}{1}$ and $\frac{x}{-3}=\frac{y-9}{2}=\frac{z-2}{4}$. Which are nearest to each other.

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27. Find the coordinates of the points where the shortest distance between the lines $\frac{x-12}{-9}=\frac{y-1}{4}=\frac{z-5}{2}$ and $\frac{x-23}{6}=\frac{y-19}{4}=\frac{z-25}{-3}$ meets them.

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

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30. If the system of equations $x = cy + bz$ $y = az + cx$ $z = bz + ay$ has a non-trivial solution, show that $a^2 + b^2 + c^2 + 2abc = 1$

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31. Let PQ be the perpendicular form $P(1, 2, 3)$ to xy-plane. If OP makes an angle theta with the positive direction of z-axis and OQ makes an angle ϕ with the positive direction of x-axis where O is the origin show that $\tan\theta = \frac{\sqrt{5}}{3}$ and $\tan\phi = 2.$

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33. The graph of the equation $x^2 + y^2 = 0$ in the three dimensional space is

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34. If a point moves so that the sum of the squars of its distances from the six faces of a cube having length of each edge 2 units is 104 units then the distance of the point from point (1,1,1) is (A) a variable (B) a constant equal to 7 units (C) a constant equal to 4 uinits (D) a constant equal to 49 units

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35. Prove that the points $O(0, 0, 0), A(2.0, 0), B(1, \sqrt{3}, 0)$ and $C\left(1, \frac{1}{\sqrt{3}}, \frac{2\sqrt{2}}{\sqrt{3}}\right)$ are the vertices of a regular tetrahedron.,

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36. Show that the angle between two diagonals of a cube is $\cos^{-1}\sqrt{\frac{1}{3}}$.

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37. The equation $\vec{r} = \lambda\hat{i} + \mu\hat{j}$ represents the plane

(A) x=0 (B) z=0 (C) y=0 (D) none of these

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38. The vector $\vec{c}$, directed along the internal bisector of the angle between the vectors

$\vec{a} = 7\hat{i} - 4\hat{j} - 4\hat{k}$ and $\vec{b} = -2\hat{i} - \hat{j} + 2\hat{k}$ with $\left|\vec{c}\right| = 5\sqrt{6}$, is

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39. The equation of the plane containing the line $2x + z - 4 = 0nd2y + z = 0$ and passing through the point (2,1,-1)$is(A)$ x+y-z=4(B)x-y-z=2(C)x+y+z+2=0(D)x+y+z=2`

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40. The locus represented by $xy + yz = 0$ is a pair of

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41. The acute angle between the planes $5x - 4y + 7z = 13$ and the y-axis is given by

(A) $\sin^{-1}\left(\frac{5}{\sqrt{90}}\right)$

(B) $\sin^{-1}\left(\frac{-4}{\sqrt{90}}\right)$

(C) $\sin^{-1}\left(\frac{7}{\sqrt{90}}\right)$

(D) $\sin^{-1}\left(\frac{4}{\sqrt{90}}\right)$

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42. The points $A(1, 1, 0), B(0, 1, 1), C(1, 0, 1)$ and $D\left(\frac{2}{3}, \frac{2}{3}, \frac{2}{3}\right)$ are

(A) coplanar (B) non coplanar (C) vertices of a paralleloram (D) none of these

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43. The equation of the parallel plane lying midway between the parallel planes $2x - 3y + 6z - 7 = 0$ and $2x - 3y + 6z + 7 = 0$ is

(A) $2x - 3y + 6z + 1 = 0$

(B) $2x - 3y + 6z - 1 = 0$

(C) $2x - 3y + 6z = 0$

(D) none of these

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44. The equation of the righat bisector plane of the segment joining (2,3,4) and (6,7,8) is (A) $x + y + z + 15 = 0$ (B) $x + y + z - 15 = 0$ (C) $x - y + z - 15 = 0$ (D) none of these

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45. The angle between the plane $3x + 4y = 0$ and z-axis is (A) 0^0 (B) 30^0 (C) 60^0 (D) 90^0

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46. If the points $(-0, -1, -2), (-3, -4, -5), (-6, -7, -8)$ and (x, x, x)

are non coplanar then x is (A) -2 (B) 0 (C) 3 (D) any real number

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47. The equation of the plane through the point (1,2,-3) which is parallel to the plane $3x-5y+2z=11$ is given by (A) $3x-5y+2z-13=0$ (B) $5x-3y+2z+13=0$ (C) $3x-2y+5z+13=0$ (D) $3x-5y+2z+13=0$

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48. The equation of any plane parallel to x-axis (A) $ay+cz+b=0, a^2+b^2+c^2=0$ (B) $x=a$ (C) $ay+cz-bx=0, a^2+c\neq 0$ (D) none of these

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

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50. The equation of the plane through the point of intersection of plane $x + 2y + 3z = 4$ and $2x + y - z - 5$ and perpendicular to the plane $5x + 3y + 6z + 8 = 0$ is

(A) $7x - 2y + 3z + 81 = 0$ (B) $23x + 14y - 9z + 48 = 0$ (C) $51x + 15y + 50z + 173 = 0$ (D) none of these

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51. The distance of the point $(2, 1, -1)$ from the plane $x - 2y + 4z = 9$ is

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52. Verify the following: (5,-1,1),(7,-4,7), (1,-6,10) and (-1,-3,4) are the vertices of a rhombus.

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53. The angle θ the line $\vec{r} = \vec{r} + \lambda \vec{b}$ and the plane $\vec{r} \cdot \hat{n} = d$ is given by (A) $\sin^{-1}\left(\frac{\vec{b} \cdot \hat{n}}{|\vec{n}||\vec{b}|}\right)$ (B) $\cos^{-1}\left(\frac{\vec{b} \cdot \hat{n}}{|\vec{b}|}\right)$ (C) $\sin^{-1}\left(\frac{\vec{a} \cdot \hat{n}}{|\vec{a}|}\right)$ (D) $\cos^{-1}\left(\frac{\vec{a} \cdot \hat{n}}{|\vec{a}|}\right)$

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54. A straighat line $\vec{r} = \vec{a} + \lambda \vec{b}$ meets the plane $\vec{r} \cdot \vec{n} = p$ in the point whose position vector is (A) $\vec{a} + \left(\frac{\vec{a} \cdot \hat{n}}{\vec{b} \cdot \hat{n}}\right)\vec{b}$ (B) $\vec{a} + \left(\frac{p - \vec{a} \cdot \hat{n}}{\vec{b} \cdot \hat{n}}\right)\vec{b}$ (C) $\vec{a} - \left(\frac{\vec{a} \cdot \hat{n}}{\vec{b} \cdot \hat{n}}\right)\vec{b}$ (D) none of these

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55. The equation of the line through $(1, 1, 1)$ and perpendicular to the plane $2x + 3y - z = 5$ is

(A) $\dfrac{x-1}{2} = \dfrac{y-1}{3} = z - 1$

(B) $\dfrac{x-1}{2} = \dfrac{y-1}{3} = \dfrac{z-1}{-1}$

(C) $\dfrac{x-1}{2} = \dfrac{y-1}{3} = \dfrac{z-1}{5}$

(D) $\dfrac{x-1}{2} = \dfrac{y-1}{-3} = z - 1$

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56. Given the line $L : \dfrac{x-1}{3} = \dfrac{y+1}{2} = \dfrac{z+3}{1}$ and the plane $\pi : x - 2y + z = 0,$ of the following assertions, the only one that is always true is ,

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57. The reflection of the point $(2, -1, 3)$ in the plane $3x - 2y - z = 9$ is

(A) $\left(\frac{28}{7}, \frac{15}{7}, \frac{17}{7}\right)$ (B) $\left(\frac{26}{7}, -\frac{15}{7}, \frac{17}{7}\right)$ (C) $\left(\frac{15}{7}, \frac{26}{,} - \frac{17}{7}\right)$ (D) $\left(\frac{26}{7}, \frac{17}{7}, -\frac{15}{70}\right)$

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58. The coordinates of the foot of perpendicular form the point $A(1, 1, 1)$ on the lline joining ponts $B(1, 4, 6)$ and $C(5, 4, 4)$ are

(A) (3,4,5)

(B) (4,5,3)

(C) (3,-4,5)

(D) (-3,-4,5)

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59. The equation of the plane thorugh the point $(-1, 2, 0)$ and parallel to the lines $\frac{x}{3} = \frac{y+1}{0} = \frac{z-2}{-1}$ and $\frac{x-1}{1} = \frac{2y+1}{2} = \frac{z+1}{-1}$ is

(A) $2x+3y+6z-4=0$ (B) $x-2y+3z+5=0$ (C) $x+y-3z+1=0$ (D) $x+y+3z-1=0$

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60. Find the shortest distance between the following pairs of lines whose Cartesian equation are: $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4} and \frac{x-2}{3}=\frac{y-3}{4}=\frac{z-5}{5}$

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61. The plane x-2y+z-6=0 and the line x/1=y/2=z/3` are related as the line (A) meets the plane obliquely (B) lies in the plane (C) meets at righat angle to the plane (D) parallel to the plane

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62. If $\overrightarrow{r}.\left(2\hat{i}+3\hat{j}-2\hat{k}\right)+\dfrac{3}{2}=0$ is the equation of a plane and $\hat{i}-2\hat{j}+3\hat{k}$ is a point then a point equidistasnt from the plane on the opposite side is

(A) $\hat{i}+2\hat{j}+3\hat{k}$ (B) $3\hat{i}+\hat{j}+\hat{k}$ (C) $3\hat{i}+2\hat{j}+3\hat{k}$ (D) $3\left(\hat{i}+\hat{j}+\hat{k}\right)$

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63. Find the line of intersection of the planes $\overrightarrow{r}.\left(3\hat{i}-\hat{j}+\hat{k}\right)=1$ and $\overrightarrow{r}.\left(\hat{i}+4\hat{j}-2\hat{k}\right)=2$

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64. For the line $\dfrac{x-1}{1}=\dfrac{y-2}{2}=\dfrac{z-3}{3}$, which one of the following is incorrect?

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65. If $l_1: \frac{x-5}{3} = \frac{y-7}{-16} = \frac{z-3}{7}$ and $l_2: \frac{x-9}{3} = \frac{y-13}{8} = \frac{z-15}{-5}$ the

(A) l_1 and l_2 intersect (B) l_1 and l_2 are skew (C) distance between l_1 and l_2 is 14 (D) none of these

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66. If $\vec{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} + \hat{j} + 4\hat{k}\right)$ and $\vec{r}\left(\hat{i} + 2\hat{j} - \hat{k}\right) = 3$ are the equations of a line and a plane respectively then which of the following is true ?

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67. The distance of the point $(1, 2, 3)$ form the coordinate axes are A,B and C respectively. $A^2 = B^2 + C^2$, $B^2 = 2C^2$, $2A^2C^2 = 13B^2$ which of these hold (s) true?

(A) 1 only (B) 1 and 3 (C) 1 and 2 (D) 2 and 3

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68. The direction ratio of the line OP are equal and the length $OP = \sqrt{3}$. Then the coordinates of the point P are

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

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69. A unit vector $\hat{a}$ makes an angle $\frac{\pi}{4}$ with z-axis, if $\hat{a} + \hat{i} + \hat{j}$ is a unit vector then $\hat{a}$ is equal to

(A) $\hat{i} + \hat{j} + \frac{\hat{k}}{2}$ (B) $\frac{\hat{i}}{2} + \frac{\hat{j}}{2} - \frac{\hat{k}}{\sqrt{2}}$ (C) $-\frac{\hat{i}}{2} - \widehat{/}2 + \frac{\hat{k}}{\sqrt{2}}$ (D) $\frac{\hat{i}}{2} - \frac{\hat{j}}{2} - \frac{\hat{k}}{\sqrt{2}}$

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70. If the direction ratio of two lines are given by $3lm - 4\ln + mn = 0$ and $l + 2m + 3n = 0$, then the angle between the lines, is

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71. If α, β and γ are the angles which a directed line makes with the positive directions of the co-ordinates axes, then find the value of $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma$.

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72. The condition of the lines $x = az + b, y = cz + d$ and $x = a_1 z + b_1, y = c_1 z + d_1$ to be perpendicular is

(A) $ac_1 + a_1 c + 1 = 0$

(B) $aa_1 + cc_1 + 1 = 0$

(C) $ac_1 + bb' + cc' = 0$

(D) $aa_1 + cc_1 - 1 = 0$

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73. The two lines $x = ay + b, z = cy + d$ and $x = a'y + b', z = c'y + d'$ are pendicular to each other if

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74. 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

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75. The diection cosines of two lines are proportional to $(2, 3, -6)$ and $(3, -4, 5)$, then the acute angle between them is (A) $\cos^{-1}\left\{\frac{49}{36}\right\}$ (B) $\cos^{-1}\left\{\frac{18\sqrt{2}}{35}\right\}$ (C) 96^0 (D) $\cos^{-1}\left(\frac{18}{35}\right)$

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76. The equation to the striaghat line passing through the points (4,-5,-2) and (-1,5,3) is (A) $\frac{x-4}{1}=\frac{y+5}{-2}=\frac{z+2}{-1}$ (B) $\frac{x+1}{1}=\frac{y-5}{2}=\frac{z-3}{-1}$ (C) $\frac{x}{-1}=\frac{y}{5}=\frac{z}{3}$ (D) $\frac{x}{4}=\frac{y}{-5}=\frac{z}{-2}$

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77. The distance between the parallel planes $4x-2y+4z+9=0$ and $8x-4y+8z+21=0$ is (A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{2}$ (D) $\frac{7}{4}$

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78. The locus of point such that the sum of the squares of its distances from the planes $x+y+z=0, x-z=0$ and $x-2y+z=0$ is 9 is (A) $x^2+y^2+z^2=3$ (B) $x^2+y^2+z^2=6$ (C) $x^2+y^2+z^2=9$ (D) $x^2+y^2+z^2=12$

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79. Which of the folloiwng conditions such that the line $\frac{x-p}{l} = \frac{y-q}{m} = \frac{z-r}{n}$ lies on the plane $Ax + By + Cz + D = 0$ is/are correct?

1. $lp + mq + nr + D = 0$

2. $Ap + Bq + Cr + D = 0$

3. $Al + Bm + Cn = 0$

Select the correct answer using the codes given

(A) 1 only

(B) 1 and 2

(C) 1 and 3

(D) 2 and 3

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80. If $\vec{a}, \vec{b}, \vec{c}$ are three non coplanar vectors then the vector equation $\vec{r} = (1 - p - q)\vec{a} + p\vec{b} + q\vec{c}$ are represents a: (A) straighat line (B) plane (C) plane passing through the origin (D) sphere

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81. A plane pi makes intercepts 3 and 4 respectively on z-axis and x-axis. If pi is parallel to y-axis, then its equation is (A) $3x - 4z = 12$ (B) $3x + 4z = 12$ (C) $3y + 4z = 12$ (D) $3z + 4y = 12$

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82. The equation of the plane passng throuogh (1,1,1) and (1,-1,-1) and perpendicular to $2x - y + z + 5 = 0$ is (A) $2x + 5y + z - 8 = 0$ (B) $x + y - z - 1 = 0$ (C) $2x + 5y + z + 4 = 0$ (D) $x - y + z - 1 = 0$

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83. The angle between the plane $2x - y + z = 6n$ and $x + y + 2z = 3$ is (A) $\frac{\pi}{3}$ (B) $\frac{\cos^{-1} 1}{6}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{6}$

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84. $\frac{\alpha}{2}, \frac{\beta}{2}, \frac{\gamma}{2}$ are the angle which a line makes with positive x,y,z axes respectively. What is the value of $\cos\alpha + \cos\beta + \cos\gamma$? (A) 1 (B) -1 (C) 2 (D) 3

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85. ABC is a triangle and AD is the median. If the coordinates of A are (4,7,-8) and the coordinates of centroid of triangle ABC are (1,1,1) what are the coordinates of D? (A) $\left(\frac{-1}{2}, 2, 11\right)$ (B) $\left(\frac{-1}{2}, -2, \frac{11}{2}\right)$ (C) $(-1, 2, 11)$ (D) (-5,-11,19)`

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86. If the points $(5, -1, 1), (-1, -3, 4)$ and $(1, -6, 10)$ are three vertices of a rhombus taken in order then which one of the following ils the fourth vertex? (A) $(7, -4, 11)$ (B) $\left(3, \frac{-7}{2}, \frac{11}{2}\right)$ (C) $(7, -4, 7)$ (D) $(7, 4, 11)$

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87. which of the following points is on the line of intersection of planes $x = 3z - 4, y = 2z - 3$? (A) $(4, 3, 0)$ (B) $(-3, -4, 0)$ (C) $(3, 2, 1)$ (D) $(-4, -3, 0)$

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88. The point of intersection of the lines $\frac{x-5}{3} = \frac{y-7}{-1} = \frac{z+2}{1} and = \frac{x+3}{-36} = \frac{y-3}{2} = \frac{z-6}{4}$ is a. $\left(21, \frac{5}{3}, \frac{10}{3}\right)$ b. $(2, 10, 4)$ c. $(-3, 3, 6)$ d. $(5, 7, -2)$

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89. The equation of the line intersection of the planes $4x + 4y - 5z = 12$ and $8x + 12y - 13z = 32$ can be written as: (A) $\frac{x}{2} = \frac{y-1}{3} = \frac{z-2}{4}$ (B) $\frac{x}{2} = \frac{y}{3} = \frac{z-2}{4}$ (C) $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z}{4}$ (D) $\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z}{4}$

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90. If line makes angle $\alpha, \beta, \gamma, \delta$ with four diagonals of a cube, then the value of $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma + \sin^2 \delta$ is (A) $\frac{4}{3}$ (B) 1 (C) $\frac{8}{3}$ (D) $\frac{7}{3}$

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91. The equation of the plane which makes with coordinate axes, a triangle with its centroid (α, β, γ) is

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92. The angle between two planes $x + 2y + 2z = 3$ and $-5x + 3y + 4z = 9$ is (A) $\frac{\cos^{-1}\left(3\sqrt{2}\right)}{10}$ (B) $\frac{\cos^{-1}\left(19\sqrt{2}\right)}{30}$ (C) $\frac{\cos^{-1}\left(9\sqrt{2}\right)}{20}$ (D) $\frac{\cos^{-1}\left(3\sqrt{2}\right)}{5}$

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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

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

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95. If the straight lines $x = -1 + s, y = 3 - \lambda s, z = 1 + \lambda s$ and $x = \frac{t}{2}, y = 1 + t, z = 2 - t$, with parameters s and t, respectively, are coplanar, then find λ.

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

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97. If $\angle\theta$ 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

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

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99. 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

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100. The plane $x + 2y - z = 4$ cuts the sphere $x^2 + y^2 + z^2 - x + z - 2 = 0$ in a circle of radius

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101. Let $\vec{a} = 3\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} - 4\hat{k}$ be the positon vectors of the points A and B respectively. If $\vec{r}$ is the position vector of any point $P(x, y, z)$ on the plane passing through the point A and perpendiculr to the line AB, then consider the following statements: The locus of $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ is given by 1. $\left(\vec{r} . \vec{a}\right) . \left(\vec{b} - \vec{a}\right) = 0$ 2.

$\left(\vec{r}-\vec{a}\right).\left(\vec{a}-\vec{b}\right)=0$ 3. $2x+3y+6z-21=0$ Which of the statements given above are correct? (A) 1,2,and 3 (B) 1 and 2 (C) 1 and 3 (D) 2 and 3

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102. If a plane cuts intercepts of lengths $8, 4$ and 4 units on the coordinate axes respectively, then the length of perpendicular from origin to the plane is

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103. 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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104. If a plane meets the equations axes at $A, BandC$ such that the centroid of the triangle is $(1, 2, 4)$, then find the equation of the plane.

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105. The position vector of the point where the line $\overrightarrow{r} = \hat{i} - \hat{j} + \hat{k} + t\left(\hat{i} + \hat{j} - \hat{k}\right)$ meets the plane $\overrightarrow{r} \cdot \left(\hat{i} + \hat{j} + \hat{k}\right) = 5$, is

(A) $5\hat{i} + \hat{j} - \hat{k}$

(B) $5\hat{i} + 3\hat{j} - 3\hat{k}$

(C) $5\hat{i} + \hat{j} + \hat{k}$

(D) $4\hat{i} + 2\hat{j} - 2\hat{k}$

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106. 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 (1) $(4, 9, -3)$ (2) $(4, -3, 3)$ (3) $(4, 3, 5)$ (4) $(4, 3, -3)$

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107. The line segment joining the points A,B makes projection $1, 4, 3 on x, y, z$ axes respectively then the direction cosiners of AB are (A) 1,4,3 (B) $\frac{1}{\sqrt{26}}, \frac{4}{\sqrt{26}}, \frac{3}{\sqrt{26}}$ (C) $\frac{-1}{\sqrt{26, \frac{4}{\sqrt{26}}, \frac{3}{\sqrt{26}}}}$ (D) $\frac{1}{\sqrt{26}}, \frac{-4}{\sqrt{26}}, \frac{3}{\sqrt{26}}$

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108. The length of projection of the line segment joinint $(3, -1, 0)$ and $\left(-3, 5, \sqrt{2}\right)$ on a line with direction cosiens $\frac{1}{2}, \frac{1}{2}, \frac{1}{\sqrt{2}}$ is (A) 1 (B) 2 (C) 3 (D) 4

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109. The line perpendicular to the plane $2x - y + 5z = 4$ passing through the point (-1,0,1) is

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

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

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

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

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110. The shortest distance between the lines $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-6}{5}$ and $\frac{x-5}{1} = \frac{y-2}{1} = \frac{z-1}{2}$ is (A) 3 (B) 2 (C) 1 (D) 0

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111. Angle between the line $\frac{x+1}{1} = \frac{y}{2} = \frac{z-1}{1}$ and a normal to plane $x - y + z = 0$ is (A) 0 degrees(B)30 degrees (C)45 degrees(D)90 degrees

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112. Foot of the perpendicular form (-2,1,4) to a plane π is (3,1,2). Then the equation of theplane π is (A) $4x-2y=11$ (B) $5x-2y=10$ (C) $5x-2z=11$ (D) $5x+2z=11$

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113. If θ is the angel between the planes $2x-y+z-1=0$ and $x-2y+z+2=0$ then $\cos\theta=(A)$2/3(B)3/4(C)4/5(D)5/6`

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114. 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 (1) $(4, 9, -3)$ (2) $(4, -3, 3)$ (3) $(4, 3, 5)$ (4) $(4, 3, -3)$

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

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116. The shortest distance form the point (1,2,-1) to the surface of the sphere $(x+1)^2+(y+2)^2+(z-1)^2=6$ (A) $3\sqrt{6}$ (B) $2\sqrt{6}$ (C) $\sqrt{6}$ (D) 2

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117. If from a point $P(a,b,c)$ perpendiculars $PAandPB$ are drawn to $YZandZX-planes$ find the vectors equation of the plane OAB.

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118. If $P(x, y, z)$ is a point on the line segment joining Q(2,2,4) and R(3,5,6) such that the projection of $\overrightarrow{OP}$ on the axes are $\frac{13}{9}, \frac{19}{5}, \frac{26}{5}$ respectively, then P divides QR in the ratio:

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119. The angle betwene the line $\vec{r} = (1 + 2\mu)\hat{i} + (2 + \mu)\hat{j} + (2\mu - 1)\hat{k}$ and the plane $3x - 2y + 6z = 0$ where μ is a scalar is (A) $\sin^{-1}\left(\frac{15}{21}\right)$ (B) $\cos^{-1}\left(\frac{16}{21}\right)$ (C) $\sin^{-1}\left(\frac{16}{21}\right)$ (D) $\frac{\pi}{2}$

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120. The equationof the plane passing through the origin and containing the line $\frac{x-1}{5} = \frac{y-2}{4} = \frac{z-3}{5}$ is (A) $x + 5y - 3z = 0$ (B) $x - 5y + 3z = 0$ (C) $x - 5y - 3z = 0$ (D) $3x - 10y + 5z = 0$

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121. The line passing through the points (5, 1, a) and (3, b, 1) crosses the yzplane at the point $\left(0, \frac{17}{2}, \frac{-13}{2}\right)$ .Then (1) $a = 2, b = 8$ (2) $a = 4, b = 6$ (3) $a = 6, b = 4$ (4) $a = 8, b = 2$

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122. 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 (1) -5 (2) 5 (3) 2 (4) -2

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123. The shortest distance between the straighat lines through the point $A_1 = (6, 2, 2)$ and $A_2 = (-4, 0, -1)$ in the directions $1, -2, 2$ and $3, -2, -2$ is

(A) 6 (B) 8 (C) 12 (D) 9

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124. The centre and radius of the sephere $x^2+y^2+z^2=3x-4z+1=0$ are (A) $\left(-\frac{3}{2}, 0, -2\right), \frac{\sqrt{21}}{2}$ (B) $\left(-\frac{3}{2}, 0, 2\right), \frac{\sqrt{21}}{2}$ (C) $\left(-\frac{3}{2}, 0, -2\right), \frac{\sqrt{21}}{2}$ (D) $\left(-\frac{3}{2}, 2, 0\right), \frac{21}{2}$

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125. The plane through the point (-1,-1,-1) nd containing the line of intersection of the planes $\vec{r}.\left(\hat{i}+3\hat{j}-\hat{k}\right)=0, \vec{r}.\left(\hat{j}+2\hat{k}\right)=0$ is

(A) $\vec{r}.\left(\hat{i}+2\hat{j}-3\hat{k}\right)=0$

(B) $\vec{r}.\left(\hat{i}+4\hat{j}+\hat{k}\right)=0$

(C) $\vec{r}.\left(\hat{i}+5\hat{j}-5\hat{k}\right)=0$

(D) $\vec{r}.\left(\hat{i}+\hat{j}-3\hat{k}\right)=0$

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126. If projections of as line on x,y and z axes are 6,2 and 3 respectively, then directions cosines of the lines are (A) $\left(\frac{6}{2}, \frac{2}{7}, \frac{3}{7}\right)$ (B) $\left(\frac{3}{5}, \frac{5}{7}, \frac{6}{7}\right)$

(C) $\left(\frac{1}{7}, \frac{2}{7}, \frac{3}{7}\right)$ (D) none of these

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

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128. The coordinates of the point of intersection of the lines $\frac{x-1}{1} = \frac{y+2}{3} = \frac{z-2}{-2}$ with the plane $3x + 4y + 5z - 25 = 0$ is (A) $(5, 6, -10)$ (B) $(5, 10, -6)$ (C) $(-6, 5, 10)$ (D) $(-6, 10, 5)$

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129. 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, and θ and Φ are acute angles , then

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130. The vlaue (s) of $\lambda,$ for the triangle with vertices $(6, 10, 10), (1, 0, -5)$ and $(6, -10, \lambda)$ will be a right angled triangle is(are) :

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

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133. The direction ratios of the bisector of the angle between the lines whose direction cosines are l_1, m_1, n_1 and l_2, m_2, n_2 are

(A) $l_1 + l_2, m_1 + m_2 + n_1 + n_2$

(B) $l_1 - l_2, m_1 - m_2 - n_1 - n_2$

(C) $l_1 m_2 - l_2 m_1, m_1 n_2 - m_2 n_1, n_1 l_2 - n_2 l_1$

(D) $l_1 m_2 + l_2 m_1, m_1 n_2 + m_2 n_1, n_1 l_2 + n_2 l_1$

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134. If straighat lin emakes and angle of 60^0 with each of the x and y-axes the angle which it makes with the z-axis is (A) $\frac{\pi}{4}$ (B) $\frac{\pi}{3}$ (C) $\frac{3\pi}{4}$ (D) $\frac{\pi}{2}$

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135. The plane $x - 2y + 7z + 21 = 0$ (A) contains the line $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ (B) contains the point (0,7,-1) (C) is perpendicular to the line $\frac{x}{1} = \frac{y}{-2} = \frac{z}{7}$ (D) is parallel to the plane $x - 2y + 7z = 0$

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136. If d_1, d_2, d_3 denote the distances of the plane $2x - 3y + 4z + 2 = 0$ from the planes $2x - 3y + 4z + 6 = 0, 4x - 6y + 8z + 3 = 0$ and $2x - 3y + 4z - 6 = 0$ respectively, then

A. $d_1 + 8d_2 - d_3 = 0$

B. $d_3 = 16d_2$

C. $8d_2 = d_1$

D. $d_1 + 2d_2 + 3d_3 = \sqrt{29}$

Answer: null

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137. $A(0, 5, 6), B(1, 4, 7), C(2, 3, 7)$ and $D(3, 4, 6)$ are four points in space. The point nearest to the origin $O(0, 0, 0)$ is (A) A (B) B (C) C (D) D

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138. If $P(2, 3, 1)$ is a point $L \equiv x - y - z - 2 = 0$ is a plane then

(A) origin and P lie on the same side of the plane

(B) distance of P from the plane is $\frac{4}{\sqrt{3}}$

(C) foot of perpendicular from point P to plane is $\left(\frac{10}{3}, \frac{5}{3}, -\frac{1}{3}\right)$

(D) image of point P i the planee is $\left(\frac{10}{3}, \frac{5}{3}, -\frac{1}{3}\right)$

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139. $P(1, 1, 1)$ and $Q(\lambda, \lambda, \lambda)$ are two points in space such that $PQ = \sqrt{27}$ the value of λ can be (A) -2 (B) -4 (C) 4 (D) 2

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140. The lines $\frac{x-1}{3}=\frac{y-1}{-1}=\frac{z+1}{0}$ and $\frac{x-4}{2}=\frac{y+0}{0}=\frac{z+1}{3}$ (A) intersect at (4,0,-1) (B) intersect at (1,1,-1) (C) do not intersect (D) intersect

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141. If α, β, γ are the angles which a line makes with the coordinate axes ,then (A) $\sin^2\alpha=\cos^2\beta+\cos^2\gamma$ (B) $\cos^2\alpha+\cos^2\beta+\cos^2\gamma=2$ (C) $\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$ (D) $\sin^2\alpha+\sin^2\beta=1+\cos^2\gamma$

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142. The equation of a line $4x-4y-z+11=0=x+2y-z-1$ can be put as $(a)\frac{x}{2}=\frac{y-2}{1}=\frac{z-3}{4}$ (b) $\frac{x-2}{2}=\frac{y-2}{1}=\frac{z}{4}$ $(c)\frac{x-2}{2}=\frac{y}{1}=\frac{z-3}{4}$ (d) None of these

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143. A point Q at a distance 3 from the point $P(1, 1, 1)$ lying on the line

joining the points

$A(0, \ -1, 3)$ and P has the coordinates

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144. If A=(2, -3, 7), B = (-1, 4, -5) and P is a point

on the line AB such that $AP : BP = 3 : 2$ then P

has the coordinates

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145. If the direction ratios of a line are $1 + \lambda, 1 - \lambda, 2,$

and it makes an angle of 60° with the y-axis then

λ is

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146. A point on the line $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z+1}{3}$ at a distance $\sqrt{6}$ from the origin is (A) $\left(\frac{-5}{7}, \frac{-10}{7}, \frac{13}{7}\right)$ (B) $\left(\frac{5}{7}, \frac{10}{7}, \frac{-13}{7}\right)$ (C) $(1, 2, -1)$ (D) $(-1, -2, 1)$

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147. A plane through the line $\frac{x-1}{1} = \frac{y+1}{-2} = \frac{z}{1}$ has the equation (A) $x+y+z=0$ (B) $3x+2y-z=1$ (C) $4x+y-2z=3$ (D) $3x+2y+z=0$

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148. The equation of a plane is $2x-y-3z=5$ and $A(1, 1, 1), B(2, 1, -3), C(1, -2, -2)$ and $D(-3, 1, 2)$ are four points, which of the following line segment are interesect by the plane?

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149. Assertion: The equation $3y + 4z = 0$ in three dimensional space represents a plane containing x-axis., Reason: An equation of the form $ax + by + cz + d = 0$ always represents a plane. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not the correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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150. Assertion: $x + y + z - 15 = 0$ is the equation of a plane which passes through the midpoint of the line segment joining the points (2,3,4) and (6,7,8). Reason: The mid point (4,5,6) satisfies the equation of the plane. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not the correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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151. Assertion : Line L is perpendicular to the plane $2x - 3y + 6z = 7$, Reason: Direction cosines of L are $\frac{2}{7}, \frac{-3}{7}, \frac{6}{7}$. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not the correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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152. Assertion: equation of the straight line passing through the point (2,3,-5) and equally inclined to the axes is $x - 2 = y - 3 = z + 5$, Reason: Direction ratios of the line which is equally inclined to the axes are $< 1, 1, 1 >$ (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not the correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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153. Assertion: The lines $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and $\frac{x-1}{-2} = \frac{y-2}{-4} = \frac{z-3}{-6}$ are parallel., Reason: two lines having direction ratios l_1, m_1, n_1 and l_2, m_2, n_2 are parallel if $\frac{l_1}{l_2} = \frac{m_1}{m_2} = \frac{n_1}{n_2}$. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not the correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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154. Assertion : The line l is parallel to the plane P. Reason: The normal of the plane P is perpendicular to the line l. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not the correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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155. Assertion: Let the points A, B, C be on x, y, z axes respectively such that the plane ax+ by+ cz = 1 passes through the point A, B, C, Reason: centroid of the triangle ABC is $\left(\frac{1}{3a}, \frac{1}{3b}, \frac{1}{3c}\right)$ (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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156. Assertion: The distance between two parallel planes $ax + by + cz + d = 0$ and $ax + by + cz + d' = 0$ is $\frac{|d - d'|}{\sqrt{a^2 + b^2 + c^2}}$, Reason: The normal of two parallel planes are perpendicular to each other. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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157. Assertion: If the lines $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}$ and $\frac{x-1}{3k}=\frac{y-1}{1}=\frac{z-6}{-5}$ are perpendicular to each other , then $k=\frac{10}{7}$, Reason: Two lines having diection ratios l_1, m_1, n_1 and l_2, m_2, n_2 are perpendiculr to each other if and only if $l_1 l_2+m_1 m_2+n_1 n_2=0$ (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not the correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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158. Assertion: The straighat line $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ is parallel to the plane $x-2y+z-6=0$ Reason: The normal of the plane is perpendicular to the line. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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159. Assertion:The equation of a straighat line through the point (a, b, c) and parallel to x-axis is $\frac{x-a}{1} = \frac{y-b}{0} = \frac{z-c}{0}$,

Reason: The direction ratio parallel to the y-axis are , $< 0, 1, 0 >$

(A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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160. Assertion: The equation of the plane thorugh the orign and parallel to the plane $3x - 4y + 5z - 6 = 0 is 3x - 4y = 5z = 0$ Reason: The normals of two parallel planes are always parallel. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not the correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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161. Assertion:The centre of the sphere which passes through the point $(a, 0, 0), (0, b, 0), (0, 0, c)$ and $(0, 0, 0) si\left(\frac{a}{2}, 0, 0\right)$ Reason: Points on a sphere are equidistant from its centre. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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162. Assertion: The shortest distance between the skew lines $\vec{r} = \vec{a} + \alpha\vec{b}$ and $\vec{r} = \vec{c} + \beta\vec{d}\, is \frac{\left|\left[\vec{a} - \vec{c}\,\vec{b}\,\vec{d}\right]\right|}{\left|\vec{b} \times \vec{d}\right|}$, Reason: Two lines are skew lines if they are not coplanar. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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163. Assertion: ABCD is a rhombus. Reason: AB=BC=CD=DA and $AC \neq BD$.

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true R is not the correct explanation of A

(C) A is true but R is false.

(D) A is false but R is true.

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164. Assertion: The direction ratios of the line joining orign and point (x, y, z) are x,y,z., Reason: If O be the origin and $P(x, y, z)$ is a point in space and OP =r then direction cosines of OP are $\frac{x}{r}, \frac{y}{r}, \frac{z}{r}$. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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165. Assertion: The equation of the plane through the intesection of the planes $x + y + z = 6$ and $2x + 3y + 4z + 5 = 0$ and the point $(4, 4, 4)$ is $29x + 23y + 17z = 276.$

Reason: Equation of the plane through the line of intersection of the planes $P_1 = 0$ and $P_2 = 0$ is $P_1 + \lambda P_2 = 0, \lambda \neq 0.$

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true R is not te correct explanation of A

(C) A is true but R is false.

(D) A is false but R is true.

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166. Assertion: The equation $2x^2 - 6y^2 + 4z^2 + 18yz + 2z + xy = 0$ represents a pair of perpendicular planes, Reason: A pair of planes represented by $ax^2 + by^2 + cz^3 + 2fyz + 2gzx + 2hxy = 0$ are perpendicular if $a + b + c = 0$ (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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167. Assertion: The points (2,1,5) and (3,4,5) lie on opposite side of the plane $2x + 2y - 2z - 1 = 0$, Reason: Values of $2x + 2y - 2z - 1$ for points (2,1,5) and (3,4,3)` have opposite signs. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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168. Assertion: If coordinates of the centroid and circumcentre oif a triangle are known, coordinates of its orthocentre can be found., Reason: Centroid, orthocentre and circumcentre of a triangle are collinear. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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169. Assertion: The shortest distance between the skew lines $\frac{x+3}{-4}=\frac{y-6}{3}=\frac{z}{2}$ and $\frac{x+2}{-4}=\frac{y}{1}=\frac{z-7}{1}$ is 9., Reason: Two lines are skew lines if there exists no plane passing through them. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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170. Assertion : A^{-1} exists, Reason: $|A|=0$ (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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171. A tetahedron is a three dimensional figure bounded by forunon coplanar trianglular plane.So a tetrahedron has four no coplnar points as its vertices. Suppose a tetrahedron has points A,B,C,D as its vertices which have coordinates $(x_1, y_1, z_1)(x_2, y_2, zs_2), (x_3, y_3, z_3)$ and (x_4, y_4, z_4) respectivley in a rectngular three dimensionl space. Then the coordinates of tis centroid are $\frac{x_1 + x_2 + x_3 + x4}{4}, \frac{y_1 + y_2 + y_3 + 4}{4}, \frac{z_1 + z_2 + z_3 + z_4}{4}$. the circumcentre of the tetrahedron is th centre of a sphere pssing thorugh its vetices. So, this is a point equidistasnt from each ofhate vertices fo the tetrahedron. Let a tetrahedron hve three of its vertices reresented by the points (0,0,0) ,(6,-5,-1) and (-4,1,3) and its centrod lies at the point (2,3,5). THe coordinate of the fourth vertex of the tetrahedron is

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172. A tetrahedron is a three dimensional figure bounded by four non coplanar triangular plane.So a tetrahedron has four no coplnar points as its vertices. Suppose a tetrahedron has points A,B,C,D as its vertices which have coordinates $(x_1, y_1, z_1)(x_2, y_2, z_2)$, (x_3, y_3, z_3) and (x_4, y_4, z_4) respectively in a rectangular three dimensional space. Then the coordinates of its centroid are $\left(\frac{x_1 + x_2 + x_3 + x_3 + x_4}{4}, \frac{y_1 + y_2 + y_3 + y_3 + y_4}{4}, \frac{z_1 + z_2 + z_3 + z_3 + z}{4}\right.$. the circumcentre of the tetrahedron is the center of a sphere passing through its vertices. So, this is a point equidistant from each of the vertices of the tetrahedron. Let a tetrahedron have three of its vertices represented by the points (0,0,0) ,(6,-5,-1) and (-4,1,3) and its centroid lies at the point (1,2,5). The coordinate of the fourth vertex of the tetrahedron is

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173. A tetahedron is a three dimensional figure bounded by forunon coplanar trianglular plane.So a tetrahedron has four no coplnar points as its vertices. Suppose a tetrahedron has points A,B,C,D as its vertices which have coordinates $(x_1, y_1, z_1)(x_2, y_2, zs_2)$, (x_3, y_3, z_3) and (x_4, y_4, z_4) respectivley in a rectngular three dimensionl space. Then the coordinates of tis centroid are

$\frac{x_1+x_2+x_3+x4}{4}, \frac{y_1+y_2+y_3+4}{4}, \frac{z_1+z_2+z_3+z_4}{4}$. the circumcentre of the tetrahedron is th centre of a sphere pssing thorugh its vetices. So, this is a point equidistasnt from each ofhate vertices fo the tetrahedron. Let a tetrahedron hve three of its vertices reresented by the points (0,0,0) ,(6,5,1) and (-4,1,3) and its centrod lies at the point (2,3,5). THe coordinate of the fourth vertex of the tetrahedron is

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174. A tetahedron is a three dimensional figure bounded by forunon coplanar trianglular plane.So a tetrahedron has four no coplnar points as its vertices. Suppose a tetrahedron has points A,B,C,D as its vertices which have coordinates $(x_1, y_1, z_1)(x_2, y_2, zs_2), (x_3, y_3, z_3)$ and (x_4, y_4, z_4) respectivley in a rectngular three dimensionl space. Then the coordinates of tis centroid are $\frac{x_1+x_2+x_3+x4}{4}, \frac{y_1+y_2+y_3+y_4}{4}, \frac{z_1+z_2+z_3+z_4}{4}$. the circumcentre of the tetrahedron is th centre of a sphere pssing thorugh its vetices. So, this is a point equidistasnt from each ofhate vertices fo the tetrahedron. Let a tetrahedron hve three of its vertices reresented by the points (0,0,0) ,(6,-5,-1) and (-4,1,3) and its centrod lies at the point (1,2,5). THe coordinate of the fourth vertex of the tetrahedron is

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175. Supose directioncoisnes of two lines are given by $ul+vm+wn=0$ and $al^2+bm^2+cn^2=0$ where u,v,w,a,b,c are arbitrary constnts and l,m,n are directioncosines of the lines. For $u=v=w=1$ directionc isines of both lines satisfy the relation. (A) $(b+c)\left(\frac{n}{l}\right)^2+2b\left(\frac{n}{l}\right)+(a+b)=0$ (B) $(c+a)\left(\frac{l}{m}\right)^2+2c\left(\frac{l}{m}\right)+(b+c)=0$ (C) $(a+b)\left(\frac{m}{n}\right)^2+2a\left(\frac{m}{n}\right)+(c+a)=0$ (D) all of the above

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176. Supose directioncoisnes of two lines are given by $ul+vm+wn=0$ and $al^2+bm^2+cn^2=0$ where u,v,w,a,b,c are arbitrary constnts and l,m,n are directioncosines of the lines. For

$u = v = w = 1$ if $\frac{n_1 n_2}{l_1 l_2} = \left(\frac{a+b}{b+c}\right)$ then (A) $\frac{m_1 m_2}{l_1 l_2} = \frac{(b+c)}{(c+a)}$ (B) $\frac{m_1 m_2}{l_1 l_2} = \frac{(c+a)}{(b+c)}$ (C) $\frac{m_1 m_2}{l_1 l_2} = \frac{(a+b)}{(c+a)}$ (D) $\frac{m_1 m_2}{l_1 l_2} = \frac{(c+a)}{(a+b)}$

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177. Supose directioncoisnes of two lines are given by $ul + vm + wn = 0$ and $al^2 + bm^2 + cn^2 = 0$ where u,v,w,a,b,c are arbitrary constnts and l,m,n are directioncosines of the lines. For $u = v = w = 1$ if lines are perpendicular then. (A) $a + b + c = 0$ (B) $ab + bc + ca = 0$ (C) $ab + bc + ca = 3abc$ (D) $ab + bc + ca = abc$

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

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179. The position of a mving point in space is $x = 2t, y = 4t, z = 4t$ where t is measured in seconds and coordinates of moving point are in kilometers: The distance of thepoint from the starting point `O(0,0,0) in 15 sec is

(A) 3 km (B) 60km (C) 90km (D) 120km

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180. Let two planes $p_1 : 2x - y + z = 2$ and $p_2 : x + 2y - z = 3$ are given :

equation of the plane through the intersection of p_1 and p_2 and the point $(3, 2, 1)$ is :

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181. Let two planes $p_1 : 2x - y + z = 2$ and $p_2 : x + 2y - z = 3$ are given :

Equation of the plane which passes through the point $(-1, 3, 2)$ and is perpendicular to each of the plane is:

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182. The equation of the acute angle bisector of planes $2x - y + z - 2 = 0$ and $x + 2y - z - 3 = 0$ is $x - 3y + 2z + 1 = 0$ (b) $3x + 3y - 2z + 1 = 0$ $x + 3y - 2z + 1 = 0$ (d) $3x + y = 5$

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183. The equation of the acute angle bisector of planes $2x - y + z - 2 = 0$ and $x + 2y - z - 3 = 0$ is $x - 3y + 2z + 1 = 0$ (b) $3x + 3y - 2z + 1 = 0$ $x + 3y - 2z + 1 = 0$ (d) $3x + y = 5$

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184. The image of plane $2x - y + z = 2$ in the plane mirror $x + 2y - z = 3$ is $x + 7y - 4x + 5 = 0$ (b) $3x + 4y - 5z + 9 = 0$ $7x - y + 2z - 9 = 0$ (d) None of these

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