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MATHEMATICS · JEE MAIN

Straight Lines

Chapter-wise previous year questions, with answer key

39	2020–2025	5
PYQS	PAPERS	TOPICS

Distance from a Point to a Line · Locus · Distance and Section Formula · Forms of a Line · Angle Between Lines

1. Attempt each question on paper first. They're grouped by topic, newest papers first.
2. Check yourself against the answer key at the end.
3. Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

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Distance from a Point to a Line · 10 PYQs

Q1 JEE Main 2025 · 3 Apr · Shift 2

Let the equation $x(x+2)(12-k)=2$ have equal roots. Then the distance of the point $\left(k, \frac{k}{2}\right)$ from the line $3x+4y+5=0$ is

(A) 15

(B) 12

(C) $5\sqrt{3}$

(D) $15\sqrt{5}$

Step-by-step solution ▸ prepwiser.in/questions/BBaCGPCL-X

Q2 JEE Main 2025 · 28 Jan · Shift 1

If $\alpha = 1 + \sum_{r=1}^{6}(-3)^{r-1} \quad {}^{12}C_{2r-1}$, then the distance of the point $(12, \sqrt{3})$ from the line $\alpha x - \sqrt{3}y + 1 = 0$ is _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/IMUj8WCGJA

Q3 JEE Main 2024 · 8 Apr · Shift 2

If the image of the point $(-4, 5)$ in the line $x+2y=2$ lies on the circle $(x+4)^2+(y-3)^2=r^2$, then r is equal to:

(A) 2

(B) 3

(C) 4

(D) 1

Step-by-step solution ▸ prepwiser.in/questions/_BLa-gJ_m5

Q4 JEE Main 2024 · 30 Jan · Shift 2

If $x^2-y^2+2hxy+2gx+2fy+c=0$ is the locus of a point, which moves such that it is always equidistant from the lines $x+2y+7=0$ and $2x-y+8=0$, then the value of $g+c+h-f$ equals

(A) 8

(B) 14

(C) 29

(D) 6

Step-by-step solution ▸ prepwiser.in/questions/ODBq-hJTjG

Q5 JEE Main 2024 · 29 Jan · Shift 2

Let A be the point of intersection of the lines $3x+2y=14, 5x-y=6$ and B be the point of intersection of the lines $4x+3y=8, 6x+y=5$. The distance of the point $P(5,-2)$ from the line AB is

(A) $\frac{13}{2}$

(B) 8

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

(D) 6

Step-by-step solution ▸ prepwiser.in/questions/_HWRhuE5Cs

Q6 JEE Main 2024 · 27 Jan · Shift 2

If the sum of squares of all real values of α, for which the lines $2x-y+3=0, 6x+3y+1=0$ and $\alpha x+2y-2=0$ do not form a triangle is p, then the greatest integer less than or equal to p is _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/2sAB0nJ8qk

Q7 JEE Main 2021 · 31 Aug · Shift 1

If p and q are the lengths of the perpendiculars from the origin on the lines,

x cosec α − y sec α = k cot 2α and

x sinα + y cosα = k sin2α

respectively, then k^2 is equal to :

(A) $4p^2 + q^2$

(B) $2p^2 + q^2$

(C) $p^2 + 2q^2$

(D) $p^2 + 4q^2$

Step-by-step solution ▸ prepwiser.in/questions/0SpynPLfKB

Q8 JEE Main 2020 · 5 Sep · Shift 1

If the line, 2x - y + 3 = 0 is at a distance
$\frac{1}{\sqrt{5}}$ and $\frac{2}{\sqrt{5}}$ from the lines 4x - 2y + α = 0
and 6x - 3y + β = 0, respectively, then the sum of all possible values of α and β is :

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/kOxrKsjvYg

Q9 JEE Main 2020 · 4 Sep · Shift 2

Let PQ be a diameter of the circle $x^2 + y^2 = 9$. If α and β are the lengths of the perpendiculars from P and Q on the straight line,
x + y = 2 respectively, then the maximum value of $\alpha\beta$ is _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/1rGNKwzdLf

Q10 JEE Main 2020 · 8 Jan · Shift 2

The length of the perpendicular from the origin, on the normal to the curve,
$x^2 + 2xy - 3y^2 = 0$ at the point (2,2) is

(A) $\sqrt{2}$

(B) $4\sqrt{2}$

(C) 2

(D) $2\sqrt{2}$

Step-by-step solution ▸ prepwiser.in/questions/x6MUbN4oJT

Locus · 5 PYQs

Q11 JEE Main 2025 · 28 Jan · Shift 2

If A and B are the points of intersection of the circle $x^2 + y^2 - 8x = 0$ and the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ and a point P moves on the line $2x - 3y + 4 = 0$, then the centroid of ΔPAB lies on the line :

(A) $x + 9y = 36$

(B) $9x - 9y = 32$

(C) $4x - 9y = 12$

(D) $6x - 9y = 20$

Step-by-step solution ▸ prepwiser.in/questions/fV4ho7MV7d

Q12 JEE Main 2022 · 26 Jul · Shift 1

A point P moves so that the sum of squares of its distances from the points $(1, 2)$ and $(-2, 1)$ is 14. Let $f(x, y) = 0$ be the locus of P, which intersects the x-axis at the points A, B and the y-axis at the points C, D. Then the area of the quadrilateral ACBD is equal to :

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

(B) $\frac{3\sqrt{17}}{2}$

(C) $\frac{3\sqrt{17}}{4}$

(D) 9

Step-by-step solution ▸ prepwiser.in/questions/MxzdjMBr_b

Q13 JEE Main 2022 · 25 Jun · Shift 2

A circle touches both the y-axis and the line x + y = 0. Then the locus of its center is :

(A) $y = \sqrt{2}x$

(B) $x = \sqrt{2}y$

(C) $y^2 - x^2 = 2xy$

(D) $x^2 - y^2 = 2xy$

Step-by-step solution ▸ prepwiser.in/questions/W0wGHYZWYw

Q14 JEE Main 2021 · 26 Aug · Shift 1

The locus of a point, which moves such that the sum of squares of its distances from the points (0, 0), (1, 0), (0, 1), (1, 1) is 18 units, is a circle of diameter d. Then d^2 is equal to _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/sTLOcaG3NJ

Q15 JEE Main 2021 · 24 Feb · Shift 2

Let a point P be such that its distance from the point (5, 0) is thrice the distance of P from the point $(-5, 0)$. If the locus of the point P is a circle of radius r, then $4r^2$ is equal to _____

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/1WWv_MLmoJ

Distance and Section Formula · 13 PYQs

Q16 JEE Main 2025 · 7 Apr · Shift 1

Let ABC be the triangle such that the equations of lines AB and AC be $3y - x = 2$ and $x + y = 2$, respectively, and the points B and C lie on x-axis. If P is the orthocentre of the triangle ABC , then the area of the triangle PBC is equal to

(A) 8 **(B)** 4

(C) 10 **(D)** 6

Step-by-step solution ▸ prepwiser.in/questions/u7X_JDgR5m

Q17 JEE Main 2025 · 22 Jan · Shift 2

Let the distance between two parallel lines be 5 units and a point P lie between the lines at a unit distance from one of them. An equilateral triangle PQR is formed such that Q lies on one of the parallel lines, while R lies on the other. Then $(QR)^2$ is equal to _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/vUV3aV06RA

Q18 JEE Main 2025 · 22 Jan · Shift 1

Let the triangle PQR be the image of the triangle with vertices $(1, 3), (3, 1)$ and $(2, 4)$ in the line $x + 2y = 2$. If the centroid of $\triangle \mathrm{PQR}$ is the point (α, β), then $15(\alpha - \beta)$ is equal to :

(A) 21 **(B)** 19

(C) 22 **(D)** 24

Step-by-step solution ▸ prepwiser.in/questions/rzuBaAcEcQ

Q19 JEE Main 2023 · 13 Apr · Shift 2

Let (α, β) be the centroid of the triangle formed by the lines $15x - y = 82, 6x - 5y = -4$ and $9x + 4y = 17$. Then $\alpha + 2\beta$ and $2\alpha - \beta$ are the roots of the equation :

(A) $x^2 - 7x + 12 = 0$ **(B)** $x^2 - 13x + 42 = 0$

(C) $x^2 - 14x + 48 = 0$ **(D)** $x^2 - 10x + 25 = 0$

Step-by-step solution ▸ prepwiser.in/questions/TDhcdEcxkm

Q20 JEE Main 2023 · 29 Jan · Shift 1

Let B and C be the two points on the line $y + x = 0$ such that B and C are symmetric with respect to the origin. Suppose A is a point on $y - 2x = 2$ such that $\triangle ABC$ is an equilateral triangle. Then, the area of the $\triangle ABC$ is :

(A) $\frac{10}{\sqrt{3}}$ **(B)** $2\sqrt{3}$

(C) $3\sqrt{3}$ **(D)** $\frac{8}{\sqrt{3}}$

Step-by-step solution ▸ prepwiser.in/questions/v_lixiDvqC

Q21 JEE Main 2022 · 29 Jun · Shift 1

The distance between the two points A and A' which lie on y = 2 such that both the line segments AB and A' B (where B is the point (2, 3)) subtend angle $\frac{\pi}{4}$ at the origin, is equal to :

(A) 10 **(B)** $\frac{48}{5}$

(C) $\frac{52}{5}$ **(D)** 3

Step-by-step solution ▸ prepwiser.in/questions/IFcyJo-z6Z

Q22 JEE Main 2022 · 24 Jun · Shift 2

Let the area of the triangle with vertices A(1, α), B(α, 0) and C(0, α) be 4 sq. units. If the points (α, $-\alpha$), ($-\alpha$, α) and (α^2, β) are collinear, then β is equal to :

(A) 64 **(B)** -8

(C) -64 **(D)** 512

Step-by-step solution ▸ prepwiser.in/questions/33uaHwWw7L

Q23 JEE Main 2022 · 24 Jun · Shift 1

Let $A\left(\frac{3}{\sqrt{a}}, \sqrt{a}\right)$, $a > 0$, be a fixed point in the xy-plane. The image of A in y-axis be B and the image of B in x-axis be C. If $D(3\cos\theta, a\sin\theta)$ is a point in the fourth quadrant such that the maximum area of ΔACD is 12 square units, then a is equal to _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Wj5oF6KGq5

Q24 JEE Main 2021 · 27 Aug · Shift 2

Let A(a, 0), B(b, 2b + 1) and C(0, b), $b \neq 0$, $|b| \neq 1$, be points such that the area of triangle ABC is 1 sq. unit, then the sum of all possible values of a is :

(A) $\frac{-2b}{b+1}$ **(B)** $\frac{2b}{b+1}$

(C) $\frac{2b^2}{b+1}$ **(D)** $\frac{-2b^2}{b+1}$

Step-by-step solution ▸ prepwiser.in/questions/B3Ie_g8_Kv

Q25 JEE Main 2021 · 17 Mar · Shift 1

In a triangle PQR, the co-ordinates of the points P and Q are $(-2, 4)$ and $(4, -2)$ respectively. If the equation of the perpendicular bisector of PR is $2x - y + 2 = 0$, then the centre of the circumcircle of the Δ PQR is :

(A) $(-1, 0)$ **(B)** (1, 4)

(C) (0, 2) **(D)** $(-2, -2)$

Step-by-step solution ▸ prepwiser.in/questions/tBStH81732

Q26 JEE Main 2021 · 17 Mar · Shift 2

Let $\tan\alpha$, $\tan\beta$ and $\tan\gamma$; $\alpha, \beta, \gamma \neq \frac{(2n-1)\pi}{2}$, n$\in$N be the slopes of three line segments OA, OB and OC, respectively, where O is origin. If circumcentre of ΔABC coincides with origin and its orthocentre lies on y-axis, then the value of $\left(\frac{\cos 3\alpha + \cos 3\beta + \cos 3\gamma}{\cos\alpha\cos\beta\cos\gamma}\right)^2$ is equal to _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/nxNeTrc7im

Q27 JEE Main 2020 · 9 Jan · Shift 1

Let C be the centroid of the triangle with vertices (3, –1), (1, 3) and (2, 4). Let P be the point of intersection of the lines x + 3y – 1 = 0 and 3x – y + 1 = 0. Then the line passing through the points C and P also passes through the point :

(A) (–9, –7)

(B) (9, 7)

(C) (7, 6)

(D) (–9, –6)

Step-by-step solution ▸ prepwiser.in/questions/Yzhs4tScYM

Q28 JEE Main 2020 · 8 Jan · Shift 1

Let two points be A(1, –1) and B(0, 2). If a point P(x', y') be such that the area of ΔPAB = 5 sq. units and it lies on the line, 3x + y – 4λ = 0, then a value of λ is :

(A) 4

(B) 1

(C) -3

(D) 3

Step-by-step solution ▸ prepwiser.in/questions/sX4GkYA10-

Forms of a Line · 9 PYQs

Q29 JEE Main 2024 · 1 Feb · Shift 2

The lines $\mathrm{L}_1, \mathrm{L}_2, \ldots, \mathrm{L}_{20}$ are distinct. For $\mathrm{n} = 1, 2, 3, \ldots, 10$ all the lines $\mathrm{L}_{2\mathrm{n}-1}$ are parallel to each other and all the lines L_{2n} pass through a given point P. The maximum number of points of intersection of pairs of lines from the set $\{\mathrm{L}_1, \mathrm{L}_2, \ldots, \mathrm{L}_{20}\}$ is equal to _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/kUZzg731qb

Q30 JEE Main 2022 · 29 Jul · Shift 2

Let m_1, m_2 be the slopes of two adjacent sides of a square of side a such that $a^2 + 11a + 3\left(m_1^2 + m_2^2\right) = 220$. If one vertex of the square is $(10(\cos\alpha - \sin\alpha), 10(\sin\alpha + \cos\alpha))$, where $\alpha \in \left(0, \frac{\pi}{2}\right)$ and the equation of one diagonal is $(\cos\alpha - \sin\alpha)x + (\sin\alpha + \cos\alpha)y = 10$, then $72\left(\sin^4\alpha + \cos^4\alpha\right) + a^2 - 3a + 13$ is equal to :

(A) 119

(B) 128

(C) 145

(D) 155

Step-by-step solution ▸ prepwiser.in/questions/KtZ-0zmROg

Q31 JEE Main 2021 · 27 Jul · Shift 2

The point P (a, b) undergoes the following three transformations successively :

(a) reflection about the line y = x.

(b) translation through 2 units along the positive direction of x-axis.

(c) rotation through angle $\frac{\pi}{4}$ about the origin in the anti-clockwise direction.

If the co-ordinates of the final position of the point P are $\left(-\frac{1}{\sqrt{2}}, \frac{7}{\sqrt{2}}\right)$, then the value of 2a + b is equal to :

(A) 13 **(B)** 9

(C) 5 **(D)** 7

Step-by-step solution ▸ prepwiser.in/questions/wfjnnqOE5y

Q32 JEE Main 2021 · 18 Mar · Shift 1

The number of integral values of m so that the abscissa of point of intersection of lines 3x + 4y = 9 and y = mx + 1 is also an integer, is :

(A) 1 **(B)** 2

(C) 3 **(D)** 0

Step-by-step solution ▸ prepwiser.in/questions/U9JRXsw5VN

Q33 JEE Main 2021 · 26 Feb · Shift 1

The intersection of three lines $x - y = 0$, x + 2y = 3 and 2x + y = 6 is a :

(A) Right angled triangle **(B)** Equilateral triangle

(C) None of the above **(D)** Isosceles triangle

Step-by-step solution ▸ prepwiser.in/questions/rC7x5GNSZZ

Q34 JEE Main 2021 · 25 Feb · Shift 1

The image of the point (3, 5) in the line $x - y + 1 = 0$, lies on :

(A) $(x - 4)^2 + (y - 4)^2 = 8$

(B) $(x - 4)^2 + (y + 2)^2 = 16$

(C) $(x - 2)^2 + (y - 2)^2 = 12$

(D) $(x - 2)^2 + (y - 4)^2 = 4$

Step-by-step solution ▸ prepwiser.in/questions/kqAYv6dOKX

Q35 JEE Main 2020 · 6 Sep · Shift 2

Let L denote the line in the xy-plane with x and y intercepts as 3 and 1 respectively. Then the image of the point (–1, –4) in this line is :

(A) $\left(\frac{11}{5}, \frac{28}{5}\right)$

(B) $\left(\frac{29}{5}, \frac{11}{5}\right)$

(C) $\left(\frac{29}{5}, \frac{8}{5}\right)$

(D) $\left(\frac{8}{5}, \frac{29}{5}\right)$

Step-by-step solution ▸ prepwiser.in/questions/O24t4SRNdg

Q36 JEE Main 2020 · 4 Sep · Shift 2

If the perpendicular bisector of the line segment joining the points P(1 ,4) and Q(k, 3) has y-intercept equal to –4, then a value of k is :

(A) $\sqrt{14}$

(B) -4

(C) –2

(D) $\sqrt{15}$

Step-by-step solution ▸ prepwiser.in/questions/NY0w-AKAgs

Q37 JEE Main 2020 · 2 Sep · Shift 2

The set of all possible values of θ in the interval $(0, \pi)$ for which the points (1, 2) and (sin θ, cos θ) lie on the same side of the line x + y = 1 is :

(A) $\left(0, \frac{\pi}{4}\right)$

(B) $\left(0, \frac{3\pi}{4}\right)$

(C) $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$

(D) $\left(0, \frac{\pi}{2}\right)$

Step-by-step solution ▸ prepwiser.in/questions/QVCUA4sC5i

Angle Between Lines · 2 PYQs

Q38 JEE Main 2024 · 8 Apr · Shift 2

If the line segment joining the points $(5, 2)$ and $(2, a)$ subtends an angle $\frac{\pi}{4}$ at the origin, then the absolute value of the product of all possible values of a is :

(A) 4

(B) 8

(C) 6

(D) 2

Step-by-step solution ▸ prepwiser.in/questions/TVkMx6XAg5

Q39 JEE Main 2021 · 18 Mar · Shift 1

The equation of one of the straight lines which passes through the point (1, 3) and makes an angles $\tan^{-1}\left(\sqrt{2}\right)$ with the straight line, y + 1 = $3\sqrt{2}$ x is :

(A) $4\sqrt{2}x + 5y - \left(15 + 4\sqrt{2}\right) = 0$

(B) $5\sqrt{2}x + 4y - \left(15 + 4\sqrt{2}\right) = 0$

(C) $4\sqrt{2}x + 5y - 4\sqrt{2} = 0$

(D) $4\sqrt{2}x - 5y - \left(5 + 4\sqrt{2}\right) = 0$

Step-by-step solution ▸ prepwiser.in/questions/EBWyxGH_4n

Answer key: Straight Lines

Answers follow NTA's final answer keys. Typing errors are possible, so check doubtful answers against the official key. Spotted a mistake? prepwiser.in/feedback · Terms: prepwiser.in/terms

Numbers match the question numbers above. For full working, open the solution link under each question.

1 **A**	2 **5**	3 **A**	4 **B**	5 **D**	6 **32**	7 **A**	8 **30**
9 **7**	10 **D**	11 **D**	12 **B**	13 **D**	14 **16**	15 **56**	16 **D**
17 **28**	18 **C**	19 **B**	20 **D**	21 **C**	22 **C**	23 **8**	24 **D**
25 **D**	26 **144**	27 **D**	28 **D**	29 **101**	30 **B**	31 **B**	32 **B**
33 **D**	34 **D**	35 **A**	36 **B**	37 **D**	38 **A**	39 **A**	

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