MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

STRAIGHT LINE IN SPACE

Others

1. 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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2. If the points $A(-1,3,2), B(-4,2,-2) and C(5,5,\lambda)$ are collinear, find the value of λ.

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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. Find the length of the perpendicular from the point $(1, 2, 3)$ to the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$.

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5. Find the vector equation of a line which passes through the point with position vector $2\hat{i} = \hat{j} + 4\hat{k}$ and is in the direction of $\hat{i} + \hat{j} - 2\hat{k}$. Also, reduce it to Cartesian form.

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6. Find the vector equation of the line through $A(3, 4, -7) and B(1, -1, 6)$. Find also, its Cartesian equations.

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7. Find the vector equation of a line passing through a point with position vector $2\hat{i} - \hat{j} + \hat{k}$, and parallel to the line joining the points $-\hat{i} + 4\hat{j} + \hat{k} and \hat{i} + 2\hat{j} + 2\hat{k}$. Also, find the Cartesian equivalent of this equation.

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8. $\overrightarrow{A}B = 3\hat{i} - \hat{j} + \hat{k} and \overrightarrow{C}D = -3\hat{i} + 2\hat{j} + 4\hat{k}$ are two vectors. The position vectors of the points $A and C$ are $= 6\hat{i} + 7\hat{j} + 4\hat{k} and = -9\hat{j} + 2\hat{k}$ respectively. Find the position vector of a point P on the line AB and a point Q on the line CD such that $\overrightarrow{P}Q$ is perpendicular to $\overrightarrow{A}B and \overrightarrow{C}B$ both.

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9. Find the direction cosines of the line $\frac{x-2}{2}=\frac{2y-5}{-3}, z=-1.$

Also, find the vector equation of the line.

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10. Show that the lines $\frac{x-1}{3}=\frac{y+1}{2}=\frac{z-1}{5} and \frac{x+2}{4}=\frac{y-1}{3}=\frac{z+1}{-2}$ do not intersect.

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11. 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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12. Find the vector of a line passing through $(2, -1, 1)$ and parallel to the line whose equations are $\frac{x-3}{2} = \frac{y+1}{7} = \frac{z-2}{-3}$.

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13. The Cartesian equations of a line are $x = ay + b, z = cy + d$ Find its direction ratios and reduce it to vector form.

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14. By computing the shortest distance determine whether the following pairs of lines intersect or not:

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

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

$\frac{x-1}{2} = \frac{y+1}{3} = z and \frac{x+1}{5} = \frac{y-2}{1}; z = 2$

$\frac{x-5}{4} = \frac{y-7}{-5} = \frac{z+3}{-5} and \frac{x-8}{7} = \frac{y-7}{1} = \frac{z-5}{3}$.

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15. Find the proof of perpendicular from the point $(2, 3, 4)$ to the line $\frac{4-x}{2} = \frac{y}{6} = \frac{1-z}{3}$. Also, find the perpendicular distance from the given point to the line.

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16. Find the image of the point $(1, 6, 3)$ in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$. Also, write the equation of the line joining the given point and its image and find length of the segment joining the given point and its image.

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17. Show that the distance d from point P to the line l having equation $\vec{r} = \vec{a} + \lambda \vec{b}$ is given by $d = \frac{\left|\vec{b} \times \vec{PQ}\right|}{\left|\vec{s}\right|}, where Q$ is any point on the line l.

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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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19. Find the angle between two lines whose direction ratios are proportional to $1, 1, 2 and \left(\sqrt{3}-1\right), \left(-\sqrt{3}-1\right), 4$.

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20. Find the angle between the lines $\frac{x-2}{3}=\frac{y+1}{-2}, z=2$ and $\frac{x-1}{1}=\frac{2y+3}{3}=\frac{z+5}{2}$.

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

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22. Find the vector equation of a line passing through the point with position vector $\hat{i} - 2\hat{j} - 3\hat{k}$ and parallel to the line joining the points with position vectors $\hat{i} - \hat{j} + 4\hat{k} and 2\hat{i} + \hat{j} + 2\hat{k}$. Also, find the Cartesian equivalent of this equation.

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23. Find the vector equation of the line passing through the point $(2, -1, -1)$ which is parallel to the line $6x - 2 = 3y + 1 = 2z - 2$.

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24. Find the equation of the line passing through the point $(1, -1, 1)$ and perpendicular to the lines joining the points $(4, 3, 2), (1, -1, 0) and (1, 2, -1), (2, 1, 1)$.

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25. Find the equation of the line passing through the point $\hat{i}+\hat{j}-\hat{k}$ and perpendicular to the lines $\vec{r}=\hat{i}+\lambda\left(2\hat{i}+\hat{j}-3\hat{k}\right) and \vec{r}=\left(2\hat{i}+\hat{j}-\hat{k}\right)$.

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26. Find the equation of a line passing through $(1, -1, 0)$ and parallel to the line $\frac{x-2}{3}=\frac{2y+1}{2}=\frac{5-z}{1}$

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27. 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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28. Find the distance from the point $P(3, 8, 1)$ to the line $\frac{x-3}{3} = \frac{y+7}{-1} = \frac{z+2}{5}$.

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

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30. Find the value of λ so that the following lines are perpendicular to each other. $\frac{x-5}{5\lambda+2} = \frac{2-y}{5} = \frac{1-z}{-1}, \frac{x}{1} = \frac{2y+1}{4\lambda} = \frac{1-z}{-3}$

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

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32. Find the length of the perpendicular drawn from the point $(5, 4, -1)$. to the line $\vec{r} = \hat{i} + \lambda\left(2\hat{i} + 9\hat{j} + 5\hat{k}\right)$.

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

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34. Find the coordinates of the foot of perpendicular drawn from th point $A(1, 8, 4)$ to the line joining the points $B(0, -1, 3) and C(2 - 3, -1)$.

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35. By computing the shortest distance determine whether the following pairs of line intersect or not:

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

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

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

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37. By computing the shortest distance determine whether the following pairs of lines intersect or not:

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

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

$\frac{x-1}{2}=\frac{y+1}{3}=zand\frac{x+1}{5}=\frac{y-2}{1};z=2$

$\frac{x-5}{4}=\frac{y-7}{-5}=\frac{z+3}{-5}and\frac{x-8}{7}=\frac{y-7}{1}=\frac{z-5}{3}.$

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38. Find the foot of the perpendicular from the point $(0, 2, 3)$ on the line $\frac{x+3}{5}=\frac{y-1}{2}=\frac{z+4}{3}$. Also, find the length of the perpendicular.

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

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40. Prove that the lines through $A(0,\ -1,\ -1)andB(4, 5, 1)$ intersecrs the line through $C(3, 9, 2)andD(-4, 4, 4)$. Also, find their point of intersection.

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

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42. Find the Cartesian equation of a line passing through the points $A(2, \ -1, \ 3) and \ B(4, \ 2, \ 1)$. Also reduce it to vector form.

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43. Show that the points whose position vectors are $5\hat{i} + 5\hat{k}, \ 2\hat{i} + \hat{j} + 3\hat{k} \ and \ -4\hat{i} + 3\hat{j} - \hat{k}$ are collinear.

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44. Find the vector and Cartesian equations of the line through the point $(5,\ 2,\ -4)$ and which is pralel to the vector $3\hat{i}+2\hat{j}-8k$.

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45. Find the vector equation of the line passing thought the points $(-1,\ 0,\ 2) and\ (3,\ 4,\ 6)$.

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46. Find the vector equation of a line which is parallel to the vector $2\hat{i}-\hat{j}+3\hat{k}$ and which passes through the point (5, -2,4). Also reduce it to Cartesian form.

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

vector and Cartesian form.

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48. $ABCD$ is a parallelogram the position vectors of the points $A,\ B,\ and\ C$ are respectively, $4\hat{i}+5\hat{j}-10\hat{k},\ 2\hat{i}-3\hat{j}+4\hat{k}\ and\ -\hat{i}+2\hat{j}+\hat{k}$. Find the vector equation of the line BD. Also, reduce it to Cartesian form.

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49. Find the vector form as well as in Cartesian form, the equation of the line passing through the points $A(1,\ 2,\ -1) and\ B(2,\ 1,\ 1)$.

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50. Find the vector equation for the line which passes through the point (1, ,2 3) and parallel to the vector $\hat{i}-2\hat{j}+3\hat{k}$. reduce the corresponding

equation in the Cartesian from.

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51. The Cartesian equations of a line are $\frac{x-5}{3}=\frac{y+4}{7}=\frac{z-6}{2}$. Find a vector equation for the line.

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52. Find the Cartesian equation of a line passing through (1, -1, 2) and parallel to the line whose equations are $\frac{x-3}{1}=\frac{y-1}{2}=\frac{z+1}{2}$. Also, reduce the equation obtained in vector form.

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53. Find the direction cosines of the line $\frac{4-x}{2}=\frac{y}{6}=\frac{1-z}{3}$. Also, reduce it to vector form.

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54. Find the points on the line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ at a distance of 5 units from the point $P(1, 3, 3)$

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55. Show that the points whose position vectors are $-2\hat{i} + 3\hat{j},\ \hat{i} + 2\hat{j} + 3\hat{k}\ and\ 7\hat{i} + 9\hat{k}$ e collinear.

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56. Find the Cartesian and vector equations of a line which passes through the pointing (1, 2, 3) and is parallel to the line $\frac{x-z}{1} = \frac{y+3}{7} = \frac{2z-6}{3}$.

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57. The Cartesian equations of a line are $3x + 1 = 6y - 2 = 1 - z$, find the fixed point through which it passes, its direction ratios and also its vector equation.

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58. Prove that the line $x = ay + b,\ z = cy + d\ and\ x = a'y + b',\ z = c'y + d'$ are perpendicular if aa' +cc'+ 1=0`

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59. Find the equation of a line passing through a point (2, -1, 3) and parallel to the line $\vec{r} = \left(\hat{i} + \hat{j}\right) + \lambda\left(2\hat{i} + \hat{j} - 2\hat{k}\right)$.

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60. Find the Cartesian equations of the line passing through the point (-1, 3, -2) and perpendicular to the lines $\frac{x}{1}=\frac{y}{2}=\frac{z}{3} and \frac{x+2}{-3}=\frac{y-1}{2}=\frac{z+1}{5}$

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

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62. Show that the three lines with direction cosines $\frac{12}{13},\frac{-3}{13},\frac{-4}{13};\frac{4}{13};\frac{12}{13},\frac{3}{13};\frac{3}{13},\frac{-4}{13},\frac{12}{13}$ are mutually perpendicular.

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63. Show that the line through the points (1, -1, 2) and (3, 4,-2) is perpendicular to the through the points (0, 3,2) and (3, 5, 6).

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64. Show that the line through the point (4, 7, 8) and (2, 3, 4) is parallel to the line through the points (-1, -2, 1) and (1, 2, 5).

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65. Find the Cartesian equation of the line with passes through the point (-2, 4, -5) and parallel to the line given by $\frac{x+3}{3} = \frac{y-4}{3} = \frac{z+8}{6}$.

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66. Show that the lines $\frac{x-5}{7}=\frac{y+2}{-5}=\frac{z}{1}$ and $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ are perpendicular to each other.

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67. Show that the line joining the origin to the point (2, 1, 1) is perpendicular to the line determined by the points (3, 5, -10 and (4, 3, -1).

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68. Find the equation of a line parallel to x-axis and passing through the origin.

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69. Find the angle between the following pairs of lines: $\rightarrow r=\left(4\hat{i}-\hat{j}\right)+\lambda\left(\hat{i}+2\hat{j}-2\hat{k}\right) and \rightarrow r=\hat{i}-\hat{j}+2\hat{k}-\mu\left(2\hat{i}+4\hat{j}\right.$

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70. Find the angle between the following pairs of lines:

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

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71. Find the angle between the following pairs of lines:

$\rightarrow r = \lambda\left(\hat{i} + \hat{j} + 2\hat{k}\right) and \rightarrow r = 2\hat{j} + \mu\left[\left(\sqrt{3} - 1\right)\hat{i} - \left(\sqrt{3} + 1\right)\hat{j} + 4\hat{k}\right.$

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72. Find the angle between the following pairs of line:

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

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73. Find the angle between the following pairs of line: $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{-3} and \frac{x+3}{-1}=\frac{y-5}{8}=\frac{z-1}{4}$

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74. Find the angle between the following pairs of line: $\frac{5-x}{-2}=\frac{y+3}{1}=\frac{1-z}{3}$ and $\frac{x}{3}=\frac{1-y}{-2}=\frac{z+5}{-1}$

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75. Find the angle between the following pairs of line: $\frac{x-2}{3}=\frac{y+3}{-2}=z=5 and \frac{x+1}{1}=\frac{2y-3}{3}=\frac{z-5}{2}$

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76. Find the angle between the following pairs of line: $\frac{x-5}{1}=\frac{2y+6}{-2}=\frac{z-3}{1} and \frac{x-2}{3}=\frac{y+1}{4}=\frac{z-6}{5}$

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77. Find the angle between the following pairs of line: $\frac{-x+2}{-2}=\frac{y-1}{7}=\frac{z+3}{-3} and \frac{x+2}{-1}=\frac{2y-8}{4}=\frac{z-5}{4}$

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78. Find the angle between the pairs of lines with direction ratio proportional to: 5, -12, 13 and -3, 4, 5

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79. Find the angle between the pairs of lines with direction ratio proportional to: 1, 2, -2, and -2, 2, 1

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80. Find the angle between the pairs of lines with direction ratio proportional to: 2, 2, 1 and 4, 1, 8

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81. Find the angle between the pairs of lines with direction ratio proportional to: $a,\ b,\ c\ and\ b-c,\ c-a,\ a-b$.

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82. Find the angle between two lines, one of which was direction ratios 2, 2, 1 while the other one is obtained by joining het points (3, 1, 4) and (7, 2, 12).

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83. Find the equations of the line passing through the point (-1, 2,1) and parallel to the line $\frac{2x-1}{4}=\frac{3y+5}{2}=\frac{2-z}{3}$.

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

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85. Show that the lines $\frac{x-5}{7}=\frac{y+2}{-5}=\frac{z}{1}$ and $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ are perpendicular to each other.

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86. Determine the equations of the line passing through the point (1, 2, -4) and perpendicular to the two lines $\frac{x-8}{8}=\frac{y+9}{-16}=\frac{z-10}{7} and \frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$.

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87. If the coordinates of the points $A,\ B,\ C,\ D$ be $(1,\ 2,\ 3),\ (4,\ 5,\ 7),\ (-4,\ 3,\ -6)$ and $(2,\ 9,\ 2)$ respectively then find the angle between the lines AB and CD.

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88. Find the direction cosines of the line $\frac{x+2}{2}=\frac{2y-7}{6}=\frac{1-z}{-3}$. Also, find the vector equation of the line through the point $A(-1,\ 2,\ 3)$ and parallel to the given line.

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89. Determine whether the following pair of lines intersect or not.

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

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90. Show that the lines $\frac{x}{1} = \frac{y-2}{2} = \frac{z+3}{3} and \frac{x-2}{2} = \frac{y-6}{3} = \frac{z-3}{4}$ intersect and find their point of intersection

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91. Show that the lines $\frac{x-1}{3} = \frac{y+1}{2} = \frac{z-1}{5} and \frac{x+2}{4} = \frac{y-1}{3} = \frac{z+1}{-2}$ do not intersect.

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92. Show that the lines $\frac{x+1}{3}=\frac{y+3}{5}=\frac{z+5}{7}$ and $\frac{x-2}{1}=\frac{y-4}{3}=\frac{z-6}{5}$ intersect. Also find the their point of intersection.

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93. Determine whether the following pair of lines intersect or not. $\vec{r}=\hat{i}+\hat{j}-\hat{k}+\lambda\left(3\hat{i}-\hat{j}\right);\ \vec{r}=4\hat{i}-\hat{k}+\mu\left(2\hat{i}+3\hat{k}\right)$

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94. Find the equation of the perpendicular from point $(3,\ -1,\ 11)$ to line $\frac{x}{2}=\frac{y-2}{3}=\frac{z-3}{4}$. Also, find the coordinates of foot of perpendicular and the length of perpendicular.

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95. Find the perpendicular distasnce of the point (1,0,0) from the lines (x-1)/2=(y+1)/(-3)=(z+10)/8`

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

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97. Find the equation of the perpendicular drawn from the point $P(2, 4, -1)$ to the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$ Also, write down the coordinates of the foot of the perpendicular from P.

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98. Find the foot of the perpendicular drawn from the point $\hat{i}+6\hat{j}+3\hat{k}$ to the line $\vec{r}=\hat{j}+2\hat{k}+\lambda\left(\hat{i}+2\hat{j}+3\hat{k}\right)$. Also, find the length of the perpendicular.

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99. Fine the equation of the perpendicular drawn from the point $P(-1,\ 3,\ 2)$ to the line $\rightarrow r=\left(2\hat{j}+3\hat{k}\right)+\lambda\left(\hat{i}+2\hat{j}+3\hat{k}\right)$. Also find the coordinates of the foot of the perpendicular from P.

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100. find the foot of perpendicular form (0,2,7) to lien $\frac{x+2}{-1}=\frac{y-1}{3}=\frac{z-3}{-2}$

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101. Find the equation of line passing through points $A(0, 6, -9)$ and $B(-3, -6, 3)$. If D is the foot of perpendicular drawn from the point $C(7, 4, -1)$ on the line AB, then find the coordinates of point D and equation of line CD.

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102. Find the shortest distance between the following pairs of line whose vector equation are:

$\vec{r} = 3\hat{i} + 8\hat{j} + 3\hat{k} + \lambda\left(3\hat{i} - \hat{j} + \hat{k}\right) and \vec{r} = -3\hat{i} - 7\hat{j} + 6\hat{k} + \mu\left(-3\hat{i}\right.$

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103. Find the shortest distance between the following pairs of line whose vector equation are:

$\vec{r} = \left(3\hat{i} + 5\hat{j} + 7\hat{k}\right) + \lambda\left(\hat{i} - 2\hat{j} + 7\hat{k}\right) and \vec{r} = -\hat{i} - \hat{j} - \hat{k} + \mu\left(7\hat{i} -\right.$

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104. Find the shortest distance between the following pairs of line whose vector equation are:

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

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105. Find the shortest distance between the following pairs of line whose vector equation are:

$\vec{r} = (1-t)\hat{i} + (t-2)\hat{j} + (3-t)\hat{k} and\ \vec{r} = (s+1)\hat{i} + (2s-1)\hat{j} - (2s$

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106. Find the shortest distance between the following pairs of line whose vector equation are:

$\vec{r} = (\lambda - 1)\hat{i} + (\lambda + 1)\hat{j} - (1+\lambda)\hat{k}\ and\ \vec{r} = (1-\mu)\hat{i} + (2\mu - 1)\hat{j} + ($

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107. Find the shortest distance between the lines whose vector equations are:

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

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

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109. Find the shortest distance between the following pairs of line whose vector equation are:

$\vec{r} = (8 + 3\lambda)\hat{i} - (9 + 16\lambda)\hat{j} + (10 + 7\lambda)\hat{k}$ and $\vec{r} = 15\hat{i} + 29\hat{j} + 5\hat{k} + \mu$

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110. 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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111. Find the shortest distance between the following pair of lines and hence write whether the lines are intersecting or not : $\frac{x-1}{2}=\frac{y+1}{3}=z; \frac{x+1}{5}=\frac{y-2}{1}=z-2$

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112. Find the shortest distance between the following lines: $\frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1}$ and $\frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1}$

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113. By computing the shortest distance determine whether the following pairs of lines intersect or not :

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

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114. Determine the shortest distance between the pair of lines : $\vec{r} = \left(\hat{i} + \hat{j} - \hat{k}\right) + \lambda\left(3\hat{i} - \hat{j}\right) and\ \vec{r} = \left(2\hat{i} - \hat{k}\right) + \mu\left(2\hat{i} + 2\hat{k}\right).$

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115. Find the shortest distance between the following pair of lines: $\frac{x-1}{2} = \frac{y+1}{3} = z; \frac{x+1}{5} = \frac{y-2}{1} = z - 2$

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116. Show that the lines $\frac{x-5}{4} = \frac{y-7}{4} = \frac{z+3}{-5}$ and $\frac{x-8}{7} = \frac{y-4}{1} = \frac{z-5}{3}$ intersect each other

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117. Find the shortest distance between the parallel lines whose equation are:

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

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118. Find the shortest distance between the parallel lines whose equation are:

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

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119. Find the equation of the lines joining the following pairs of vertices :

$(0, 0, 0) and\ (1,\ 0,\ 2)\cdot$

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120. Find the equation of the lines joining the following pairs of vertices :

$(1,\ 3,\ 0) and\ (0,\ 3,\ 0)$.

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121. Write the vector equations of the following lines and hence determine the distance between them

$$\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+4}{6} and \frac{x-3}{4}=\frac{y-3}{6}=\frac{z+5}{12}$$

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122. Find the shortest distance between the lines

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

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

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123. Find the shortest distance between the lines $\frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1}$ and $\frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1}$

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124. Find the shortest distance between the lines: $\vec{r}=\hat{i}+2\hat{j}+3\hat{k}+\lambda\left(\hat{i}-3\hat{j}+2\hat{k}\right) and\ \vec{r}=4\hat{i}+5\hat{j}+6\hat{k}+\mu\left(2\hat{i}+3\hat{j}\right.$

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125. Find the shortest distance between the lines: $\vec{r}=6\hat{i}+2\hat{j}+2\hat{k}+\lambda\left(\hat{i}-2\hat{j}+2\hat{k}\right) and\ \vec{r}=-4\hat{i}-\hat{k}+\mu\left(3\hat{i}-2\hat{j}-\right.$

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126. Find the distance between the lines $l_1 and\, l_2$ given by $\vec{r}=\hat{i}+2\hat{j}-4\hat{k}+\lambda\left(2\hat{i}+3\hat{j}+6\hat{k}\right) and\ ,\ \vec{r}=3\hat{i}+3\hat{j}-5\hat{k}+\mu\left(2\hat{i}+\right.$

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127. Write the Cartesian and vector equation of X-axis.

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128. Write the Cartesian and vector equations of Y-axis.

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129. Write the Cartesian and vector equations of Z-axis.

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130. Write the vector equation of a line passing through a point having position vector $\vec{\alpha}$ and parallel to $\vec{A}B$.

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131. Cartesian equation of a line AB are $\frac{2x-1}{2} = \frac{4-y}{7} = \frac{z+1}{2}$. write the direction ratios of a line parallel to AB.

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132. Write the direction cosines of the line $\frac{x-2}{2} = \frac{2y-5}{-3}, z = 2.$

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133. Write the coordinate axis to which the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-1}{0}$ is perpendicular.

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134. Write the direction cosine of the line whose Cartesian equations are $2x = 3y = -z$.

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135. Write the angle between the lines $2x = 3y = z \; and \; 6x = -y = -4z$.

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136. Write the value of λ for which the lines $\frac{x-3}{-3} = \frac{y+2}{2\lambda} = \frac{z+4}{2} and \frac{x+1}{3\lambda} = \frac{y-2}{1} = \frac{z+6}{-5}$ are perpendicular to each other.

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137. Write the formula for the shortest distance between the lines $\vec{r} = \vec{a}_1 + \lambda \vec{b}_1 and \; \vec{r} = \vec{a}_2 + \mu \vec{b}_2$.

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138. Write the condition for the lines $\vec{r} = \vec{a}_1 + \lambda \vec{b}_1 and \vec{r} = \vec{a}_2 + \mu \vec{b}_2$ to be intersecting.

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139. The Cartesian equations of a line AB are $\frac{2x-1}{\sqrt{3}} = \frac{y+2}{2} = \frac{z-3}{3}$.

Find the direction cosines of a line parallel to AB.

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140. If the equation of a line $\mathrm{A\,B}$ is $\frac{\mathrm{x}-3}{1} = \frac{\mathrm{y}+2}{-2} = \frac{\mathrm{z}-5}{4}$, find the direction ratios of a line parallel to $\mathrm{A\,B}$

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141. Write the vector equation of a line given by $\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2}$

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142. The equation of a line given by $\frac{4-x}{3}=\frac{y+3}{3}=\frac{z+2}{6}$. Write the direction cosines of a line parallel to this line.

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143. Find the cartesian equation of the line which passes through the point $(-2, 4, -5)$ and parallel and line are $(3, 5, 6)$.

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144. Find the Cartesian equation of the line which passes through the point (-2, 4, -5) and is parallel to the line $\frac{x+3}{3}=\frac{4-y}{5}=\frac{z+8}{6}$.

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145. Find the angle between the lines $\vec{r} = \left(2\hat{i} - 5\hat{j} + \hat{k}\right) + \lambda\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right) and\ \vec{r} = 7\hat{i} - 6\hat{k} + \mu\left(\hat{i} + 2\hat{j} + 2\right.$

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146. Find the angle between the lines $2x = 3y = -z and 6x = -y = -4z.$

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147. The angle between the straight lines $\frac{x+1}{2} = \frac{y-2}{5} = \frac{z+3}{4} and \frac{x-1}{1} = \frac{y+2}{2} = \frac{z-3}{-3}$ is 45^0 b. 30^0 c. 60^0 d. 90^0

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148. 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 a. coincident b. skew c. intersecting d. parallel

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149. The angle between the lines $\frac{x-1}{1}=\frac{y-1}{1}=\frac{z-1}{2} and \frac{x-1}{-\sqrt{3}-1}=\frac{y-1}{\sqrt{3}-1}=\frac{z-1}{4}$ is $\cos^{-1}\left(\frac{1}{65}\right)$ b. $\frac{\pi}{6}$ c. $\frac{\pi}{3}$ d. $\frac{\pi}{4}$

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150. The direction ratios of the line $2y+z-5=0=x-3y-6$ are proportional to $3, 1, -2$ b. $2, -4, 1$ c. $\frac{3}{\sqrt{14}}, \frac{1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}$ d. $\frac{2}{\sqrt{41}}, \frac{-4}{\sqrt{41}}, \frac{1}{\sqrt{41}}$

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

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152. The equation of the line passing through the points ($a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$) and parallel to $(b_1\hat{i} + b_2\hat{j} + b_3\hat{k})$ is (a) $\vec{r} = \left(a_1\hat{i} + a_2\hat{j} + a_3\hat{k}\right) + \lambda\left(b_1\hat{i} + b_2\hat{j} + b_3\hat{k}\right)$ (b) $\vec{r} = \left(a_1\hat{i} + a_2\hat{j} + a_3\hat{k}\right) - t\left(b_1\hat{i} + b_2\hat{j} + b_3\hat{k}\right)$ (c) $\vec{r} = a_1(1-t)\hat{i} +_2 (1-t)\hat{j} + a_3(1-t)\hat{k} + t\left(b_1\hat{i} + b_2\hat{j} + b_3\hat{k}\right)$. (d)

None of these

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153. If a line makes angles α, β, γ with the axes respectively tehn $\cos 2\alpha + \cos 2\beta + \cos 2\gamma =$ -2 b. -1 c. 1 d. 2

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154. If the direction ratios of a line are proportional to (1, -3, 2) then its direction cosines are $\frac{1}{\sqrt{14}}, -\frac{3}{\sqrt{14}}, \frac{2}{\sqrt{14}}$ b. $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ c. $-\frac{1}{\sqrt{14}}, \frac{3}{\sqrt{14}}, \frac{2}{\sqrt{14}}$ d. $-\frac{1}{\sqrt{14}}, -\frac{2}{\sqrt{14}}, -\frac{3}{\sqrt{14}}$

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155. If a line makes angle $\frac{\pi}{3} and \frac{\pi}{4}$ with x-axis and y-axis respectively, then the angle made by the line with z-axis is $\pi/2$ b. $\pi/3$ c. $\pi/4$ d. $5\pi/12$

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156. The projections of a line segment on X, Y and Z axes are 12,4 and 3 respectively. The length and direction cosines of the line segment are a. 13; $\frac{12}{13}, \frac{4}{13}, \frac{3}{13}$ b. 19; $\frac{12}{19}, \frac{4}{19}, \frac{9}{19}$ c. 11; $\frac{12}{11}, \frac{14}{11}, \frac{3}{12}$ d. none of these

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157. The lines $6x = 3y = 2z$ and $\frac{x-1}{-2} = \frac{y-2}{-4} = \frac{z-3}{-6}$ are (A) parallel (B) skew (C) intersecting (D) coincident

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158. The straight line $\frac{x-3}{3} = \frac{y-2}{1} = \frac{z-1}{0}$ is (a) Parallel to x-axis (b) Parallel to the y-axis (c) Parallel to the z-axis (d) Perpendicular to the z-axis

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159. 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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