

JEE MAIN THREE DIMENSIONAL GEOMETRY — EQUATION OF A LINE IN SPACE (VECTOR AND CARTESIAN FORMS) — PYQS

Max. Marks: 52

Questions: 13

Section A (MCQ) — 10 questions

- Q.1** A line with direction ratios 1, -1, 2 intersects the lines $\frac{x}{2} = \frac{y}{3} = \frac{z+1}{3}$ and $\frac{x+1}{-1} = \frac{y-2}{1} = \frac{z}{4}$ at the points P and Q, respectively. If the length of the line segment PQ is α , then $225\alpha^2$ is equal to:

[JEE Main 2026 (Online) 4th April Morning Shift]

- (1) 1024 (2) 1014 (3) 1104 (4) 1204

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- Q.2** If the distances of the point (1, 2, a) from the line $\frac{x-1}{1} = \frac{y}{2} = \frac{z-1}{1}$ along the lines

$$L_1: \frac{x-1}{3} = \frac{y-2}{4} = \frac{z-a}{b} \text{ and } L_2: \frac{x-1}{1} = \frac{y-2}{4} = \frac{z-a}{c}$$

are equal, then $a + b + c$ is equal to

[JEE Main 2026 (Online) 28th January Morning Shift]

- (1) 4 (2) 6 (3) 7 (4) 5

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- Q.3** Let the lines $L_1: \vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda(2\hat{i} + 3\hat{j} + 4\hat{k})$, $\lambda \in \mathbb{R}$ and $L_2: \vec{r} = (4\hat{i} + \hat{j}) + \mu(5\hat{i} + 2\hat{j} + \hat{k})$, $\mu \in \mathbb{R}$, intersect at the point R. Let P and Q be the points lying on lines L_1 and L_2 , respectively, such that $|\vec{PR}| = \sqrt{29}$ and $|\vec{PQ}| = \sqrt{\frac{47}{3}}$. If the point P lies in the first octant, then $27(QR)^2$ is equal to

[JEE Main 2026 (Online) 24th January Morning Shift]

- (1) 360 (2) 348 (3) 320 (4) 340

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- Q.4** Let L be the line $\frac{x+1}{2} = \frac{y+1}{3} = \frac{z+3}{6}$ and let S be the set of all points (a, b, c) on L, whose distance from the line $\frac{x+1}{2} = \frac{y+1}{3} = \frac{z-9}{0}$ along the line L is 7. Then $\sum_{(a, b, c) \in S} (a + b + c)$ is equal to:

[JEE Main 2026 (Online) 22nd January Evening Shift]

- (1) 28 (2) 6 (3) 40 (4) 34

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- Q.5** Let the line L_1 be parallel to the vector $-3\hat{i} + 2\hat{j} + 4\hat{k}$ and pass through the point (2, 6, 7), and the line L_2 be parallel to the vector $2\hat{i} + \hat{j} + 3\hat{k}$ and pass through the point (4, 3, 5). If the line L_3 is parallel to the vector $-3\hat{i} + 5\hat{j} + 16\hat{k}$ and intersects the lines L_1 and L_2 at the points C and D, respectively, then $|\vec{CD}|^2$ is equal to:

[JEE Main 2026 (Online) 21st January Evening Shift]

- (1) 290 (2) 171 (3) 89 (4) 312

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- Q.6** Let the line L pass through (1, 1, 1) and intersect the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z}{1}$. Then, which of the following points lies on the line L? [JEE Main 2025 (Online) 7th April Morning Shift]

- (1) (7, 15, 13) (2) (4, 22, 7)
-
- (3) (10, -29, -50) (4) (5, 4, 3)

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- Q.7** If the equation of the line passing through the point $(0, -\frac{1}{2}, 0)$ and perpendicular to the lines $\vec{r} = \lambda(\hat{i} + a\hat{j} + b\hat{k})$ and $\vec{r} = (\hat{i} - \hat{j} - 6\hat{k}) + \mu(-b\hat{i} + a\hat{j} + 5\hat{k})$ is $\frac{x-1}{-2} = \frac{y+4}{d} = \frac{z-c}{-4}$, then $a + b + c + d$ is equal to:

[JEE Main 2025 (Online) 7th April Evening Shift]

- (1) 13 (2) 14 (3) 12 (4) 10

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- Q.8** Let a line passing through the point (4, 1, 0) intersect the line $L_1: \frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ at the point $A(\alpha, \beta, \gamma)$ and the line $L_2: x - 6 = y = -z + 4$ at the point $B(a, b, c)$. Then $\begin{vmatrix} 1 & 0 & 1 \\ \alpha & \beta & \gamma \\ a & b & c \end{vmatrix}$ is equal to

[JEE Main 2025 (Online) 3rd April Morning Shift]

- (1) 16 (2) 6 (3) 8 (4) 12

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full solution



Q.9 Let $L_1: \frac{x-1}{1} = \frac{y-2}{-1} = \frac{z-1}{2}$ and

$L_2: \frac{x+1}{-1} = \frac{y-2}{2} = \frac{z}{1}$ be two lines.

Let L_3 be a line passing through the point (α, β, γ) and be perpendicular to both L_1 and L_2 . If L_3 intersects L_1 , then $|5\alpha - 11\beta - 8\gamma|$ equals :

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) 25 (2) 20 (3) 16 (4) 18

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full solution



Q.10 Let $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + 7\hat{j} + 3\hat{k}$. Let

$L_1: \vec{r} = (-\hat{i} + 2\hat{j} + \hat{k}) + \lambda\vec{a}, \lambda \in \mathbb{R}$ and

$L_2: \vec{r} = (\hat{j} + \hat{k}) + \mu\vec{b}, \mu \in \mathbb{R}$ be two lines. If the line L_3 passes through the point of intersection of L_1 and L_2 and is parallel to $\vec{a} + \vec{b}$, then L_3 passes through the point :

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) $(-1, -1, 1)$ (2) $(2, 8, 5)$
(3) $(8, 26, 12)$ (4) $(5, 17, 4)$

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Section B (Numerical) — 3 questions

Q.11 If the distance of the point $P(43, \alpha, \beta)$, $\beta < 0$, from the line $\vec{r} = 4\hat{i} - \hat{k} + \mu(2\hat{i} + 3\hat{k})$, $\mu \in \mathbb{R}$ along a line with direction ratios 3, -1, 0 is $13\sqrt{10}$, then $\alpha^2 + \beta^2$ is equal to _____

[JEE Main 2026 (Online) 28th January Evening Shift]

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full solution



Q.12 Let a line L passing through the point $P(1, 1, 1)$ be perpendicular to the lines $\frac{x-4}{4} = \frac{y-1}{1} = \frac{z-1}{1}$ and $\frac{x-17}{1} = \frac{y-71}{1} = \frac{z}{0}$. Let the line L intersect the yz -plane at the point Q . Another line parallel to L and passing through the point $S(1, 0, -1)$ intersects the yz -plane at the point R . Then the square of the area of the parallelogram $PQRS$ is equal to _____.

[JEE Main 2026 (Online) 24th January Morning Shift]

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Q.13 Let the area of the triangle formed by the lines

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

$$\frac{x}{-3} = \frac{y-3}{3} = \frac{z-2}{1} \text{ be } A. \text{ Then } A^2 \text{ is equal to } \underline{\hspace{2cm}}.$$

[JEE Main 2025 (Online) 8th April Evening Shift]

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ANSWER KEY

Section A (MCQ) — 10 questions

Ques.	1	2	3	4	5	6	7	8	9	10	
Ans.	2	3	1	4	1	1	2	3	1	3	

Section B (Numerical) — 3 questions

Ques.	11	12	13				
Ans.	170	6	56				