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MATHEMATICS · JEE MAIN

Circles

Chapter-wise previous year questions, with answer key

37	2020–2024	6
PYQS	PAPERS	TOPICS

Equation of a Circle · Tangent and Normal · Chord of Contact · Radical Axis · Family of Circles · Intersection of Two Circles

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?

Every question has a free step-by-step solution on PrepWiser — tap “Step-by-step solution” under it.

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Equation of a Circle · 14 PYQs

Q1 JEE Main 2024 · 9 Apr · Shift 1

Let a circle passing through $(2, 0)$ have its centre at the point (h, k). Let $(x_\mathrm{c}, y_\mathrm{c})$ be the point of intersection of the lines $3x + 5y = 1$ and $(2 + \mathrm{c})x + 5\mathrm{c}^2 y = 1$. If $\mathrm{h} = \lim\limits_{\mathrm{c}\to 1} x_\mathrm{c}$ and $\mathrm{k} = \lim\limits_{\mathrm{c}\to 1} y_\mathrm{c}$, then the equation of the circle is :

(A) $5x^2 + 5y^2 - 4x - 2y - 12 = 0$

(B) $25x^2 + 25y^2 - 20x + 2y - 60 = 0$

(C) $25x^2 + 25y^2 - 2x + 2y - 60 = 0$

(D) $5x^2 + 5y^2 - 4x + 2y - 12 = 0$

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

Q2 JEE Main 2023 · 8 Apr · Shift 1

Consider a circle $C_1 : x^2 + y^2 - 4x - 2y = \alpha - 5$. Let its mirror image in the line $y = 2x + 1$ be another circle $C_2 : 5x^2 + 5y^2 - 10fx - 10gy + 36 = 0$. Let r be the radius of C_2. Then $\alpha + r$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Egq-E4-ua5

Q3 JEE Main 2022 · 29 Jul · Shift 1

Let the mirror image of a circle $c_1 : x^2 + y^2 - 2x - 6y + \alpha = 0$ in line $y = x + 1$ be $c_2 : 5x^2 + 5y^2 + 10gx + 10fy + 38 = 0$. If r is the radius of circle c_2, then $\alpha + 6\mathrm{r}^2$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/p-nA7Ic4Ym

Q4 JEE Main 2022 · 27 Jul · Shift 1

If the circle $x^2 + y^2 - 2gx + 6y - 19c = 0, g, c \in \mathbb{R}$ passes through the point $(6, 1)$ and its centre lies on the line $x - 2cy = 8$, then the length of intercept made by the circle on x-axis is :

(A) $\sqrt{11}$

(B) 4

(C) 3

(D) $2\sqrt{23}$

Step-by-step solution ▸ prepwiser.in/questions/8lwgt_TZam

Q5 JEE Main 2022 · 26 Jul · Shift 2

Let the abscissae of the two points P and Q on a circle be the roots of $x^2 - 4x - 6 = 0$ and the ordinates of P and Q be the roots of $y^2 + 2y - 7 = 0$. If PQ is a diameter of the circle $x^2 + y^2 + 2ax + 2by + c = 0$, then the value of $(a + b - c)$ is _____.

(A) 12

(B) 13

(C) 14

(D) 16

Step-by-step solution ▸ prepwiser.in/questions/bUQKlC8dUR

Q6 JEE Main 2022 · 27 Jun · Shift 2

The set of values of k, for which the circle $C : 4x^2 + 4y^2 - 12x + 8y + k = 0$ lies inside the fourth quadrant and the point $\left(1, -\frac{1}{3}\right)$ lies on or inside the circle C, is :

(A) an empty set

(B) $\left(6, \frac{65}{9}\right]$

(C) $\left[\frac{80}{9}, 10\right)$

(D) $\left(9, \frac{92}{9}\right]$

Step-by-step solution ▸ prepwiser.in/questions/IJD9g53r1M

Q7 JEE Main 2022 · 26 Jun · Shift 1

Let C be a circle passing through the points A(2, -1) and B(3, 4). The line segment AB s not a diameter of C. If r is the radius of C and its centre lies on the circle $(x-5)^2+(y-1)^2=\frac{13}{2}$, then r^2 is equal to :

(A) 32 **(B)** $\frac{65}{2}$

(C) $\frac{61}{2}$ **(D)** 30

Step-by-step solution ▸ prepwiser.in/questions/XpI0kCke5L

Q8 JEE Main 2022 · 25 Jun · Shift 1

Let the abscissae of the two points P and Q be the roots of $2x^2-rx+p=0$ and the ordinates of P and Q be the roots of $x^2-sx-q=0$. If the equation of the circle described on PQ as diameter is $2(x^2+y^2)-11x-14y-22=0$, then $2r+s-2q+p$ is equal to _____.

Numerical answer — enter the value.

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

Q9 JEE Main 2022 · 24 Jun · Shift 1

Let $x^2+y^2+Ax+By+C=0$ be a circle passing through (0, 6) and touching the parabola $y=x^2$ at (2, 4). Then A + C is equal to _____.

(A) 16 **(B)** 88/5

(C) 72 **(D)** -8

Step-by-step solution ▸ prepwiser.in/questions/825n8YaqCH

Q10 JEE Main 2021 · 27 Aug · Shift 1

Let the equation $x^2+y^2+px+(1-p)y+5=0$ represent circles of varying radius $r \in (0, 5]$. Then the number of elements in the set $S=\{q : q=p^2$ and q is an integer$\}$ is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/dKKAm5xf1W

Q11 JEE Main 2021 · 26 Aug · Shift 2

A circle C touches the line x = 2y at the point (2, 1) and intersects the circle

$C_1 : x^2+y^2+2y-5=0$ at two points P and Q such that PQ is a diameter of C_1. Then the diameter of C is :

(A) $7\sqrt{5}$ **(B)** 15

(C) $\sqrt{285}$ **(D)** $4\sqrt{15}$

Step-by-step solution ▸ prepwiser.in/questions/yBg7hJPJQI

Q12 JEE Main 2021 · 26 Feb · Shift 2

If the locus of the mid-point of the line segment from the point (3, 2) to a point on the circle, $x^2+y^2=1$ is a circle of radius r, then r is equal to :

(A) $\frac{1}{4}$ **(B)** $\frac{1}{2}$

(C) 1 **(D)** $\frac{1}{3}$

Step-by-step solution ▸ prepwiser.in/questions/09Wv2BWVzh

Q13 JEE Main 2021 · 26 Feb · Shift 2

Let the normals at all the points on a given curve pass through a fixed point (a, b). If the curve passes through (3, -3) and (4, $-2\sqrt{2}$), and given that a $-$ $2\sqrt{2}$ b = 3,

then (a^2 + b^2 + ab) is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/bd8MQO3V9u

Q14 JEE Main 2020 · 2 Sep · Shift 1

The number of integral values of k for which the line, 3x + 4y = k intersects the circle,

x^2 + y^2 – 2x – 4y + 4 = 0 at two distinct points is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/E6UeuMstuW

Tangent and Normal · 8 PYQs

Q15 JEE Main 2023 · 15 Apr · Shift 1

The number of common tangents, to the circles

$x^2 + y^2 - 18x - 15y + 131 = 0$

and $x^2 + y^2 - 6x - 6y - 7 = 0$, is :

(A) 4 **(B)** 2

(C) 3 **(D)** 1

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

Q16 JEE Main 2023 · 8 Apr · Shift 2

Let O be the origin and OP and OQ be the tangents to the circle $x^2 + y^2 - 6x + 4y + 8 = 0$ at the points P and Q on it. If the circumcircle of the triangle OPQ passes through the point $\left(\alpha, \frac{1}{2}\right)$, then a value of α is :

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

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

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

Q17 JEE Main 2023 · 31 Jan · Shift 1

Let a circle C_1 be obtained on rolling the circle $x^2 + y^2 - 4x - 6y + 11 = 0$ upwards 4 units on the tangent T to it at the point $(3, 2)$. Let C_2 be the image of C_1 in T. Let A and B be the centers of circles C_1 and C_2 respectively, and M and N be respectively the feet of perpendiculars drawn from A and B on the x-axis. Then the area of the trapezium AMNB is :

(A) $2\left(2 + \sqrt{2}\right)$ **(B)** $4\left(1 + \sqrt{2}\right)$

(C) $3 + 2\sqrt{2}$ **(D)** $2\left(1 + \sqrt{2}\right)$

Step-by-step solution ▸ prepwiser.in/questions/nUYA3HjyWG

Q18 JEE Main 2022 · 28 Jun · Shift 1

Let the lines $y + 2x = \sqrt{11} + 7\sqrt{7}$ and $2y + x = 2\sqrt{11} + 6\sqrt{7}$ be normal to a circle $C : (x - h)^2 + (y - k)^2 = r^2$. If the line $\sqrt{11}y - 3x = \frac{5\sqrt{77}}{3} + 11$ is tangent to the circle C, then the value of $(5h - 8k)^2 + 5r^2$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/ixU-wuhyyb

Q19 JEE Main 2021 · 16 Mar · Shift 2

Let the lengths of intercepts on x-axis and y-axis made by the circle $x^2 + y^2 + ax + 2ay + c = 0$, $(a < 0)$ be $2\sqrt{2}$ and $2\sqrt{5}$, respectively. Then the shortest distance from origin to a tangent to this circle which is perpendicular to the line $x + 2y = 0$, is equal to :

(A) $\sqrt{10}$ **(B)** $\sqrt{6}$

(C) $\sqrt{11}$ **(D)** $\sqrt{7}$

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

Q20 JEE Main 2021 · 24 Feb · Shift 2

If the area of the triangle formed by the positive x-axis, the normal and the tangent to the circle $(x - 2)^2 + (y - 3)^2 = 25$ at the point (5, 7) is A, then 24A is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/98-ZjlIW05

Q21 JEE Main 2020 · 6 Sep · Shift 2

The centre of the circle passing through the point (0, 1) and touching the parabola $y = x^2$ at the point (2, 4) is :

(A) $\left(\frac{6}{5}, \frac{53}{10}\right)$

(B) $\left(\frac{3}{10}, \frac{16}{5}\right)$

(C) $\left(\frac{-53}{10}, \frac{16}{5}\right)$

(D) $\left(\frac{-16}{5}, \frac{53}{10}\right)$

Step-by-step solution ▸ prepwiser.in/questions/V3pobV31j1

Q22 JEE Main 2020 · 8 Jan · Shift 2

If a line, $y = mx + c$ is a tangent to the circle, $(x - 3)^2 + y^2 = 1$ and it is perpendicular to a line L_1, where L_1 is the tangent to the circle, $x^2 + y^2 = 1$ at the point $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$, then :

(A) $c^2 + 6c + 7 = 0$

(B) $c^2 - 7c + 6 = 0$

(C) $c^2 - 6c + 7 = 0$

(D) $c^2 + 7c + 6 = 0$

Step-by-step solution ▸ prepwiser.in/questions/_W1oD7k73a

Chord of Contact · 1 PYQs

Q23 JEE Main 2023 · 29 Jan · Shift 2

A circle with centre (2, 3) and radius 4 intersects the line $x + y = 3$ at the points P and Q. If the tangents at P and Q intersect at the point $S(\alpha, \beta)$, then $4\alpha - 7\beta$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/NzSXmyuey6

Radical Axis · 2 PYQs

Q24 JEE Main 2024 · 5 Apr · Shift 2

Let the circle $C_1 : x^2 + y^2 - 2(x + y) + 1 = 0$ and C_2 be a circle having centre at $(-1, 0)$ and radius 2 . If the line of the common chord of C_1 and C_2 intersects the y-axis at the point P, then the square of the distance of P from the centre of C_1 is:

(A) 4 **(B)** 6

(C) 2 **(D)** 1

Step-by-step solution ▸ prepwiser.in/questions/A6MIWr9dUU

Q25 JEE Main 2022 · 28 Jun · Shift 2

If one of the diameters of the circle $x^2 + y^2 - 2\sqrt{2}x - 6\sqrt{2}y + 14 = 0$ is a chord of the circle $(x - 2\sqrt{2})^2 + (y - 2\sqrt{2})^2 = r^2$, then the value of r^2 is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/DKCbTQWP5J

Family of Circles · 7 PYQs

Q26 JEE Main 2024 · 9 Apr · Shift 1

Let the centre of a circle, passing through the points $(0, 0), (1, 0)$ and touching the circle $x^2 + y^2 = 9$, be (h, k). Then for all possible values of the coordinates of the centre $(h, k), 4\left(h^2 + k^2\right)$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/oUdM0hYxjw

Q27 JEE Main 2022 · 28 Jul · Shift 2

The differential equation of the family of circles passing through the points $(0, 2)$ and $(0, -2)$ is :

(A) $2xy\frac{dy}{dx} + \left(x^2 - y^2 + 4\right) = 0$

(B) $2xy\frac{dy}{dx} + \left(x^2 + y^2 - 4\right) = 0$

(C) $2xy\frac{dy}{dx} + \left(y^2 - x^2 + 4\right) = 0$

(D) $2xy\frac{dy}{dx} - \left(x^2 - y^2 + 4\right) = 0$

Step-by-step solution ▸ prepwiser.in/questions/hc0XUUpv3D

Q28 JEE Main 2022 · 25 Jul · Shift 2

If the circles $x^2 + y^2 + 6x + 8y + 16 = 0$ and

$$x^2 + y^2 + 2\left(3 - \sqrt{3}\right)x + 2\left(4 - \sqrt{6}\right)y = k + 6\sqrt{3} + 8\sqrt{6}$$

, $k > 0$, touch internally at the point $P(\alpha, \beta)$, then $\left(\alpha + \sqrt{3}\right)^2 + \left(\beta + \sqrt{6}\right)^2$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/WW4C5SzCqK

Q29 JEE Main 2022 · 30 Jun · Shift 1

Let $\frac{dy}{dx} = \frac{ax-by+a}{bx+cy+a}$, $a, b, c \in R$, represents a circle with center (α, β). Then, $\alpha + 2\beta$ is equal to :

(A) -1 **(B)** 0

(C) 1 **(D)** 2

Step-by-step solution ▸ prepwiser.in/questions/-Ie56LrbwM

Q30 JEE Main 2022 · 27 Jun · Shift 1

Let $\frac{dy}{dx} = \frac{ax-by+a}{bx+cy+a}$, where a, b, c are constants, represent a circle passing through the point (2, 5). Then the shortest distance of the point (11, 6) from this circle is :

(A) 10 **(B)** 8

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

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

Q31 JEE Main 2021 · 18 Mar · Shift 2

Let $S_1 : x^2 + y^2 = 9$ and $S_2 : (x - 2)^2 + y^2 = 1$. Then the locus of center of a variable circle S which touches S_1 internally and S_2 externally always passes through the points :

(A) $\left(\frac{1}{2}, \pm\frac{\sqrt{5}}{2}\right)$

(B) $(1, \pm 2)$

(C) $\left(2, \pm\frac{3}{2}\right)$

(D) $(0, \pm \sqrt{3})$

Step-by-step solution ▸ prepwiser.in/questions/5S2EKeQ9RC

Q32 JEE Main 2020 · 4 Sep · Shift 2

The circle passing through the intersection of the circles,
$x^2 + y^2 - 6x = 0$ and $x^2 + y^2 - 4y = 0$, having its centre on
the line, $2x - 3y + 12 = 0$, also passes through the point :

(A) (–3, 1) **(B)** (1, –3)

(C) (–1, 3) **(D)** (–3, 6)

Step-by-step solution ▸ prepwiser.in/questions/X-Tg9D391d

Intersection of Two Circles · 5 PYQs

Q33 JEE Main 2024 · 1 Feb · Shift 1

Let $C : x^2 + y^2 = 4$ and $C' : x^2 + y^2 - 4\lambda x + 9 = 0$ be two circles. If the set of all values of λ so that the circles C and C intersect at two distinct points, is $\mathrm{R} - [\mathrm{a}, \mathrm{b}]$, then the point $(8\mathrm{a} + 12, 16\mathrm{b} - 20)$ lies on the curve :

(A) $x^2 + 2y^2 - 5x + 6y = 3$

(B) $5x^2 - y = -11$

(C) $x^2 - 4y^2 = 7$

(D) $6x^2 + y^2 = 42$

Step-by-step solution ▸ prepwiser.in/questions/dIyhRP-73F

Q34 JEE Main 2024 · 30 Jan · Shift 1

If the circles $(x + 1)^2 + (y + 2)^2 = r^2$ and $x^2 + y^2 - 4x - 4y + 4 = 0$ intersect at exactly two distinct points, then

(A) $\frac{1}{2} < \mathrm{r} < 7$

(B) $3 < \mathrm{r} < 7$

(C) $5 < \mathrm{r} < 9$

(D) $0 < \mathrm{r} < 7$

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

Q35 JEE Main 2021 · 18 Mar · Shift 1

Choose the correct statement about two circles whose equations are given below :

$x^2 + y^2 - 10x - 10y + 41 = 0$

$x^2 + y^2 - 22x - 10y + 137 = 0$

(A) circles have same centre

(B) circles have no meeting point

(C) circles have only one meeting point

(D) circles have two meeting points

Step-by-step solution ▸ prepwiser.in/questions/H4vKFkNVxK

Q36 JEE Main 2021 · 17 Mar · Shift 1

Choose the incorrect statement about the two circles whose equations are given below :

$x^2 + y^2 - 10x - 10y + 41 = 0$ and

$x^2 + y^2 - 16x - 10y + 80 = 0$

(A) Distance between two centres is the average of radii of both the circles.

(B) Both circles pass through the centre of each other.

(C) Circles have two intersection points.

(D) Both circle's centers lie inside region of one another.

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

Q37 JEE Main 2020 · 9 Jan · Shift 2

If the curves, $x^2 - 6x + y^2 + 8 = 0$ and

$x^2 - 8y + y^2 + 16 - k = 0$, $(k > 0)$ touch each other at a point, then the largest value of k is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/mEjAfGa7yI

Answer key — Circles

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

1 **B**	2 **2**	3 **12**	4 **D**	5 **A**	6 **D**	7 **B**	8 **7**
9 **A**	10 **61**	11 **A**	12 **B**	13 **9**	14 **9**	15 **C**	16 **C**
17 **B**	18 **816**	19 **B**	20 **1225**	21 **D**	22 **A**	23 **11**	24 **C**
25 **10**	26 **9**	27 **A**	28 **25**	29 **C**	30 **B**	31 **C**	32 **D**
33 **D**	34 **B**	35 **C**	36 **D**	37 **36**			