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MATHEMATICS · JEE MAIN

# Three Dimensional Geometry

## Previous Year Questions with answers

**416** questions · **200** papers · **2002–2026** · newest paper first

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**What is in this PDF:** every Three Dimensional Geometry question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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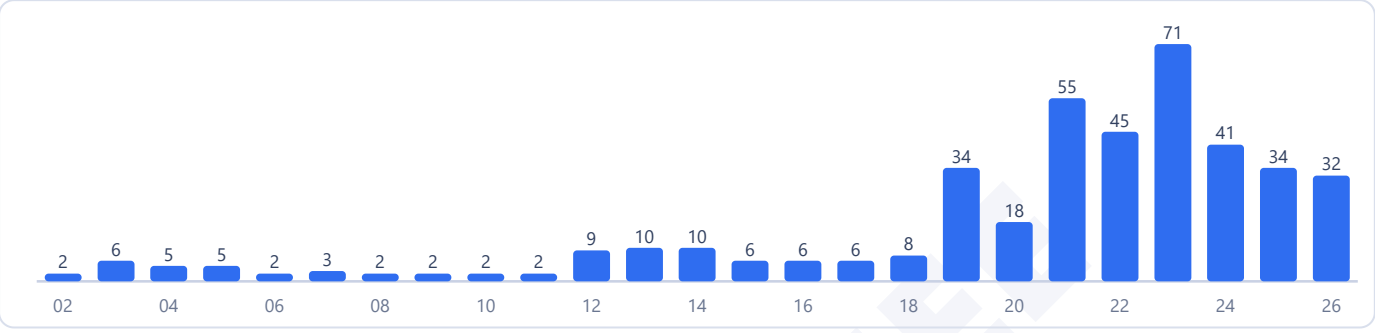
# Chapter at a glance

| 7.2% | 416 | 162 of 162 | 330 / 86 |
|---|---|---|---|
| of Mathematics questions, 2019–2026 | questions, 2002–2026 | papers asked it, 2019–2026 | MCQ / numerical, 2002–2026 |

**Trend.** Steady: 1.8 questions per paper in 2024–2026 against 2.1 in 2019–2023.

### Questions per year




Counts are the questions we hold: 416 in 200 papers. 2 questions in this chapter came back in more than one paper.

### Most-asked topics in this chapter (2002–2026)




## How often it comes up

Three dimensional geometry is the single highest-weight chapter in JEE Main mathematics under Unit 11: Three Dimensional Geometry in the Class 12 curriculum, claiming rank 1 among the 29 chapters in the subject. Between 2019 and 2026, 330 questions were asked from this chapter across 162 papers, representing 7.2 percent of all mathematics questions. It appeared in all 162 papers, meaning every paper in that period contained questions from this chapter, and it has surfaced every year since 2019. Over the recent 2024 to 2026 testing sessions, it contributed 107 questions across 58 papers, averaging 1.8 questions per paper and holding a 6.9 percent subject share. Comparing the earlier 2002 to 2018 share of 6.6 percent with 2024 to 2026 shows that its long-term share is about the same, while comparing 2019 to 2026 against 2024 to 2026 also shows it is about the same. Across the complete historical record from 2002 to 2026 covering 200 papers, 416 questions were asked across all 200 papers, with 86 numerical answer questions appearing between 2019 and 2026.

Students will find questions from this chapter in every examination shift without exception, with the majority featuring two or three distinct problems. The annual totals during 2024, 2025, and 2026 were 41, 34, and 32 questions respectively.

Even with the formal removal of plane equations from the syllabus starting in 2024, the chapter has maintained its top-tier prominence. Modern examination shifts focus intensively on skew lines, shortest distance calculations, parametric coordinates of line points, foot of perpendiculars, and reflections in spatial lines.

## Most-asked topics

Questions in this chapter organize across four distinct topics:

1. **Lines (176 questions, 2019-2026; 198 total, last asked 2026)** The predominant topic in recent papers. Focuses on symmetric equations of lines, finding points of intersection between intersecting lines, shortest distance between

skew lines, conditions for coplanarity, foot of the perpendicular from a point to a line, and image reflections across lines.

2. **Planes (140 questions, 2019-2026; 186 total, last asked 2023)** Historically the largest component, covering equations of planes passing through three points, distance of a point from a plane, angle between intersecting planes, line of intersection of two planes, and family of planes. This topic was officially removed from the syllabus in 2024, which is why it was last asked in 2023.

3. **Points & Direction Cosines (14 questions, 2019-2026; 27 total, last asked 2026)** Deals with direction cosines and direction ratios of lines, simultaneous linear and quadratic equations satisfied by direction components, angles between vectors, projection of spatial segments, and section formulas.

4. **Sphere (legacy) (0 questions, 2019-2026; 5 total, last asked 2007)** Covered basic equations of spheres, diametric forms, and plane intersections in old AIEEE papers before being retired long ago.

## What the questions look like

Examiners test three-dimensional lines through several reliable problem patterns:

- **Shortest Distance Between Skew Lines**: Given two skew lines in symmetric form, compute the shortest distance connecting them using the scalar triple product formula or finding endpoints of the common perpendicular.
- **Foot of Perpendicular and Spatial Image**: Dropping a perpendicular from a point onto a line, finding the coordinates of the foot by enforcing orthogonality with direction ratios, and determining the reflected point.
- **Direction Cosines from Simultaneous Relations**: Solving a linear and a quadratic relation in direction ratios l, m, and n to deduce the angle between two lines.
- **Line Intersecting Two Given Lines**: Constructing a third line intersecting two given skew lines at points C and D, followed by evaluating the distance squared between C and D.

## How to practise it

Mastering three-dimensional lines requires disciplined parametric thinking:

- **Express points on a line parametrically**: Set the symmetric line ratio equal to lambda. A general point on the line then has coordinates linearly dependent on lambda, converting geometric intersections and perpendicularity checks into simple linear equations.
- **Master the shortest distance formula**: For lines r equals a1 plus lambda b1 and r equals a2 plus mu b2, the shortest distance is the magnitude of the dot product of a2 minus a1 with the cross product of b1 and b2, divided by the magnitude of that cross product.
- **Enforce orthogonality via dot products**: To locate the foot of the perpendicular from an external point to a line, represent the foot as a general parametric point F(lambda). The vector connecting the external point to F must have a zero dot product with the direction vector of the line.
- **Recognise coplanar lines**: Two lines are coplanar if they either intersect or are parallel. Setting the determinant formed by the difference vector a2 minus a1 and both direction vectors equal to zero directly provides the condition for coplanarity.

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**Q1** JEE Main 2026 · 8 Apr · Shift 2 MCQ

Let the foot of perpendicular from the point $(\lambda, 2, 3)$ on the line $\frac{x-4}{1} = \frac{y-9}{2} = \frac{z-5}{1}$ be the point $(1, \mu, 2)$. Then the distance between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+4}{6}$ and $\frac{x-\lambda}{2} = \frac{y-\mu}{3} = \frac{z+5}{6}$ is equal to :

(A) $\frac{12}{7}$

(B) $\frac{\sqrt{145}}{7}$

(C) $\frac{\sqrt{146}}{7}$

(D) $\frac{\sqrt{143}}{7}$

**Answer: (C)** $\frac{\sqrt{146}}{7}$ · Official NTA final key

**Q2** JEE Main 2026 · 8 Apr · Shift 2 Numerical

Let a line $L_1$ pass through the origin and be perpendicular to the lines

$L_2 : \vec{r} = (3+t)\hat{i} + (2t-1)\hat{j} + (2t+4)\hat{k}$ and

$L_3 : \vec{r} = (3+2s)\hat{i} + (3+2s)\hat{j} + (2+s)\hat{k}$, $t, s \in \mathbf{R}$.

If $(a, b, c)$, $a \in \mathbf{Z}$, is the point on $L_3$ at a distance of $\sqrt{17}$ from the point of intersection of $L_1$ and $L_2$, then $(a+b+c)^2$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 4.** · Official NTA final key

**Q3** JEE Main 2026 · 6 Apr · Shift 1 MCQ

Let the image of the point $P(1, 6, a)$ in the line $L : \frac{x}{1} = \frac{y-1}{2} = \frac{z-a+1}{b}$, $b > 0$, be $\left(\frac{a}{3}, 0, a+c\right)$. If $S(\alpha, \beta, \gamma)$, $\alpha > 0$, is the point on L such that the distance of S from the foot of perpendicular from the point P on L is $2\sqrt{14}$, then $\alpha + \beta + \gamma$ is equal to:

(A) 19

(B) 20

(C) 21

(D) 22

**Answer: (C) 21** · Official NTA final key

**Q4** JEE Main 2026 · 6 Apr · Shift 1 MCQ

Let a line L be perpendicular to both the lines $L_1 : \frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $L_2 : \frac{x-2}{1} = \frac{y-4}{4} = \frac{z-6}{7}$.

If $\theta$ is the acute angle between the lines L and $L_3$ : $\frac{x-\frac{8}{7}}{2}=\frac{y-\frac{4}{7}}{1}=\frac{z}{2}$, then $\tan\theta$ is equal to:

(A) $\frac{3}{2}\sqrt{2}$
(B) $\frac{5}{2}\sqrt{2}$
(C) $\frac{5}{3}\sqrt{2}$
(D) $\frac{4}{3}\sqrt{2}$

**Answer: (B)** $\frac{5}{2}\sqrt{2}$ · Official NTA final key

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**Q5** JEE Main 2026 · 6 Apr · Shift 2 MCQ

The shortest distance between the lines $\frac{x-4}{1}=\frac{y-3}{2}=\frac{z-2}{-3}$ and $\frac{x+2}{2}=\frac{y-6}{4}=\frac{z-5}{-5}$ is :

(A) $\frac{5\sqrt{6}}{6}$
(B) $2\sqrt{5}$
(C) $3\sqrt{5}$
(D) $4\sqrt{5}$

**Answer: (C)** $3\sqrt{5}$ · Official NTA final key

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**Q6** JEE Main 2026 · 6 Apr · Shift 2 Numerical

Let the image of the point $P(0,-5,0)$ in the line $\frac{x-1}{2}=\frac{y}{1}=\frac{z+1}{-2}$ be the point R and the image of the point $Q\left(0,\frac{-1}{2},0\right)$ in the line $\frac{x-1}{-1}=\frac{y+9}{4}=\frac{z+1}{1}$ be the point S. Then the square of the area of the parallelogram PQRS is _____.

Numerical value type: the answer is a number.

**Answer: 162.** · Official NTA final key

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**Q7** JEE Main 2026 · 5 Apr · Shift 1 MCQ

The square of the distance of the point $P(5,6,7)$ from the line $\frac{x-2}{2}=\frac{y-5}{3}=\frac{z-2}{4}$ is equal to:

(A) 3
(B) 5
(C) 6
(D) 8

**Answer: (C)** 6 · Official NTA final key

**Q8** JEE Main 2026 · 5 Apr · Shift 1 MCQ

The square of the distance of the point of intersection of the lines $\vec{r} = (\hat{i} + \hat{j} - \hat{k}) + \lambda(a\hat{i} - \hat{j})$, $a \neq 0$ and $\vec{r} = (4\hat{i} - \hat{k}) + \mu(2\hat{i} + a\hat{k})$ from the origin is:

(A) 5
(B) 10
(C) 17
(D) 26

**Answer: (C) 17** · Official NTA final key

**Q9** JEE Main 2026 · 5 Apr · Shift 2 MCQ

Let a triangle PQR be such that P and Q lie on the line $\frac{x+3}{8} = \frac{y-4}{2} = \frac{z+1}{2}$ and are at a distance of 6 units from R $(1, 2, 3)$. If $(\alpha, \beta, \gamma)$ is the centroid of $\Delta$PQR, then $\alpha + \beta + \gamma$ is equal to :

(A) 4
(B) 5
(C) 6
(D) 8

**Answer: (C) 6** · Official NTA final key

**Q10** JEE Main 2026 · 5 Apr · Shift 2 MCQ

If the distance of the point $(a, 2, 5)$ from the image of the point $(1, 2, 7)$ in the line $\frac{x}{1} = \frac{y-1}{1} = \frac{z-2}{2}$ is 4, then the sum of all possible values of a is equal to :

(A) 11
(B) 9
(C) 6
(D) 4

**Answer: (C) 6** · Official NTA final key

**Q11** JEE Main 2026 · 4 Apr · Shift 1 MCQ

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 $\alpha$, then $225\alpha^2$ is equal to:

(A) 1024
(B) 1014
(C) 1104
(D) 1204

**Answer: (B) 1014** · Official NTA final key

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**Q12** JEE Main 2026 · 4 Apr · Shift 1 MCQ

The square of the distance of the point $(-2,-8,6)$ from the line $\frac{x-1}{1}=\frac{y-1}{2}=\frac{z}{-1}$ along the line $\frac{x+5}{1}=\frac{y+5}{-1}=\frac{z}{2}$ is equal to:

(A) 3
(B) 6
(C) 8
(D) 12

**Answer: (B) 6** · Official NTA final key

**Q13** JEE Main 2026 · 4 Apr · Shift 2 MCQ

The shortest distance between the lines
$\vec{r}=\left(\frac{1}{3}\hat{i}+2\hat{j}+\frac{8}{3}\hat{k}\right)+\lambda\left(2\hat{i}-5\hat{j}+6\hat{k}\right)$
and $\vec{r}=\left(-\frac{2}{3}\hat{i}-\frac{1}{3}\hat{k}\right)+\mu\left(\hat{j}-\hat{k}\right)$, $\lambda,\mu\in\mathbb{R}$, is:

(A) $\sqrt{5}$
(B) 3
(C) $2\sqrt{3}$
(D) $\sqrt{15}$

**Answer: (B) 3** · Official NTA final key

**Q14** JEE Main 2026 · 4 Apr · Shift 2 MCQ

If $\left(2\alpha+1,\ \alpha^2-3\alpha,\ \frac{\alpha-1}{2}\right)$ is the image of $(\alpha,2\alpha,1)$ in the line $\frac{x-2}{3}=\frac{y-1}{2}=\frac{z}{1}$, then the possible value(s) of $\alpha$ is (are)

(A) Only 3
(B) Only 3 and $-1$
(C) Only 3, $\frac{1}{4}$ and $-1$
(D) Only 3 and $\frac{1}{4}$

**Answer: (A) Only 3** · Official NTA final key

**Q15** JEE Main 2026 · 2 Apr · Shift 1 MCQ

If the point of intersection of the lines $\frac{x+1}{3}=\frac{y+\mathrm{a}}{5}=\frac{z+\mathrm{b}+1}{7}$ and $\frac{x-2}{1}=\frac{y-\mathrm{b}}{4}=\frac{z-2\mathrm{a}}{7}$ lies on xy-plane, then the value of $\mathrm{a}+\mathrm{b}$ is :

(A) 2
(B) 5
(C) 7
(D) 9

**Answer: (C) 7** · Official NTA final key

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**Q16** JEE Main 2026 · 2 Apr · Shift 1 MCQ

Let a line L passing through the point (1, 1, 1) be perpendicular to both the vectors $2\hat{i}+2\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}+2\hat{k}$. If P(a, b, c) is the foot of perpendicular from the origin on the line L, then the value of $34(\mathrm{a}+\mathrm{b}+\mathrm{c})$ is :

(A) 50
(B) 80
(C) 100
(D) 120

**Answer: (C) 100** · Official NTA final key

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**Q17** JEE Main 2026 · 2 Apr · Shift 2 MCQ

Let the point A be the foot of perpendicular drawn from the point $\mathrm{P}(\mathrm{a},\mathrm{b},0)$ on the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-\alpha}{3}$. If the midpoint of the line segment PA is $\left(0,\frac{3}{4},\frac{-1}{4}\right)$, then the value of $\mathrm{a}^2+\mathrm{b}^2+\alpha^2$ is equal to :

(A) 1
(B) 2
(C) 6
(D) 9

**Answer: (A) 1** · Official NTA final key

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**Q18** JEE Main 2026 · 28 Jan · Shift 1 MCQ

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 $\mathrm{L}_1:\frac{x-1}{3}=\frac{y-2}{4}=\frac{z-a}{b}$ and $\mathrm{L}_2:\frac{x-1}{1}=\frac{y-2}{4}=\frac{z-a}{c}$ are equal, then $a+b+c$ is equal to

(A) 5
(B) 6
(C) 4
(D) 7

**Answer: (D) 7** · Official NTA final key

**Q19** JEE Main 2026 · 28 Jan · Shift 2 MCQ

Let Q(a, b, c) be the image of the point P(3, 2, 1) in the line $\frac{x-1}{1}=\frac{y}{2}=\frac{z-1}{1}$. Then the distance of Q from the line $\frac{x-9}{3}=\frac{y-9}{2}=\frac{z-5}{-2}$ is :

(A) 8
(B) 7
(C) 6
(D) 5

**Answer: (B) 7** · Official NTA final key

**Q20** JEE Main 2026 · 28 Jan · Shift 2 Numerical

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

Numerical value type: the answer is a number.

**Answer: 170.** · Official NTA final key

**Q21** JEE Main 2026 · 24 Jan · Shift 1 MCQ

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

(A) 340
(B) 348
(C) 360
(D) 320

**Answer: (C) 360** · Official NTA final key

**Q22** JEE Main 2026 · 24 Jan · Shift 1 Numerical

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 _____.

Numerical value type: the answer is a number.

**Answer: 6.** · Official NTA final key

**Q23** JEE Main 2026 · 24 Jan · Shift 2 MCQ

The sum of all values of $\alpha$, for which the shortest distance between the lines $\frac{x+1}{\alpha}=\frac{y-2}{-1}=\frac{z-4}{-\alpha}$ and $\frac{x}{\alpha}=\frac{y-1}{2}=\frac{z-1}{2\alpha}$ is $\sqrt{2}$, is

(A) 6
(B) $-6$
(C) $-8$
(D) 8

**Answer: (B)** $-6$ · Official NTA final key

**Q24** JEE Main 2026 · 23 Jan · Shift 1 MCQ

Let the direction cosines of two lines satisfy the equations : $4l+m-n=0$ and $2mn+10nl+3lm=0$. Then the cosine of the acute angle between these lines is :

(A) $\frac{10}{3\sqrt{38}}$
(B) $\frac{20}{3\sqrt{38}}$
(C) $\frac{10}{7\sqrt{38}}$
(D) $\frac{10}{\sqrt{38}}$

**Answer: (A)** $\frac{10}{3\sqrt{38}}$ · Official NTA final key

**Q25** JEE Main 2026 · 23 Jan · Shift 1 MCQ

The vertices B and C of a triangle ABC lie on the line $\frac{x}{1}=\frac{1-y}{-2}=\frac{z-2}{3}$. The coordinates of A and B are $(1,6,3)$ and $(4,9,\alpha)$ respectively and C is at a distance of 10 from B. The area (in sq. units) of $\Delta$ ABC is :

(A) $10\sqrt{13}$
(B) $15\sqrt{13}$
(C) $5\sqrt{13}$
(D) $20\sqrt{13}$

**Answer: (C)** $5\sqrt{13}$ · Official NTA final key

**Q26** JEE Main 2026 · 23 Jan · Shift 2 Numerical

If the image of the point P$(a,2,a)$ in the line $\frac{x}{2}=\frac{y+a}{1}=\frac{z}{1}$ is Q and the image of Q in the line $\frac{x-2b}{2}=\frac{y-a}{1}=\frac{z+2b}{-5}$ is P, then $a+b$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 3.** · Official NTA final key

**Q27** JEE Main 2026 · 22 Jan · Shift 1 MCQ

If the image of the point P$(1, 2, a)$ in the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{7-z}{2}$ is Q$(5, b, c)$, then $a^2 + b^2 + c^2$ is equal to

(A) 293
(B) 298
(C) 264
(D) 283

**Answer: (B)** 298 · Official NTA final key

**Q28** JEE Main 2026 · 22 Jan · Shift 1 MCQ

Let P$(\alpha, \beta, \gamma)$ be the point on the line $\frac{x-1}{2} = \frac{y+1}{-3} = z$ at a distance $4\sqrt{14}$ from the point $(1, -1, 0)$ and nearer to the origin. Then the shortest distance, between the lines $\frac{x-\alpha}{1} = \frac{y-\beta}{2} = \frac{z-\gamma}{3}$ and $\frac{x+5}{2} = \frac{y-10}{1} = \frac{z-3}{1}$, is equal to

(A) $7\sqrt{\frac{5}{4}}$
(B) $4\sqrt{\frac{5}{7}}$
(C) $2\sqrt{\frac{7}{4}}$
(D) $4\sqrt{\frac{7}{5}}$

**Answer: (D)** $4\sqrt{\frac{7}{5}}$ · Official NTA final key

**Q29** JEE Main 2026 · 22 Jan · Shift 2 MCQ

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 :

(A) 34
(B) 40
(C) 6
(D) 28

**Answer: (A)** 34 · Official NTA final key

**Q30** JEE Main 2026 · 21 Jan · Shift 1 MCQ

Let $(\alpha, \beta, \gamma)$ be the co-ordinates of the foot of the perpendicular drawn from the point $(5, 4, 2)$ on the line $\vec{r} = (-\hat{i} + 3\hat{j} + \hat{k}) + \lambda(2\hat{i} + 3\hat{j} - \hat{k})$. Then the length of the projection of the vector $\alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$

on the vector $6\hat{i}+2\hat{j}+3\hat{k}$ is :

(A) 3
(B) $\frac{15}{7}$
(C) $\frac{18}{7}$
(D) 4

**Answer: (C)** $\frac{18}{7}$ · Official NTA final key

**Q31** JEE Main 2026 · 21 Jan · Shift 2 MCQ

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 $|\overrightarrow{CD}|^2$ is equal to :

(A) 290
(B) 89
(C) 312
(D) 171

**Answer: (A)** 290 · Official NTA final key

**Q32** JEE Main 2026 · 21 Jan · Shift 2 MCQ

Let the line L pass through the point $(-3,5,2)$ and make equal angles with the positive coordinate axes. If the distance of L from the point $(-2,r,1)$ is $\sqrt{\frac{14}{3}}$, then the sum of all possible values of r is :

(A) 16
(B) 12
(C) 10
(D) 6

**Answer: (C)** 10 · Official NTA final key

**Q33** JEE Main 2025 · 8 Apr · Shift 2 MCQ

Let the values of $\lambda$ for which the shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-\lambda}{3}=\frac{y-4}{4}=\frac{z-5}{5}$ is $\frac{1}{\sqrt{6}}$ be $\lambda_1$ and $\lambda_2$. Then the radius of the circle passing through the points $(0,0)$, $(\lambda_1,\lambda_2)$ and $(\lambda_2,\lambda_1)$ is

(A) 3

(B) 4

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

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

**Answer: (C)** $\frac{5\sqrt{2}}{3}$ · Key from source paper

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**Q34** JEE Main 2025 · 8 Apr · Shift 2 Numerical

Let the area of the triangle formed by the lines $x+2=y-1=z$, $\frac{x-3}{5}=\frac{y}{-1}=\frac{z-1}{1}$ and $\frac{x}{-3}=\frac{y-3}{3}=\frac{z-2}{1}$ be $A$. Then $A^2$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 56.** · Key from source paper

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**Q35** JEE Main 2025 · 7 Apr · Shift 1 MCQ

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 ?

(A) (5, 4, 3)

(B) (7, 15, 13)

(C) (4, 22, 7)

(D) (10, –29, –50)

**Answer: (B)** (7, 15, 13) · Key from source paper

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**Q36** JEE Main 2025 · 7 Apr · Shift 1 MCQ

If the shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x}{1}=\frac{y}{\alpha}=\frac{z-5}{1}$ is $\frac{5}{\sqrt{6}}$, then the sum of all possible values of $\alpha$ is

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

(B) –3

(C) $-\frac{3}{2}$

(D) 3

**Answer: (B)** –3 · Key from source paper

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**Q37** JEE Main 2025 · 7 Apr · Shift 2 MCQ

Consider the lines $L_1: x-1=y-2=z$ and $L_2: x-2=y=z-1$. Let the feet of the perpendiculars from the point $P(5,1,-3)$ on the lines $L_1$ and $L_2$ be $Q$ and $R$ respectively. If the area of the triangle PQR is A , then $4A^2$ is equal to:

(A) 143
(B) 151
(C) 147
(D) 139

**Answer: (C) 147** · Key from source paper

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**Q38** JEE Main 2025 · 7 Apr · Shift 2 MCQ

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

(A) 14
(B) 13
(C) 10
(D) 12

**Answer: (A) 14** · Key from source paper

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**Q39** JEE Main 2025 · 4 Apr · Shift 1 MCQ

Let A and B be two distinct points on the line $L : \frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$. Both A and B are at a distance $2\sqrt{17}$ from the foot of perpendicular drawn from the point $(1, 2, 3)$ on the line $L$. If $O$ is the origin, then $\overrightarrow{OA} \cdot \overrightarrow{OB}$ is equal to

(A) 62
(B) 47
(C) 21
(D) 49

**Answer: (B) 47** · Key from source paper

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**Q40** JEE Main 2025 · 4 Apr · Shift 1 MCQ

Let the shortest distance between the lines $\frac{x-3}{3} = \frac{y-\alpha}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-\beta}{4}$ be $3\sqrt{30}$. Then the positive value of $5\alpha + \beta$ is

(A) 48
(B) 42
(C) 40
(D) 46

**Answer: (D) 46** · Key from source paper

**Q41** JEE Main 2025 · 4 Apr · Shift 2 MCQ

Let the values of p, for which the shortest distance between the lines $\frac{x+1}{3}=\frac{y}{4}=\frac{z}{5}$ and $\vec{r}=\left(p\hat{i}+2\hat{j}+\hat{k}\right)+\lambda\left(2\hat{i}+3\hat{j}+4\hat{k}\right)$ is $\frac{1}{\sqrt{6}}$, be $a, b, (a<b)$. Then the length of the latus rectum of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is :

(A) $\frac{2}{3}$
(B) 18
(C) 9
(D) $\frac{3}{2}$

**Answer: (A)** $\frac{2}{3}$ · Key from source paper

**Q42** JEE Main 2025 · 4 Apr · Shift 2 MCQ

Let A be the point of intersection of the lines $L_1: \frac{x-7}{1}=\frac{y-5}{0}=\frac{z-3}{-1}$ and $L_2: \frac{x-1}{3}=\frac{y+3}{4}=\frac{z+7}{5}$. Let B and C be the points on the lines $L_1$ and $L_2$ respectively such that $AB=AC=\sqrt{15}$. Then the square of the area of the triangle ABC is :

(A) 57
(B) 60
(C) 63
(D) 54

**Answer: (D)** 54 · Key from source paper

**Q43** JEE Main 2025 · 3 Apr · Shift 1 MCQ

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

(A) 6
(B) 8
(C) 16
(D) 12

**Answer: (B)** 8 · Key from source paper

**Q44** JEE Main 2025 · 3 Apr · Shift 1 MCQ

Line $L_1$ passes through the point $(1,2,3)$ and is parallel to $z$ -axis. Line $L_2$ passes through the point $(\lambda,5,6)$ and is parallel to $y$ -axis. Let for $\lambda=\lambda_1, \lambda_2, \lambda_2<\lambda_1$, the shortest distance between the two lines be 3 . Then the square of the distance of the point $(\lambda_1,\lambda_2,7)$ from the line $L_1$ is

(A) 37
(B) 32
(C) 40
(D) 25

**Answer: (D)** 25 · Key from source paper

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**Q45** JEE Main 2025 · 3 Apr · Shift 2 MCQ

The distance of the point $(7, 10, 11)$ from the line $\frac{x-4}{1} = \frac{y-4}{0} = \frac{z-2}{3}$ along the line $\frac{x-9}{2} = \frac{y-13}{3} = \frac{z-17}{6}$ is

(A) 18
(B) 16
(C) 12
(D) 14

**Answer: (D)** 14 · Checked by our team

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**Q46** JEE Main 2025 · 3 Apr · Shift 2 MCQ

Each of the angles $\beta$ and $\gamma$ that a given line makes with the positive $y$ - and $z$ -axes, respectively, is half of the angle that this line makes with the positive $x$ -axes. Then the sum of all possible values of the angle $\beta$ is

(A) $\frac{\pi}{2}$
(B) $\pi$
(C) $\frac{3\pi}{2}$
(D) $\frac{3\pi}{4}$

**Answer: (D)** $\frac{3\pi}{4}$ · Key from source paper

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**Q47** JEE Main 2025 · 2 Apr · Shift 1 MCQ

Let the vertices Q and R of the triangle PQR lie on the line $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z+4}{3}$, $QR = 5$ and the coordinates of the point $P$ be $(0, 2, 3)$. If the area of the triangle PQR is $\frac{m}{n}$ then:

(A) $2m - 5\sqrt{21}n = 0$
(B) $5m - 2\sqrt{21}n = 0$
(C) $5m - 21\sqrt{2}n = 0$
(D) $m - 5\sqrt{21}n = 0$

**Answer: (A)** $2m - 5\sqrt{21}n = 0$ · Key from source paper

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**Q48** JEE Main 2025 · 2 Apr · Shift 2 MCQ

If the image of the point P(1,0,3) in the line joining the points A(4,7,1) and B(3,5,3) is $Q(\alpha, \beta, \gamma)$, then $\alpha + \beta + \gamma$ is equal to :

(A) 13
(B) $\frac{47}{3}$
(C) 18
(D) $\frac{46}{3}$

**Answer: (D)** $\frac{46}{3}$ · Key from source paper

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**Q49** JEE Main 2025 · 2 Apr · Shift 2 MCQ

The line $L_1$ is parallel to vector $\vec{a} = -3\hat{i} + 2\hat{j} + 4\hat{k}$ and passes through the point $(7, 6, 2)$ and the line $L_2$ is parallel to vector $\vec{b} = 2\hat{i} + \hat{j} + 3\hat{k}$ and passes through the point $(5, 3, 4)$. The shortest distance between the lines $L_1$ and $L_2$ is :

(A) $\frac{21}{\sqrt{38}}$
(B) $\frac{23}{\sqrt{57}}$
(C) $\frac{21}{\sqrt{57}}$
(D) $\frac{23}{\sqrt{38}}$

**Answer: (D)** $\frac{23}{\sqrt{38}}$ · Key from source paper

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**Q50** JEE Main 2025 · 29 Jan · Shift 1 MCQ

Let $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + 7\hat{j} + 3\hat{k}$. Let $L_1 : \vec{r} = (-\hat{i} + 2\hat{j} + \hat{k}) + \lambda\vec{a}, \lambda \in \mathbf{R}$ and $L_2 : \vec{r} = (\hat{j} + \hat{k}) + \mu\vec{b}, \mu \in \mathbf{R}$ 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 :

(A) $(5, 17, 4)$
(B) $(2, 8, 5)$
(C) $(8, 26, 12)$
(D) $(-1, -1, 1)$

**Answer: (C)** $(8, 26, 12)$ · Key from source paper

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**Q51** JEE Main 2025 · 29 Jan · Shift 1 MCQ

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 $(\alpha, \beta, \gamma)$ and be perpendicular to both $L_1$ and $L_2$. If $L_3$ intersects $L_1$, then $|5\alpha - 11\beta - 8\gamma|$ equals :

(A) 20
(B) 18
(C) 25
(D) 16

**Answer: (C)** 25 · Key from source paper

**Q52** JEE Main 2025 · 29 Jan · Shift 2 MCQ

Let P be the foot of the perpendicular from the point $(1,2,2)$ on the line L : $\frac{x-1}{1}=\frac{y+1}{-1}=\frac{z-2}{2}$. Let the line $\vec{r}=(-\hat{i}+\hat{j}-2\hat{k})+\lambda(\hat{i}-\hat{j}+\hat{k}), \lambda \in \mathbf{R}$, intersect the line L at Q . Then $2(\mathrm{PQ})^2$ is equal to :

(A) 25
(B) 19
(C) 29
(D) 27

**Answer: (D) 27** · Key from source paper

**Q53** JEE Main 2025 · 29 Jan · Shift 2 MCQ

Let a straight line $L$ pass through the point $P(2,-1,3)$ and be perpendicular to the lines $\frac{x-1}{2}=\frac{y+1}{1}=\frac{z-3}{-2}$ and $\frac{x-3}{1}=\frac{y-2}{3}=\frac{z+2}{4}$. If the line $L$ intersects the $yz$-plane at the point $Q$, then the distance between the points $P$ and $Q$ is :

(A) $\sqrt{10}$
(B) $2\sqrt{3}$
(C) 2
(D) 3

**Answer: (D) 3** · Key from source paper

**Q54** JEE Main 2025 · 28 Jan · Shift 1 MCQ

If the image of the point $(4,4,3)$ in the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-1}{3}$ is $(\alpha,\beta,\gamma)$, then $\alpha+\beta+\gamma$ is equal to

(A) 9
(B) 12
(C) 7
(D) 8

**Answer: (A) 9** · Key from source paper

**Q55** JEE Main 2025 · 28 Jan · Shift 1 MCQ

Let $\mathrm{A}(x,y,z)$ be a point in $xy$-plane, which is equidistant from three points $(0,3,2),(2,0,3)$ and $(0,0,1)$. Let $\mathrm{B}=(1,4,-1)$ and $\mathrm{C}=(2,0,-2)$. Then among the statements (S1) : $\triangle$ABC is an isosceles right angled triangle, and (S2) : the area of $\triangle$ABC is $\frac{9\sqrt{2}}{2}$,

(A) both are true
(B) only (S2) is true
(C) only (S1) is true
(D) both are false

**Answer: (C) only (S1) is true** · Key from source paper

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**Q56** JEE Main 2025 · 28 Jan · Shift 2 MCQ

The square of the distance of the point $\left(\frac{15}{7}, \frac{32}{7}, 7\right)$ from the line $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ in the direction of the vector $\hat{i} + 4\hat{j} + 7\hat{k}$ is :

(A) 54
(B) 44
(C) 41
(D) 66

**Answer: (D) 66** · Key from source paper

**Q57** JEE Main 2025 · 24 Jan · Shift 1 MCQ

Let in a $\triangle ABC$, the length of the side $AC$ be 6 , the vertex $B$ be $(1, 2, 3)$ and the vertices $A, C$ lie on the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$. Then the area (in sq. units) of $\triangle$ABC is:

(A) 17
(B) 21
(C) 56
(D) 42

**Answer: (B) 21** · Key from source paper

**Q58** JEE Main 2025 · 24 Jan · Shift 1 MCQ

Let the line passing through the points $(-1, 2, 1)$ and parallel to the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z}{4}$ intersect the line $\frac{x+2}{3} = \frac{y-3}{2} = \frac{z-4}{1}$ at the point $P$. Then the distance of $P$ from the point $Q(4, -5, 1)$ is

(A) 5
(B) $5\sqrt{5}$
(C) $5\sqrt{6}$
(D) 10

**Answer: (B)** $5\sqrt{5}$ · Key from source paper

**Q59** JEE Main 2025 · 24 Jan · Shift 2 Numerical

Let P be the image of the point $\mathrm{Q}(7, -2, 5)$ in the line $\mathrm{L} : \frac{x-1}{2} = \frac{y+1}{3} = \frac{z}{4}$ and $\mathrm{R}(5, \mathrm{p}, \mathrm{q})$ be a point on $L$. Then the square of the area of $\triangle PQR$ is _____ .

Numerical value type: the answer is a number.

**Answer: 957.** · Key from source paper

**Q60** JEE Main 2025 · 23 Jan · Shift 1 MCQ

Let $P$ be the foot of the perpendicular from the point $Q(10, -3, -1)$ on the line $\frac{x-3}{7} = \frac{y-2}{-1} = \frac{z+1}{-2}$. Then the area of the right angled triangle $PQR$, where $R$ is the point $(3, -2, 1)$, is

(A) $9\sqrt{15}$
(B) $\sqrt{30}$
(C) $8\sqrt{15}$
(D) $3\sqrt{30}$

**Answer: (D)** $3\sqrt{30}$ · Key from source paper

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**Q61** JEE Main 2025 · 23 Jan · Shift 2 MCQ

The distance of the line $\frac{x-2}{2}=\frac{y-6}{3}=\frac{z-3}{4}$ from the point $(1,4,0)$ along the line $\frac{x}{1}=\frac{y-2}{2}=\frac{z+3}{3}$ is :

(A) $\sqrt{17}$
(B) $\sqrt{15}$
(C) $\sqrt{14}$
(D) $\sqrt{13}$

**Answer: (C)** $\sqrt{14}$ · Key from source paper

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**Q62** JEE Main 2025 · 23 Jan · Shift 2 MCQ

If the square of the shortest distance between the lines $\frac{x-2}{1}=\frac{y-1}{2}=\frac{z+3}{-3}$ and $\frac{x+1}{2}=\frac{y+3}{4}=\frac{z+5}{-5}$ is $\frac{m}{n}$, where m, n are coprime numbers, then $\mathrm{m}+\mathrm{n}$ is equal to :

(A) 21
(B) 9
(C) 14
(D) 6

**Answer: (B)** 9 · Key from source paper

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**Q63** JEE Main 2025 · 22 Jan · Shift 1 MCQ

Let $\mathrm{L}_1 : \frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\mathrm{L}_2 : \frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$ be two lines. Then which of the following points lies on the line of the shortest distance between $L_1$ and $L_2$ ?

(A) $\left(\frac{14}{3},-3,\frac{22}{3}\right)$
(B) $\left(-\frac{5}{3},-7,1\right)$
(C) $\left(2,3,\frac{1}{3}\right)$
(D) $\left(\frac{8}{3},-1,\frac{1}{3}\right)$

**Answer: (A)** $\left(\frac{14}{3},-3,\frac{22}{3}\right)$ · Key from source paper

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**Q64** JEE Main 2025 · 22 Jan · Shift 1 Numerical

Let $\mathrm{L}_1 : \frac{x-1}{3}=\frac{y-1}{-1}=\frac{z+1}{0}$ and $\mathrm{L}_2 : \frac{x-2}{2}=\frac{y}{0}=\frac{z+4}{\alpha}$, $\alpha \in \mathbf{R}$, be two lines, which intersect at the point $B$. If $P$ is the foot of perpendicular from the point $A(1,1,-1)$ on $L_2$, then the value of $26\alpha(\mathrm{PB})^2$ is _____

Numerical value type: the answer is a number.

**Answer: 216.** · Key from source paper

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**Q65** JEE Main 2025 · 22 Jan · Shift 2 MCQ

Let a line pass through two distinct points $P(-2,-1,3)$ and $Q$, and be parallel to the vector $3\hat{i}+2\hat{j}+2\hat{k}$. If the distance of the point Q from the point $R(1,3,3)$ is 5 , then the square of the area of $\triangle PQR$ is equal to :

(A) 148
(B) 136
(C) 144
(D) 140

**Answer: (B)** 136 · Key from source paper

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**Q66** JEE Main 2025 · 22 Jan · Shift 2 MCQ

The perpendicular distance, of the line $\frac{x-1}{2}=\frac{y+2}{-1}=\frac{z+3}{2}$ from the point $\mathrm{P}(2,-10,1)$, is :

(A) 6
(B) $5\sqrt{2}$
(C) $4\sqrt{3}$
(D) $3\sqrt{5}$

**Answer: (D)** $3\sqrt{5}$ · Key from source paper

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**Q67** JEE Main 2024 · 9 Apr · Shift 1 MCQ

Let the line L intersect the lines $x-2=-y=z-1,\ 2(x+1)=2(y-1)=z+1$ and be parallel to the line $\frac{x-2}{3}=\frac{y-1}{1}=\frac{z-2}{2}$. Then which of the following points lies on L?

(A) $\left(-\frac{1}{3},1,-1\right)$
(B) $\left(-\frac{1}{3},-1,1\right)$
(C) $\left(-\frac{1}{3},1,1\right)$
(D) $\left(-\frac{1}{3},-1,-1\right)$

**Answer: (A)** $\left(-\frac{1}{3},1,-1\right)$ · Key from source paper

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**Q68** JEE Main 2024 · 9 Apr · Shift 1 MCQ

The shortest distance between the lines $\frac{x-3}{4}=\frac{y+7}{-11}=\frac{z-1}{5}$ and $\frac{x-5}{3}=\frac{y-9}{-6}=\frac{z+2}{1}$ is:

(A) $\frac{178}{\sqrt{563}}$
(B) $\frac{187}{\sqrt{563}}$
(C) $\frac{185}{\sqrt{563}}$
(D) $\frac{179}{\sqrt{563}}$

**Answer: (B)** $\frac{187}{\sqrt{563}}$ · Key from source paper

**Q69** JEE Main 2024 · 9 Apr · Shift 2 MCQ

Consider the line $L$ passing through the points $(1, 2, 3)$ and $(2, 3, 5)$. The distance of the point $\left(\frac{11}{3}, \frac{11}{3}, \frac{19}{3}\right)$ from the line L along the line $\frac{3x-11}{2} = \frac{3y-11}{1} = \frac{3z-19}{2}$ is equal to

(A) 6
(B) 5
(C) 4
(D) 3

**Answer: (D)** 3 · Key from source paper

**Q70** JEE Main 2024 · 9 Apr · Shift 2 Numerical

The square of the distance of the image of the point $(6, 1, 5)$ in the line $\frac{x-1}{3} = \frac{y}{2} = \frac{z-2}{4}$, from the origin is _____

Numerical value type: the answer is a number.

**Answer: 62.** · Key from source paper

**Q71** JEE Main 2024 · 8 Apr · Shift 1 MCQ

If the shortest distance between the lines

$L_1 : \vec{r} = (2+\lambda)\hat{i} + (1-3\lambda)\hat{j} + (3+4\lambda)\hat{k}, \quad \lambda \in \mathbb{R}$

$L_2 : \vec{r} = 2(1+\mu)\hat{i} + 3(1+\mu)\hat{j} + (5+\mu)\hat{k}, \quad \mu \in \mathbb{R}$

is $\frac{m}{\sqrt{n}}$, where $\gcd(m, n) = 1$, then the value of $m + n$ equals

(A) 390
(B) 384
(C) 377
(D) 387

**Answer: (D)** 387 · Key from source paper

**Q72** JEE Main 2024 · 8 Apr · Shift 1 MCQ

Let $P(x, y, z)$ be a point in the first octant, whose projection in the $xy$-plane is the point $Q$. Let $OP = \gamma$; the angle between $OQ$ and the positive $x$-axis be $\theta$; and the angle between $OP$ and the positive $z$-axis be $\phi$, where $O$ is the origin. Then the distance of $P$ from the $x$-axis is

(A) $\gamma\sqrt{1-\sin^2\phi\cos^2\theta}$
(B) $\gamma\sqrt{1-\sin^2\theta\cos^2\phi}$
(C) $\gamma\sqrt{1+\cos^2\phi\sin^2\theta}$
(D) $\gamma\sqrt{1+\cos^2\theta\sin^2\phi}$

**Answer: (A)** $\gamma\sqrt{1-\sin^2\phi\cos^2\theta}$ · Key from source paper

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**Q73** JEE Main 2024 · 8 Apr · Shift 2 MCQ

If the shortest distance between the lines $\frac{x-\lambda}{2}=\frac{y-4}{3}=\frac{z-3}{4}$ and $\frac{x-2}{4}=\frac{y-4}{6}=\frac{z-7}{8}$ is $\frac{13}{\sqrt{29}}$, then a value of $\lambda$ is :

(A) -1
(B) $-\frac{13}{25}$
(C) $\frac{13}{25}$
(D) 1

**Answer: (D)** 1 · Key from source paper

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**Q74** JEE Main 2024 · 8 Apr · Shift 2 Numerical

Let $\mathrm{P}(\alpha,\beta,\gamma)$ be the image of the point $\mathrm{Q}(1,6,4)$ in the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$. Then $2\alpha+\beta+\gamma$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 11.** · Key from source paper

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**Q75** JEE Main 2024 · 6 Apr · Shift 1 MCQ

The shortest distance between the lines $\frac{x-3}{2}=\frac{y+15}{-7}=\frac{z-9}{5}$ and $\frac{x+1}{2}=\frac{y-1}{1}=\frac{z-9}{-3}$ is

(A) $8\sqrt{3}$
(B) $4\sqrt{3}$
(C) $5\sqrt{3}$
(D) $6\sqrt{3}$

**Answer: (B)** $4\sqrt{3}$ · Key from source paper

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**Q76** JEE Main 2024 · 6 Apr · Shift 1 Numerical

Let $P$ be the point $(10,-2,-1)$ and $Q$ be the foot of the perpendicular drawn from the point $R(1,7,6)$ on the line passing through the points $(2,-5,11)$ and $(-6,7,-5)$. Then the length of the line segment $PQ$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 13.** · Key from source paper

**Q77** JEE Main 2024 · 6 Apr · Shift 2 MCQ

Let P($\alpha, \beta, \gamma$) be the image of the point Q(3, $-3$, 1) in the line $\frac{x-0}{1} = \frac{y-3}{1} = \frac{z-1}{-1}$ and R be the point (2, 5, $-1$). If the area of the triangle $PQR$ is $\lambda$ and $\lambda^2 = 14K$, then $K$ is equal to :

(A) 36
(B) 81
(C) 72
(D) 18

**Answer: (B) 81** · Key from source paper

**Q78** JEE Main 2024 · 6 Apr · Shift 2 Numerical

If the shortest distance between the lines $\frac{x-\lambda}{3} = \frac{y-2}{-1} = \frac{z-1}{1}$ and $\frac{x+2}{-3} = \frac{y+5}{2} = \frac{z-4}{4}$ is $\frac{44}{\sqrt{30}}$, then the largest possible value of $|\lambda|$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 43.** · Key from source paper

**Q79** JEE Main 2024 · 5 Apr · Shift 1 MCQ

If the line $\frac{2-x}{3} = \frac{3y-2}{4\lambda+1} = 4 - z$ makes a right angle with the line $\frac{x+3}{3\mu} = \frac{1-2y}{6} = \frac{5-z}{7}$, then $4\lambda + 9\mu$ is equal to :

(A) 4
(B) 13
(C) 5
(D) 6

**Answer: (D) 6** · Key from source paper

**Q80** JEE Main 2024 · 5 Apr · Shift 1 MCQ

Let d be the distance of the point of intersection of the lines $\frac{x+6}{3} = \frac{y}{2} = \frac{z+1}{1}$ and $\frac{x-7}{4} = \frac{y-9}{3} = \frac{z-4}{2}$ from the point $(7, 8, 9)$. Then $d^2 + 6$ is equal to :

(A) 69
(B) 78
(C) 72
(D) 75

**Answer: (D) 75** · Key from source paper

**Q81** JEE Main 2024 · 5 Apr · Shift 2 MCQ

Let $(\alpha, \beta, \gamma)$ be the image of the point $(8, 5, 7)$ in the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{5}$. Then $\alpha + \beta + \gamma$ is equal to :

(A) 16
(B) 20
(C) 14
(D) 18

**Answer: (C) 14** · Key from source paper

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**Q82** JEE Main 2024 · 5 Apr · Shift 2 · Numerical

Let the point $(-1, \alpha, \beta)$ lie on the line of the shortest distance between the lines $\frac{x+2}{-3} = \frac{y-2}{4} = \frac{z-5}{2}$ and $\frac{x+2}{-1} = \frac{y+6}{2} = \frac{z-1}{0}$. Then $(\alpha - \beta)^2$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 25.** · Key from source paper

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**Q83** JEE Main 2024 · 4 Apr · Shift 1 · MCQ

Let the point, on the line passing through the points $P(1, -2, 3)$ and $Q(5, -4, 7)$, farther from the origin and at distance of 9 units from the point P, be $(\alpha, \beta, \gamma)$. Then $\alpha^2 + \beta^2 + \gamma^2$ is equal to :

(A) 165
(B) 160
(C) 155
(D) 150

**Answer: (C) 155** · Key from source paper

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**Q84** JEE Main 2024 · 4 Apr · Shift 1 · Numerical

If the shortest distance between the lines $\frac{x+2}{2} = \frac{y+3}{3} = \frac{z-5}{4}$ and $\frac{x-3}{1} = \frac{y-2}{-3} = \frac{z+4}{2}$ is $\frac{38}{3\sqrt{5}}\mathrm{k}$, and $\int_0^{\mathrm{k}} [x^2]\, dx = \alpha - \sqrt{\alpha}$, where $[x]$ denotes the greatest integer function, then $6\alpha^3$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 48.** · Key from source paper

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**Q85** JEE Main 2024 · 4 Apr · Shift 2 · MCQ

Let P be the point of intersection of the lines $\frac{x-2}{1} = \frac{y-4}{5} = \frac{z-2}{1}$ and $\frac{x-3}{2} = \frac{y-2}{3} = \frac{z-3}{2}$. Then, the shortest distance of P from the line $4x = 2y = z$ is

(A) $\frac{5\sqrt{14}}{7}$
(B) $\frac{3\sqrt{14}}{7}$
(C) $\frac{\sqrt{14}}{7}$
(D) $\frac{6\sqrt{14}}{7}$

**Answer: (B) $\frac{3\sqrt{14}}{7}$** · Key from source paper

**Q86** JEE Main 2024 · 4 Apr · Shift 2 Numerical

Consider a line L passing through the points $\mathrm{P}(1,2,1)$ and $\mathrm{Q}(2,1,-1)$. If the mirror image of the point $\mathrm{A}(2,2,2)$ in the line L is $(\alpha,\beta,\gamma)$, then $\alpha+\beta+6\gamma$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 6.** · Key from source paper

**Q87** JEE Main 2024 · 1 Feb · Shift 1 MCQ

If the shortest distance between the lines $\frac{x-\lambda}{-2}=\frac{y-2}{1}=\frac{z-1}{1}$ and $\frac{x-\sqrt{3}}{1}=\frac{y-1}{-2}=\frac{z-2}{1}$ is 1, then the sum of all possible values of $\lambda$ is

(A) 0
(B) $2\sqrt{3}$
(C) $3\sqrt{3}$
(D) $-2\sqrt{3}$

**Answer: (B)** $2\sqrt{3}$ · Key from source paper

**Q88** JEE Main 2024 · 1 Feb · Shift 1 Numerical

Let the line of the shortest distance between the lines $L_1 : \vec{r}=(\hat{i}+2\hat{j}+3\hat{k})+\lambda(\hat{i}-\hat{j}+\hat{k})$ and $L_2 : \vec{r}=(4\hat{i}+5\hat{j}+6\hat{k})+\mu(\hat{i}+\hat{j}-\hat{k})$ intersect $L_1$ and $L_2$ at $P$ and $Q$ respectively. If $(\alpha,\beta,\gamma)$ is the midpoint of the line segment $PQ$, then $2(\alpha+\beta+\gamma)$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 21.** · Key from source paper

**Q89** JEE Main 2024 · 1 Feb · Shift 2 MCQ

If the mirror image of the point $P\,(3,4,9)$ in the line $\frac{x-1}{3}=\frac{y+1}{2}=\frac{z-2}{1}$ is $\alpha,\beta,\gamma$, then $14\alpha+\beta+\gamma$ is:

(A) 102
(B) 138
(C) 108
(D) 132

**Answer: (C)** 108 · Key from source paper

**Q90** JEE Main 2024 · 1 Feb · Shift 2 MCQ

Let $P$ and $Q$ be the points on the line $\frac{x+3}{8}=\frac{y-4}{2}=\frac{z+1}{2}$ which are at a distance of 6 units from the point $R\,(1,2,3)$. If the centroid of the triangle $PQR$ is $\alpha,\beta,\gamma$, then $\alpha^2+\beta^2+\gamma^2$ is:

(A) 26
(B) 36
(C) 18
(D) 24

**Answer: (C) 18** · Key from source paper

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**Q91** JEE Main 2024 · 31 Jan · Shift 1 MCQ

The distance of the point $Q(0,\ 2,\ -2)$ form the line passing through the point $P(5,\ -4,\ 3)$ and perpendicular to the lines $\vec{r} = -3\hat{i} + 2\hat{k} + \lambda 2\hat{i} + 3\hat{j} + 5\hat{k}$, $\lambda \in \mathbb{R}$ and $\vec{r} = \hat{i} - 2\hat{j} + \hat{k} + \mu - \hat{i} + 3\hat{j} + 2\hat{k}$, $\mu \in \mathbb{R}$ is

(A) $\sqrt{86}$
(B) $\sqrt{20}$
(C) $\sqrt{54}$
(D) $\sqrt{74}$

**Answer: (D)** $\sqrt{74}$ · Key from source paper

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**Q92** JEE Main 2024 · 31 Jan · Shift 1 Numerical

Let $Q$ and $R$ be the feet of perpendiculars from the point $P(a,\ a,\ a)$ on the lines $x = y,\ z = 1$ and $x = -y,\ z = -1$ respectively. If $\angle QPR$ is a right angle, then $12a^2$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 12.** · Key from source paper

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**Q93** JEE Main 2024 · 31 Jan · Shift 2 MCQ

Let $\alpha, \beta, \gamma$ be mirror image of the point $(2, 3, 5)$ in the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$. Then $2\alpha + 3\beta + 4\gamma$ is equal to

(A) 32
(B) 33
(C) 31
(D) 34

**Answer: (B) 33** · Key from source paper

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**Q94** JEE Main 2024 · 31 Jan · Shift 2 MCQ

The shortest distance between lines $L_1$ and $L_2$, where $L_1$: $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+4}{2}$ and $L_2$ is the line passing through the points $A(-4, 4, 3)$, $B(-1, 6, 3)$ and perpendicular to the line $\frac{x-3}{-2} = \frac{y}{3} = \frac{z-1}{1}$, is

(A) $\frac{121}{\sqrt{221}}$
(B) $\frac{24}{\sqrt{117}}$
(C) $\frac{141}{\sqrt{221}}$
(D) $\frac{42}{\sqrt{117}}$

**Answer: (C)** $\frac{141}{\sqrt{221}}$ · Key from source paper

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**Q95** JEE Main 2024 · 31 Jan · Shift 2 Numerical

A line passes through $A(4,-6,-2)$ and $B(16,-2,4)$. The point $P(a,b,c)$ where $a,b,c$ are non-negative integers, on the line $AB$ lies at a distance of 21 units, from the point $A$. The distance between the points $P(a,b,c)$ and $Q(4,-12,3)$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 22.** · Key from source paper

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**Q96** JEE Main 2024 · 30 Jan · Shift 1 MCQ

Let $(\alpha,\beta,\gamma)$ be the foot of perpendicular from the point $(1,2,3)$ on the line $\frac{x+3}{5}=\frac{y-1}{2}=\frac{z+4}{3}$. then $19(\alpha+\beta+\gamma)$ is equal to :

(A) 102
(B) 101
(C) 99
(D) 100

**Answer: (B) 101** · Key from source paper

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**Q97** JEE Main 2024 · 30 Jan · Shift 1 Numerical

If $d_1$ is the shortest distance between the lines $x+1=2y=-12z$, $x=y+2=6z-6$ and $d_2$ is the shortest distance between the lines $\frac{x-1}{2}=\frac{y+8}{-7}=\frac{z-4}{5}$, $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-6}{-3}$, then the value of $\frac{32\sqrt{3}\,d_1}{d_2}$ is :

Numerical value type: the answer is a number.

**Answer: 16.** · Key from source paper

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**Q98** JEE Main 2024 · 30 Jan · Shift 2 MCQ

Let $L_1:\vec{r}=\hat{i}-\hat{j}+2\hat{k}+\lambda\hat{i}-\hat{j}+2\hat{k},\ \lambda\in R,\ L_2:\vec{r}=\hat{j}-\hat{k}+\mu 3\hat{i}+\hat{j}+p\hat{k},\ \mu\in R$ and $L_3:\vec{r}=\delta\left(l\hat{i}+m\hat{j}+n\hat{k}\right),\ \delta\in R$ be three lines such that $L_1$ is perpendicular to $L_2$ and $L_3$ is perpendicular to both $L_1$ and $L_2$. Then the point which lies on $L_3$ is

(A) $(-1, 7, 4)$
(B) $(-1, -7, 4)$
(C) $(1, 7, -4)$
(D) $(1, -7, 4)$

**Answer: (A)** $(-1, 7, 4)$ · Key from source paper

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**Q99** JEE Main 2024 · 30 Jan · Shift 2 Numerical

Let a line passing through the point $(-1, 2, 3)$ intersect the lines $L_1 : \frac{x-1}{3} = \frac{y-2}{2} = \frac{z+1}{-2}$ at $M(\alpha, \beta, \gamma)$ and $L_2 : \frac{x+2}{-3} = \frac{y-2}{-2} = \frac{z-1}{4}$ at $N(a, b, c)$. Then the value of $\frac{(\alpha+\beta+\gamma)^2}{(a+b+c)^2}$ equals _____.

Numerical value type: the answer is a number.

**Answer: 196.** · Key from source paper

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**Q100** JEE Main 2024 · 29 Jan · Shift 1 MCQ

Let $PQR$ be a triangle with $R(-1, 4, 2)$. Suppose $M(2, 1, 2)$ is the mid point of $PQ$. The distance of the centroid of $\Delta PQR$ from the point of intersection of the line $\frac{x-2}{0} = \frac{y}{2} = \frac{z+3}{-1}$ and $\frac{x-1}{1} = \frac{y+3}{-3} = \frac{z+1}{1}$ is

(A) 69
(B) 9
(C) $\sqrt{69}$
(D) $\sqrt{99}$

**Answer: (C)** $\sqrt{69}$ · Key from source paper

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**Q101** JEE Main 2024 · 29 Jan · Shift 1 Numerical

A line with direction ratio 2, 1, 2 meets the lines x = y + 2 = z and x + 2 = 2y = 2z respectively at the point P and Q. if the length of the perpendicular from the point $(1, 2, 12)$ to the line PQ is $l$, then $l^2$ is

Numerical value type: the answer is a number.

**Answer: 65.** · Key from source paper

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**Q102** JEE Main 2024 · 29 Jan · Shift 2 MCQ

Let P(3, 2, 3), Q(4, 6, 2) and R(7, 3, 2) be the vertices of $\Delta$ PQR. Then, the angle $\angle$ QPR is

(A) $\frac{\pi}{6}$
(B) $\cos^{-1}\left(\frac{7}{18}\right)$
(C) $\cos^{-1}\left(\frac{1}{18}\right)$
(D) $\frac{\pi}{3}$

**Answer: (D)** $\frac{\pi}{3}$ · Key from source paper

**Q103** JEE Main 2024 · 29 Jan · Shift 2 Numerical

Let $O$ be the origin, and $M$ and $N$ be the points on the lines $\frac{x-5}{4}=\frac{y-4}{1}=\frac{z-5}{3}$ and $\frac{x+8}{12}=\frac{y+2}{5}=\frac{z+11}{9}$ respectively such that $MN$ is the shortest distance between the given lines. Then $\overrightarrow{OM}\cdot\overrightarrow{ON}$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 9.** · Key from source paper

**Q104** JEE Main 2024 · 27 Jan · Shift 1 MCQ

The distance, of the point $(7,-2,11)$ from the line $\frac{x-6}{1}=\frac{y-4}{0}=\frac{z-8}{3}$ along the line $\frac{x-5}{2}=\frac{y-1}{-3}=\frac{z-5}{6}$, is :

(A) 12
(B) 14
(C) 18
(D) 21

**Answer: (B) 14** · Key from source paper

**Q105** JEE Main 2024 · 27 Jan · Shift 1 MCQ

If the shortest distance between the lines $\frac{x-4}{1}=\frac{y+1}{2}=\frac{z}{-3}$ and $\frac{x-\lambda}{2}=\frac{y+1}{4}=\frac{z-2}{-5}$ is $\frac{6}{\sqrt{5}}$, then the sum of all possible values of $\lambda$ is :

(A) 5
(B) 8
(C) 7
(D) 10

**Answer: (B) 8** · Key from source paper

**Q106** JEE Main 2024 · 27 Jan · Shift 2 MCQ

Let the image of the point $(1,0,7)$ in the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$ be the point $(\alpha,\beta,\gamma)$. Then which one of the following points lies on the line passing through $(\alpha,\beta,\gamma)$ and making angles $\frac{2\pi}{3}$ and $\frac{3\pi}{4}$ with y - axis and z - axis respectively and an acute angle with x - axis?

(A) $(1,-2,1+\sqrt{2})$
(B) $(1,2,1-\sqrt{2})$
(C) $(3,4,3-2\sqrt{2})$
(D) $(3,-4,3+2\sqrt{2})$

**Answer: (C)** $(3,4,3-2\sqrt{2})$ · Key from source paper

**Q107** JEE Main 2024 · 27 Jan · Shift 2 Numerical

The lines $\frac{x-2}{2}=\frac{y}{-2}=\frac{z-7}{16}$ and $\frac{x+3}{4}=\frac{y+2}{3}=\frac{z+2}{1}$ intersect at the point P. If the distance of P from the line $\frac{x+1}{2}=\frac{y-1}{3}=\frac{z-1}{1}$ is $l$, then $14l^2$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 108.** · Key from source paper

**Q108** JEE Main 2023 · 15 Apr · Shift 1 MCQ

Let the foot of perpendicular of the point $P(3,-2,-9)$ on the plane passing through the points $(-1,-2,-3)$, $(9,3,4)$, $(9,-2,1)$ be $Q(\alpha,\beta,\gamma)$. Then the distance $Q$ from the origin is

(A) $\sqrt{42}$
(B) $\sqrt{38}$
(C) $\sqrt{35}$
(D) $\sqrt{29}$

**Answer: (A)** $\sqrt{42}$ · Key from source paper

**Q109** JEE Main 2023 · 15 Apr · Shift 1 MCQ

Let $S$ be the set of all values of $\lambda$, for which the shortest distance between the lines $\frac{x-\lambda}{0}=\frac{y-3}{4}=\frac{z+6}{1}$ and $\frac{x+\lambda}{3}=\frac{y}{-4}=\frac{z-6}{0}$ is 13. Then $8\left|\sum_{\lambda\in S}\lambda\right|$ is equal to

(A) 306
(B) 304
(C) 308
(D) 302

**Answer: (A)** 306 · Key from source paper

**Q110** JEE Main 2023 · 15 Apr · Shift 1 Numerical

Let the plane $P$ contain the line $2x+y-z-3=0=5x-3y+4z+9$ and be parallel to the line $\frac{x+2}{2}=\frac{3-y}{-4}=\frac{z-7}{5}$. Then the distance of the point $A(8,-1,-19)$ from the plane $P$ measured parallel to the line $\frac{x}{-3}=\frac{y-5}{4}=\frac{2-z}{-12}$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 26.** · Key from source paper

**Q111** JEE Main 2023 · 13 Apr · Shift 1 MCQ

Let the equation of plane passing through the line of intersection of the planes $x+2y+az=2$ and $x-y+z=3$ be $5x-11y+bz=6a-1$. For $c\in\mathbb{Z}$, if the distance of this plane from the point $(a,-c,c)$ is $\frac{2}{\sqrt{a}}$, then $\frac{a+b}{c}$ is equal to

(A) $2$
(B) $4$
(C) $-4$
(D) $-2$

**Answer: (C)** $-4$ · Key from source paper

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**Q112** JEE Main 2023 · 13 Apr · Shift 1 MCQ

The distance of the point $(-1, 2, 3)$ from the plane $\vec{r} \cdot \left(\hat{i} - 2\hat{j} + 3\hat{k}\right) = 10$ parallel to the line of the shortest distance between the lines $\vec{r} = \left(\hat{i} - \hat{j}\right) + \lambda\left(2\hat{i} + \hat{k}\right)$ and $\vec{r} = \left(2\hat{i} - \hat{j}\right) + \mu\left(\hat{i} - \hat{j} + \hat{k}\right)$ is

(A) $4\sqrt{6}$
(B) $2\sqrt{5}$
(C) $2\sqrt{6}$
(D) $3\sqrt{5}$

**Answer: (C)** $2\sqrt{6}$ · Key from source paper

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**Q113** JEE Main 2023 · 13 Apr · Shift 1 Numerical

Let the image of the point $\left(\frac{5}{3}, \frac{5}{3}, \frac{8}{3}\right)$ in the plane $x - 2y + z - 2 = 0$ be $P$. If the distance of the point $Q(6, -2, \alpha)$, $\alpha > 0$, from $P$ is 13, then $\alpha$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 15.** · Key from source paper

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**Q114** JEE Main 2023 · 13 Apr · Shift 2 MCQ

The plane, passing through the points $(0, -1, 2)$ and $(-1, 2, 1)$ and parallel to the line passing through $(5, 1, -7)$ and $(1, -1, -1)$, also passes through the point

(A) $-2, 5, 0$
(B) $1, -2, 1$
(C) $2, 0, 1$
(D) $0, 5, -2$

**Answer: (A)** $-2, 5, 0$ · Key from source paper

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**Q115** JEE Main 2023 · 13 Apr · Shift 2 MCQ

The line, that is coplanar to the line $\frac{x+3}{-3} = \frac{y-1}{1} = \frac{z-5}{5}$, is

(A) $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{4}$
(B) $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$
(C) $\frac{x-1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$
(D) $\frac{x+1}{1} = \frac{y-2}{2} = \frac{z-5}{5}$

**Answer: (B)** $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$ · Key from source paper

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## Q116 JEE Main 2023 · 13 Apr · Shift 2 MCQ

Let $N$ be the foot of perpendicular from the point $P(1, -2, 3)$ on the line passing through the points $(4, 5, 8)$ and $(1, -7, 5)$. Then the distance of $N$ from the plane $2x - 2y + z + 5 = 0$ is

(A) 8
(B) 6
(C) 9
(D) 7

**Answer: (D) 7** · Key from source paper

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## Q117 JEE Main 2023 · 12 Apr · Shift 1 Numerical

Let the plane $x + 3y - 2z + 6 = 0$ meet the co-ordinate axes at the points $A$, $B$, $C$. If the orthocenter of the triangle $ABC$ is $\left(\alpha, \beta, \frac{6}{7}\right)$, then $98(\alpha + \beta)^2$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 288.** · Key from source paper

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## Q118 JEE Main 2023 · 12 Apr · Shift 1 MCQ

Let the lines $L_1 : \frac{x+5}{3} = \frac{y+4}{1} = \frac{z-\alpha}{-2}$ and $L_2 : 3x + 2y + z - 2 = 0 = x - 3y + 2z - 13$ be coplanar. If the point $P(a, b, c)$ on $L_1$ is nearest to the point $Q(-4, -3, 2)$, then $|a| + |b| + |c|$ is equal to

(A) 12
(B) 14
(C) 8
(D) 10

**Answer: (D) 10** · Key from source paper

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## Q119 JEE Main 2023 · 12 Apr · Shift 1 MCQ

Let the plane $P : 4x - y + z = 10$ be rotated by an angle $\frac{\pi}{2}$ about its line of intersection with the plane $x + y - z = 4$. If $\alpha$ is the distance of the point $(2, 3, -4)$ from the new position of the plane $P$, then $35\alpha$ is equal to

(A) 85
(B) 105
(C) 126
(D) 90

**Answer: (C)** 126 · Key from source paper

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**Q120** JEE Main 2023 · 11 Apr · Shift 1 MCQ

Let $(\alpha, \beta, \gamma)$ be the image of point $P\,(2, 3, 5)$ in the plane $2x + y - 3z = 6$. Then $\alpha + \beta + \gamma$ is equal to

(A) 5
(B) 10
(C) 12
(D) 9

**Answer: (B)** 10 · Key from source paper

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**Q121** JEE Main 2023 · 11 Apr · Shift 1 MCQ

If the equation of the plane that contains the point $(-2, 3, 5)$ and is perpendicular to each of the planes $2x + 4y + 5z = 8$ and $3x - 2y + 3z = 5$ is $\alpha x + \beta y + \gamma z + 97 = 0$ then $\alpha + \beta + \gamma =$

(A) 15
(B) 18
(C) 16
(D) 17

**Answer: (A)** 15 · Key from source paper

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**Q122** JEE Main 2023 · 11 Apr · Shift 1 Numerical

Let a line $L$ pass through the origin and be perpendicular to the lines
$L_1 : \vec{r} = \hat{i} - 11\hat{j} - 7\hat{k} + \lambda\hat{i} + 2\hat{j} + 3\hat{k}$, $\lambda \in \mathbb{R}$ and
$L_2 : \vec{r} = -\hat{i} + \hat{k} + \mu 2\hat{i} + 2\hat{j} + \hat{k}$, $\mu \in \mathbb{R}$. If $P$ is the point of intersection of $L$ and $L_1$, and $Q\alpha, \beta, \gamma$ is the foot of perpendicular from $P$ on $L_2$, then $9\alpha + \beta + \gamma$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 5.** · Key from source paper

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**Q123** JEE Main 2023 · 11 Apr · Shift 2 MCQ

Let $P$ be the plane passing through the points $(5, 3, 0)$, $(13, 3, -2)$ and $(1, 6, 2)$. For $\alpha \in \mathbb{N}$, if the distance of the points $A(3, 4, \alpha)$ and $B(2, \alpha, a)$ from the plane $P$ are 2 and 3 respectively, then the positive value of $a$ is

(A) 6
(B) 3
(C) 5
(D) 4

**Answer: (D) 4** · Key from source paper

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**Q124** JEE Main 2023 · 11 Apr · Shift 2 MCQ

Let the line passing through the points $P(2,-1,2)$ and $Q(5,3,4)$ meet the plane $x-y+z=4$ at the point $R$. Then the distance of the point $R$ from the plane $x+2y+3z+2=0$ measured parallel to the line $\frac{x-7}{2}=\frac{y+3}{2}=\frac{z-2}{1}$ is

(A) $\sqrt{61}$
(B) $\sqrt{189}$
(C) $\sqrt{31}$
(D) 3

**Answer: (D) 3** · Key from source paper

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**Q125** JEE Main 2023 · 11 Apr · Shift 2 Numerical

Let the line $L: x=\frac{1-y}{-2}=\frac{z-3}{\lambda}, \lambda \in \mathbb{R}$ meet the plane $P: x+2y+3z=4$ at the point $(\alpha,\beta,\gamma)$. If the angle between the line $L$ and the plane $P$ is $\cos^{-1}\left(\sqrt{\frac{5}{14}}\right)$, then $\alpha+2\beta+6\gamma$ is equal to

Numerical value type: the answer is a number.

**Answer: 11.** · Key from source paper

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**Q126** JEE Main 2023 · 10 Apr · Shift 1 MCQ

Let two vertices of a triangle $ABC$ be $2,4,6$ and $0,-2,-5$, and its centroid be $2,1,-1$. If the image of the third vertex in the plane $x+2y+4z=11$ is $\alpha,\beta,\gamma$, then $\alpha\beta+\beta\gamma+\gamma\alpha$ is equal to

(A) 70
(B) 76
(C) 74
(D) 72

**Answer: (C) 74** · Key from source paper

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**Q127** JEE Main 2023 · 10 Apr · Shift 1 MCQ

The shortest distance between the lines $\frac{x+2}{1}=\frac{y}{-2}=\frac{z-5}{2}$ and $\frac{x-4}{1}=\frac{y-1}{2}=\frac{z+3}{0}$ is

(A) 8
(B) 6
(C) 7
(D) 9

**Answer: (D) 9** · Key from source paper

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**Q128** JEE Main 2023 · 10 Apr · Shift 1 MCQ

Let $P$ be the point of intersection of the line $\frac{x+3}{3} = \frac{y+2}{1} = \frac{1-z}{2}$ and the plane $x + y + z = 2$. If the distance of the point $P$ from the plane $3x - 4y + 12z = 32$ is $q$, then $q$ and $2q$ are the roots of the equation

(A) $x^2 - 18x - 72 = 0$
(B) $x^2 - 18x + 72 = 0$
(C) $x^2 + 18x + 72 = 0$
(D) $x^2 + 18x - 72 = 0$

**Answer: (B)** $x^2 - 18x + 72 = 0$ · Key from source paper

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**Q129** JEE Main 2023 · 10 Apr · Shift 2 MCQ

Let the image of the point P(1, 2, 6) in the plane passing through the points A(1, 2, 0) and B(1, 4, 1) C(0, 5, 1) be $Q(\alpha, \beta, \gamma)$. Then $\alpha^2 + \beta^2 + \gamma^2$ equal to

(A) 65
(B) 62
(C) 76
(D) 70

**Answer: (A) 65** · Key from source paper

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**Q130** JEE Main 2023 · 10 Apr · Shift 2 MCQ

Let the line $\frac{x}{1} = \frac{6-y}{2} = \frac{z+8}{5}$ intersect the lines $\frac{x-5}{4} = \frac{y-7}{3} = \frac{z+2}{1}$ and $\frac{x+3}{6} = \frac{3-y}{3} = \frac{z-6}{1}$ at the points A and B respectively. Then the distance of the mid-point of the line segment $AB$ from the plane $2x - 2y + z = 14$ is

(A) 3
(B) $\frac{11}{3}$
(C) 4
(D) $\frac{10}{3}$

**Answer: (C) 4** · Key from source paper

**Q131** JEE Main 2023 · 10 Apr · Shift 2 · Numerical

Let the foot of perpendicular from the point $A4, 3, 1$ on the plane $P: x - y + 2z + 3 = 0$ be $N$. If $B(5, \alpha, \beta)$, $\alpha, \beta \in \mathbb{Z}$ is a point on plane $P$ such that the area of the triangle $ABN$ is $3\sqrt{2}$, then $\alpha^2 + \beta^2 + \alpha\beta$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 7.** · Key from source paper

**Q132** JEE Main 2023 · 8 Apr · Shift 1 · MCQ

The shortest distance between the lines $\frac{x-4}{4} = \frac{y+2}{5} = \frac{z+3}{3}$ and $\frac{x-1}{3} = \frac{y-3}{4} = \frac{z-4}{2}$ is

(A) $6\sqrt{3}$
(B) $2\sqrt{6}$
(C) $6\sqrt{2}$
(D) $3\sqrt{6}$

**Answer: (D)** $3\sqrt{6}$ · Key from source paper

**Q133** JEE Main 2023 · 8 Apr · Shift 1 · MCQ

If the equation of the plane containing the line $x + 2y + 3z - 4 = 0 = 2x + y - z + 5$ and perpendicular to the plane $\vec{r} = (\hat{i} - \hat{j}) + \lambda(\hat{i} + \hat{j} + \hat{k}) + \mu(\hat{i} - 2\hat{j} + 3\hat{k})$ is $ax + by + cz = 4$ then $(a - b + c)$ is equal to

(A) 18
(B) 22
(C) 20
(D) 24

**Answer: (B)** 22 · Key from source paper

**Q134** JEE Main 2023 · 8 Apr · Shift 1 · Numerical

Let $\lambda_1$, $\lambda_2$ be the values of $\lambda$ for which the points $\left(\frac{5}{2}, 1, \lambda\right)$ and $(-2, 0, 1)$ are at equal distance from the plane $2x + 3y - 6z + 7$ If $\lambda_1 > \lambda_2$ then the distance of the point $(\lambda_1 - \lambda_2, \lambda_2, \lambda_1)$ from the line $\frac{x-5}{1} = \frac{y-1}{2} = \frac{z+7}{2}$ is _____

Numerical value type: the answer is a number.

**Answer: 9.** · Key from source paper

**Q135** JEE Main 2023 · 8 Apr · Shift 2 · MCQ

For $a, b \in Z$ and $|a - b| \leq 10$, let the angle between the plane $P : ax + y - z = b$ and the line $L : x - 1 = a - y = z + 1$ be $\cos^{-1}\left(\frac{1}{3}\right)$. If the distance of the point $(6, -6, 4)$ from the plane $P$ is $3\sqrt{6}$, then $a^4 + b^2$ is equal to

(A) 32
(B) 85
(C) 25
(D) 48

**Answer: (A) 32** · Key from source paper

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**Q136** JEE Main 2023 · 8 Apr · Shift 2 MCQ

Let $P$ be the plane passing through the line $\frac{x-1}{1} = \frac{y-2}{-3} = \frac{z+5}{7}$ and the point $(2, 4, -3)$. If the image of the point $(-1, 3, 4)$ in the plane $P$ is $(\alpha, \beta, \gamma)$, then $\alpha + \beta + \gamma$ is equal to

(A) 10
(B) 12
(C) 9
(D) 11

**Answer: (A) 10** · Key from source paper

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**Q137** JEE Main 2023 · 8 Apr · Shift 2 Numerical

Let $P_1$ be the plane $3x - y - 7z = 11$ and $P_2$ be the plane passing through the points $(2, -1, 0)$, $(2, 0, -1)$, and $(5, 1, 1)$. If the foot of the perpendicular drawn from the point $(7, 4, -1)$ on the line of intersection of the planes $P_1$ and $P_2$ is $(\alpha, \beta, \gamma)$, then $\alpha + \beta + \gamma$ is equal to

Numerical value type: the answer is a number.

**Answer: 11.** · Key from source paper

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**Q138** JEE Main 2023 · 6 Apr · Shift 1 MCQ

One vertex of a rectangular parallelopiped is at the origin $O$ and the lengths of its edges along $x$, $y$ and $z$ axes are 3, 4 and 5 units respectively. Let $P$ be the vertex $(3, 4, 5)$. Then the shortest distance between the diagonal $OP$ and an edge parallel to $z$ axis, not passing through $O$ or $P$ is

(A) $\frac{12}{\sqrt{5}}$
(B) $12\sqrt{5}$
(C) $\frac{12}{5\sqrt{5}}$
(D) $\frac{12}{5}$

**Answer: (D) $\frac{12}{5}$** · Key from source paper

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**Q139** JEE Main 2023 · 6 Apr · Shift 1 MCQ

If the equation of the plane passing through the line of intersection of the planes $2x - y + z = 3$, $4x - 3y + 5z + 9 = 0$ and parallel to the line $\frac{x+1}{-2} = \frac{y+3}{4} = \frac{z-2}{5}$ is $ax + by + cz + 6 = 0$, then $a + b + c$ is equal to

(A) 12
(B) 14
(C) 16
(D) 13

**Answer: (B) 14** · Key from source paper

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**Q140** JEE Main 2023 · 6 Apr · Shift 1 Numerical

Let the image of the point $P(1, 2, 3)$ in the plane $2x - y + z = 9$ be $Q$. If the coordinates of the point $R$ are $(6, 10, 7)$, then the square of the area of the triangle $PQR$ is _____ .

Numerical value type: the answer is a number.

**Answer: 594.** · Key from source paper

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**Q141** JEE Main 2023 · 6 Apr · Shift 2 MCQ

Let the line $L$ pass through the point $(0, 1, 2)$, intersect the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and be parallel to the plane $2x + y - 3z = 4$. Then the distance of the point $P(1, -9, 2)$ from the line $L$ is

(A) $\sqrt{74}$
(B) $\sqrt{69}$
(C) $\sqrt{54}$
(D) 9

**Answer: (A) $\sqrt{74}$** · Key from source paper

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**Q142** JEE Main 2023 · 6 Apr · Shift 2 MCQ

A plane $P$ contains the line of intersection of the plane $\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 6$ and $\vec{r} \cdot (2\hat{i} + 3\hat{j} + 4\hat{k}) = -5$. If $P$ passes through the point $(0, 2, -2)$, then the square of distance of the point $(12, 12, 18)$ from the plane $P$ is

(A) 620
(B) 155
(C) 310
(D) 1240

**Answer: (A) 620** · Key from source paper

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**Q143** JEE Main 2023 · 6 Apr · Shift 2 Numerical

If the lines $\frac{x-1}{2} = \frac{2-y}{-3} = \frac{z-3}{\alpha}$ and $\frac{x-4}{5} = \frac{y-1}{2} = \frac{z}{\beta}$ intersect, then the magnitude of the minimum value of $8\alpha\beta$ is _____ .

Numerical value type: the answer is a number.

**Answer: 18.** · Key from source paper

**Q144** JEE Main 2023 · 1 Feb · Shift 1 MCQ

Let the image of the point $P2, -1, 3$ in the plane $x + 2y - z = 0$ be $Q$. Then the distance of the plane $3x + 2y + z + 29 = 0$ from the point $Q$ is

(A) $\frac{22\sqrt{2}}{7}$
(B) $\frac{24\sqrt{2}}{7}$
(C) $2\sqrt{14}$
(D) $3\sqrt{14}$

**Answer: (D)** $3\sqrt{14}$ · Key from source paper

**Q145** JEE Main 2023 · 1 Feb · Shift 1 MCQ

The shortest distance between the lines $\frac{x-5}{1} = \frac{y-2}{2} = \frac{z-4}{-3}$ and $\frac{x+3}{1} = \frac{y+5}{4} = \frac{z-1}{-5}$ is

(A) $7\sqrt{3}$
(B) $5\sqrt{3}$
(C) $6\sqrt{3}$
(D) $4\sqrt{3}$

**Answer: (C)** $6\sqrt{3}$ · Key from source paper

**Q146** JEE Main 2023 · 1 Feb · Shift 2 MCQ

Let the plane $P$ pass through the intersection of the planes $2x + 3y - z = 2$ and $x + 2y + 3z = 6$, and be perpendicular to the plane $2x + y - z + 1 = 0$. If $d$ is the distance of $P$ from the point $(-7, 1, 1)$, then $d^2$ is equal to :

(A) $\frac{250}{83}$
(B) $\frac{15}{53}$
(C) $\frac{25}{83}$
(D) $\frac{250}{82}$

**Answer: (A)** $\frac{250}{83}$ · Key from source paper

**Q147** JEE Main 2023 · 1 Feb · Shift 2 Numerical

Let $\alpha x + \beta y + \gamma z = 1$ be the equation of a plane passing through the point $(3, -2, 5)$ and perpendicular to the line joining the points $(1, 2, 3)$ and $(-2, 3, 5)$. Then the value of $\alpha\ \beta\ \gamma$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 6.** · Key from source paper

**Q148** JEE Main 2023 · 1 Feb · Shift 2 Numerical

The point of intersection $C$ of the plane $8x + y + 2z = 0$ and the line joining the points $A(-3, -6, 1)$ and $B(2, 4, -3)$ divides the line segment $AB$ internally in the ratio $k : 1$. If $a, b, c$ ($|a|, |b|, |c|$ are coprime) are the direction ratios of the perpendicular from the point $C$ on the line $\frac{1-x}{1} = \frac{y+4}{2} = \frac{z+2}{3}$, then $|a + b + c|$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 10.** · Key from source paper

**Q149** JEE Main 2023 · 31 Jan · Shift 1 MCQ

Let the shortest distance between the lines L: $\frac{x-5}{-2} = \frac{y-\lambda}{0} = \frac{z+\lambda}{1}$, $\lambda \geq 0$ and $L_1$: $x + 1 = y - 1 = 4 - z$ be $2\sqrt{6}$. If $(\alpha, \beta, \gamma)$ lies on L, then which of the following is NOT possible?

(A) $\alpha + 2\gamma = 24$

(B) $2\alpha + \gamma = 7$

(C) $2\alpha - \gamma = 9$

(D) $\alpha - 2\gamma = 19$

**Answer: (A)** $\alpha + 2\gamma = 24$ · Key from source paper

**Q150** JEE Main 2023 · 31 Jan · Shift 1 Numerical

Let the line L: $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z-3}{1}$ intersect the plane $2x + y + 3z = 16$ at the point $P$. Let the point $Q$ be the foot of perpendicular from the point $R1, -1, -3$ on the line $L$. If $\alpha$ is the area of triangle $PQR$. then $\alpha^2$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 180.** · Key from source paper

**Q151** JEE Main 2023 · 31 Jan · Shift 1 Numerical

Let $\theta$ be the angle between the planes $P_1 = \vec{r} \cdot \hat{i} + \hat{j} + 2\hat{k} = 9$ and $P_2 = \vec{r} \cdot 2\hat{i} - \hat{j} + \hat{k} = 15$. Let L be the line that meets $P_2$ at the point 4, - 2, 5 and makes an angle $\theta$ with the normal of $P_2$. If $\alpha$ is the angle between $L$ and $P_2$ then $\tan^2\theta \cot^2\alpha$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 9.** · Key from source paper

**Q152** JEE Main 2023 · 31 Jan · Shift 2 MCQ

Let the plane $P : 8x + \alpha_1 y + \alpha_2 z + 12 = 0$ be parallel to the line $L : \frac{x+2}{2} = \frac{y-3}{3} = \frac{z+4}{5}$. If the intercept of $P$ on the $y$-axis is 1 , then the distance between $P$ and $L$ is

(A) $\sqrt{\frac{2}{7}}$
(B) $\frac{6}{\sqrt{14}}$
(C) $\sqrt{\frac{7}{2}}$
(D) $\sqrt{14}$

**Answer: (D)** $\sqrt{14}$ · Key from source paper

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**Q153** JEE Main 2023 · 31 Jan · Shift 2 MCQ

Let $P$ be the plane, passing through the point $(1, -1, -5)$ and perpendicular to the line joining the points $(4, 1, -3)$ and $(2, 4, 3)$. Then the distance of $P$ from the point $(3, -2, 2)$ is

(A) 6
(B) 4
(C) 5
(D) 7

**Answer: (C)** 5 · Key from source paper

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**Q154** JEE Main 2023 · 31 Jan · Shift 2 MCQ

The foot of perpendicular from the origin $O$ to a plane $P$ which meets the co-ordinate axes at the point $A, B, C$ is $(2, a, 4)$, $a \in N$. If the volume of the tetrahedron $OABC$ is 144 unit$^3$, then which of the following points is NOT on $P$?

(A) $(0, 4, 4)$
(B) $(3, 0, 4)$
(C) $(0, 6, 3)$
(D) $(2, 2, 4)$

**Answer: (B)** $(3, 0, 4)$ · Key from source paper

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**Q155** JEE Main 2023 · 30 Jan · Shift 1 MCQ

The line $l_1$ passes through the point 2, 6, 2 and is perpendicular to the plane $2x + y - 2z = 10$. Then the shortest distance between the line $l_1$ and the line $\frac{x+1}{2} = \frac{y+4}{-3} = \frac{z}{2}$ is:

(A) 7
(B) $\frac{19}{3}$
(C) $\frac{19}{2}$
(D) 9

**Answer: (D)** 9 · Key from source paper

**Q156** JEE Main 2023 · 30 Jan · Shift 1 MCQ

Let a unit vector $\overrightarrow{OP}$ make angle $\alpha, \beta, \gamma$ with the positive directions of the co-ordinate axes OX, OY, OZ respectively, where $\beta \in 0, \frac{\pi}{2}$. $\overrightarrow{OP}$ is perpendicular to the plane through points 1, 2, 3, 2, 3, 4 and 1, 5, 7, then which one of the following is true ?

(A) $\alpha \in \frac{\pi}{2}, \pi$ and $\gamma \in \frac{\pi}{2}, \pi$
(B) $\alpha \in 0, \frac{\pi}{2}$ and $\gamma \in 0, \frac{\pi}{2}$
(C) $\alpha \in \frac{\pi}{2}, \pi$ and $\gamma \in 0, \frac{\pi}{2}$
(D) $\alpha \in 0, \frac{\pi}{2}$ and $\gamma \in \frac{\pi}{2}, \pi$

**Answer: (A)** $\alpha \in \frac{\pi}{2}, \pi$ and $\gamma \in \frac{\pi}{2}, \pi$ · Key from source paper

**Q157** JEE Main 2023 · 30 Jan · Shift 1 Numerical

If the equation of the plane passing through the point $(1, 1, 2)$ and perpendicular to the line $x - 3y + 2z - 1 = 0 = 4x - y + z$ is $Ax + By + Cz = 1$, then $140(C - B + A)$ is equal to

Numerical value type: the answer is a number.

**Answer: 15.** · Key from source paper

**Q158** JEE Main 2023 · 30 Jan · Shift 1 Numerical

If $\lambda_1 < \lambda_2$ are two values of $\lambda$ such that the angle between the planes $P_1 : \vec{r}\left(3\hat{i} - 5\hat{j} + \hat{k}\right) = 7$ and $P_2 : \vec{r} \cdot \left(\lambda\hat{i} + \hat{j} - 3\hat{k}\right) = 9$ is $\sin^{-1}\frac{2\sqrt{6}}{5}$, then the square of the length of perpendicular from the point $38\lambda_1, 10\lambda_2, 2$ to the plane $P_1$ is

Numerical value type: the answer is a number.

**Answer: 315.** · Key from source paper

**Q159** JEE Main 2023 · 30 Jan · Shift 2 MCQ

A vector $\vec{v}$ in the first octant is inclined to the $x$ axis at 60°, to the $y$-axis at 45° and to the $z$-axis at an acute angle. If a plane passing through the points $\left(\sqrt{2}, -1, 1\right)$ and $(a, b, c)$, is normal to $\vec{v}$, then

(A) $\sqrt{2}a + b + c = 1$
(B) $a + b + \sqrt{2}c = 1$
(C) $a + \sqrt{2}b + c = 1$
(D) $\sqrt{2}a - b + c = 1$

**Answer: (C)** $a + \sqrt{2}b + c = 1$ · Key from source paper

**Q160** JEE Main 2023 · 30 Jan · Shift 2 MCQ

If a plane passes through the points $(-1, k, 0)$, $(2, k, -1)$, $(1, 1, 2)$ and is parallel to the line $\frac{x-1}{1} = \frac{2y+1}{2} = \frac{z+1}{-1}$, then the value of $\frac{k^2+1}{(k-1)(k-2)}$ is

(A) $\frac{17}{5}$
(B) $\frac{5}{17}$
(C) $\frac{6}{13}$
(D) $\frac{13}{6}$

**Answer: (D)** $\frac{13}{6}$ · Key from source paper

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**Q161** JEE Main 2023 · 30 Jan · Shift 2 Numerical

Let a line $L$ pass through the point $P(2,3,1)$ and be parallel to the line $x+3y-2z-2=0=x-y+2z$. If the distance of $L$ from the point $(5,3,8)$ is $\alpha$, then $3\alpha^2$ is equal to _____ .

Numerical value type: the answer is a number.

**Answer: 158.** · Key from source paper

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**Q162** JEE Main 2023 · 29 Jan · Shift 1 Numerical

Let the equation of the plane P containing the line $x+10=\frac{8-y}{2}=z$ be $ax+by+3z=2(a+b)$ and the distance of the plane P from the point $(1,27,7)$ be $c$. Then $\mathrm{a}^2+\mathrm{b}^2+\mathrm{c}^2$ is equal to

Numerical value type: the answer is a number.

**Answer: 355.** · Key from source paper

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**Q163** JEE Main 2023 · 29 Jan · Shift 1 Numerical

Let the co-ordinates of one vertex of $\triangle ABC$ be $A(0,2,\alpha)$ and the other two vertices lie on the line $\frac{x+\alpha}{5}=\frac{y-1}{2}=\frac{z+4}{3}$. For $\alpha\in\mathbb{Z}$, if the area of $\triangle ABC$ is 21 sq. units and the line segment $BC$ has length $2\sqrt{21}$ units, then $\alpha^2$ is equal to _____ .

Numerical value type: the answer is a number.

**Answer: 9.** · Key from source paper

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**Q164** JEE Main 2023 · 29 Jan · Shift 2 MCQ

Shortest distance between the lines
$\frac{x-1}{2}=\frac{y+8}{-7}=\frac{z-4}{5}$ and $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-6}{-3}$ is

(A) $2\sqrt{3}$
(B) $4\sqrt{3}$
(C) $3\sqrt{3}$
(D) $5\sqrt{3}$

**Answer: (B)** $4\sqrt{3}$ · Key from source paper

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**Q165** JEE Main 2023 · 29 Jan · Shift 2 MCQ

The plane $2x-y+z=4$ intersects the line segment joining the points A$(a,-2,4)$ and B$(2,b,-3)$ at the point C in the ratio $2:1$ and the distance of the point C from the origin is $\sqrt{5}$. If $ab<0$ and P is

the point $(a-b, b, 2b-a)$ then $\mathrm{CP}^2$ is equal to:

(A) $\frac{17}{3}$
(B) $\frac{16}{3}$
(C) $\frac{73}{3}$
(D) $\frac{97}{3}$

**Answer: (A)** $\frac{17}{3}$ · Key from source paper

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**Q166** JEE Main 2023 · 29 Jan · Shift 2 MCQ

If the lines $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z+3}{1}$ and $\frac{x-a}{2}=\frac{y+2}{3}=\frac{z-3}{1}$ intersects at the point $P$, then the distance of the point $P$ from the plane $z=a$ is :

(A) 16
(B) 28
(C) 10
(D) 22

**Answer: (B)** 28 · Key from source paper

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**Q167** JEE Main 2023 · 25 Jan · Shift 1 MCQ

The distance of the point $P(4,6,-2)$ from the line passing through the point $(-3,2,3)$ and parallel to a line with direction ratios $3,3,-1$ is equal to:

(A) 3
(B) $\sqrt{6}$
(C) $2\sqrt{3}$
(D) $\sqrt{14}$

**Answer: (D)** $\sqrt{14}$ · Key from source paper

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**Q168** JEE Main 2023 · 25 Jan · Shift 1 MCQ

Consider the lines $L_1$ and $L_2$ given by
$L_1: \frac{x-1}{2}=\frac{y-3}{1}=\frac{z-2}{2}$
$L_2: \frac{x-2}{1}=\frac{y-2}{2}=\frac{z-3}{3}$
A line $L_3$ having direction ratios $1,-1,-2$, intersects $L_1$ and $L_2$ at the points $P$ and $Q$ respectively. Then the length of line segment $PQ$ is

(A) $2\sqrt{6}$
(B) $3\sqrt{2}$
(C) $4\sqrt{3}$
(D) 4

**Answer: (A)** $2\sqrt{6}$ · Key from source paper

**Q169** JEE Main 2023 · 25 Jan · Shift 1 · Numerical

Let the equation of the plane passing through the line $x-2y-z-5=0=x+y+3z-5$ and parallel to the line $x+y+2z-7=0=2x+3y+z-2$ be $ax+by+cz=65$. Then the distance of the point $(a,b,c)$ from the plane $2x+2y-z+16=0$ is _____ .

Numerical value type: the answer is a number.

**Answer: 9.** · Key from source paper

**Q170** JEE Main 2023 · 25 Jan · Shift 2 · MCQ

The shortest distance between the lines $x+1=2y=-12z$ and $x=y+2=6z-6$ is

(A) 2
(B) 3
(C) $\frac{5}{2}$
(D) $\frac{3}{2}$

**Answer: (A) 2** · Key from source paper

**Q171** JEE Main 2023 · 25 Jan · Shift 2 · MCQ

The foot of perpendicular of the point $(2,0,5)$ on the line $\frac{x+1}{2}=\frac{y-1}{5}=\frac{z+1}{-1}$ is $(\alpha,\beta,\gamma)$. Then. Which of the following is NOT correct?

(A) $\frac{\alpha\beta}{\gamma}=\frac{4}{15}$
(B) $\frac{\alpha}{\beta}=-8$
(C) $\frac{\beta}{\gamma}=-5$
(D) $\frac{\gamma}{\alpha}=\frac{5}{8}$

**Answer: (C)** $\frac{\beta}{\gamma}=-5$ · Key from source paper

**Q172** JEE Main 2023 · 25 Jan · Shift 2 · Numerical

If the shortest distance between the line joining the points $(1,2,3)$ and $(2,3,4)$, and the line $\frac{x-1}{2}=\frac{y+1}{-1}=\frac{z-2}{0}$ is $\alpha$, then $28\alpha^2$ is equal to _____ .

Numerical value type: the answer is a number.

**Answer: 18.** · Key from source paper

**Q173** JEE Main 2023 · 24 Jan · Shift 1 · MCQ

The distance of the point 7, -3, -4 from the plane containing the points 2, -3, 1, -1, 1, -2 and 3, -4, 2 is equal to:

(A) $4$
(B) $5$
(C) $5\sqrt{2}$
(D) $4\sqrt{2}$

**Answer: (C)** $5\sqrt{2}$ · Key from source paper

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**Q174** JEE Main 2023 · 24 Jan · Shift 1 MCQ

The distance of the point -1, 9, -16 from the plane $2x + 3y - z = 5$ measure parallel to the line $\frac{x+4}{3} = \frac{2-y}{4} = \frac{z-3}{12}$ is

(A) $13\sqrt{2}$
(B) 31
(C) 26
(D) $20\sqrt{3}$

**Answer: (C)** 26 · Key from source paper

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**Q175** JEE Main 2023 · 24 Jan · Shift 1 Numerical

The shortest distance between the lines $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-6}{2}$ and $\frac{x-6}{3} = \frac{1-y}{2} = \frac{z+8}{0}$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 14.** · Key from source paper

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**Q176** JEE Main 2023 · 24 Jan · Shift 2 MCQ

Let the plane containing the line of intersection of the planes $P_1 : x + (\lambda + 4)y + z = 1$ and $P_2 : 2x + y + z = 2$ pass through the points $(0, 1, 0)$ and $(1, 0, 1)$. Then the distance of the point $(2\lambda, \lambda, -\lambda)$ from the plane $P_2$ is

(A) $5\sqrt{6}$
(B) $4\sqrt{6}$
(C) $2\sqrt{6}$
(D) $3\sqrt{6}$

**Answer: (D)** $3\sqrt{6}$ · Key from source paper

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**Q177** JEE Main 2023 · 24 Jan · Shift 2 MCQ

If the foot of the perpendicular drawn from $(1, 9, 7)$ to the line passing through the point $(3, 2, 1)$ and parallel to the planes $x + 2y + z = 0$ and $3y - z = 3$ is $(\alpha, \beta, \gamma)$, then $\alpha + \beta + \gamma$ is equal to

(A) $-1$
(B) 3
(C) 1
(D) 5

**Answer: (D) 5** · Key from source paper

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**Q178** JEE Main 2023 · 24 Jan · Shift 2 Numerical

If the shortest distance between the lines $\frac{x+\sqrt{6}}{2}=\frac{y-\sqrt{6}}{3}=\frac{z-\sqrt{6}}{4}$ and $\frac{x-\lambda}{3}=\frac{y-2\sqrt{6}}{4}=\frac{z+2\sqrt{6}}{5}$ is 6, then sum of squares of all possible values(s) of $\lambda$ is

Numerical value type: the answer is a number.

**Answer: 624.** · Checked by our team

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**Q179** JEE Main 2022 · 29 Jul · Shift 1 MCQ

If the foot of the perpendicular from the point $A(-1,4,3)$ on the plane $P: 2x+my+nz=4$, is $\left(-2,\frac{7}{2},\frac{3}{2}\right)$, then the distance of the point $A$ from the plane $P$, measured parallel to a line with direction ratios $3,-1,-4$, is equal to

(A) 1
(B) $\sqrt{26}$
(C) $2\sqrt{2}$
(D) $\sqrt{14}$

**Answer: (B) $\sqrt{26}$** · Key from source paper

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**Q180** JEE Main 2022 · 29 Jul · Shift 1 Numerical

Let a line with direction ratios $a,-4a,-7$ be perpendicular to the lines with direction ratios $3,-1,2b$ and $b,a,-2$. If the point of intersection of the line $\frac{x+1}{a^2+b^2}=\frac{y-2}{a^2-b^2}=\frac{z}{1}$ and the plane $x-y+z=0$ is $(\alpha,\beta,\gamma)$, then $\alpha+\beta+\gamma$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 10.** · Key from source paper

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**Q181** JEE Main 2022 · 29 Jul · Shift 2 MCQ

Let $Q$ be the foot of perpendicular drawn from the point $P1,2,3$ to the plane $x+2y+z=14$. If $R$ is a point on the plane such that $\angle PRQ=60^\circ$, then the area of $\Delta PQR$ is equal to

(A) $\frac{\sqrt{3}}{2}$
(B) $\sqrt{3}$
(C) $2\sqrt{3}$
(D) $3$

**Answer: (B)** $\sqrt{3}$ · Key from source paper

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**Q182** JEE Main 2022 · 28 Jul · Shift 1 MCQ

The foot of the perpendicular from a point on the circle $x^2 + y^2 = 1, z = 0$ to the plane $2x + 3y + z = 6$ lies on which one of the following curves?

(A) $6x + 5y - 12^2 + 43x + 7y - 8^2 = 1, z = 6 - 2x - 3y$
(B) $5x + 6y - 12^2 + 43x + 5y - 9^2 = 1, z = 6 - 2x - 3y$
(C) $6x + 5y - 14^2 + 93x + 5y - 7^2 = 1, z = 6 - 2x - 3y$
(D) $5x + 6y - 14^2 + 93x + 7y - 8^2 = 1, z = 6 - 2x - 3y$

**Answer: (B)** $5x + 6y - 12^2 + 43x + 5y - 9^2 = 1, z = 6 - 2x - 3y$ · Key from source paper

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**Q183** JEE Main 2022 · 28 Jul · Shift 1 Numerical

Let $P(-2, -1, 1)$ and $Q\left(\frac{56}{17}, \frac{43}{17}, \frac{111}{17}\right)$ be the vertices of the rhombus $PRQS$. If the direction ratios of the diagonal $RS$ are $\alpha, -1, \beta$, where both $\alpha$ and $\beta$ are integers of minimum absolute values, then $\alpha^2 + \beta^2$ is equal to

Numerical value type: the answer is a number.

**Answer: 450.** · Key from source paper

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**Q184** JEE Main 2022 · 28 Jul · Shift 2 MCQ

Let the lines $\frac{x-1}{\lambda} = \frac{y-2}{1} = \frac{z-3}{2}$ and $\frac{x+26}{-2} = \frac{y+18}{3} = \frac{z+28}{\lambda}$ be coplanar and $P$ be the plane containing these two lines. Then which of the following points does NOT lies on $P$ ?

(A) $(0, -2, -2)$
(B) $(-5, 0, -1)$
(C) $(3, -1, 0)$
(D) $(0, 4, 5)$

**Answer: (D)** $(0, 4, 5)$ · Key from source paper

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**Q185** JEE Main 2022 · 28 Jul · Shift 2 MCQ

A plane $P$ is parallel to two lines whose direction ratios are $-2, 1, -3$, and $-1, 2, -2$ and it contains the point $(2, 2, -2)$. Let $P$ intersect the co-ordinate axes at the points $A, B, C$ making the intercepts $\alpha, \beta, \gamma$. If $V$ is the volume of the tetrahedron $OABC$, where $O$ is the origin and $\mathrm{p} = \alpha + \beta + \gamma$, then the ordered pair $(V, p)$ is equal to

(A) $(48, -13)$
(B) $(24, -13)$
(C) $(48, 11)$
(D) $(24, -5)$

**Answer: (B)** $(24, -13)$ · Key from source paper

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**Q186** JEE Main 2022 · 27 Jul · Shift 1 MCQ

If the plane $P$ passes through the intersection of two mutually perpendicular planes $2x + ky - 5z = 1$ and $3kx - ky + z = 5$, $k < 3$ and intercepts a unit length on positive $x$-axis, then the intercept made by the plane $P$ on the $y$-axis is

(A) $\frac{1}{11}$
(B) $\frac{5}{11}$
(C) 6
(D) 7

**Answer: (D)** 7 · Key from source paper

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**Q187** JEE Main 2022 · 27 Jul · Shift 1 Numerical

Let the line $\frac{x-3}{7} = \frac{y-2}{-1} = \frac{z-3}{-4}$ intersect the plane containing the lines $\frac{x-4}{1} = \frac{y+1}{-2} = \frac{z}{1}$ and $4ax - y + 5z - 7a = 0 = 2x - 5y - z - 3$, $a \in \mathbb{R}$ at the point $P(\alpha, \beta, \gamma)$. Then the value of $\alpha + \beta + \gamma$ equals _____ .

Numerical value type: the answer is a number.

**Answer: 12.** · Key from source paper

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**Q188** JEE Main 2022 · 27 Jul · Shift 2 MCQ

If the length of the perpendicular drawn from the point $P(a, 4, 2)$, $a > 0$ on the line $\frac{x+1}{2} = \frac{y-3}{3} = \frac{z-1}{-1}$ is $2\sqrt{6}$ units and $Q(\alpha_1, \alpha_2, \alpha_3)$ is the image of the point $P$ in this line, then $a + \sum_{i=1}^{3} \alpha_i$ is equal to

(A) 7
(B) 8
(C) 12
(D) 14

**Answer: (B)** 8 · Key from source paper

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**Q189** JEE Main 2022 · 27 Jul · Shift 2 MCQ

If the line of intersection of the planes $ax + by = 3$ and $ax + by + cz = 0$, $a > 0$ makes an angle $30^\circ$ with the plane $y - z + 2 = 0$, then the direction cosines of the line are

(A) $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0$
(B) $\frac{1}{\sqrt{2}}, \frac{-1}{\sqrt{2}}, 0$
(C) $\frac{1}{\sqrt{5}}, -\frac{2}{\sqrt{5}}, 0$
(D) $\frac{1}{2}, -\frac{\sqrt{3}}{2}, 0$

**Options (2) or (1) were accepted. More than one answer was accepted.** · Key from source paper

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**Q190** JEE Main 2022 · 26 Jul · Shift 1 MCQ

The length of the perpendicular from the point $(1, -2, 5)$ on the line passing through $(1, 2, 4)$ and parallel to the line $x + y - z = 0 = x - 2y + 3z - 5$ is:

(A) $\sqrt{\frac{21}{2}}$
(B) $\sqrt{\frac{9}{2}}$
(C) $\sqrt{\frac{73}{2}}$
(D) 1

**Answer: (A)** $\sqrt{\frac{21}{2}}$ · Key from source paper

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**Q191** JEE Main 2022 · 26 Jul · Shift 1 Numerical

Let $Q$ and $R$ be two points on the line $\frac{x+1}{2} = \frac{y+2}{3} = \frac{z-1}{2}$ at a distance $\sqrt{26}$ from the point $P(4, 2, 7)$. Then the square of the area of the triangle $PQR$ is _____ .

Numerical value type: the answer is a number.

**Answer: 153.** · Key from source paper

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**Q192** JEE Main 2022 · 26 Jul · Shift 2 Numerical

The largest value of $a$, for which the perpendicular distance of the plane containing the lines $\vec{r} = \hat{i} + \hat{j} + \lambda\hat{i} + a\hat{j} - \hat{k}$ and $\vec{r} = \hat{i} + \hat{j} + \mu\text{-}\hat{i} + \hat{j} - a\hat{k}$ from the point $2, 1, 4$ is $\sqrt{3}$, is _____ .

Numerical value type: the answer is a number.

**Answer: 2.** · Key from source paper

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**Q193** JEE Main 2022 · 26 Jul · Shift 2 Numerical

The plane passing through the line $L : l\,x - y + 31 - l\,z = 1, x + 2y - z = 2$ and perpendicular to the plane $3x + 2y + z = 6$ is $3x - 8y + 7z = 4$. If $\theta$ is the acute angle between the line $L$ and the $y$-axis, then $415\ \cos^2\theta$ is equal to _____ .

Numerical value type: the answer is a number.

**Answer: 125.** · Key from source paper

**Q194** JEE Main 2022 · 25 Jul · Shift 1 MCQ

Let $P$ be the plane containing the straight line $\frac{x-3}{9}=\frac{y+4}{-1}=\frac{z-7}{-5}$ and perpendicular to the plane containing the straight lines $\frac{x}{2}=\frac{y}{3}=\frac{z}{5}$ and $\frac{x}{3}=\frac{y}{7}=\frac{z}{8}$. If $d$ is the distance of $P$ from the point $2,-5,11$, then $d^2$ is equal to

(A) $\frac{147}{2}$
(B) $96$
(C) $\frac{32}{3}$
(D) $54$

**Answer: (C)** $\frac{32}{3}$ · Key from source paper

**Q195** JEE Main 2022 · 25 Jul · Shift 1 Numerical

The line of shortest distance between the lines $\frac{x-2}{0}=\frac{y-1}{1}=\frac{z}{1}$ and $\frac{x-3}{2}=\frac{y-5}{2}=\frac{z-1}{1}$ makes an angle of $\sin^{-1}\sqrt{\frac{2}{27}}$ with the plane $P: ax-y-z=0$, $a>0$. If the image of the point $1,1,-5$ in the plane $P$ is $\alpha,\beta,\gamma$, then $\alpha+\beta-\gamma$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 3.** · Key from source paper

**Q196** JEE Main 2022 · 25 Jul · Shift 2 MCQ

A plane $E$ is perpendicular to the two planes $2x-2y+z=0$ and $x-y+2z=4$, and passes through the point $P(1,-1,1)$. If the distance of the plane $E$ from the point $Q(a,a,2)$ is $3\sqrt{2}$, then $(PQ)^2$ is equal to

(A) $9$
(B) $12$
(C) $21$
(D) $33$

**Answer: (C)** $21$ · Key from source paper

**Q197** JEE Main 2022 · 25 Jul · Shift 2 MCQ

The shortest distance between the lines $\frac{x+7}{-6}=\frac{y-6}{7}=z$ and $\frac{7-x}{2}=y-2=z-6$ is

(A) $2\sqrt{29}$
(B) $1$
(C) $\sqrt{\frac{37}{29}}$
(D) $\frac{\sqrt{29}}{2}$

**Answer: (A)** $2\sqrt{29}$ · Key from source paper

**Q198** JEE Main 2022 · 29 Jun · Shift 1 MCQ

If the mirror image of the point $(2, 4, 7)$ in the plane $3x - y + 4z = 2$ is $(a, b, c)$, the $2a + b + 2c$ is equal to

(A) 54
(B) $-6$
(C) 50
(D) $-42$

**Answer: (B)** $-6$ · Key from source paper

**Q199** JEE Main 2022 · 29 Jun · Shift 1 Numerical

Let $d$ be the distance between the foot of perpendiculars of the points $P(1, 2, -1)$ and $Q(2, -1, 3)$ on the plane $-x + y + z = 1$. Then $d^2$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 26.** · Key from source paper

**Q200** JEE Main 2022 · 29 Jun · Shift 1 Numerical

Let $P_1 : \vec{r} \cdot \left(2\hat{i} + \hat{j} - 3\hat{k}\right) = 4$ be a plane. Let $P_2$ be another plane which passes through the points $(2, -3, 2)(2, -2, -3)$ and $(1, -4, 2)$. If the direction ratios of the line of intersection of $P_1$ and $P_2$ be $16, \alpha, \beta$, then the value of $\alpha + \beta$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 28.** · Key from source paper

**Q201** JEE Main 2022 · 29 Jun · Shift 2 MCQ

Let $\frac{x-2}{3} = \frac{y+1}{-2} = \frac{z+3}{-1}$ lie on the plane $px - qy + z = 5$, for some $p,\ q \in R$. The shortest distance of the plane from the origin is:

(A) $\sqrt{\frac{3}{109}}$
(B) $\sqrt{\frac{5}{142}}$
(C) $\sqrt{\frac{5}{71}}$
(D) $\sqrt{\frac{1}{142}}$

**Answer: (B)** $\sqrt{\frac{5}{142}}$ · Key from source paper

**Q202** JEE Main 2022 · 29 Jun · Shift 2 MCQ

Let $Q$ be the mirror image of the point $P(1,\ 2,\ 1)$ with respect to the plane $x+2y+2z=16$. Let $T$ be a plane passing through the point $Q$ and contains the line $\vec{r}=-\hat{k}+\lambda\left(\hat{i}+\hat{j}+2\hat{k}\right)$, $\lambda\in R$. Then, which of the following points lies on $T$?

(A) $(2,\ 1,\ 0)$
(B) $(1,\ 2,\ 1)$
(C) $(1,\ 2,\ 2)$
(D) $(1,\ 3,\ 2)$

**Answer: (B)** $(1,\ 2,\ 1)$ · Key from source paper

**Q203** JEE Main 2022 · 28 Jun · Shift 1 MCQ

If two distinct point $Q$, $R$ lie on the line of intersection of the planes $-x+2y-z=0$ and $3x-5y+2z=0$ and $PQ=PR=\sqrt{18}$ where the point $P$ is $(1,-2,3)$, then the area of the triangle $PQR$ is equal to

(A) $\frac{2}{3}\sqrt{38}$
(B) $\frac{4}{3}\sqrt{38}$
(C) $\frac{8}{3}\sqrt{38}$
(D) $\sqrt{\frac{152}{3}}$

**Answer: (B)** $\frac{4}{3}\sqrt{38}$ · Key from source paper

**Q204** JEE Main 2022 · 28 Jun · Shift 1 MCQ

The acute angle between the planes $P_1$ and $P_2$, when $P_1$ and $P_2$ are the planes passing through the intersection of the planes $5x+8y+13z-29=0$ and $8x-7y+z-20=0$ and the points $(2,1,3)$ and $(0,1,2)$, respectively, is

(A) $\frac{\pi}{3}$
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{6}$
(D) $\frac{\pi}{12}$

**Answer: (A)** $\frac{\pi}{3}$ · Key from source paper

**Q205** JEE Main 2022 · 28 Jun · Shift 1 MCQ

Let the plane $P:\vec{r}\cdot\vec{a}=d$ contain the line of intersection of two planes $\vec{r}\cdot\left(\hat{i}+3\hat{j}-\hat{k}\right)=6$ and $\vec{r}\cdot\left(-6\hat{i}+5\hat{j}-\hat{k}\right)=7$. If the plane $P$ passes through the point $\left(2,3,\frac{1}{2}\right)$, then the value of $\frac{|13\vec{a}|^2}{d^2}$ is

equal to

(A) 90
(B) 93
(C) 95
(D) 97

**Answer: (B) 93** · Key from source paper

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## Q206 JEE Main 2022 · 28 Jun · Shift 2 MCQ

Let the plane $ax + by + cz = d$ pass through $(2, 3, -5)$ and is perpendicular to the planes $2x + y - 5z = 10$ and $3x + 5y - 7z = 12$. If $a, b, c, d$ are integers $d > 0$ and $gcd(|a|, |b|, |c|, d) = 1$ then the value of $a + 7b + c + 20d$ is equal to

(A) 18
(B) 20
(C) 24
(D) 22

**Answer: (D) 22** · Key from source paper

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## Q207 JEE Main 2022 · 28 Jun · Shift 2 Numerical

Let the image of the point $P(1, 2, 3)$ in the line $L : \frac{x-6}{3} = \frac{y-1}{2} = \frac{z-2}{3}$ be $Q$. let $R(\alpha, \beta, \gamma)$ be a point that divides internally the line segment $PQ$ in the ratio $1 : 3$. Then the value of $22(\alpha + \beta + \gamma)$ is equal to

Numerical value type: the answer is a number.

**Answer: 125.** · Key from source paper

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## Q208 JEE Main 2022 · 27 Jun · Shift 1 MCQ

If two straight lines whose direction cosines are given by the relations $l + m - n = 0,\ 3l^2 + m^2 + cnl = 0$ are parallel, then the positive value of $c$ is

(A) 6
(B) 4
(C) 3
(D) 2

**Answer: (A) 6** · Key from source paper

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## Q209 JEE Main 2022 · 27 Jun · Shift 1 Numerical

Let the mirror image of the point $(a, b, c)$ with respect to the plane $3x - 4y + 12z + 19 = 0$ be $(a - 6, \beta, \gamma)$. If $a + b + c = 5$, then $7\beta - 9\gamma$ is equal to _____ .

Numerical value type: the answer is a number.

**Answer: 137.** · Key from source paper

## Q210 JEE Main 2022 · 27 Jun · Shift 2 MCQ

Let the foot of the perpendicular from the point $(1, 2, 4)$ on the line $\frac{x+2}{4} = \frac{y-1}{2} = \frac{z+1}{3}$ be $P$. Then the distance of $P$ from the plane $3x + 4y + 12z + 23 = 0$ is

(A) $\frac{50}{13}$
(B) $\frac{63}{13}$
(C) $\frac{65}{13}$
(D) $4$

**Answer: (C)** $\frac{65}{13}$ · Key from source paper

## Q211 JEE Main 2022 · 27 Jun · Shift 2 MCQ

The shortest distance between the lines $\frac{x-3}{2} = \frac{y-2}{3} = \frac{z-1}{-1}$ and $\frac{x+3}{2} = \frac{y-6}{1} = \frac{z-5}{3}$ is

(A) $\frac{18}{\sqrt{5}}$
(B) $\frac{22}{3\sqrt{5}}$
(C) $\frac{46}{3\sqrt{5}}$
(D) $6\sqrt{3}$

**Answer: (A)** $\frac{18}{\sqrt{5}}$ · Key from source paper

## Q212 JEE Main 2022 · 26 Jun · Shift 1 MCQ

If the two lines $l_1 : \frac{x-2}{3} = \frac{y+1}{-2}, z = 2$ and $l_2 : \frac{x-1}{1} = \frac{2y+3}{\alpha} = \frac{z+5}{2}$ are perpendicular, then an angle between the lines $l_2$ and $l_3 : \frac{1-x}{3} = \frac{2y-1}{-4} = \frac{z}{4}$ is

(A) $\cos^{-1}\left(\frac{29}{4}\right)$
(B) $\sec^{-1}\left(\frac{29}{4}\right)$
(C) $\cos^{-1}\left(\frac{2}{29}\right)$
(D) $\cos^{-1}\left(\frac{2}{\sqrt{29}}\right)$

**Answer: (B)** $\sec^{-1}\left(\frac{29}{4}\right)$ · Key from source paper

## Q213 JEE Main 2022 · 26 Jun · Shift 1 MCQ

Let the plane $2x + 3y + z + 20 = 0$ be rotated through a right angle about its line of intersection with the plane $x - 3y + 5z = 8$. If the mirror image of the point $(2, -\frac{1}{2}, 2)$ in the rotated plane is $B(a, b, c)$, then

(A) $\frac{a}{8}=\frac{b}{5}=\frac{c}{-4}$
(B) $\frac{a}{4}=\frac{b}{5}=\frac{c}{-2}$
(C) $\frac{a}{8}=\frac{b}{-5}=\frac{c}{4}$
(D) $\frac{a}{4}=\frac{b}{5}=\frac{c}{2}$

**Answer: (A)** $\frac{a}{8}=\frac{b}{5}=\frac{c}{-4}$ · Key from source paper

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**Q214** JEE Main 2022 · 26 Jun · Shift 2 MCQ

If the plane $2x+y-5z=0$ is rotated about its line of intersection with the plane $3x-y+4z-7=0$ by an angle of $\frac{\pi}{2}$, then the plane after the rotation passes through the point

(A) $(2,-2,0)$
(B) $(-2,2,0)$
(C) $(1,0,2)$
(D) $(-1,0,-2)$

**Answer: (C)** $(1,0,2)$ · Key from source paper

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**Q215** JEE Main 2022 · 26 Jun · Shift 2 MCQ

If the lines $\vec{r}=(\hat{i}-\hat{j}+\hat{k})+\lambda(3\hat{j}-\hat{k})$ and $\vec{r}=(\alpha\hat{i}-\hat{j})+\mu(2\hat{i}-3\hat{k})$ are co-planar, the the distance of the plane containing these two lines from the point $(\alpha,0,0)$ is

(A) $\frac{2}{9}$
(B) $\frac{2}{11}$
(C) $\frac{4}{11}$
(D) 2

**Answer: (B)** $\frac{2}{11}$ · Key from source paper

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**Q216** JEE Main 2022 · 25 Jun · Shift 1 MCQ

Let $Q$ be the mirror image of the point $P1,0,1$ with respect to the plane $S: x+y+z=5$. If a line $L$ passing through $1,-1,-1$, parallel to the line $PQ$ meets the plane $S$ at $R$, then $QR^2$ is equal to

(A) 2
(B) 5
(C) 7
(D) 11

**Answer: (B)** 5 · Key from source paper

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**Q217** JEE Main 2022 · 25 Jun · Shift 1 Numerical

Let the lines $L_1: \vec{r}=\lambda\left(\hat{i}+2\hat{j}+3\hat{k}\right), \lambda\in R$ and $L_2: \vec{r}=\hat{i}+3\hat{j}+\hat{k}+\mu\left(\hat{i}+\hat{j}+5\hat{k}\right); \mu\in R$, intersect at the point $S$. If a plane $ax+by-z+d=0$ passes through $S$ and is parallel to the lines $L_1$

and $L_2$, then the value of $a+b+d$ is equal to _____ .

Numerical value type: the answer is a number.

**Answer: 5.** · Key from source paper

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**Q218** JEE Main 2022 · 25 Jun · Shift 2 MCQ

Let $P$ be the plane passing through the intersection of the planes $\vec{r}\cdot\hat{i}+3\hat{j}-\hat{k}=5$ and $\vec{r}\cdot 2\hat{i}-\hat{j}+\hat{k}=3$, and the point $2,1,-2$. Let the position vectors of the points $X$ and $Y$ be $\hat{i}-2\hat{j}+4\hat{k}$ and $5\hat{i}-\hat{j}+2\hat{k}$ respectively. Then the points

(A) $X$ and $X+Y$ are on the same side of $P$

(B) $Y$ and $Y-X$ are on the opposite sides of $P$

(C) $X$ and $Y$ are on the opposite sides of $P$

(D) $X+Y$ and $X-Y$ are on the same side of $P$

**Answer: (C) $X$ and $Y$ are on the opposite sides of $P$** · Key from source paper

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**Q219** JEE Main 2022 · 25 Jun · Shift 2 Numerical

Let $l_1$ be the line in $xy$-plane with $x$ and $y$ intercepts $\frac{1}{8}$ and $\frac{1}{4\sqrt{2}}$ respectively, and $l_2$ be the line in $zx$-plane with $x$ and $z$ intercepts $-\frac{1}{8}$ and $-\frac{1}{6\sqrt{3}}$ respectively. If $d$ is the shortest distance between the line $l_1$ and $l_2$, then $d^{-2}$ is equal to _____ .

Numerical value type: the answer is a number.

**Answer: 51.** · Key from source paper

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**Q220** JEE Main 2022 · 24 Jun · Shift 1 Numerical

Let a line having direction ratios $1,-4,2$ intersect the lines $\frac{x-7}{3}=\frac{y-1}{-1}=\frac{z+2}{1}$ and $\frac{x}{2}=\frac{y-7}{3}=\frac{z}{1}$ at the points $A$ and $B$. Then $(AB)^2$ is equal to

Numerical value type: the answer is a number.

**Answer: 84.** · Key from source paper

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**Q221** JEE Main 2022 · 24 Jun · Shift 1 Numerical

If the shortest distance between the lines $\vec{r}=\left(-\hat{i}+3\hat{k}\right)+\lambda\left(\hat{i}-a\hat{j}\right)$ and $\vec{r}'=\left(-\hat{j}+2\hat{k}\right)+\mu\left(\hat{i}-\hat{j}+\hat{k}\right)$ is $\sqrt{\frac{2}{3}}$, then the integral value of $a$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 2.** · Key from source paper

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**Q222** JEE Main 2022 · 24 Jun · Shift 2 MCQ

If the shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{\lambda}$ and $\frac{x-2}{1}=\frac{y-4}{4}=\frac{z-5}{5}$ is $\frac{1}{\sqrt{3}}$, then the sum of all possible values of $\lambda$ is:

(A) $16$
(B) $6$
(C) $12$
(D) $15$

**Answer: (A)** $16$ · Key from source paper

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**Q223** JEE Main 2022 · 24 Jun · Shift 2 MCQ

Let the points on the plane $P$ be equidistant from the points $(-4, 2, 1)$ and $(2, -2, 3)$. Then the acute angle between the plane $P$ and the plane $2x + y + 3z = 1$ is

(A) $\frac{\pi}{6}$
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{3}$
(D) $\frac{5\pi}{12}$

**Answer: (C)** $\frac{\pi}{3}$ · Key from source paper

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**Q224** JEE Main 2021 · 1 Sep · Shift 2 MCQ

The distance of line $3y - 2z - 1 = 0 = 3x - z + 4$ from the point $(2, -1, 6)$ is :

(A) $2\sqrt{5}$
(B) $2\sqrt{6}$
(C) $\sqrt{26}$
(D) $4\sqrt{2}$

**Answer: (B)** $2\sqrt{6}$ · Key from source paper

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**Q225** JEE Main 2021 · 1 Sep · Shift 2 MCQ

Let the acute angle bisector of the two planes $x - 2y - 2z + 1 = 0$ and $2x - 3y - 6z + 1 = 0$ be the plane $P$. Then which of the following points lies on $P$ ?

(A) $(0, 2, -4)$
(B) $-2, 0, -\frac{1}{2}$
(C) $(4, 0, -2)$
(D) $3, 1, -\frac{1}{2}$

**Answer: (B)** $-2, 0, -\frac{1}{2}$ · Key from source paper

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**Q226** JEE Main 2021 · 31 Aug · Shift 1 MCQ

Let the equation of the plane, that passes through the point $(1, 4, -3)$ and contains the line of intersection of the planes $3x - 2y + 4z - 7 = 0$ and $x + 5y - 2z + 9 = 0$, be $\alpha x + \beta y + \gamma z + 3 = 0$, then $\alpha + \beta + \gamma$ is equal to :

(A) $-15$
(B) $15$
(C) $-23$
(D) $23$

**Answer: (C)** $-23$ · Key from source paper

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**Q227** JEE Main 2021 · 31 Aug · Shift 1 Numerical

The square of the distance of the point of intersection of the line $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+1}{6}$ and the plane $2x-y+z=6$ from the point $(-1,-1,2)$ is _____

Numerical value type: the answer is a number.

**Answer: 61.** · Key from source paper

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**Q228** JEE Main 2021 · 31 Aug · Shift 2 MCQ

The distance of the point $(-1,2,-2)$ from the line of intersection of the planes $2x+3y+2z=0$ and $x-2y+z=0$ is :

(A) $\frac{1}{\sqrt{2}}$
(B) $\frac{\sqrt{42}}{2}$
(C) $\frac{5}{2}$
(D) $\frac{\sqrt{34}}{2}$

**Answer: (D)** $\frac{\sqrt{34}}{2}$ · Key from source paper

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**Q229** JEE Main 2021 · 31 Aug · Shift 2 Numerical

Suppose the line $\frac{x-2}{\alpha}=\frac{y-2}{-5}=\frac{z+2}{2}$ lies on the plane $x+3y-2z+\beta=0$. Then $(\alpha+\beta)$ is equal to _____

Numerical value type: the answer is a number.

**Answer: 7.** · Key from source paper

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**Q230** JEE Main 2021 · 27 Aug · Shift 1 MCQ

The distance of the point $(1,-2,3)$ from the plane $x-y+z=5$ measured parallel to a line, whose direction ratios are $2,3,-6$, is

(A) $2$
(B) $5$
(C) $3$
(D) $1$

**Answer: (D)** $1$ · Key from source paper

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**Q231** JEE Main 2021 · 27 Aug · Shift 1 MCQ

Equation of a plane at a distance $\sqrt{\frac{2}{21}}$ units from the origin, which contains the line of intersection of the planes $x-y-z-1=0$ and $2x+y-3z+4=0$, is

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

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

(C) $3x-1y-5z+2=0$

(D) $4x-y-5z+2=0$

**Answer: (D)** $4x-y-5z+2=0$ · Key from source paper

**Q232** JEE Main 2021 · 27 Aug · Shift 2 MCQ

The equation of the plane passing through the line of intersection of the planes $\vec{r}\cdot\left(\hat{i}+\hat{j}+\hat{k}\right)=1$ and $\vec{r}\cdot\left(2\hat{i}+3\hat{j}-\hat{k}\right)+4=0$ and parallel to the $x$-axis, is

(A) $\vec{r}\cdot\left(\hat{i}+3\hat{k}\right)+6=0$

(B) $\vec{r}\cdot\left(\hat{i}-3\hat{k}\right)+6=0$

(C) $\vec{r}\cdot\left(\hat{j}-3\hat{k}\right)-6=0$

(D) $\vec{r}\cdot\left(\hat{j}-3\hat{k}\right)+6=0$

**Answer: (D)** $\vec{r}\cdot\left(\hat{j}-3\hat{k}\right)+6=0$ · Key from source paper

**Q233** JEE Main 2021 · 27 Aug · Shift 2 MCQ

The angle between the straight lines, whose direction cosines $l, m, n$ are given by the equations $2l+2m-n=0$ and $mn+nl+\mathrm{lm}=0$, is:

(A) $\frac{\pi}{3}$

(B) $\frac{\pi}{2}$

(C) $\cos^{-1}\left(\frac{8}{9}\right)$

(D) $\pi-\cos^{-1}\left(\frac{4}{9}\right)$

**Answer: (B)** $\frac{\pi}{2}$ · Key from source paper

**Q234** JEE Main 2021 · 27 Aug · Shift 2 Numerical

Let $S$ be the mirror image of the point $Q(1,3,4)$ with respect to the plane $2x-y+z+3=0$ and let $R(3,5,\gamma)$ be a point of this plane. Then the square of the length of the line segment $SR$ is

Numerical value type: the answer is a number.

**Answer: 72.** · Key from source paper

## Q235 JEE Main 2021 · 26 Aug · Shift 1 MCQ

A plane $P$ contains the line $x+2y+3z+1=0=x-y-z-6$, and is perpendicular to the plane $-2x+y+z+8=0$. Then which of the following points lies on $P$?

(A) $(2,-1,1)$
(B) $(0,1,1)$
(C) $(-1,1,2)$
(D) $(1,0,1)$

**Answer: (B)** $(0,1,1)$ · Key from source paper

## Q236 JEE Main 2021 · 26 Aug · Shift 1 Numerical

Let the line $L$ be the projection of the line $\frac{x-1}{2}=\frac{y-3}{1}=\frac{z-4}{2}$ in the plane $x-2y-z=3$. If $d$ is the distance of the point $(0,0,6)$ from $L$, then $d^2$ is equal to

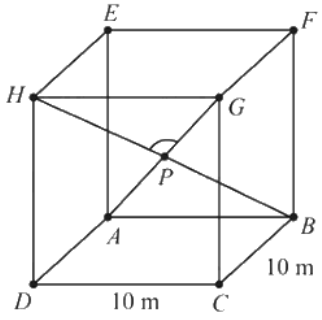
Numerical value type: the answer is a number.

**Answer: 26.** · Key from source paper

## Q237 JEE Main 2021 · 26 Aug · Shift 2 MCQ

A hall has a square floor of dimension $10\text{ m}\times 10\text{ m}$ (see the figure) and vertical walls. If the angle $GPH$ between the diagonals $AG$ and $BH$ is $\cos^{-1}\frac{1}{5}$, then the height of the hall (in meters) is:
*(see the figure above)*

**Q78.** A hall has a square floor of dimension $10\text{ m}\times 10\text{ m}$ (see the figure) and vertical walls. If the angle $GPH$ between the diagonals $AG$ and $BH$ is $\cos^{-1}\frac{1}{5}$, then the height of the hall (in meters) is:




(1) $5\sqrt{2}$ (2) $5\sqrt{3}$
(3) $5\sqrt{10}$ (4) $5$

(A) $5\sqrt{2}$
(B) $5\sqrt{3}$
(C) $5\sqrt{10}$
(D) $5$

**Answer: (A)** $5\sqrt{2}$ · Key from source paper

**Q238** JEE Main 2021 · 26 Aug · Shift 2 MCQ

Let $P$ be the plane passing through the point $(1, 2, 3)$ and the line of intersection of the planes $\vec{r} \cdot \left(\hat{i} + \hat{j} + 4\hat{k}\right) = 16$ & $\vec{r} \cdot \left(-\hat{i} + \hat{j} + \hat{k}\right) = 6$. Then which of the following points does NOT lie on $P$?

(A) $(4, 2, 2)$
(B) $(6, -6, 2)$
(C) $(-8, 8, 6)$
(D) $(3, 3, 2)$

**Answer: (A)** $(4, 2, 2)$ · Key from source paper

**Q239** JEE Main 2021 · 26 Aug · Shift 2 Numerical

Let $Q$ be the foot of the perpendicular from the point $P(7, -2, 13)$ on the plane containing the lines $\frac{x+1}{6} = \frac{y-1}{7} = \frac{z-3}{8}$ and $\frac{x-1}{3} = \frac{y-2}{5} = \frac{z-3}{7}$. Then $(PQ)^2$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 96.** · Key from source paper

**Q240** JEE Main 2021 · 27 Jul · Shift 1 MCQ

Let the plane passing through the point $(-1, 0, -2)$ and perpendicular to each of the planes $2x + y - z = 2$ and $x - y - z = 3$ be $ax + by + cz + 8 = 0$. Then the value of $a + b + c$ is equal to:

(A) 3
(B) 8
(C) 5
(D) 4

**Answer: (D) 4** · Key from source paper

**Q241** JEE Main 2021 · 27 Jul · Shift 1 Numerical

Let a plane $P$ pass through the point $(3, 7, -7)$ and contain the line, $\frac{x-2}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$. If distance of the plane $P$ from the origin is $d$, then $d^2$ is equal to

Numerical value type: the answer is a number.

**Answer: 3.** · Key from source paper

**Q242** JEE Main 2021 · 27 Jul · Shift 2 MCQ

For real numbers $\alpha$ and $\beta \neq 0$, if the point of intersection of the straight lines $\frac{x-\alpha}{1} = \frac{y-1}{2} = \frac{z-1}{3}$ and $\frac{x-4}{\beta} = \frac{y-6}{3} = \frac{z-7}{3}$ lies on the plane $x + 2y - z = 8$, then $\alpha - \beta$ is equal to :

(A) 5
(B) 9
(C) 3
(D) 7

**Answer: (D) 7** · Key from source paper

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**Q243** JEE Main 2021 · 27 Jul · Shift 2 Numerical

The distance of the point $P(3,4,4)$ from the point of intersection of the line joining the points $Q(3,-4,-5)$ and $R(2,-3,1)$ and the plane $2x+y+z=7$, is equal to _____.

Numerical value type: the answer is a number.

**Answer: 7.** · Key from source paper

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**Q244** JEE Main 2021 · 25 Jul · Shift 1 MCQ

Let the foot of perpendicular from a point $P(1,2,-1)$ to the straight line $L:\frac{x}{1}=\frac{y}{0}=\frac{z}{-1}$ be $N$. Let a line be drawn from $P$ parallel to the plane $x+y+2z=0$ which meets $L$ at point $Q$. If $\alpha$ is the acute angle between the lines $PN$ and $PQ$, then $\cos\alpha$ is equal to _____.

(A) $\frac{1}{\sqrt{5}}$
(B) $\frac{\sqrt{3}}{2}$
(C) $\frac{1}{\sqrt{3}}$
(D) $\frac{1}{2\sqrt{3}}$

**Answer: (C)** $\frac{1}{\sqrt{3}}$ · Key from source paper

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**Q245** JEE Main 2021 · 25 Jul · Shift 2 Numerical

If the lines $\frac{x-k}{1}=\frac{y-2}{2}=\frac{z-3}{3}$ and $\frac{x+1}{3}=\frac{y+2}{2}=\frac{z+3}{1}$ are co-planar, then the value of $k$ is _____.

Numerical value type: the answer is a number.

**Answer: 1.** · Key from source paper

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**Q246** JEE Main 2021 · 22 Jul · Shift 1 MCQ

Let $L$ be the line of intersection of planes $\vec{r}\cdot\left(\hat{i}-\hat{j}+2\hat{k}\right)=2$ and $\vec{r}\cdot\left(2\hat{i}+\hat{j}-\hat{k}\right)=2$. If $P(\alpha,\beta,\gamma)$ is the foot of perpendicular on $L$ from the point $(1,2,0)$, then the value of $35(\alpha+\beta+\gamma)$ is equal to:

(A) 101
(B) 119
(C) 143
(D) 134

**Answer: (B)** 119 · Key from source paper

EdLoop JEE

**Q247** JEE Main 2021 · 22 Jul · Shift 1 MCQ

If the shortest distance between the straight lines $3(x-1)=6(y-2)=2(z-1)$ and $4(x-2)=2(y-\lambda)=(z-3)$, $\lambda \in R$ is $\frac{1}{\sqrt{38}}$, then the integral value of $\lambda$ is equal to:

(A) $3$
(B) $2$
(C) $5$
(D) $-1$

**Answer: (A)** $3$ · Key from source paper

**Q248** JEE Main 2021 · 20 Jul · Shift 1 Numerical

Let $P$ be a plane passing through the points $(1,0,1)$, $(1,-2,1)$ and $(0,1,-2)$. Let a vector $\vec{a}=\alpha\hat{i}+\beta\hat{j}+\gamma\hat{k}$ be such that $\vec{a}$ is parallel to the plane $P$, perpendicular to $\left(\hat{i}+2\hat{j}+3\hat{k}\right)$ and $\vec{a}\cdot\left(\hat{i}+\hat{j}+2\hat{k}\right)=2$, then $(\alpha-\beta+\gamma)^2$ equals _____.

Numerical value type: the answer is a number.

**Answer: 81.** · Key from source paper

**Q249** JEE Main 2021 · 20 Jul · Shift 1 Numerical

If the shortest distance between the lines $\vec{r_1}=\alpha\hat{i}+2\hat{j}+2\hat{k}+\lambda\left(\hat{i}-2\hat{j}+2\hat{k}\right)$, $\lambda\in R$, $\alpha>0$ and $\vec{r_2}=-4\hat{i}-\hat{k}+\mu\left(3\hat{i}-2\hat{j}-2\hat{k}\right)$, $\mu\in R$ is $9$, then $\alpha$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 6.** · Key from source paper

**Q250** JEE Main 2021 · 20 Jul · Shift 2 MCQ

The lines $x=ay-1=z-2$ and $x=3y-2=bz-2$, $(ab\neq 0)$ are coplanar, if:

(A) $b=1, a\in R-\{0\}$
(B) $a=1,\ b\in R-\{0\}$
(C) $a=2,\ b=2$
(D) $a=2,\ b=3$

**Answer: (A)** $b=1, a\in R-\{0\}$ · Key from source paper

**Q251** JEE Main 2021 · 20 Jul · Shift 2 MCQ

Consider the line $L$ given by the equation $\frac{x-3}{2}=\frac{y-1}{1}=\frac{z-2}{1}$. Let $Q$ be the mirror image of the point $(2,3,-1)$ with respect to $L$. Let a plane $P$ be such that it passes through $Q$, and the line $L$ is perpendicular to $P$. Then which of the following points is on the plane $P$?

(A) $(-1, 1, 2)$
(B) $(1, 1, 1)$
(C) $(1, 1, 2)$
(D) $(1, 2, 2)$

**Answer: (D)** $(1, 2, 2)$ · Key from source paper

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**Q252** JEE Main 2021 · 18 Mar · Shift 1 · Numerical

Let the plane $ax + by + cz + d = 0$ bisect the line joining the points $(4, -3, 1)$ and $(2, 3, -5)$ at the right angles. If $a$, $b$, $c$, $d$ are integers, then the minimum value of $\left(a^2 + b^2 + c^2 + d^2\right)$ is

Numerical value type: the answer is a number.

**Answer: 28.** · Key from source paper

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**Q253** JEE Main 2021 · 18 Mar · Shift 1 · Numerical

The equation of the planes parallel to the plane $x - 2y + 2z - 3 = 0$ which are at unit distance from the point $(1, 2, 3)$ is $ax + by + cz + d = 0$. If $(b - d) = K(c - a)$, then the positive value of $K$ is

Numerical value type: the answer is a number.

**Answer: 4.** · Key from source paper

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**Q254** JEE Main 2021 · 18 Mar · Shift 2 · Numerical

Let the mirror image of the point $(1, 3, a)$ with respect to the plane $\vec{r} \cdot \left(2\hat{i} - \hat{j} + \hat{k}\right) - b = 0$ be $(-3, 5, 2)$. Then the value of $|a + b|$ is equal to _____ .

Numerical value type: the answer is a number.

**Answer: 1.** · Key from source paper

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**Q255** JEE Main 2021 · 18 Mar · Shift 2 · Numerical

Let $P$ be a plane containing the line $\frac{x-1}{3} = \frac{y+6}{4} = \frac{z+5}{2}$ and parallel to the line $\frac{x-3}{4} = \frac{y-2}{-3} = \frac{z+5}{7}$. If the point $(1, -1, \alpha)$ lies on the plane $P$, then the value of $|5\alpha|$ is equal to _____ .

Numerical value type: the answer is a number.

**Answer: 38.** · Key from source paper

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**Q256** JEE Main 2021 · 17 Mar · Shift 1 · MCQ

The equation of the plane which contains the $y$-axis and passes through the point $(1, 2, 3)$ is:

(A) $x + 3z = 10$
(B) $x + 3z = 0$
(C) $3x + z = 6$
(D) $3x - z = 0$

**Answer: (D)** $3x - z = 0$ · Key from source paper

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**Q257** JEE Main 2021 · 17 Mar · Shift 1 Numerical

If the equation of the plane passing through the line of intersection of the planes $2x - 7y + 4z - 3 = 0, 3x - 5y + 4z + 11 = 0$ and the point $(-2, 1, 3)$ is $ax + by + cz - 7 = 0$, then the value of $2a + b + c - 7$ is _____.

Numerical value type: the answer is a number.

**Answer: 4.** · Key from source paper

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**Q258** JEE Main 2021 · 17 Mar · Shift 2 MCQ

If the equation of plane passing through the mirror image of a point $(2, 3, 1)$ with respect to line $\frac{x+1}{2} = \frac{y-3}{1} = \frac{z+2}{-1}$ and containing the line $\frac{x-2}{3} = \frac{1-y}{2} = \frac{z+1}{1}$ is $\alpha x + \beta y + \gamma z = 24$ then $\alpha + \beta + \gamma$ is equal to:

(A) 20
(B) 19
(C) 18
(D) 21

**Answer: (B)** 19 · Key from source paper

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**Q259** JEE Main 2021 · 17 Mar · Shift 2 Numerical

Let $P$ be an arbitrary point having sum of the squares of the distance from the planes $x + y + z = 0, lx - nz = 0$ and $x - 2y + z = 0$ equal to 9 units. If the locus of the point $P$ is $x^2 + y^2 + z^2 = 9$, then the value of $l - n$ is equal to

Numerical value type: the answer is a number.

**Answer: 0.** · Key from source paper

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**Q260** JEE Main 2021 · 16 Mar · Shift 1 MCQ

If for $a > 0$, the feet of perpendiculars from the points $A(a, -2a, 3)$ and $B(0, 4, 5)$ on the plane $lx + my + nz = 0$ are points $C(0, -a, -1)$ and $D$ respectively, then the length of line segment $CD$ is equal to :

(A) $\sqrt{31}$
(B) $\sqrt{41}$
(C) $\sqrt{55}$
(D) $\sqrt{66}$

**Answer: (D)** $\sqrt{66}$ · Key from source paper

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## Q261 JEE Main 2021 · 16 Mar · Shift 1 MCQ

Let the position vectors of two points $P$ and $Q$ be $3\hat{i}-\hat{j}+2\hat{k}$ and $\hat{i}+2\hat{j}-4\hat{k}$, respectively. Let $R$ and $S$ be two points such that the direction ratios of lines $PR$ and $QS$ are $(4,-1,2)$ and $(-2,1,-2)$, respectively. Let lines $PR$ and $QS$ intersect at $T$. If the vector $\overrightarrow{TA}$ is perpendicular to both $\overrightarrow{PR}$ and $\overrightarrow{QS}$ and the length of vector $\overrightarrow{TA}$ is $\sqrt{5}$ units, then the modulus of a position vector of $A$ is :

(A) $\sqrt{482}$
(B) $\sqrt{171}$
(C) $\sqrt{5}$
(D) $\sqrt{227}$

**Answer: (B)** $\sqrt{171}$ · Key from source paper

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## Q262 JEE Main 2021 · 16 Mar · Shift 1 MCQ

Let $P$ be a plane $lx+my+nz=0$ containing the line, $\frac{1-x}{1}=\frac{y+4}{2}=\frac{z+2}{3}$. If plane $P$ divides the line segment $AB$ joining points $A(-3,-6,1)$ and $B(2,4,-3)$ in ratio $k:1$ then the value of $k$ is equal to :

(A) 1.5
(B) 3
(C) 2
(D) 4

**Answer: (C)** 2 · Key from source paper

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## Q263 JEE Main 2021 · 16 Mar · Shift 2 MCQ

If $(x,y,z)$ be an arbitrary point lying on a plane $P$ which passes through the point $(42,0,0)$, $(0,42,0)$ and $(0,0,42)$, then the value of expression $3+\frac{x-11}{(y-19)^2(z-12)^2}+\frac{y-19}{(x-11)^2(z-12)^2}+\frac{z-12}{(x-11)^2(y-19)^2}-\frac{x+y+z}{14(x-11)(y-19)(z-12)}$ is

(A) 0
(B) 3
(C) 39
(D) $-45$

**Answer: (B)** 3 · Key from source paper

**Q264** JEE Main 2021 · 16 Mar · Shift 2 MCQ

If the foot of the perpendicular from point $(4, 3, 8)$ on the line $L_1 : \frac{x-a}{l} = \frac{y-2}{3} = \frac{z-b}{4}$, $l \neq 0$ is $(3, 5, 7)$, then the shortest distance between the line $L_1$ and line $L_2 : \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$ is equal to

(A) $\frac{1}{2}$
(B) $\frac{1}{\sqrt{6}}$
(C) $\sqrt{\frac{2}{3}}$
(D) $\frac{1}{\sqrt{3}}$

**Answer: (B)** $\frac{1}{\sqrt{6}}$ · Key from source paper

**Q265** JEE Main 2021 · 16 Mar · Shift 2 Numerical

If the distance of the point $(1, -2, 3)$ from the plane $x + 2y - 3z + 10 = 0$ measured parallel to the line, $\frac{x-1}{3} = \frac{2-y}{m} = \frac{z+3}{1}$ is $\sqrt{\frac{7}{2}}$, then the value of $|m|$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 2.** · Key from source paper

**Q266** JEE Main 2021 · 26 Feb · Shift 1 MCQ

Consider the three planes
$P_1 : 3x + 15y + 21z = 9$
$P_2 : x - 3y - z = 5$, and
$P_3 : 2x + 10y + 14z = 5$
Then, which one of the following is true?

(A) $P_2$ and $P_3$ are parallel.
(B) $P_1$, $P_2$ and $P_3$ all are parallel.
(C) $P_1$ and $P_2$ are parallel.
(D) $P_1$ and $P_3$ are parallel.

**Answer: (D)** $P_1$ and $P_3$ are parallel. · Key from source paper

**Q267** JEE Main 2021 · 26 Feb · Shift 1 Numerical

Let $(\lambda, 2, 1)$ be a point on the plane which passes through the point $(4, -2, 2)$. If the plane is perpendicular to the line joining the points $(-2, -21, 29)$ and $(-1, -16, 23)$, then $\left(\frac{\lambda}{11}\right)^2 - \frac{4\lambda}{11} - 4$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 8.** · Key from source paper

EdLoop JEE

**Q268** JEE Main 2021 · 26 Feb · Shift 2 MCQ

Let $L$ be a line obtained from the intersection of two planes $x + 2y + z = 6$ and $y + 2z = 4$. If point $P(\alpha, \beta, \gamma)$ is the foot of perpendicular from $(3, 2, 1)$ on $L$, then the value of $21(\alpha + \beta + \gamma)$ equals:

(A) $102$
(B) $142$
(C) $68$
(D) $136$

**Answer: (A)** $102$ · Key from source paper

**Q269** JEE Main 2021 · 26 Feb · Shift 2 MCQ

If the mirror image of the point $(1, 3, 5)$ with respect to the plane $4x - 5y + 2z = 8$ is $(\alpha, \beta, \gamma)$, then $5(\alpha + \beta + \gamma)$ equals :

(A) $43$
(B) $47$
(C) $41$
(D) $39$

**Answer: (B)** $47$ · Key from source paper

**Q270** JEE Main 2021 · 25 Feb · Shift 1 MCQ

Let $\alpha$ be the angle between the lines whose direction cosines satisfy the equations $l + m - n = 0$ and $l^2 + m^2 - n^2 = 0$. Then the value of $\sin^4\alpha + \cos^4\alpha$ is :

(A) $\frac{5}{8}$
(B) $\frac{1}{2}$
(C) $\frac{3}{8}$
(D) $\frac{3}{4}$

**Answer: (A)** $\frac{5}{8}$ · Key from source paper

**Q271** JEE Main 2021 · 25 Feb · Shift 1 MCQ

The equation of the line through the point $(0, 1, 2)$ and perpendicular to the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{-2}$ is :

(A) $\frac{x}{3} = \frac{y-1}{-4} = \frac{z-2}{3}$
(B) $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{3}$
(C) $\frac{x}{-3} = \frac{y-1}{4} = \frac{z-2}{3}$
(D) $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{-3}$

**Answer: (C)** $\frac{x}{-3} = \frac{y-1}{4} = \frac{z-2}{3}$ · Key from source paper

EdLoop JEE

**Q272** JEE Main 2021 · 25 Feb · Shift 2 MCQ

A plane passes through the points $A(1,2,3)$, $B(2,3,1)$ and $C(2,4,2)$. If $O$ is the origin and $P$ is $(2,-1,1)$, then the projection of $\overrightarrow{OP}$ on this plane is of length:

(A) $\sqrt{\frac{2}{5}}$

(B) $\sqrt{\frac{2}{7}}$

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

(D) $\sqrt{\frac{2}{11}}$

**Answer: (D)** $\sqrt{\frac{2}{11}}$ · Key from source paper

**Q273** JEE Main 2021 · 25 Feb · Shift 2 Numerical

A line $l$ passing through origin is perpendicular to the lines

$l_1 : \vec{r} = (3+t)\hat{i} + (-1+2t)\hat{j} + (4+2t)\hat{k}$

$l_2 : \vec{r} = (3+2s)\hat{i} + (3+2s)\hat{j} + (2+s)\hat{k}$

If the co-ordinates of the point in the first octant on $l_2$ at a distance of $\sqrt{17}$ from the point of intersection of $l$ and $l_1$ are $(a,b,c)$, then $18(a+b+c)$ is equal to _____.

Numerical value type: the answer is a number.

**Answer: 44.** · Key from source paper

**Q274** JEE Main 2021 · 24 Feb · Shift 1 MCQ

The distance of the point $1,1,9$ from the point of intersection of the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ and the plane $x+y+z=17$ is:

(A) $19\sqrt{2}$

(B) $2\sqrt{19}$

(C) $\sqrt{38}$

(D) $38$

**Answer: (C)** $\sqrt{38}$ · Key from source paper

**Q275** JEE Main 2021 · 24 Feb · Shift 1 MCQ

The equation of the plane passing through the point $1,\ 2,\ -3$ and perpendicular to the planes $3x+y-2z=5$ and $2x-5y-z=7$, is

(A) $11x+y+17z+38=0$

(B) $3x-10y-2z+11=0$

(C) $6x-5y+2z+10=0$

(D) $6x-5y-2z-2=0$

**Answer: (A)** $11x+y+17z+38=0$ · Key from source paper

**Q276** JEE Main 2021 · 24 Feb · Shift 2 MCQ

The vector equation of the plane passing through the intersection of the planes $\vec{r} \cdot \left(\hat{i} + \hat{j} + \hat{k}\right) = 1$ and $\vec{r} \cdot \left(\hat{i} - 2\hat{j}\right) = -2$, and the point $(1,\ 0,\ 2)$ is:

(A) $\vec{r} \cdot \left(\hat{i} + 7\hat{j} + 3\hat{k}\right) = 7$

(B) $\vec{r} \cdot \left(\hat{i} - 7\hat{j} + 3\hat{k}\right) = \frac{7}{3}$

(C) $\vec{r} \cdot \left(\hat{i} + 7\hat{j} + 3\hat{k}\right) = \frac{7}{3}$

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

**Answer: (A)** $\vec{r} \cdot \left(\hat{i} + 7\hat{j} + 3\hat{k}\right) = 7$ · Key from source paper

**Q277** JEE Main 2021 · 24 Feb · Shift 2 MCQ

Let $a, b \in R$. If the mirror image of the point $P(a, 6, 9)$ with respect to the line $\frac{x-3}{7} = \frac{y-2}{5} = \frac{z-1}{-9}$ is $(20,\ b,\ -a-9)$, then $|a+b|$ is equal to:

(A) $86$

(B) $90$

(C) $84$

(D) $88$

**Answer: (D)** $88$ · Key from source paper

**Q278** JEE Main 2021 · 24 Feb · Shift 2 Numerical

Let $\lambda$ be an integer. If the shortest distance between the lines $x - \lambda = 2y - 1 = -2z$ and $x = y + 2\lambda = z - \lambda$ is $\frac{\sqrt{7}}{2\sqrt{2}}$, then the value of $|\lambda|$ is _____.

Numerical value type: the answer is a number.

**Answer: 1.** · Key from source paper

**Q279** JEE Main 2020 · 6 Sep · Shift 1 MCQ

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

(A) $1$

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

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

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

**Answer: (B)** $\frac{1}{\sqrt{3}}$ · Key from source paper

**Q280** JEE Main 2020 · 6 Sep · Shift 2 MCQ

A plane P meets the coordinate axes at A, B and C respectively. The centroid of $\Delta$ ABC is given to be $(1, 1, 2)$. Then the equation of the line through this centroid and perpendicular to the plane P is :

(A) $\frac{x-1}{2} = \frac{y-1}{1} = \frac{z-2}{1}$
(B) $\frac{x-1}{1} = \frac{y-1}{1} = \frac{z-2}{2}$
(C) $\frac{x-1}{2} = \frac{y-1}{2} = \frac{z-2}{1}$
(D) $\frac{x-1}{1} = \frac{y-1}{2} = \frac{z-2}{2}$

**Answer: (C)** $\frac{x-1}{2} = \frac{y-1}{2} = \frac{z-2}{1}$ · Key from source paper

**Q281** JEE Main 2020 · 5 Sep · Shift 1 MCQ

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:

(A) 2
(B) $-1$
(C) 3
(D) 1

**Answer: (A)** 2 · Key from source paper

**Q282** JEE Main 2020 · 5 Sep · Shift 2 MCQ

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 :

(A) (10, 2, 2)
(B) (2, $-10$, $-2$)
(C) (10, $-2$, $-2$)
(D) ($-2$, 10, 2)

**Answer: (B)** (2, $-10$, $-2$) · Key from source paper

**Q283** JEE Main 2020 · 4 Sep · Shift 1 Numerical

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 _____

Numerical value type: the answer is a number.

**Answer: 3.** · Key from source paper

**Q284** JEE Main 2020 · 4 Sep · Shift 2 MCQ

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 :

(A) $\frac{7}{5}$
(B) 1
(C) $\frac{1}{7}$
(D) 7

**Answer: (B) 1** · Key from source paper

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**Q285** JEE Main 2020 · 3 Sep · Shift 1 MCQ

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

(A) $2x + y - z = 1$
(B) $x - y - 2z = 1$
(C) $x - 2y + z = 1$
(D) $x + 2y - z = 1$

**Answer: (A)** $2x + y - z = 1$ · Key from source paper

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**Q286** JEE Main 2020 · 3 Sep · Shift 1 MCQ

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

(A) Do not intersect for any values of $l$ and $m$
(B) Intersect for all values of $l$ and $m$
(C) Intersect when $l = 2$ and $m = \frac{1}{2}$
(D) Intersect when $l = 1$ and $m = 2$

**Answer: (A) Do not intersect for any values of $l$ and $m$** · Key from source paper

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**Q287** JEE Main 2020 · 3 Sep · Shift 2 MCQ

The plane which bisects the line joining the points $(4,\ -2,\ 3)$ and $(2,\ 4,\ -1)$ at right angles also passes through the point :

(A) $(0,\ -1,\ 1)$
(B) $(4,\ 0,\ -1)$
(C) $(4,\ 0,\ 1)$
(D) $(0,\ 1,\ -1)$

**Answer: (B)** $(4,\ 0,\ -1)$ · Key from source paper

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**Q288** JEE Main 2020 · 3 Sep · Shift 2 Numerical

Let a plane P contain two lines $\vec{r} = \hat{i} + \lambda(\hat{i} + \hat{j}),\ \lambda \in R$ 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 _____

Numerical value type: the answer is a number.

**Answer: 5.** · Key from source paper

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**Q289** JEE Main 2020 · 2 Sep · Shift 1 MCQ

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

(A) $(0, 6, -2)$
(B) $(-2, 0, 1)$
(C) $(0, -6, 2)$
(D) $(2, 0, -1)$

**Answer: (B)** $(-2, 0, 1)$ · Key from source paper

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**Q290** JEE Main 2020 · 2 Sep · Shift 2 MCQ

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 $(\alpha, -3, 5)$, then $\alpha$ is equal to

(A) $5$
(B) $-10$
(C) $10$
(D) $-5$

**Answer: (A)** $5$ · Key from source paper

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**Q291** JEE Main 2020 · 9 Jan · Shift 1 Numerical

The projection of the line segment joining the point $(1, -1, 3)$ and $(2, -4, 11)$ on the line joining the points $(-1, 2, 3)$ and $(3, -2, 10)$ is _____.

Numerical value type: the answer is a number.

**Answer: 8.** · Key from source paper

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**Q292** JEE Main 2020 · 9 Jan · Shift 2 Numerical

If the distance between the plane, $23x - 10y - 2z + 48 = 0$ and the plane containing the lines $\frac{x+1}{2} = \frac{y-3}{4} = \frac{z+1}{3}$ 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 _____.

Numerical value type: the answer is a number.

**Answer: 3.** · Key from source paper

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**Q293** JEE Main 2020 · 8 Jan · Shift 1 MCQ

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) $2\sqrt{30}$
(B) $\frac{7}{2}\sqrt{30}$
(C) $3\sqrt{30}$
(D) $3$

**Answer: (C)** $3\sqrt{30}$ · Key from source paper

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**Q294** JEE Main 2020 · 8 Jan · Shift 2 MCQ

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?

(A) $(1, 1, 1)$
(B) $(1, -1, 1)$
(C) $(-1, -1, 1)$
(D) $(-1, -1, -1)$

**Answer: (B)** $(1, -1, 1)$ · Key from source paper

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**Q295** JEE Main 2020 · 7 Jan · Shift 1 MCQ

Let $P$ be a plane passing 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

(A) $(6, 5, 2)$
(B) $(6, 5, -2)$
(C) $(4, 3, 2)$
(D) $(3, 4, -2)$

**Answer: (B)** $(6, 5, -2)$ · Key from source paper

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**Q296** JEE Main 2020 · 7 Jan · Shift 2 Numerical

If the foot of the perpendicular drawn from the point $(1, 0, 3)$ on a line passing through $(\alpha, 7, 1)$ is $\left(\frac{5}{3}, \frac{7}{3}, \frac{17}{3}\right)$, then $\alpha$ is equal to

Numerical value type: the answer is a number.

**Answer: 4.** · Key from source paper

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**Q297** JEE Main 2019 · 12 Apr · Shift 1 MCQ

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

(A) $2\sqrt{7}$
(B) $14$
(C) $2\sqrt{14}$
(D) $\sqrt{14}$

**Answer: (C)** $2\sqrt{14}$ · Key from source paper

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**Q298** JEE Main 2019 · 12 Apr · Shift 2 MCQ

A plane which bisects the angle between the two given planes $2x - y + 2z - 4 = 0$ and $x + 2y + 2z - 2 = 0$, passes through the point

(A) $(2,\ 4,\ 1)$
(B) $(1,\ -4,\ 1)$
(C) $(1,\ 4,\ -1)$
(D) $(2,\ -4,\ 1)$

**Answer: (D)** $(2,\ -4,\ 1)$ · Key from source paper

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**Q299** JEE Main 2019 · 12 Apr · Shift 2 MCQ

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

(A) $\frac{1}{3}$
(B) $3$
(C) $\sqrt{3}$
(D) $\frac{1}{\sqrt{3}}$

**Answer: (C)** $\sqrt{3}$ · Key from source paper

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**Q300** JEE Main 2019 · 10 Apr · Shift 1 MCQ

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

(A) $\frac{1}{\sqrt{30}}$
(B) $\frac{1}{6\sqrt{10}}$
(C) $\frac{1}{\sqrt{15}}$
(D) $\frac{1}{2\sqrt{15}}$

**Answer: (C)** $\frac{1}{\sqrt{15}}$ · Key from source paper

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**Q301** JEE Main 2019 · 10 Apr · Shift 1 MCQ

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 $\beta$ is equal to

(A) $2$
(B) $-1$
(C) $-2$
(D) $1$

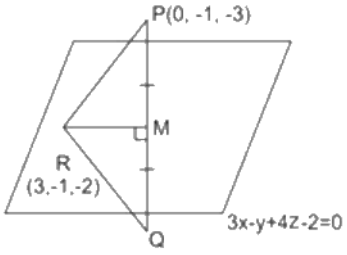
**Answer: (B)** $-1$ · Key from source paper

## Q302 JEE Main 2019 · 10 Apr · Shift 1 MCQ

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 $\Delta PQR$ is

*(see the figure above)*

**Q89.** 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 $\Delta PQR$ is




(1) $\frac{\sqrt{91}}{4}$
(2) $\frac{\sqrt{91}}{2}$
(3) $2\sqrt{13}$
(4) $\frac{\sqrt{65}}{2}$

(A) $\frac{\sqrt{91}}{4}$
(B) $\frac{\sqrt{91}}{2}$
(C) $2\sqrt{13}$
(D) $\frac{\sqrt{65}}{2}$

**Answer: (B)** $\frac{\sqrt{91}}{2}$ · Key from source paper

## Q303 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The distance of the point having position vector $-\hat{i}+2\hat{j}+6\hat{k}$ from the straight line passing through the point $2,\ 3,\ -4$ and parallel to the vector, $6\hat{i}+3\hat{j}-4\hat{k}$ is

(A) $4\sqrt{3}$
(B) $6$
(C) $2\sqrt{13}$
(D) $7$

**Answer: (D)** $7$ · Key from source paper

## Q304 JEE Main 2019 · 10 Apr · Shift 2 MCQ

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:

(A) $9$
(B) $15$
(C) $13$
(D) $5$

**Answer: (C)** $13$ · Key from source paper

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## Q305 JEE Main 2019 · 10 Apr · Shift 2 MCQ

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 coordinates of $Q$ are:

(A) $2,\ 0,\ 1$
(B) $-1,\ 0,\ 4$
(C) $4,\ 0,\ -1$
(D) $1,\ 0,\ 2$

**Answer: (A)** $2,\ 0,\ 1$ · Key from source paper

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## Q306 JEE Main 2019 · 9 Apr · Shift 1 MCQ

A plane passing though 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

(A) $(\sqrt{2}, -1, 4)$
(B) $(\sqrt{2}, 1, 4)$
(C) $(-\sqrt{2}, -1, -4)$
(D) $(-\sqrt{2}, 1, -4)$

**Answer: (B)** $(\sqrt{2}, 1, 4)$ · Key from source paper

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## Q307 JEE Main 2019 · 9 Apr · Shift 1 MCQ

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,

(A) $2\sqrt{5}$
(B) $\frac{9}{2}$
(C) $\frac{\sqrt{5}}{2}$
(D) $\frac{7}{2}$

**Answer: (B)** $\frac{9}{2}$ · Key from source paper

**Q308** JEE Main 2019 · 9 Apr · Shift 2 MCQ

If a unit vector $\vec{a}$ makes angles $\frac{\pi}{3}$ with $\hat{i}$, $\frac{\pi}{4}$ with $\hat{j}$ and $\theta \in (0, \pi)$ with $\hat{k}$, then a value of $\theta$ is:

(A) $\frac{5\pi}{6}$
(B) $\frac{5\pi}{12}$
(C) $\frac{\pi}{4}$
(D) $\frac{2\pi}{3}$

**Answer: (D)** $\frac{2\pi}{3}$ · Key from source paper

**Q309** JEE Main 2019 · 9 Apr · Shift 2 MCQ

The vertices $B$ and $C$ of a $\Delta ABC$ 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 the point $A(1, -1, 2)$, is

(A) 6
(B) $2\sqrt{34}$
(C) $\sqrt{34}$
(D) $5\sqrt{17}$

**Answer: (C)** $\sqrt{34}$ · Key from source paper

**Q310** JEE Main 2019 · 9 Apr · Shift 2 MCQ

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:

(A) $205\sqrt{5}$ units
(B) $\frac{17}{\sqrt{5}}$ units
(C) $\frac{11}{\sqrt{5}}$ units
(D) $63\sqrt{5}$ units

**Answer: (C)** $\frac{11}{\sqrt{5}}$ units · Key from source paper

**Q311** JEE Main 2019 · 8 Apr · Shift 1 MCQ

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

(A) greater than 3 but less than 4
(B) greater than 4
(C) less than 2
(D) greater than 2 but less than 3

**Answer: (A) greater than 3 but less than 4** · Key from source paper

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**Q312** JEE Main 2019 · 8 Apr · Shift 1 MCQ

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

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

**Answer: (C)** $x - y - z = 0$ · Key from source paper

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**Q313** JEE Main 2019 · 8 Apr · Shift 2 MCQ

The vector equation of the plane through the line of intersection of the planes $x + y + z = 1$ and $2x + 3y + 4z = 5$ which is perpendicular to the plane $x - y + z = 0$ is

(A) $\vec{r} \times \hat{i} + \hat{k} + 2 = 0$
(B) $\vec{r} \cdot \hat{i} - \hat{k} - 2 = 0$
(C) $\vec{r} \times \hat{i} - \hat{k} + 2 = 0$
(D) $\vec{r} \cdot \left(\hat{i} - \hat{k}\right) + 2 = 0$

**Answer: (D)** $\vec{r} \cdot \left(\hat{i} - \hat{k}\right) + 2 = 0$ · Key from source paper

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**Q314** JEE Main 2019 · 8 Apr · Shift 2 MCQ

If a point $R4, y, z$ lies on the line segment joining the points $P2, -3, 4$ and $Q8, 0, 10$, then the distance of $R$ from the origin is

(A) $2\sqrt{21}$
(B) $\sqrt{53}$
(C) 6
(D) $2\sqrt{14}$

**Answer: (D)** $2\sqrt{14}$ · Key from source paper

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**Q315** JEE Main 2019 · 12 Jan · Shift 1 MCQ

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

(A) $\cos^{-1}\left(\frac{7}{31}\right)$
(B) $\cos^{-1}\left(\frac{17}{31}\right)$
(C) $\cos^{-1}\left(\frac{19}{35}\right)$
(D) $\cos^{-1}\left(\frac{9}{35}\right)$

**Answer: (C)** $\cos^{-1}\left(\frac{19}{35}\right)$ · Key from source paper

## Q316 JEE Main 2019 · 12 Jan · Shift 1 MCQ

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

(A) $11\sqrt{6}$
(B) $\frac{11}{\sqrt{6}}$
(C) 11
(D) $6\sqrt{11}$

**Answer: (B)** $\frac{11}{\sqrt{6}}$ · Key from source paper

## Q317 JEE Main 2019 · 12 Jan · Shift 2 MCQ

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

(A) $\sqrt{\frac{5}{3}}$
(B) $\sqrt{\frac{3}{5}}$
(C) $-\frac{3}{5}$
(D) $-\frac{5}{3}$

**Answer: (A)** $\sqrt{\frac{5}{3}}$ · Key from source paper

## Q318 JEE Main 2019 · 12 Jan · Shift 2 MCQ

Let $S$ be the set of all real values of $\lambda$ 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 :

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

**Answer: (D)** $\{\sqrt{3},\ -\sqrt{3}\}$ · Key from source paper

**Q319** JEE Main 2019 · 11 Jan · Shift 1 MCQ

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?

(A) (2,2,0)
(B) (-2,2,2)
(C) (0,-2,2)
(D) (2,0,-2)

**Answer: (D)** (2,0,-2) · Key from source paper

**Q320** JEE Main 2019 · 11 Jan · Shift 1 MCQ

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; 2,-1,1 2, $\sqrt{2} - \sqrt{2}$ $\sqrt{2}, 1, -1$ $2\sqrt{3}, 1, -1$

(A) option 1 and 2
(B) option 2 and 3
(C) option 3 and 4
(D) all the options

**Answer: (B)** option 2 and 3 · Key from source paper

**Q321** JEE Main 2019 · 11 Jan · Shift 2 MCQ

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:

(A) (2,-4,-7)
(B) (2,4,7)
(C) (2,-4,7)
(D) (-2,4,7)

**Answer: (A)** (2,-4,-7) · Key from source paper

**Q322** JEE Main 2019 · 11 Jan · Shift 2 MCQ

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 :

(A) 12
(B) 7
(C) 5
(D) 17

**Answer: (B)** 7 · Key from source paper

**Q323** JEE Main 2019 · 10 Jan · Shift 1 MCQ

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 $\mu$ for which the vector $\overrightarrow{AB}$ is parallel to the plane $x - 4y + 3z = 1$ is

(A) $\frac{1}{2}$
(B) $\frac{1}{4}$
(C) $-\frac{1}{4}$
(D) $\frac{1}{8}$

**Answer: (B)** $\frac{1}{4}$ · Key from source paper

**Q324** JEE Main 2019 · 10 Jan · Shift 1 MCQ

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

(A) $(1,\ 1,\ -1)$
(B) $(-1,\ -1,\ -1)$
(C) $(-1,\ -1,\ 1)$
(D) $(1,\ 1,\ 1)$

**Answer: (D)** $(1,\ 1,\ 1)$ · Key from source paper

**Q325** JEE Main 2019 · 10 Jan · Shift 2 MCQ

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?

(A) $(2,\ 1,\ 3)$
(B) $(4,\ 1,\ -2)$
(C) $(4,\ -1,\ 7)$
(D) $(-2,\ 3,\ 5)$

**Answer: (B)** $(4,\ 1,\ -2)$ · Key from source paper

**Q326** JEE Main 2019 · 10 Jan · Shift 2 MCQ

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, $x + y + z = 2$?

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

**Answer: (B)** $\frac{x-1}{1}=\frac{y-3}{2}=\frac{z+4}{-5}$ · Key from source paper

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## Q327 JEE Main 2019 · 9 Jan · Shift 1 MCQ

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

(A) $3,3,-1$
(B) $-3,1,1$
(C) $3,2,1$
(D) $-3,0,-1$

**Answer: (C)** $3,2,1$ · Key from source paper

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## Q328 JEE Main 2019 · 9 Jan · Shift 1 MCQ

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

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

**Answer: (A)** $\frac{x+4}{3}=\frac{y-3}{-1}=\frac{z-1}{1}$ · Key from source paper

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## Q329 JEE Main 2019 · 9 Jan · Shift 2 MCQ

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

(A) $cc'+a+a'=0$
(B) $aa'+c+c'=0$
(C) $bb'+cc'+1=0$
(D) $ab'+bc'+1=0$

**Answer: (B)** $aa'+c+c'=0$ · Key from source paper

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**Q330** JEE Main 2019 · 9 Jan · Shift 2 MCQ

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:

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

**Answer: (C)** $x-2y+z=0$ · Key from source paper

**Q331** JEE Main 2018 · 16 Apr · Online MCQ

The sum of the intercepts on the coordinate axes of the plane passing through the point $(-2,-2,2)$ and containing the line joining the points $(1,-1,2)$ and $(1,1,1)$ is

(A) 4
(B) 12
(C) $-8$
(D) $-4$

**Answer: (D)** $-4$ · Key from source paper

**Q332** JEE Main 2018 · 16 Apr · Online MCQ

If the angle between the lines $\frac{x}{2}=\frac{y}{2}=\frac{z}{1}$ and $\frac{5-x}{-2}=\frac{7y-14}{P}=\frac{z-3}{4}$ is $\cos^{-1}\left(\frac{2}{3}\right)$, then $P$ is equal to

(A) $\frac{2}{7}$
(B) $\frac{7}{2}$
(C) $-\frac{4}{7}$
(D) $-\frac{7}{4}$

**Answer: (B)** $\frac{7}{2}$ · Key from source paper

**Q333** JEE Main 2018 · 15 Apr · Shift 1 MCQ

A variable plane passes through a fixed point $(3, 2, 1)$ and meets $x, y$ and $z$ axes at $A$, $B$ and $C$ respectively. A plane is drawn parallel to $yz$ - plane through $A$, a second plane is drawn parallel $zx$ plane through $B$ and a third plane is drawn parallel to $xy$ - plane through $C$. Then the locus of the point of intersection of these three planes, is

(A) $(x+y+z=6)$
(B) $\frac{x}{3}+\frac{y}{2}+\frac{z}{1}=1$
(C) $\frac{3}{x}+\frac{2}{y}+\frac{1}{z}=1$
(D) $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=\frac{11}{6}$

**Answer: (C)** $\frac{3}{x}+\frac{2}{y}+\frac{1}{z}=1$ · Key from source paper

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## Q334 JEE Main 2018 · 15 Apr · Shift 1 MCQ

An angle between the plane, $x+y+z=5$ and the line of intersection of the planes, $3x+4y+z-1=0$ and $5x+8y+2z+14=0$, is

(A) $\cos^{-1}\left(\frac{3}{\sqrt{17}}\right)$
(B) $\cos^{-1}\left(\sqrt{\frac{3}{17}}\right)$
(C) $\sin^{-1}\left(\frac{3}{\sqrt{17}}\right)$
(D) $\sin^{-1}\left(\sqrt{\frac{3}{17}}\right)$

**Answer: (D)** $\sin^{-1}\left(\sqrt{\frac{3}{17}}\right)$ · Key from source paper

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## Q335 JEE Main 2018 · 15 Apr · Shift 2 MCQ

An angle between the lines whose direction cosines are given by the equations, $l+3m+5n=0$ and $5lm-2mn+6nl=0$, is

(A) $\cos^{-1}\left(\frac{1}{8}\right)$
(B) $\cos^{-1}\left(\frac{1}{6}\right)$
(C) $\cos^{-1}\left(\frac{1}{3}\right)$
(D) $\cos^{-1}\left(\frac{1}{4}\right)$

**Answer: (B)** $\cos^{-1}\left(\frac{1}{6}\right)$ · Key from source paper

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## Q336 JEE Main 2018 · 15 Apr · Shift 2 MCQ

A plane bisects the line segment joining the points $(1,2,3)$ and $(-3,4,5)$ at right angles. Then this plane also passes through the point.

(A) $(-3,2,1)$
(B) $(3,2,1)$
(C) $(1,2,-3)$
(D) $(-1,2,3)$

**Answer: (A)** $(-3,2,1)$ · Key from source paper

**Q337** JEE Main 2018 · 8 Apr · Offline MCQ

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

(A) $\frac{1}{\sqrt{2}}$
(B) $\frac{1}{4\sqrt{2}}$
(C) $\frac{1}{3\sqrt{2}}$
(D) $\frac{1}{2\sqrt{2}}$

**Answer: (C)** $\frac{1}{3\sqrt{2}}$ · Key from source paper

**Q338** JEE Main 2018 · 8 Apr · Offline MCQ

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

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

**Answer: (A)** $\sqrt{\frac{2}{3}}$ · Key from source paper

**Q339** JEE Main 2017 · 9 Apr · Online MCQ

If the line, $\frac{x-3}{1} = \frac{y+2}{-1} = \frac{z+\lambda}{-2}$ lies in the plane, $2x - 4y + 3z = 2$ , then the shortest distance between this line and the line, $\frac{x-1}{12} = \frac{y}{9} = \frac{z}{4}$ is

(A) 1
(B) 2
(C) 3
(D) 0

**Answer: (D)** 0 · Key from source paper

**Q340** JEE Main 2017 · 9 Apr · Online MCQ

If a variable plane, at a distance of 3 units from the origin, intersects the coordinate axes at $A$, $B$ & $C$, then locus of the centroid of $\Delta ABC$ is

(A) $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=1$
(B) $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=3$
(C) $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=9$
(D) $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=\frac{1}{9}$

**Answer: (A)** $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=1$ · Key from source paper

## Q341 JEE Main 2017 · 8 Apr · Online MCQ

The coordinates of the foot of the perpendicular from the point $(1,-2,1)$ on the plane containing the lines $\frac{x+1}{6}=\frac{y-1}{7}=\frac{z-3}{8}$ and $\frac{x-1}{3}=\frac{y-2}{5}=\frac{z-3}{7}$, is:

(A) $(2,\ -4,\ 2)$
(B) $(1,\ 1,\ 1)$
(C) $(0,\ 0,\ 0)$
(D) $(-1,\ 2,\ -1)$

**Answer: (C)** $(0,\ 0,\ 0)$ · Key from source paper

## Q342 JEE Main 2017 · 8 Apr · Online MCQ

The line of intersection of the planes $\vec{r}\cdot\left(3\hat{i}-\hat{j}+\hat{k}\right)=1$ and $\vec{r}\cdot\left(\hat{i}+4\hat{j}-2\hat{k}\right)=2$, is,

(A) $\frac{x-\frac{6}{13}}{2}=\frac{y-\frac{5}{13}}{7}=\frac{z}{-13}$
(B) $\frac{x-\frac{4}{7}}{2}=\frac{y}{-7}=\frac{z+\frac{5}{7}}{13}$
(C) $\frac{x-\frac{6}{13}}{2}=\frac{y-\frac{5}{13}}{-7}=\frac{z}{-13}$
(D) $\frac{x-\frac{4}{7}}{-2}=\frac{y}{7}=\frac{z-\frac{5}{7}}{13}$

**Answer: (C)** $\frac{x-\frac{6}{13}}{2}=\frac{y-\frac{5}{13}}{-7}=\frac{z}{-13}$ · Key from source paper

## Q343 JEE Main 2017 · 2 Apr · Offline MCQ

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:

(A) $3\sqrt{5}$
(B) $2\sqrt{42}$
(C) $\sqrt{42}$
(D) $6\sqrt{5}$

**Answer: (B)** $2\sqrt{42}$ · Key from source paper

## Q344 JEE Main 2017 · 2 Apr · Offline MCQ

The distance of the point $(1,\ 3,\ -7)$ from the plane passing through the point $(1,\ -1,\ -1)$, having normal perpendicular to both the lines $\frac{x-1}{1}=\frac{y+2}{-2}=\frac{z-4}{3}$ and $\frac{x-2}{2}=\frac{y+1}{-1}=\frac{z+7}{-1}$, is:

(A) $\frac{20}{\sqrt{74}}$
(B) $\frac{10}{\sqrt{83}}$
(C) $\frac{5}{\sqrt{83}}$
(D) $\frac{10}{\sqrt{74}}$

**Answer: (B)** $\frac{10}{\sqrt{83}}$ · Key from source paper

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## Q345 JEE Main 2016 · 10 Apr · Online MCQ

The number of distinct real values of $\lambda$, for which the lines $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z+3}{\lambda^2}$ and $\frac{x-3}{1}=\frac{y-2}{\lambda^2}=\frac{z-1}{2}$, are coplanar is

(A) $2$
(B) $4$
(C) $3$
(D) $1$

**Answer: (C)** $3$ · Key from source paper

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## Q346 JEE Main 2016 · 10 Apr · Online MCQ

$ABC$ is a triangle in a plane with vertices $A(2,\ 3,\ 5)$, $B(-1,\ 3,\ 2)$ and $C(\lambda,\ 5,\ \mu)$. If the median through $A$ is equally inclined to the coordinate axes, then the value of $\left(\lambda^3+\mu^3+5\right)$ is

(A) $1130$
(B) $1348$
(C) $1077$
(D) $676$

**Answer: (B)** $1348$ · Key from source paper

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## Q347 JEE Main 2016 · 9 Apr · Online MCQ

The shortest distance between the lines $\frac{x}{2}=\frac{y}{2}=\frac{z}{1}$ and $\frac{x+2}{-1}=\frac{y-4}{8}=\frac{z-5}{4}$, lies in the interval:

(A) $(3,4]$
(B) $(2,3]$
(C) $[1,2)$
(D) $[0,1)$

**Answer: (B)** $(2,3]$ · Key from source paper

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## Q348 JEE Main 2016 · 9 Apr · Online MCQ

The distance of the point $(1,\ -2,\ 4)$ from the plane passing through the point $(1,\ 2,\ 2)$ and perpendicular to the planes $x-y+2z=3$ and $2x-2y+z+12=0$, is :

(A) $2$
(B) $\sqrt{2}$
(C) $2\sqrt{2}$
(D) $\frac{1}{\sqrt{2}}$

**Answer: (C)** $2\sqrt{2}$ · Key from source paper

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**Q349** JEE Main 2016 · 3 Apr · Offline MCQ

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

(A) $5$
(B) $2$
(C) $26$
(D) $18$

**Answer: (B)** $2$ · Key from source paper

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**Q350** JEE Main 2016 · 3 Apr · Offline MCQ

The distance of the point $(1, -5, 9)$ from the plane $x - y + z = 5$ measured along the line $x = y = z$ is

(A) $\frac{10}{\sqrt{3}}$
(B) $\frac{20}{3}$
(C) $3\sqrt{10}$
(D) $10\sqrt{3}$

**Answer: (D)** $10\sqrt{3}$ · Key from source paper

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**Q351** JEE Main 2015 · 11 Apr · Online MCQ

A plane containing the point $(3, 2, 0)$ and the line $\frac{x-1}{1} = \frac{y-2}{5} = \frac{z-3}{4}$ also contains the point

(A) $(0,\ 7,\ -10)$
(B) $(0,\ 7,\ 10)$
(C) $(0,\ 3,\ 1)$
(D) $(0,\ -3,\ 1)$

**Answer: (B)** $(0,\ 7,\ 10)$ · Key from source paper

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**Q352** JEE Main 2015 · 11 Apr · Online MCQ

The shortest distance between the $z$ - axis and the line $x + y + 2z - 3 = 0 = 2x + 3y + 4z - 4$, is

(A) 1
(B) 2
(C) 3
(D) 4

**Answer: (B) 2** · Key from source paper

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**Q353** JEE Main 2015 · 10 Apr · Online MCQ

If the points $(1,\ 1,\ \lambda)$ & $(-3,\ 0,\ 1)$, are equidistant from the plane, $3x + 4y - 12z + 13 = 0$, then $\lambda$ satisfies the equation:

(A) $3x^2 + 10x + 7 = 0$
(B) $3x^2 + 10x - 13 = 0$
(C) $3x^2 - 10x + 7 = 0$
(D) $3x^2 - 10x + 21 = 0$

**Answer: (C)** $3x^2 - 10x + 7 = 0$ · Key from source paper

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**Q354** JEE Main 2015 · 10 Apr · Online MCQ

If the shortest distance between the line $\frac{x-1}{\alpha} = \frac{y+1}{-1} = \frac{z}{1}$, $(\alpha \neq -1)$ , and $x + y + z + 1 = 0 = 2x - y + z + 3$ is $\frac{1}{\sqrt{3}}$,then value of $\alpha$ is :

(A) $-\frac{19}{16}$
(B) $\frac{32}{19}$
(C) $-\frac{16}{19}$
(D) $\frac{19}{32}$

**Answer: (B)** $\frac{32}{19}$ · Key from source paper

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**Q355** JEE Main 2015 · 4 Apr · Offline MCQ

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

(A) $13$
(B) $2\sqrt{14}$
(C) $8$
(D) $3\sqrt{21}$

**Answer: (A)** $13$ · Key from source paper

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**Q356** JEE Main 2015 · 4 Apr · Offline MCQ

The equation of the plane containing the line of intersection of $2x - 5y + z = 3$; $x + y + 4z = 5$, and parallel to the plane, $x + 3y + 6z = 1$, is

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

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

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

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

**Answer: (D)** $x + 3y + 6z = 7$ · Key from source paper

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## Q357 JEE Main 2014 · 19 Apr · Online MCQ

If the angle between the line $2(x+1) = y = z + 4$ and the plane $2x - y + \sqrt{\lambda}z + 4 = 0$ is $\frac{\pi}{6}$, then the value of $\lambda$ is

(A) $\frac{45}{7}$

(B) $\frac{135}{11}$

(C) $\frac{135}{7}$

(D) $\frac{45}{11}$

**Answer: (A)** $\frac{45}{7}$ · Key from source paper

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## Q358 JEE Main 2014 · 19 Apr · Online MCQ

Equation of the line of the shortest distance between the lines $\frac{x}{1} = \frac{y}{-1} = \frac{z}{1}$ and $\frac{x-1}{0} = \frac{y+1}{-2} = \frac{z}{1}$ is

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

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

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

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

**Answer: (C)** $\frac{x-1}{1} = \frac{y+1}{-1} = \frac{z}{-2}$ · Key from source paper

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## Q359 JEE Main 2014 · 12 Apr · Online MCQ

A symmetrical form of the line of intersection of the planes $x = ay + b$ and $z = cy + d$ is

(A) $\frac{x-b}{a} = \frac{y-1}{1} = \frac{z-d}{c}$

(B) $\frac{x-b-a}{a} = \frac{y-1}{1} = \frac{z-d-c}{c}$

(C) $\frac{\mathrm{x}-\mathrm{a}}{\mathrm{b}} = \frac{\mathrm{y}-0}{1} = \frac{\mathrm{z}-\mathrm{c}}{\mathrm{d}}$

(D) $\frac{\mathrm{x}-\mathrm{b}-\mathrm{a}}{\mathrm{b}} = \frac{\mathrm{y}-1}{0} = \frac{\mathrm{z}-\mathrm{d}-\mathrm{c}}{\mathrm{d}}$

**Answer: (B)** $\frac{x-b-a}{a} = \frac{y-1}{1} = \frac{z-d-c}{c}$ · Key from source paper

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## Q360 JEE Main 2014 · 12 Apr · Online MCQ

If the distance between planes, $4x - 2y - 4z + 1 = 0$ and $4x - 2y - 4z + d = 0$ is $7$ , then $d$ is:

(A) $41$ or $-42$

(B) $42$ or $-43$

(C) $-41$ or $43$

(D) $-42$ or $44$

**Answer: (C)** $-41$ or $43$ · Key from source paper

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## Q361 JEE Main 2014 · 11 Apr · Online MCQ

Let $\mathrm{A}(2,3,5), \mathrm{B}(-1,3,2)$ and $\mathrm{C}(\lambda,5,\mu)$ be the vertices of a $\triangle\mathrm{ABC}$. If the median through A is equally inclined to the coordinate axes, then:

(A) $5\lambda - 8\mu = 0$

(B) $8\lambda - 5\mu = 0$

(C) $10\lambda - 7\mu = 0$

(D) $7\lambda - 10\mu = 0$

**Answer: (C)** $10\lambda - 7\mu = 0$ · Key from source paper

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## Q362 JEE Main 2014 · 11 Apr · Online MCQ

The plane containing the line $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ and parallel to the line $\frac{x}{1} = \frac{y}{1} = \frac{z}{4}$ passes through the point:

(A) $(1,-2,5)$

(B) $(1,0,5)$

(C) $(0,3,-5)$

(D) $(-1,-3,0)$

**Answer: (B)** $(1,0,5)$ · Key from source paper

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## Q363 JEE Main 2014 · 9 Apr · Online MCQ

Equation of the plane which passes through the point of intersection of lines $\frac{x-1}{3} = \frac{y-2}{1} = \frac{z-3}{2}$ and $\frac{x-3}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ and has the largest distance from the origin is:

(A) $4x + 3y + 5z = 50$

(B) $3x + 4y + 5z = 49$

(C) $5x + 4y + 3z = 57$

(D) $7x + 2y + 4z = 54$

**Answer: (A)** $4x + 3y + 5z = 50$ · Key from source paper

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## Q364 JEE Main 2014 · 9 Apr · Online MCQ

A line in the 3-dimensional space makes an angle $\theta\left(0 < \theta \leq \frac{\pi}{2}\right)$ with both the $X$ and $Y$-axes. Then, the set of all values of $\theta$ is in the interval :

(A) $\left(\frac{\pi}{3}, \frac{\pi}{2}\right]$
(B) $\left(0, \frac{\pi}{4}\right]$
(C) $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$
(D) $\left[\frac{\pi}{6}, \frac{\pi}{3}\right]$

**Answer: (C)** $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$ · Key from source paper

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## Q365 JEE Main 2014 · 6 Apr · Offline MCQ

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

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

**Answer: (C)** $\frac{x+3}{3} = \frac{y-5}{1} = \frac{z-2}{-5}$ · Key from source paper

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## Q366 JEE Main 2014 · 6 Apr · Offline MCQ

The angle between the lines whose direction cosines satisfy the equations $l + m + n = 0$ and $l^2 = m^2 + n^2$ is

(A) $\frac{\pi}{6}$
(B) $\frac{\pi}{2}$
(C) $\frac{\pi}{3}$
(D) $\frac{\pi}{4}$

**Answer: (C)** $\frac{\pi}{3}$ · Key from source paper

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## Q367 JEE Main 2013 · 25 Apr · Online MCQ

Let ABC be a triangle with vertices at points A $(2, 3, 5)$, B $(-1, 3, 2)$ and C$(\lambda, 5, \mu)$ in three dimensional space. If the median through A is equally inclined with the axes, then $(\lambda, \mu)$ is equal to:

(A) $(10, 7)$
(B) $(7, 5)$
(C) $(7, 10)$
(D) $(5, 7)$

**Answer: (C)** $(7, 10)$ · Key from source paper

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## Q368 JEE Main 2013 · 25 Apr · Online MCQ

The equation of a plane through the line of intersection of the planes $x + 2y = 3, y - 2z + 1 = 0$, and perpendicular to the first plane is :

(A) $2x - y - 10z = 9$
(B) $2x - y + 7z = 11$
(C) $2x - y + 10z = 11$
(D) $2x - y - 9z = 10$

**Answer: (C)** $2x - y + 10z = 11$ · Key from source paper

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## Q369 JEE Main 2013 · 23 Apr · Online MCQ

If two lines $L_1$ and $L_2$ in space, are defined by
$L_1 = \{x = \sqrt{\lambda}y + (\sqrt{\lambda} - 1)$,
$z = (\sqrt{\lambda} - 1)y + \sqrt{\lambda}\}$ and
$L_2 = \{x = \sqrt{\mu}y + (1 - \sqrt{\mu})$,
$z = (1 - \sqrt{\mu})y + \sqrt{\mu}\}$
then $L_1$ is perpendicular to $L_2$, for all nonnegative reals $\lambda$ and $\mu$, such that :

(A) $\sqrt{\lambda} + \sqrt{\mu} = 1$
(B) $\lambda \neq \mu$
(C) $\lambda + \mu = 0$
(D) $\lambda = \mu$

**Answer: (C)** $\lambda + \mu = 0$ · Checked by our team

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## Q370 JEE Main 2013 · 23 Apr · Online MCQ

If the projections of a line segment on the $x, y$ and $z$-axes in 3-dimensional space are 2, 3 and 6 respectively, then the length of the line segment is :

(A) 12
(B) 7
(C) 9
(D) 6

**Answer: (B)** 7 · Key from source paper

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## Q371 JEE Main 2013 · 22 Apr · Online MCQ

The acute angle between two lines such that the direction cosines $l, m, n$, of each of them satisfy the equations $l + m + n = 0$ and $l^2 + m^2 - n^2 = 0$ is :

(A) $15^\circ$
(B) $30^\circ$
(C) $60^\circ$
(D) $45^\circ$

**Answer: (C)** $60^\circ$ · Key from source paper

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**Q372** JEE Main 2013 · 22 Apr · Online MCQ

Let Q be the foot of perpendicular from the origin to the plane $4x - 3y + z + 13 = 0$ and $R$ be a point $(-1, 1, -6)$ on the plane. Then length $QR$ is :

(A) $\sqrt{14}$
(B) $\sqrt{\frac{19}{2}}$
(C) $3\sqrt{\frac{7}{2}}$
(D) $\frac{3}{\sqrt{2}}$

**Answer: (C)** $3\sqrt{\frac{7}{2}}$ · Key from source paper

**Q373** JEE Main 2013 · 9 Apr · Online MCQ

A vector $\vec{n}$ is inclined to $x$-axis at $45^\circ$, to $y$-axis at $60^\circ$ and at an acute angle to $z$-axis. If $\vec{n}$ is a normal to a plane passing through the point $(\sqrt{2}, -1, 1)$ then the equation of the plane is :

(A) $4\sqrt{2}x + 7y + z = 2$
(B) $2x + y + 2z = 2\sqrt{2} + 1$
(C) $3\sqrt{2}x - 4y - 3z = 7$
(D) $\sqrt{2}x + y + z = 2$

**Answer: (D)** $\sqrt{2}x + y + z = 2$ · Checked by our team

**Q374** JEE Main 2013 · 9 Apr · Online MCQ

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

(A) $\frac{11}{2}$
(B) $-\frac{11}{2}$
(C) $\frac{9}{2}$
(D) $-\frac{9}{2}$

**Answer: (A)** $\frac{11}{2}$ · Key from source paper

**Q375** JEE Main 2013 · 7 Apr · Offline MCQ

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

(A) exactly two values.
(B) exactly three values.
(C) any value.
(D) exactly one value.

**Answer: (A) exactly two values.** · Key from source paper

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**Q376** JEE Main 2013 · 7 Apr · Offline MCQ

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

(A) $\frac{7}{2}$
(B) $\frac{9}{2}$
(C) $\frac{3}{2}$
(D) $\frac{5}{2}$

**Answer: (A)** $\frac{7}{2}$ · Key from source paper

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**Q377** AIEEE 2012 · 26 May · Online MCQ

The distance of the point $-\hat{i} + 2\hat{j} + 6\hat{k}$ from the straight line that passes through the point $2\hat{i} + 3\hat{j} - 4\hat{k}$ and is parallel to the vector $6\hat{i} + 3\hat{j} - 4\hat{k}$ is

(A) 9
(B) 8
(C) 7
(D) 10

**Answer: (C) 7** · Key from source paper

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**Q378** AIEEE 2012 · 26 May · Online MCQ

Consider the following planes
$P : x + y - 2z + 7 = 0$
$Q : x + y + 2z + 2 = 0$
$R : 3x + 3y - 6z - 11 = 0$

(A) $P$ and $R$ are perpendicular
(B) $Q$ and $R$ are perpendicular
(C) $P$ and $Q$ are parallel
(D) $P$ and $R$ are parallel

**Answer: (D)** $P$ and $R$ are parallel · Key from source paper

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**Q379** AIEEE 2012 · 26 May · Online MCQ

The equation of a plane containing the line $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ and the point $(0, 7, -7)$ is

(A) $x+y+z=0$
(B) $x+2y+z=21$
(C) $3x-2y+5z+35=0$
(D) $3x+2y+5z+21=0$

**Answer: (A)** $x+y+z=0$ · Key from source paper

## Q380 AIEEE 2012 · 19 May · Online MCQ

If the three planes $x=5, 2x-5ay+3z-2=0$ and $3bx+y-3z=0$ contain a common line, then $(a,b)$ is equal to

(A) $\left(\frac{8}{15},-\frac{1}{5}\right)$
(B) $\left(\frac{1}{5},-\frac{8}{15}\right)$
(C) $\left(-\frac{8}{15},\frac{1}{5}\right)$
(D) $\left(-\frac{1}{5},\frac{8}{15}\right)$

**Answer: (B)** $\left(\frac{1}{5},-\frac{8}{15}\right)$ · Key from source paper

## Q381 AIEEE 2012 · 19 May · Online MCQ

Statement 1: The shortest distance between the lines $\frac{x}{2}=\frac{y}{-1}=\frac{z}{2}$ and $\frac{x-1}{4}=\frac{y-1}{-2}=\frac{z-1}{4}$ is $\sqrt{2}$.
Statement 2: The shortest distance between two parallel lines is the perpendicular distance from any point on one of the lines to the other line.

(A) Statement 1 is true, Statement 2 is false.
(B) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1.
(C) Statement 1 is false, Statement 2 is true.
(D) Statement 1 is true, Statement 2 is true, , Statement 2 is not a correct explanation for Statement 1.

**Answer: (B) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1.** · Checked by our team

## Q382 AIEEE 2012 · 12 May · Online MCQ

The coordinates of the foot perpendicular from the point $(1,0,0)$ to the line

$$\frac{x-1}{2}=\frac{y+1}{-3}=\frac{z+10}{8}$$

are

(A) $(2, -3, 8)$
(B) $(1, -1, -10)$
(C) $(5, -8, -4)$
(D) $(3, -4, -2)$

**Answer: (D)** $(3, -4, -2)$ · Key from source paper

## Q383 AIEEE 2012 · 7 May · Online MCQ

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

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

**Answer: (C)** $\sqrt{3}$ · Key from source paper

## Q384 AIEEE 2012 · Offline MCQ

An equation of a plane parallel to the plane $x - 2y + 2z - 5 = 0$ and at a unit distance from the origin is

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

**Answer: (A)** $x - 2y + 2z - 3 = 0$ · Key from source paper

## Q385 AIEEE 2012 · Offline MCQ

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

(A) $-1$
(B) $\frac{2}{9}$
(C) $\frac{9}{2}$
(D) $0$

**Answer: (C)** $\frac{9}{2}$ · Key from source paper

## Q386 AIEEE 2011 MCQ

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

(A) $\frac{3}{2}$
(B) $\frac{2}{5}$
(C) $\frac{5}{3}$
(D) $\frac{2}{3}$

**Answer: (D)** $\frac{2}{3}$ · Key from source paper

## Q387 AIEEE 2011 MCQ

This question has Statement $-1$ and Statement $-2$. Of the four choices given after the statements, choose the one that best describes the two statements. Statement-1 : The point $A(1,0,7)$ is the mirror image of the point $B(1,6,3)$ in the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$. Statement-2 : The line: $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$ bisects the line segment joining $A(1,0,7)$ and $B(1,6,3)$.

(A) Statement $-1$ is true, Statement-2 is true; Statement $-2$ is not a correct explanation for Statement $-1$
(B) Statement $-1$ is true, Statement $-2$ is false.
(C) Statement $-1$ is false, Statement $-2$ is true.
(D) Statement $-1$ is true, Statement $-2$ is true; Statement $-2$ is a correct explanation for Statement $-1$

**Answer: (A) Statement $-1$ is true, Statement-2 is true; Statement $-2$ is not a correct explanation for Statement $-1$** · Key from source paper

## Q388 AIEEE 2010 MCQ

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 $B(1,3,4)$.

(A) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for Statement-1
(B) Statement-1 is true, Statement-2 is false
(C) Statement-1 is false, Statement-2 is true
(D) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation for Statement-1

**Answer: (A) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for Statement-1** · Key from source paper

## Q389 AIEEE 2010 MCQ

A line $AB$ in three-dimensional space makes angles $45^\circ$ and $120^\circ$ with the positive $x$-axis and the positive $y$-axis respectively. If $AB$ makes an acute angle $\theta$ with the positive $z$-axis, then $\theta$ equals

(A) $45^\circ$
(B) $60^\circ$
(C) $75^\circ$
(D) $30^\circ$

**Answer: (B)** $60^\circ$ · Key from source paper

## Q390 AIEEE 2009 MCQ

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 $(\alpha, \beta)$ equals

(A) $(6, -17)$
(B) $(-6, 7)$
(C) $(5, -15)$
(D) $(-5, 15)$

**Answer: (B)** $(-6, 7)$ · Key from source paper

## Q391 AIEEE 2009 MCQ

The projections of a vector on the three coordinate axis are 6, $-3$, 2 respectively. The direction cosines of the vector are

(A) 6, $-3$, 2
(B) $\frac{6}{5}, -\frac{3}{5}, \frac{2}{5}$
(C) $\frac{6}{7}, -\frac{3}{7}, \frac{2}{7}$
(D) $-\frac{6}{7}, -\frac{3}{7}, \frac{2}{7}$

**Answer: (C)** $\frac{6}{7}, -\frac{3}{7}, \frac{2}{7}$ · Key from source paper

## Q392 AIEEE 2008 MCQ

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

(A) $a = 2, b = 8$
(B) $a = 4, b = 6$
(C) $a = 6, b = 4$
(D) $a = 8, b = 2$

**Answer: (C)** $a = 6, b = 4$ · Key from source paper

## Q393 AIEEE 2008 MCQ

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

(A) $-5$
(B) 5
(C) 2
(D) $-2$

**Answer: (A)** $-5$ · Key from source paper

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## Q394 AIEEE 2007 MCQ

Let $L$ be the line of intersection of the planes $2x+3y+z=1$ and $x+3y+2z=2$. If $L$ makes an angles $\alpha$ with the positive $x$-axis, then $\cos\alpha$ equals

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

**Answer: (A)** $\frac{1}{\sqrt{3}}$ · Key from source paper

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## Q395 AIEEE 2007 MCQ

If a line makes an angle of $\frac{\pi}{4}$ with the positive directions of each of $x$-axis and $y$-axis, then the angle that the line makes with the positive direction of the $z-$axis is

(A) $\frac{\pi}{6}$
(B) $\frac{\pi}{3}$
(C) $\frac{\pi}{4}$
(D) $\frac{\pi}{2}$

**Answer: (D)** $\frac{\pi}{2}$ · Key from source paper

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## Q396 AIEEE 2007 MCQ

If $(2,3,5)$ is one end of a diameter of the sphere $x^2+y^2+z^2-6x-12y-2z+20=0$, then the coordinates of the other end of the diameter are

(A) $(4,9,-3)$
(B) $(4,-3,3)$
(C) $(4,3,5)$
(D) $(4,3,-3)$

**Answer: (A)** $(4,9,-3)$ · Key from source paper

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## Q397 AIEEE 2006 MCQ

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

(A) $aa' + cc' = -1$
(B) $aa' + cc' = 1$
(C) $\frac{a}{a'} + \frac{c}{c'} = -1$
(D) $\frac{a}{a'} + \frac{c}{c'} = 1$

**Answer: (A)** $aa' + cc' = -1$ · Key from source paper

## Q398 AIEEE 2006 MCQ

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

(A) $\left(-\frac{17}{3}, -\frac{19}{3}, 4\right)$
(B) $(15, 11, 4)$
(C) $\left(-\frac{17}{3}, -\frac{19}{3}, 1\right)$
(D) none of these

**Answer: (D) none of these** · Key from source paper

## Q399 AIEEE 2005 MCQ

If the 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 $\lambda$ is

(A) $\frac{5}{3}$
(B) $\frac{-3}{5}$
(C) $\frac{3}{4}$
(D) $\frac{-4}{3}$

**Answer: (A)** $\frac{5}{3}$ · Key from source paper

## Q400 AIEEE 2005 MCQ

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

(A) $0^\circ$
(B) $90^\circ$
(C) $45^\circ$
(D) $30^\circ$

**Answer: (B)** $90^\circ$ · Key from source paper

## Q401 AIEEE 2005 MCQ

If the plane $2ax - 3ay + 4az + 6 = 0$ passes through the midpoint of the line joining the centres 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 a equals

(A) -1
(B) $1$
(C) -2
(D) $2$

**Answer: (C)** -2 · Key from source paper

## Q402 AIEEE 2005 MCQ

The distance between the line $\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and the plane $\vec{r} \cdot (\hat{i} + 5\hat{j} + \hat{k}) = 5$ is

(A) $\frac{10}{9}$
(B) $\frac{10}{3\sqrt{3}}$
(C) $\frac{3}{10}$
(D) $\frac{10}{3}$

**Answer: (B)** $\frac{10}{3\sqrt{3}}$ · Key from source paper

## Q403 AIEEE 2005 MCQ

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

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

**Answer: (B)** $1$ · Key from source paper

## Q404 AIEEE 2004 MCQ

A line makes the same angle $\theta$, with each of the $x$ and $z$ axis. If the angle $\beta$, which it makes with $y$-axis, is such that $\sin^2\beta = 3\sin^2\theta$, then $\cos^2\theta$ equals

(A) $\frac{2}{3}$
(B) $\frac{1}{5}$
(C) $\frac{3}{5}$
(D) $\frac{2}{5}$

**Answer: (C)** $\frac{3}{5}$ · Key from source paper

## Q405 AIEEE 2004 MCQ

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 co-planar then $\lambda$ equals

(A) $-2$
(B) $-1$
(C) $-\frac{1}{2}$
(D) $0$

**Answer: (A)** $-2$ · Key from source paper

## Q406 AIEEE 2004 MCQ

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

(A) $\frac{3}{2}$
(B) $\frac{5}{2}$
(C) $\frac{7}{2}$
(D) $\frac{9}{2}$

**Answer: (C)** $\frac{7}{2}$ · Key from source paper

## Q407 AIEEE 2004 MCQ

A line with direction cosines proportional to $2, 1, 2$ meets each of the lines $x = y + a = z$ and $x + a = 2y = 2z$. The co-ordinates of each of the point of intersection are given by

(A) $(3a, 3a, 3a), (a, a, a)$
(B) $(3a, 2a, 3a), (a, a, a)$
(C) $(3a, 2a, 3a), (a, a, 2a)$
(D) $(2a, 3a, 3a), (2a, a, a)$

**Answer: (B)** $(3a, 2a, 3a), (a, a, a)$ · Key from source paper

## Q408 AIEEE 2004 MCQ

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 sphere and the plane

(A) $x - y - z = 1$
(B) $x - 2y - z = 1$
(C) $x - y - 2z = 1$
(D) $2x - y - z = 1$

**Answer: (D)** $2x - y - z = 1$ · Key from source paper

## Q409 AIEEE 2003 MCQ

The lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-k}$ and $\frac{x-1}{k} = \frac{y-4}{2} = \frac{z-5}{1}$ are coplanar if

(A) k = 3 or $-2$
(B) k = 0 or $-1$
(C) k = 1 or $-1$
(D) k = 0 or $-3$

**Answer: (D)** k = 0 or $-3$ · Key from source paper

### Q410 AIEEE 2003 MCQ

A tetrahedron has vertices at O(0, 0, 0), A(1, 2, 1)B(2, 1, 3) and C($-1$, 1, 2). Then the angle between the faces OAB and ABC will be

(A) $90^\circ$
(B) $\cos^{-1}\left(\frac{19}{35}\right)$
(C) $\cos^{-1}\left(\frac{17}{31}\right)$
(D) $30^\circ$

**Answer: (B)** $\cos^{-1}\left(\frac{19}{35}\right)$ · Key from source paper

### Q411 AIEEE 2003 MCQ

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

(A) 39
(B) 26
(C) $11\frac{4}{13}$
(D) 13

**Answer: (D)** 13 · Key from source paper

### Q412 AIEEE 2003 MCQ

The two lines $x = ay + b, z = cy + d$ and $x = a'y + b'z = c'y + d'$ will be perpendicular, if and only if

(A) $aa' + cc' + 1 = 0$
(B) $\mathrm{aa'} + \mathrm{bb'} + \mathrm{cc'} + 1 = 0$
(C) $\mathrm{a'} + \mathrm{bb'} + \mathrm{cc'} = 0$
(D) $(a + a')(b + b')(c + c') = 0$

**Answer: (A)** $aa' + cc' + 1 = 0$ · Key from source paper

### Q413 AIEEE 2003 MCQ

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

(A) 4
(B) 1
(C) 2
(D) 3

**Answer: (D) 3** · Key from source paper

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## Q414 AIEEE 2003 MCQ

Two system of rectangular axes have the same origin. If a plane cuts them at distances a, b, c and a', b', c' from the origin then

(A) $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}-\frac{1}{a'^2}-\frac{1}{b'^2}-\frac{1}{c'^2}=0$
(B) $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}+\frac{1}{a^{22}}+\frac{1}{b^{22}}+\frac{1}{c^{22}}=0$
(C) $\frac{1}{a^2}+\frac{1}{b^2}-\frac{1}{c^2}+\frac{1}{a'^2}+\frac{1}{b'^2}-\frac{1}{c'^2}=0$
(D) $\frac{1}{a^2}-\frac{1}{b^2}-\frac{1}{c^2}+\frac{1}{a'^2}-\frac{1}{b'^2}-\frac{1}{c'^2}=0$

**Answer: (A)** $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}-\frac{1}{a'^2}-\frac{1}{b'^2}-\frac{1}{c'^2}=0$ · Key from source paper

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## Q415 AIEEE 2002 MCQ

A plane which passes through the point $(3,2,0)$ and the line $\frac{x-4}{1}=\frac{y-7}{5}=\frac{z-4}{4}$ is

(A) x - y + z = 1
(B) x + y + z = 5
(C) x + 2y - z = 1
(D) 2x - y + z = 5

**Answer: (A) x - y + z = 1** · Key from source paper

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## Q416 AIEEE 2002 MCQ

The d.r. of normal to the plane through $(1,0,0)$, $(0,1,0)$ which makes an angle $\pi/4$ with plane $x+y=3$ are

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

**Answer: (B)** $1,1,\sqrt{2}$ · Key from source paper

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