Three Dimensional Geometry

1. Let the line $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$ lie in the plane $x + 3y - \alpha z + \beta = 0$. Then (α, β) equals **[AIEEE-2009]**

   (1) (–6, 7) (2) (5, –15)

   (3) (–5, 5) (4) (6, –17)

2. A line AB in three-dimensional space makes angles 45° and 120° with the positive x-axis and the positive y-axis respectively. If AB makes an acute angle θ with the positive z-axis, then θ equals **[AIEEE-2010]**

   (1) 30° (2) 45°

   (3) 60° (4) 75°

3. **Statement-1 :** The point $A(3, 1, 6)$ is the mirror image of the point $B(1, 3, 4)$ in the plane $x - y + z = 5$.

   Statement-2 : The plane $x - y + z = 5$ bisects the line segment joining $A(3, 1, 6)$ and $B(1, 3, 4)$. **[AIEEE-2010]**

   (1) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1

   (2) Statement-1 is true, Statement-2 is true; Statement-2 is ***not*** a correct explanation for Statement-1

   (3) Statement-1 is true, Statement-2 is false

   (4) Statement-1 is false, Statement-2 is true

4. There are 10 points in a plane, out of these 6 are collinear. If N is the number of triangles formed by joining these points, then **[AIEEE-2011]**

   (1) $140 < N \leq 190$ (2) $N > 190$

   (3) $N \leq 100$ (4) $100 < N \leq 140$

5. The length of the perpendicular drawn from the point (3, –1, 11) to the line $\frac{x}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ is **[AIEEE-2011]**

   (1) $\sqrt{53}$ (2) $\sqrt{66}$

   (3) $\sqrt{29}$ (4) $\sqrt{33}$

6. The distance of the point (1, – 5, 9) from the plane $x - y + z = 5$ measured along a straight line $x = y = z$ is **[AIEEE-2011]**

   (1) $3\sqrt{10}$ (2) $3\sqrt{5}$

   (3) $10\sqrt{3}$ (4) $5\sqrt{3}$

7. An equation of a plane parallel to the plane $x - 2y + 2z - 5 = 0$ and at a unit distance from the origin is **[AIEEE-2012]**

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

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

   (3) $x - 2y + 2z + 5 = 0$

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

8. If the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then k is equal to **[AIEEE-2012]**

   (1) $\frac{2}{9}$ (2) $\frac{9}{2}$

   (3) 0 (4) –1

9. Distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$ is **[JEE (Main)-2013]**

   (1) $\frac{3}{2}$ (2) $\frac{5}{2}$

   (3) $\frac{7}{2}$ (4) $\frac{9}{2}$

10. If 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, then k can have **[JEE (Main)-2013]**

    (1) Any value

    (2) Exactly one value

    (3) Exactly two values

    (4) Exactly three values

11. The image of the line

$\frac{x-1}{3}=\frac{y-3}{1}=\frac{z-4}{-5}$ in the plane $2x - y + z + 3 = 0$ is the line **[JEE (Main)-2014]**

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

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

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

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

12. The distance of the point (1, 0, 2) from the point of intersection of the line $\frac{x-2}{3}=\frac{y+1}{4}=\frac{z-2}{12}$ and the plane $x - y + z = 16$, is **[JEE (Main)-2015]**

(1) $2\sqrt{14}$ (2) 8

(3) $3\sqrt{21}$ (4) 13

13. The equation of the plane containing the line $2x - 5y + z = 3$; $x + y + 4z = 5$, and parallel to the plane, $x + 3y + 6z = 1$, is **[JEE (Main)-2015]**

(1) $2x+6y+12z=13$

(2) $x+3y+6z=-7$

(3) $x+3y+6z=7$

(4) $2x+6y+12z=-13$

14. If the line, $\frac{x-3}{2}=\frac{y+2}{-1}=\frac{z+4}{3}$ lies in the plane, $lx+my-z=9$, then l^2+m^2 is equal to **[JEE (Main)-2016]**

(1) 18 (2) 5

(3) 2 (4) 26

15. The distance of the point (1, –5, 9) from the plane $x - y + z = 5$ measured along the line $x = y = z$ is **[JEE (Main)-2016]**

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

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

16. The distance of the point (1, 3, –7) from the plane passing through the point (1, –1, –1), having normal perpendicular to both the lines $\frac{x-1}{1}=\frac{y+2}{-2}=\frac{z-4}{3}$ and $\frac{x-2}{2}=\frac{y+1}{-1}=\frac{z+7}{-1}$, is **[JEE (Main)-2017]**

(1) $\frac{10}{\sqrt{83}}$ (2) $\frac{5}{\sqrt{83}}$

(3) $\frac{10}{\sqrt{74}}$ (4) $\frac{20}{\sqrt{74}}$

17. If the image of the point $P(1, –2, 3)$ in the plane, $2x + 3y – 4z + 22 = 0$ measured parallel to the line, $\frac{x}{1}=\frac{y}{4}=\frac{z}{5}$ is Q, then PQ is equal to **[JEE (Main)-2017]**

(1) $2\sqrt{42}$ (2) $\sqrt{42}$

(3) $6\sqrt{5}$ (4) $3\sqrt{5}$

18. If L_1 is the line of intersection of the planes $2x – 2y + 3z – 2 = 0$, $x – y + z + 1 = 0$ and L_2 is the line of intersection of the planes $x + 2y – z – 3 = 0$, $3x – y + 2z – 1 = 0$, then the distance of the origin from the plane containing the lines L_1 and L_2, is **[JEE (Main)-2018]**

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

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

19. The length of the projection of the line segment joining the points (5, –1, 4) and (4, –1, 3) on the plane, $x + y + z = 7$ is: **[JEE (Main)-2018]**

(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{2}{3}$

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

20. The plane through the intersection of the planes $x + y + z = 1$ and $2x + 3y – z + 4 = 0$ and parallel to y-axis also passes through the point **[JEE (Main)-2019]**

(1) (3, 2, 1) (2) (3, 3, –1)

(3) (–3, 0, –1) (4) (–3, 1, 1)

21. The equation of the line passing through (–4, 3, 1), parallel to the plane x + 2y – z – 5 = 0 and intersecting the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z-2}{-1}$ is

[JEE (Main)-2019]

(1) $\frac{x-4}{2}=\frac{y+3}{2}=\frac{z+1}{4}$

(2) $\frac{x+4}{-1}=\frac{y-3}{1}=\frac{z-1}{1}$

(3) $\frac{x+4}{3}=\frac{y-3}{-1}=\frac{z-1}{1}$

(4) $\frac{x+4}{1}=\frac{y-3}{1}=\frac{z-1}{3}$

22. If the lines $x = ay + b$, $z = cy + d$ and $x = a'z + b'$, $y = c'z + d'$ are perpendicular, then

[JEE (Main)-2019]

(1) $ab' + bc' + 1 = 0$ (2) $cc' + a + a' = 0$

(3) $aa' + c + c' = 0$ (4) $bb' + cc' + 1 = 0$

23. The equation of the plane containing the straight line $\frac{x}{2}=\frac{y}{3}=\frac{z}{4}$ and perpendicular to the plane containing the straight lines $\frac{x}{3}=\frac{y}{4}=\frac{z}{2}$ and $\frac{x}{4}=\frac{y}{2}=\frac{z}{3}$ is **[JEE (Main)-2019]**

(1) $x – 2y + z = 0$ (2) $x + 2y – 2z = 0$

(3) $5x + 2y – 4z = 0$ (4) $3x + 2y – 3z = 0$

24. The plane passing through the point (4, –1, 2) and parallel to the lines $\frac{x+2}{3}=\frac{y-2}{-1}=\frac{z+1}{2}$ and $\frac{x-2}{1}=\frac{y-3}{2}=\frac{z-4}{3}$ also passes through the point **[JEE (Main)-2019]**

(1) (–1, –1, –1) (2) (–1, –1, 1)

(3) (1, 1, 1) (4) (1, 1, –1)

25. Let A be a point on the line $\vec{r}=(1-3\mu)\hat{i}+(\mu-1)\hat{j}+(2+5\mu)\hat{k}$ and $B(3, 2, 6)$ be a point in the space. Then the value of μ for which the vector $\overrightarrow{AB}$ is parallel to the plane $x – 4y + 3z = 1$ is **[JEE (Main)-2019]**

(1) $\frac{1}{4}$ (2) $\frac{1}{2}$

(3) $\frac{1}{8}$ (4) $-\frac{1}{4}$

26. The plane which bisects the line segment joining the points (–3, –3, 4) and (3, 7, 6) at right angles, passes through which one of the following points?

[JEE (Main)-2019]

(1) (–2, 3, 5) (2) (4, 1, –2)

(3) (2, 1, 3) (4) (4, –1, 7)

27. On which of the following lines lies the point of intersection of the line, $\frac{x-4}{2}=\frac{y-5}{2}=\frac{z-3}{1}$ and the plane, $x + y + z = 2$? **[JEE (Main)-2019]**

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

(2) $\frac{x+3}{3}=\frac{4-y}{3}=\frac{z+1}{-2}$

(3) $\frac{x-4}{1}=\frac{y-5}{1}=\frac{z-5}{-1}$

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

28. The plane containing the line $\frac{x-3}{2}=\frac{y+2}{-1}=\frac{z-1}{3}$ and also containing its projection on the plane $2x + 3y – z = 5$, contains which one of the following points? **[JEE (Main)-2019]**

(1) (0, –2, 2) (2) (2, 2, 0)

(3) (–2, 2, 2) (4) (2, 0, –2)

29. The direction ratios of normal to the plane through the points (0, –1, 0) and (0, 0, 1) and making an angle $\frac{\pi}{4}$ with the plane $y – z + 5 = 0$ are

[JEE (Main)-2019]

(1) $2\sqrt{3}, 1, -1$ (2) $2, \sqrt{2}, -\sqrt{2}$

(3) 2, –1, 1 (4) 2, 1, –1

30. Two lines $\frac{x-3}{1}=\frac{y+1}{3}=\frac{z-6}{-1}$ and $\frac{x+5}{7}=\frac{y-2}{-6}=\frac{z-3}{4}$ intersect at the point R. The reflection of R in the xy-plane has coordinates

[JEE (Main)-2019]

(1) (–2, 4, 7) (2) (2, 4, 7)

(3) (2, –4, –7) (4) (2, –4, 7)

31. If the point $(2, \alpha, \beta)$ lies on the plane which passes through the points (3, 4, 2) and (7, 0, 6) and is perpendicular to the plane $2x - 5y = 15$, then $2\alpha - 3\beta$ is equal to **[JEE (Main)-2019]**

(1) 5 (2) 12

(3) 17 (4) 7

32. The perpendicular distance from the origin to the plane containing the two lines,

$\frac{x+2}{3} = \frac{y-2}{5} = \frac{z+5}{7}$ and $\frac{x-1}{1} = \frac{y-4}{4} = \frac{z+4}{7}$, is

[JEE (Main)-2019]

(1) $11\sqrt{6}$ (2) $6\sqrt{11}$

(3) 11 (4) $\frac{11}{\sqrt{6}}$

33. A tetrahedron has vertices $P(1, 2, 1)$, $Q(2, 1, 3)$, $R(-1, 1, 2)$ and $O(0, 0, 0)$. The angle between the faces OPQ and PQR is **[JEE (Main)-2019]**

(1) $\cos^{-1}\left(\frac{19}{35}\right)$ (2) $\cos^{-1}\left(\frac{9}{35}\right)$

(3) $\cos^{-1}\left(\frac{17}{31}\right)$ (4) $\cos^{-1}\left(\frac{7}{31}\right)$

34. Let S be the set of all real values of λ such that a plane passing through the points $(-\lambda^2, 1, 1)$, $(1, -\lambda^2, 1)$ and $(1, 1, -\lambda^2)$ also passes through the point $(-1, -1, 1)$. Then S is equal to

[JEE (Main)-2019]

(1) {1, –1} (2) $\{\sqrt{3}\}$

(3) $\{\sqrt{3}, -\sqrt{3}\}$ (4) {3, –3}

35. If an angle between the line, $\frac{x+1}{2} = \frac{y-2}{1} = \frac{z-3}{-2}$ and the plane, $x - 2y - kz = 3$ is $\cos^{-1}\left(\frac{2\sqrt{2}}{3}\right)$, then a value of k is **[JEE (Main)-2019]**

(1) $\sqrt{\frac{3}{5}}$ (2) $\sqrt{\frac{5}{3}}$

(3) $-\frac{5}{3}$ (4) $-\frac{3}{5}$

36. The equation of a plane containing the line of intersection of the planes $2x - y - 4 = 0$ and $y + 2z - 4 = 0$ and passing through the point (1, 1, 0) is : **[JEE (Main)-2019]**

(1) $2x - z = 2$ (2) $x - 3y - 2z = -2$

(3) $x - y - z = 0$ (4) $x + 3y + z = 4$

37. The length of the perpendicular from the point (2, –1, 4) on the straight ine, $\frac{x+3}{10} = \frac{y-2}{-7} = \frac{z}{1}$ is

[JEE (Main)-2019]

(1) Greater than 3 but less than 4

(2) Greater than 2 but less than 3

(3) Greater than 4

(4) Less than 2

38. If a point $R(4, y, z)$ lies on the line segment joining the points $P(2, -3, 4)$ and $Q(8, 0, 10)$, then the distance of R from the origin is **[JEE (Main)-2019]**

(1) $\sqrt{53}$ (2) $2\sqrt{21}$

(3) 6 (4) $2\sqrt{14}$

39. If the line, $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{4}$ meets the plane, $x + 2y + 3z = 15$ at a point P, then the distance of P from the origin is **[JEE (Main)-2019]**

(1) $2\sqrt{5}$ (2) $\frac{9}{2}$

(3) $\frac{7}{2}$ (4) $\frac{\sqrt{5}}{2}$

40. A plane passing through the points (0, –1, 0) and (0, 0, 1) and making an angle $\frac{\pi}{4}$ with the plane $y - z + 5 = 0$, also passes through the point

[JEE (Main)-2019]

(1) $\left(\sqrt{2}, 1, 4\right)$ (2) $\left(\sqrt{2}, -1, 4\right)$

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

41. The vertices B and C of a ΔABC lie on the line, $\frac{x+2}{3} = \frac{y-1}{0} = \frac{z}{4}$ such that $BC = 5$ units. Then the area (in sq. units) of this triangle, given that the point $A(1, -1, 2)$, is **[JEE (Main)-2019]**

(1) $5\sqrt{17}$ (2) $\sqrt{34}$

(3) 6 (4) $2\sqrt{34}$

42. Let P be the plane, which contains the line of intersection of the planes, $x + y + z - 6 = 0$ and $2x + 3y + z + 5 = 0$ and it is perpendicular to the xy-plane. Then the distance of the point $(0, 0, 256)$ from P is equal to **[JEE (Main)-2019]**

(1) $63\sqrt{5}$ (2) $\frac{17}{\sqrt{5}}$

(3) $205\sqrt{5}$ (4) $\frac{11}{\sqrt{5}}$

43. If the length of the perpendicular from the point $(\beta, 0, \beta)$ $(\beta \neq 0)$ to the line, $\frac{x}{1} = \frac{y-1}{0} = \frac{z+1}{-1}$ is $\sqrt{\frac{3}{2}}$, then β is equal to **[JEE (Main)-2019]**

(1) -1 (2) -2

(3) 1 (4) 2

44. Let $A(3, 0, -1)$, $B(2, 10, 6)$ and $C(1, 2, 1)$ be the vertices of a triangle and M be the mid point of AC. If G divides BM in the ratio, 2 : 1 then $\cos(\angle GOA)$ (O being the origin) is equal to **[JEE (Main)-2019]**

(1) $\frac{1}{6\sqrt{10}}$ (2) $\frac{1}{\sqrt{30}}$

(3) $\frac{1}{2\sqrt{15}}$ (4) $\frac{1}{\sqrt{15}}$

45. If $Q(0, -1, -3)$ is the image of the point P in the plane $3x - y + 4z = 2$ and R is the point $(3, -1, -2)$, then the area (in sq. units) of ΔPQR is : **[JEE (Main)-2019]**

(1) $\frac{\sqrt{65}}{2}$ (2) $\frac{\sqrt{91}}{4}$

(3) $2\sqrt{13}$ (4) $\frac{\sqrt{91}}{2}$

46. A perpendicular is drawn from a point on the line $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{1}$ to the plane $x + y + z = 3$ such that the foot of the perpendicular Q also lies on the plane $x - y + z = 3$. Then the co-ordinates of Q are **[JEE (Main)-2019]**

(1) (1, 0, 2) (2) (2, 0, 1)

(3) (4, 0, –1) (4) (–1, 0, 4)

47. If the plane $2x - y + 2z + 3 = 0$ has the distances $\frac{1}{3}$ and $\frac{2}{3}$ units from the planes $4x - 2y + 4z + \lambda = 0$ and $2x - y + 2z + \mu = 0$, respectively, then the maximum value of $\lambda + \mu$ is equal to **[JEE (Main)-2019]**

(1) 13 (2) 15

(3) 5 (4) 9

48. If the line $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{-1}$ intersects the plane $2x + 3y - z + 13 = 0$ at a point P and the plane $3x + y + 4z = 16$ at a point Q, then PQ is equal to **[JEE (Main)-2019]**

(1) $2\sqrt{14}$ (2) 14

(3) $2\sqrt{7}$ (4) $\sqrt{14}$

49. The length of the perpendicular drawn from the point (2, 1, 4) to the plane containing the lines $\vec{r} = (\hat{i} + \hat{j}) + \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = (\hat{i} + \hat{j}) + \mu(-\hat{i} + \hat{j} - 2\hat{k})$ is **[JEE (Main)-2019]**

(1) $\frac{1}{3}$ (2) 3

(3) $\frac{1}{\sqrt{3}}$ (4) $\sqrt{3}$

50. Let P be a plane through the points (2, 1, 0), (4, 1, 1) and (5, 0, 1) and R be any point (2, 1, 6). Then the image of R in the plane P is **[JEE (Main)-2020]**

(1) (6, 5, 2) (2) (4, 3, 2)

(3) (3, 4, –2) (4) (6, 5, –2)

51. The shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{2}$ is **[JEE (Main)-2020]**

(1) $2\sqrt{30}$ (2) $\frac{7}{2}\sqrt{30}$

(3) $3\sqrt{30}$ (4) 3

52. The mirror image of the point (1, 2, 3) in a plane is $\left(-\frac{7}{3}, -\frac{4}{3}, -\frac{1}{3}\right)$. Which of the following points lies on this plane? **[JEE (Main)-2020]**

(1) (–1, –1, –1) (2) (1, 1, 1)

(3) (–1, –1, 1) (4) (1, –1, 1)

53. The plane passing through the points (1, 2, 1), (2, 1, 2) and parallel to the line, $2x = 3y$, $z = 1$ also passes through the point **[JEE (Main)-2020]**

(1) (0, 6, –2) (2) (–2, 0, 1)

(3) (0, –6, 2) (4) (2, 0 –1)

54. A plane passing through the point (3, 1, 1) contains two lines whose direction ratios are 1, –2, 2 and 2, 3, –1 respectively. If this plane also passes through the point (α, –3, 5), then α is equal to **[JEE (Main)-2020]**

(1) 5 (2) 10

(3) –10 (4) –5

55. The foot of the perpendicular drawn from the point (4, 2, 3) to the line joining the points (1, –2, 3) and (1, 1, 0) lies on the plane **[JEE (Main)-2020]**

(1) x – 2y + z = 1 (2) x + 2y – z = 1

(3) x – y – 2z = 1 (4) 2x + y – z = 1

56. The lines

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

$\vec{r} = (2\hat{i} - \hat{j}) + m(\hat{i} + \hat{j} - \hat{k})$ **[JEE (Main)-2020]**

(1) do not intersect for any values of l and m

(2) intersect for all values of l and m

(3) intersect when $l = 2$ and $m = \frac{1}{2}$

(4) intersect when $l = 1$ and $m = 2$

57. The plane which bisects the line joining, the points (4, –2, 3) and (2, 4, –1) at right angles also passes through the point **[JEE (Main)-2020]**

(1) (4, 0, 1) (2) (0, –1, 1)

(3) (0, 1, –1) (4) (4, 0, –1)

58. The distance of the point (1, –2, 3) from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$ is **[JEE (Main)-2020]**

(1) 7 (2) $\frac{7}{5}$

(3) 1 (4) $\frac{1}{7}$

59. If (a, b, c) is the image of the point (1, 2, –3) in the line, $\frac{x+1}{2} = \frac{y-3}{-2} = \frac{z}{-1}$, then $a + b + c$ is equal to **[JEE (Main)-2020]**

(1) 2 (2) 1

(3) 3 (4) –1

60. If for some $\alpha \in R$, the lines

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

$L_2 : \frac{x+2}{\alpha} = \frac{y+1}{5-\alpha} = \frac{z+1}{1}$ are coplanar,

then the line L_2 passes through the point **[JEE (Main)-2020]**

(1) (10, 2, 2) (2) (2, –10, –2)

(3) (10, –2, –2) (4) (–2, 10, 2)

61. The shortest distance between the lines $\frac{x-1}{0} = \frac{y+1}{-1} = \frac{z}{1}$ and $x + y + z + 1 = 0$, $2x - y + z + 3 = 0$ is **[JEE (Main)-2020]**

(1) $\frac{1}{\sqrt{2}}$ (2) 1

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

62. A plane P meets the coordinate axes at A, B and C respectively. The centroid of ΔABC is given to be (1, 1, 2). Then the equation of the line through this centroid and perpendicular to the plane P is **[JEE (Main)-2020]**

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

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

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

(4) $\frac{x-1}{2} = \frac{y-1}{1} = \frac{z-2}{1}$

63. If the foot of the perpendicular drawn from the point (1, 0, 3) on a line passing through (α, 7, 1) is $\left(\frac{5}{3}, \frac{7}{3}, \frac{17}{3}\right)$, then α is equal to _____. **[JEE (Main)-2020]**

64. The projection of the line segment joining the points (1, –1, 3) and (2, –4, 11) on the line joining the points (–1, 2, 3) and (3, –2, 10) is _____. **[JEE (Main)-2020]**

65. If the distance between the plane, $23x - 10y - 2z + 48 = 0$ and the plane containing the lines

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

$$\frac{x+3}{2} = \frac{y+2}{6} = \frac{z-1}{\lambda} (\lambda \in R)$$

is equal to $\frac{k}{\sqrt{633}}$, then k is equal to

[JEE (Main)-2020]

66. Let a plane P contain two lines

$$\vec{r} = \hat{i} + \lambda(\hat{i} + \hat{j}),\ \lambda \in R \text{ and}$$

$$\vec{r} = -\hat{j} + \mu(\hat{j} - \hat{k}),\ \mu \in R$$

If $Q(\alpha, \beta, \gamma)$ is the foot of the perpendicular drawn from the point $M(1, 0, 1)$ to P, then $3(\alpha + \beta + \gamma)$ equals _____. **[JEE (Main)-2020]**

67. If the equation of a plane P, passing through the intersection of the planes $x + 4y - z + 7 = 0$ and $3x + y + 5z = 8$ is $ax + by + 6z = 15$ for some $a, b \in R$, then the distance of the point (3, 2, –1) from the plane P is _____. **[JEE (Main)-2020]**

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