EXERCISE - O

SINGLE CORRECT TYPE QUESTIONS

1. Centres of the three circles $x^2 + y^2 - 4x - 6y - 14 = 0$, $x^2 + y^2 + 2x + 4y - 5 = 0$ and $x^2 + y^2 - 10x - 16y + 7 = 0$

(A) are the vertices of a right triangle

(B) the vertices of an isosceles triangle which is not regular

(C) vertices of a regular triangle

(D) are collinear

MCR001

2. $y - 1 = m_1(x - 3)$ and $y - 3 = m_2(x - 1)$ are two family of straight lines, right angled to each other. The locus of their point of intersection is

(A) $x^2 + y^2 - 2x - 6y + 10 = 0$ (B) $x^2 + y^2 - 4x - 4y + 6 = 0$

(C) $x^2 + y^2 - 2x - 6y + 6 = 0$ (D) $x^2 + y^2 - 4x - 4y - 6 = 0$

MCR002

3. Suppose that the equation of the circle having (–3, 5) and (5, –1) as end points of a diameter is $(x - a)^2 + (y - b)^2 = r^2$. Then $a + b + r, (r > 0)$ is

(A) 8 (B) 9 (C) 10 (D) 11

MCR003

4. The area of an equilateral triangle inscribed in the circle $x^2 + y^2 - 2x = 0$ is

(A) $\frac{3\sqrt{3}}{4}$ (B) $\frac{3\sqrt{3}}{2}$ (C) $\frac{3\sqrt{3}}{8}$ (D) none

MCR004

5. The smallest distance between the circle $(x - 5)^2 + (y + 3)^2 = 1$ and the line $5x + 12y - 4 = 0$, is

(A) 1/13 (B) 2/13 (C) 3/15 (D) 4/15

MCR005

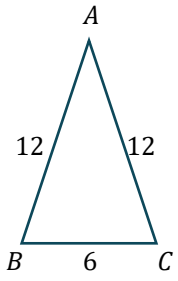
6. The equation of the image of the circle $x^2 + y^2 + 16x - 24y + 183 = 0$ by the line mirror $4x + 7y + 13 = 0$ is

(A) $x^2 + y^2 + 32x - 4y + 235 = 0$ (B) $x^2 + y^2 + 32x + 4y - 235 = 0$

(C) $x^2 + y^2 + 32x - 4y - 235 = 0$ (D) $x^2 + y^2 + 32x + 4y + 235 = 0$

MCR006

7. The radius of the circle passing through the vertices of the triangle ABC, is



(A) $\frac{8\sqrt{15}}{5}$ (B) $\frac{3\sqrt{15}}{5}$ (C) $3\sqrt{5}$ (D) $3\sqrt{2}$

MCR007

8. (6, 0), (0, 6) and (7, 7) are the vertices of a triangle. The circle inscribed in the triangle has the equation

(A) $x^2 + y^2 - 9x + 9y + 36 = 0$ (B) $x^2 + y^2 - 9x - 9y + 36 = 0$

(C) $x^2 + y^2 + 9x - 9y + 36 = 0$ (D) $x^2 + y^2 - 9x - 9y - 36 = 0$

MCR008

9. The line joining (5, 0) to (10cosθ, 10sinθ) is divided internally in the ratio 2 : 3 at P. If θ varies then the locus of P is :

(A) a pair of straight lines (B) a circle

(C) a straight line (D) a second degree curve which is not a circle

MCR009

10. The locus of the center of the circles such that the point (2, 3) is the mid point of the chord $5x + 2y = 16$ is

(A) $2x - 5y + 11 = 0$ (B) $2x + 5y - 11 = 0$

(C) $2x + 5y + 11 = 0$ (D) none

MCR010

11. Tangents PA and PB are drawn to the circle $x^2 + y^2 = 4$, then the locus of the point P if the triangle PAB is equilateral, is equal to-

(A) $x^2 + y^2 = 16$ (B) $x^2 + y^2 = 8$ (C) $x^2 + y^2 = 64$ (D) $x^2 + y^2 = 32$

MCR011

12. In the xy plane, the segment with end points (3, 8) and (–5, 2) is the diameter of the circle. The point $(k, 10)$ lies on the circle for

(A) no value of k (B) exactly one integral k

(C) exactly one non integral k (D) two real values of k

MCR012

13. Consider the points $P(2, 1)$; $Q(0, 0)$; $R(4, -3)$ and the circle $S: x^2 + y^2 - 5x + 2y - 5 = 0$

(A) exactly one point lies outside S (B) exactly two points lie outside S

(C) all the three points lie outside S (D) none of the point lies outside S

MCR013

14. The angle between the two tangents from the origin to the circle $(x - 7)^2 + (y + 1)^2 = 25$ equals

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

MCR014

15. The area of the quadrilateral formed by the tangents from the point (4, 5) to the circle $x^2 + y^2 - 4x - 2y - 11 = 0$ with the pair of radii through the points of contact of the tangents is :

(A) 4 sq. units (B) 8 sq. units (C) 6 sq. units (D) none

MCR015

16. If L_1 and L_2 are the length of the tangent from (0, 5) to the circles $x^2 + y^2 + 2x - 4 = 0$ and $x^2 + y^2 - 2x - y + 1 = 0$ then

(A) $L_1 = 2L_2$ (B) $L_2 = 2L_1$ (C) $L_1 = L_2$ (D) $L_1^2 = L_2$

MCR016

17. From (3, 4) chords are drawn to the circle $x^2 + y^2 - 4x = 0$. The locus of the mid points of the chords is:

(A) $x^2 + y^2 - 5x - 4y + 6 = 0$ (B) $x^2 + y^2 + 5x - 4y + 6 = 0$

(C) $x^2 + y^2 - 5x + 4y + 6 = 0$ (D) $x^2 + y^2 - 5x - 4y - 6 = 0$

MCR017

18. Combined equation to the pair of tangents drawn from the origin to the circle $x^2 + y^2 + 4x + 6y + 9 = 0$ is

(A) $3(x^2 + y^2) = (x + 2y)^2$ (B) $2(x^2 + y^2) = (3x + y)^2$

(C) $9(x^2 + y^2) = (2x + 3y)^2$ (D) $x^2 + y^2 = (2x + 3y)^2$

MCR018

19. A circle of radius 5 is tangent to the line $4x - 3y = 18$ at $M(3, -2)$ and lies above the line. The equation of the circle, is-

(A) $x^2 + y^2 - 6x + 4y - 12 = 0$ (B) $x^2 + y^2 + 2x - 2y - 3 = 0$

(C) $x^2 + y^2 + 2x - 2y - 23 = 0$ (D) $x^2 + y^2 + 6x + 4y - 12 = 0$

MCR019

20. Let C_1 and C_2 are circles defined by $x^2 + y^2 - 20x + 64 = 0$ and $x^2 + y^2 + 30x + 144 = 0$. The length of the shortest line segment PQ that is tangent to C_1 at P and to C_2 at Q is -

(A) 15 (B) 18 (C) 20 (D) 24

MCR020

MULTIPLE CORRECT TYPE QUESTIONS

21. $\frac{x - x_1}{\cos\theta} = \frac{y - y_1}{\sin\theta} = r$, represents : (Where x_1, y_1 are constant)

(A) equation of a straight line, if θ is constant and r is variable

(B) equation of a circle, if r is constant and θ is a variable

(C) a straight line passing through a fixed point and having a known slope

(D) a circle with a known centre and a given radius.

MCR049

22. Which of the following lines have the intercepts of equal lengths on the circle, $x^2 + y^2 - 2x + 4y = 0$?

(A) $3x - y = 0$ (B) $x + 3y = 0$

(C) $x + 3y + 10 = 0$ (D) $3x - y - 10 = 0$

MCR050

23. One of the diameter of the circle circumscribing the rectangle $ABCD$ is $x - 3y + 1 = 0$. If two vertices of rectangle are the points (–2, 5) and (6, 5) respectively, then which of the following hold(s) good?

(A) Area of rectangle $ABCD$ is 64 square units.

(B) Centre of circle is (2, 1)

(C) The other two vertices of the rectangle are (–2, –3) and (6, –3)

(D) Equation of sides are $x = -2, y = -3, x = 5$ and $y = 6$.

MCR051

24. Three concentric circles of which the biggest is $x^2 + y^2 = 1$, have their radii in A.P. If the line $y = x + 1$ cuts all the circles in real and distinct points. The permissible values of common difference of A.P. is/are

(A) 0.4 (B) 0.6 (C) 0.01 (D) 0.1

MCR052

25. The equation of circles passing through (3, –6) touching both the axes is

(A) $x^2 + y^2 - 6x + 6y + 9 = 0$ (B) $x^2 + y^2 + 6x - 6y + 9 = 0$

(C) $x^2 + y^2 + 30x - 30y + 225 = 0$ (D) $x^2 + y^2 - 30x + 30y + 225 = 0$

MCR053

26. Tangents are drawn to the circle $x^2 + y^2 = 50$ from a point 'P' lying on the x –axis. These tangents meet the y –axis at points 'P_1' and 'P_2'. Possible coordinates of 'P' so that area of triangle PP_1P_2 is minimum, is/are

(A) (10, 0)
(B) $(10\sqrt{2}, 0)$
(C) (–10, 0)
(D) $(-10\sqrt{2}, 0)$

MCR054

27. The equations of the tangents drawn from the origin to the circle, $x^2 + y^2 - 2rx - 2hy + h^2 = 0$ are :

(A) $x = 0$
(B) $y = 0$
(C) $(h^2 - r^2)x - 2rhy = 0$
(D) $(h^2 - r^2)x + 2rhy = 0$

MCR055

28. Which of the following is/are True?

The circles $x^2 + y^2 - 6x - 6y + 9 = 0$ and $x^2 + y^2 + 6x + 6y + 9 = 0$ are such that -

(A) they do not intersect
(B) they touch each other
(C) their exterior common tangents are parallel.
(D) their interior common tangents are perpendicular.

MCR056

29. For the circles $x^2 + y^2 - 10x + 16y + 89 - r^2 = 0$ and $x^2 + y^2 + 6x - 14y + 42 = 0$ which of the following is/are true.

(A) Number of integral values of r are 7 for which circles are intersecting.
(B) Number of integral values of r are 9 for which circles are intersecting.
(C) For r equal to 13 number of common tangents are 3.
(D) For r equal to 21 number of common tangents are 2.

MCR057

30. Which of the following statement(s) is/are correct with respect to the circles

$S_1 \equiv x^2 + y^2 - 4 = 0$ and $S_2 \equiv x^2 + y^2 - 2x - 4y + 4 = 0$?

(A) S_1 and S_2 intersect at an angle of 90°.

(B) The point of intersection of the two circle are (2, 0) and $\left(\frac{6}{5}, \frac{8}{5}\right)$.

(C) Length of the common of chord of S_1 and S_2 is $\frac{4}{\sqrt{5}}$.

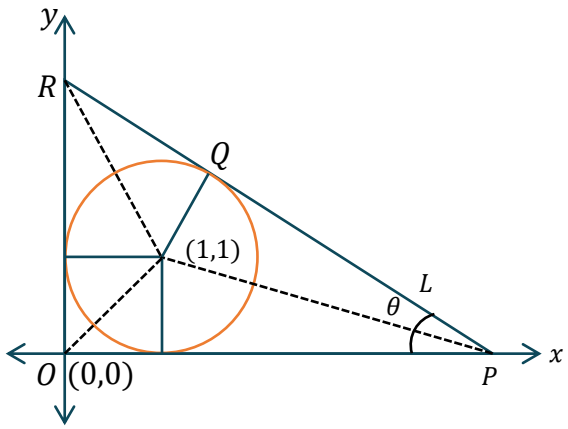
(D) The point (2, 3) lies outside the circles S_1 and S_2.

MCR058

COMPREHENSION TYPE QUESTIONS

Paragraph for Question No. 31 to 33

In the diagram as shown, a circle is drawn with centre $C(1, 1)$ and radius 1 and a line L. The line L is tangential to the circle at Q. Further L meet the y –axis at R and the x –axis at P in such a way that the angle OPQ equals θ where $0 < \theta < \frac{\pi}{2}$.



31. The coordinates of Q are

(A) (1 + cosθ, 1 + sinθ) (B) (sinθ, cosθ)

(C) (1 + sinθ, cosθ) (D) (1 + sinθ, 1 + cosθ)

MCR059

32. Equation of the line PR is

(A) $x\cos\theta + y\sin\theta = \sin\theta + \cos\theta + 1$ (B) $x\sin\theta + y\cos\theta = \cos\theta + \sin\theta - 1$

(C) $x\sin\theta + y\cos\theta = \cos\theta + \sin\theta + 1$ (D) $x\tan\theta + y = 1 + \cot\left(\frac{\theta}{2}\right)$

MCR060

33. If the area bounded by the circle, the x –axis and PQ is $A(\theta)$, then $A\left(\frac{\pi}{4}\right)$ equals

(A) $\sqrt{2}+1-\frac{3\pi}{8}$ (B) $\sqrt{2}-1+\frac{3\pi}{8}$ (C) $\sqrt{2}+1+\frac{\pi}{8}$ (D) $\sqrt{2}-1+\frac{\pi}{8}$

MCR061

Paragraph for Question No. 34 to 36

Let S_1, S_2, S_3 be the circles $x^2 + y^2 + 3x + 2y + 1 = 0$, $x^2 + y^2 - x + 6y + 5 = 0$ and $x^2 + y^2 + 5x - 8y + 15 = 0$, respectively then

34. Point from which length of tangents to these three circles is same is (α, β) then (α + β) is

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

MCR062

35. Equation of circle S_4 which cut orthogonally to all given circle is $x^2 + y^2 + ax + by + c = 0$ then $|a + b + c|$ is

(A) 16 (B) 20 (C) 24 (D) 28

MCR063

36. Radical centre of circles $S_1, S_2, \& S_4$ is (p, q) then $|p + q|$ is

(A) 2.20 (B) 3.20 (C) 1.20 (D) 4.20

MCR064

MATCHING LIST TYPE QUESTION

37.

	Column - I		**Column - II**
(A)	If director circle of two given circles C_1 and C_2 of equal radii touches each other, then ratio of length of internal common tangent of C_1 and C_2 to their radii equals to	(P)	13
(B)	Let two circles having radii r_1 and r_2 are orthogonal to each other. If length of their common chord is k times the square root of hormonic mean between squares of their radii, then k^4 equals to	(Q)	7
(C)	The axes are translated so that the new equation of the circle $x^2+y^2-5x+2y-5=0$ has no first degree terms and the new equation $x^2+y^2=\frac{\lambda^2}{4}$, then a value of λ is	(R)	4
(D)	The number of integral points which lie on or inside the circle $x^2+y^2=4$ is	(S)	2

MCR065

38. Consider two circles C_1 of radius 'a' and C_2 of radius 'b' $(b>a)$ both lying in the first quadrant and touching the coordinate axes. In each of the conditions listed in **Column-I**, the ratio of b/a is given in **Column-II.**

	Column-I		**Column-II**
(A)	C_1 and C_2 touch each other	(P)	$2+\sqrt{2}$
(B)	C_1 and C_2 are orthogonal	(Q)	3
(C)	C_1 and C_2 intersect so that the common chord is longest	(R)	$2+\sqrt{3}$
(D)	C_2 passes through the centre of C_1	(S)	$3+2\sqrt{2}$
		(T)	$3-2\sqrt{2}$

MCR066

EXERCISE - S

1. If the points $(\lambda, -\lambda)$ lies inside the circle $x^2 + y^2 - 4x + 2y - 8 = 0$, then number of integers in the range of λ is

MCR021

2. Circles C_1 and C_2 are externally tangent and they are both internally tangent to the circle C_3. The radii of C_1 and C_2 are 4 and 10, respectively and the centres of the three circles are collinear. A chord of C_3 is also a common internal tangent of C_1 and C_2. Given that the length of the chord is $\frac{m\sqrt{n}}{p}$ where m, n and p are positive integers, m and p are relatively prime and n is not divisible by the square of any prime, find the value of $(m + n + p)$.

MCR022

3. Consider a circle S with centre at the origin and radius 4. Four circles A, B, C and D each with radius unity and centres (–3, 0), (–1, 0), (1, 0) and (3, 0) respectively are drawn. A chord PQ of the circle S touches the circle B and passes through the centre of the circle C. If the length of this chord can be expressed as $\sqrt{x}$, find x.

MCR023

4. A line with gradient 2 is passing through the point P(1, 7) and touches the circle $x^2 + y^2 + 16x + 12y + c = 0$ at the point Q. If (a, b) are the coordinates of the point Q, then find the value of $(7a + 7b + c)$.

MCR024

5. Through a given point $P(5, 2)$, secants are drawn to cut the circle $x^2 + y^2 = 25$ at points $A_1(B_1)$, $A_2(B_2), A_3(B_3), A_4(B_4)$ and $A_5(B_5)$ such that $PA_1 + PB_1 = 5, PA_2 + PB_2 = 6, PA_3 + PB_3 = 7$, $PA_4 + PB_4 = 8$ and $PA_5 + PB_5 = 9$. Find the value of $\sum_{i=1}^{5} PA_i^2 + \sum_{i=1}^{5} PB_i^2$.

[**Note :** $A_r(B_r)$ denotes that the line passing through $P(5, 2)$ meets the circle $x^2 + y^2 = 25$ at two points A_r and B_r.]

MCR025

6. If (α, β) is a point on the circle whose centre is on the x-axis and which touches the line $x + y = 0$ at (2, –2), then find the greatest integral value of 'α'.

MCR086

7. Two circles whose radii are equal to 4 and 8 intersect at right angles. The length of their common chord is $\frac{\lambda}{\sqrt{5}}$, then find λ

MCR087

8. Let A be the centre of the circle $x^2 + y^2 - 2x - 4y - 20 = 0$. Suppose that the tangents at the points $B(1, 7)$ & $D(4, -2)$ on the circle meet at the point C. Find the area of the quadrilateral $ABCD$.

MCR088

9. The circles $x^2 + y^2 + 2ax + cy + a = 0$ and $x^2 + y^2 - 3ax + dy - 1 = 0$ intersect in two distinct points P and Q, then find the number of values of 'a' for which the line $5x + by - a = 0$ passes through P and Q.

MCR089

10. The circumference of the circle $x^2 + y^2 - 2x + 8y - q = 0$ is bisected by the circle $x^2 + y^2 + 4x + 12y + p = 0$, then find $p + q$

MCR090

EXERCISE - JEE (Main) PYQ

1. Three circles of radii $a, b, c(a < b < c)$ touch each other externally. If they have x –axis as a common tangent, then: **[JEE (Main) 2019]**

(1) $\frac{1}{\sqrt{a}} = \frac{1}{\sqrt{b}} + \frac{1}{\sqrt{c}}$ (2) a, b, c are in A.P.

(3) $\sqrt{a}, \sqrt{b}, \sqrt{c}$ are in A.P. (4) $\frac{1}{\sqrt{b}} = \frac{1}{\sqrt{a}} + \frac{1}{\sqrt{c}}$

MCR026

2. If a circle C passing through the point (4,0) touches the circle $x^2 + y^2 + 4x - 6y = 12$ externally at the point (1, –1), then the radius of C is: **[JEE (Main) 2019]**

(1) $\sqrt{57}$ (2) 4 (3) $2\sqrt{5}$ (4) 5

MCR027

3. If the area of an equilateral triangle inscribed in the circle, $x^2 + y^2 + 10x + 12y + c = 0$ is $27\sqrt{3}$ sq. units then c is equal to: **[JEE (Main) 2019]**

(1) 20 (2) 25 (3) 13 (4) –25

MCR028

4. A square is inscribed in the circle $x^2 + y^2 - 6x + 8y - 103 = 0$ with its sides parallel to the coordinate axes. Then the distance of the vertex of this square which is nearest to the origin is **:-** **[JEE (Main) 2019]**

(1) 13 (2) $\sqrt{137}$ (3) 6 (4) $\sqrt{41}$

MCR029

5. A circle cuts a chord of length $4a$ on the x –axis and passes through a point on the y –axis, distant $2b$ from the origin. Then the locus of the centre of this circle, is:- **[JEE (Main) 2019]**

(1) A hyperbola (2) A parabola (3) A straight line (4) An ellipse

MCR030

6. If a variable line, $3x + 4y - \lambda = 0$ is such that the two circles $x^2 + y^2 - 2x - 2y + 1 = 0$ and $x^2 + y^2 - 18x - 2y + 78 = 0$ are on its opposite sides, then the set of all values of λ is the interval :- **[JEE (Main) 2019]**

(1) [12, 21] (2) (2, 17) (3) (23, 31) (4) [13, 23]

MCR031

7. The sum of the squares of the lengths of the chords intercepted on the circle, $x^2 + y^2 = 16$, by the lines, $x + y = n, n \in N$, where N is the set of all natural numbers, is: **[JEE (Main) 2019]**

(1) 320 (2) 160 (3) 105 (4) 210

MCR032

8. If a tangent to the circle $x^2 + y^2 = 1$ intersects the coordinate axes at distinct points P and Q, then the locus of the mid-point of PQ is **[JEE (Main) 2019]**

(1) $x^2 + y^2 - 2xy = 0$ (2) $x^2 + y^2 - 16x^2y^2 = 0$

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

MCR033

9. The common tangent to the circles $x^2+y^2=4$ and $x^2+y^2+6x+8y-24=0$ also passes through the point :- **[JEE (Main) 2019]**

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

MCR034

10. Let the tangents drawn from the origin to the circle, $x^2+y^2-8x-4y+16=0$ touch it at the points A and B. The $(AB)^2$ is equal to: **[JEE (Main) 2020]**

(1) $\frac{52}{5}$ (2) $\frac{32}{5}$ (3) $\frac{56}{5}$ (4) $\frac{64}{5}$

MCR035

11. 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 **[JEE (Main) 2020]**

(1) $c^2-6c+7=0$ (2) $c^2+6c+7=0$ (3) $c^2+7c+6=0$ (4) $c^2-7c+6=0$

MCR036

12. 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 _____. **[JEE (Main) 2020]**

MCR037

13. If one of the diameters of the circle $x^2+y^2-2x-6y+6=0$ is a chord of another circle 'C', whose center is at (2, 1), then its radius is _____ . **[JEE (Main) 2021]**

MCR038

14. 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 : **[JEE (Main) 2021]**

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

MCR039

15. 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 $\left(4,-2\sqrt{2}\right)$, and given that $a-2\sqrt{2}\,b=3$, then (a^2+b^2+ab) is equal to.

[JEE (Main) 2021]

MCR040

16. 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 euqal to : **[JEE (Main) 2021]**

(1) $\sqrt{11}$ (2) $\sqrt{7}$ (3) $\sqrt{6}$ (4) $\sqrt{10}$

MCR041

17. The minimum distance between any two points P_1 and P_2 while considering point P_1 on one circle and point P_2 on the other circle for the given circles' equations

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

$x^2+y^2-24x-10y+160=0$ is _____ . **[JEE (Main) 2021]**

MCR042

18. Let a circle $C:(x-h)^2+(y-k)^2=r^2, k>0$, touch the x –axis at (1, 0). If the line $x+y=0$ intersects the circle C at P and Q such that the length of the chord PQ is 2, then the value of $h+k+r$ is equal to. **[JEE (Main) 2022]**

MCR043

19. 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 : **[JEE (Main) 2022]**

(1) An empty set (2) $\left(6,\frac{95}{9}\right]$ (3) $\left[\frac{80}{9},10\right)$ (4) $\left(9,\frac{92}{9}\right]$

MCR044

20. A rectangle R with end points of the one of its sides as $(1, 2)$ and $(3, 6)$ is inscribed in a circle. If the equation of a diameter of the circle is $2x - y + 4 = 0$, then the area of R is _____. **[JEE(Main)-2022]**

MCR045

21. Let the tangent to the circle $C_1: x^2 + y^2 = 2$ at the point $M(-1, 1)$ intersect the circle $C_2: (x - 3)^2 + (y - 2)^2 = 5$, at two distinct points A and B. If the tangents to C_2 at the points A and B intersect at N, then the area of the triangle ANB is equal to : **[JEE (Main) 2022]**

(1) $\frac{1}{2}$ (2) $\frac{2}{3}$ (3) $\frac{1}{6}$ (4) $\frac{5}{3}$

MCR046

22. 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 **[JEE (Main) 2022]**

(1) 12 (2) 13 (3) 14 (4) 16

MCR047

23. If the tangents at the points P and Q on the circle $x^2 + y^2 - 2x + y = 5$ meet at the point $R\left(\frac{9}{4},2\right)$, then the area of the triangle PQR is **[JEE (Main) 2023]**

(1) $\frac{13}{4}$ (2) $\frac{13}{8}$ (3) $\frac{5}{4}$ (4) $\frac{5}{8}$

MCR048

EXERCISE - JEE (Advanced) PYQ

1. Circle(s) touching x –axis at a distance 3 from the origin and having an intercept of length $2\sqrt{7}$ on y –axis is (are) **[JEE (Advanced) 2013]**

(A) $x^2+y^2-6x+8y+9=0$ (B) $x^2+y^2-6x+7y+9=0$

(C) $x^2+y^2-6x-8y+9=0$ (D) $x^2+y^2-6x-7y+9=0$

MCR067

2. A circle S passes through the point (0, 1) and is orthogonal to the circles $(x-1)^2+y^2=16$ and $x^2+y^2=1$. Then:- **[JEE (Advanced) 2014]**

(A) radius of S is 8 (B) radius of S is 7

(C) centre of S is (–7, 1) (D) centre is S is (–8, 1)

MCR068

3. Let RS be the diameter of the circle $x^2+y^2=1$, where S is the point (1,0). Let P be a variable point (other than R and S) on the circle and tangents to the circle at S and P meet at the point Q. The normal to the circle at P intersects a line drawn through Q parallel to RS at point E. then the locus of E passes through the point(s)- **[JEE (Advanced) 2016]**

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

MCR069

4. The circle $C_1: x^2+y^2=3$, with centre at O, intersects the parabola $x^2=2y$ at the point P in the first quadrant. Let the tangent to the circle C_1 at P touches other two circles C_2 and C_3 at R_2 and R_3, respectively. Suppose C_2 and C_3 have equal radii $2\sqrt{3}$ and centres Q_2 and Q_3, respectively. If Q_2 and Q_3 lie on the y-axis, then- **[JEE (Advanced) 2016]**

(A) $Q_2Q_3=12$ (B) $R_2R_3=4\sqrt{6}$

(C) area of the triangle OR_2R_3 is $6\sqrt{2}$ (D) area of the triangle PQ_2Q_3 is $4\sqrt{2}$

MCR070

5. For how many values of p, the circle $x^2+y^2+2x+4y-p=0$ and the coordinate axes have exactly three common points? **[JEE (Advanced) 2017]**

MCR071

Paragraph (Q.6 & 7)

Let S be the circle in the xy-plane defined by the equation $x^2+y^2=4$.

(There are two question based on Paragraph "X", the question given below is one of them)

6. Let E_1E_2 and F_1F_2 be the chord of S passing through the point $P_0(1,1)$ and parallel to the x-axis and the y-axis, respectively. Let G_1G_2 be the chord of S passing through P_0 and having slope –1. Let the tangents to S at E_1 and E_2 meet at E_3, the tangents of S at F_1 and F_2 meet at F_3, and the tangents to S at G_1 and G_2 meet at G_3. Then, the points E_3, F_3 and G_3 lie on the curve **[JEE (Advanced) 2018]**

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

(C) $(x-4)(y-4)=4$ (D) $xy=4$

MCR072

7. Let P be a point on the circle S with both coordinates being positive. Let the tangent to S at P intersect the coordinate axes at the points M and N. Then, the mid-point of the line segment MN must lie on the curve - **[JEE (Advanced) 2018]**

(A) $(x+y)^2 = 3xy$ (B) $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 2^{\frac{4}{3}}$

(C) $x^2 + y^2 = 2xy$ (D) $x^2 + y^2 = x^2y^2$

MCR073

8. Let T be the line passing through the points $P(-2, 7)$ and $Q(2, -5)$. Let F_1 be the set of all pairs of circles (S_1, S_2) such that T is tangents to S_1 at P and tangent to S_2 at Q, and also such that S_1 and S_2 touch each other at a point, say, M. Let E_1 be the set representing the locus of M as the pair (S_1, S_2) varies in F_1. Let the set of all straight line segments joining a pair of distinct points of E_1 and passing through the point $R(1, 1)$ be F_2. Let E_2 be the set of the mid-points of the line segments in the set F_2. Then, which of the following statement(s) is (are) **TRUE**? **[JEE (Advanced) 2018]**

(A) The point $(-2, 7)$ lies in E_1 (B) The point $\left(\frac{4}{5}, \frac{7}{5}\right)$ does **NOT** lie in E_2

(C) The point $\left(\frac{1}{2}, 1\right)$ lies in E_2 (D) The point $\left(0, \frac{3}{2}\right)$ does **NOT** lie in E_1

MCR074

9. A line $y = mx + 1$ intersects the circle $(x-3)^2 + (y+2)^2 = 25$ at the points P and Q. If the midpoint of the line segment PQ has x-coordinate $-\frac{3}{5}$, then which one of the following options is correct? **[JEE (Advanced) 2019]**

(A) $6 \le m < 8$ (B) $2 \le m < 4$

(C) $4 \le m < 6$ (D) $-3 \le m < -1$

MCR075

10. Let the point B be the reflection of the point $A(2, 3)$ with respect to the line $8x - 6y - 23 = 0$. Let Γ_A and Γ_B be circles of radii 2 and 1 with centres A and B respectively. Let T be a common tangent to the circles Γ_A and Γ_B such that both the circles are on the same side of T. If C is the point of intersection of T and the line passing through A and B, then the length of the line segment AC is **[JEE (Advanced) 2019]**

MCR076

For (Q.11 to 12) Answer the following by appropriately matching the lists based on the information given in the paragraph

Let the circles $C_1: x^2 + y^2 = 9$ and $C_2: (x-3)^2 + (y-4)^2 = 16$, intersect at the points X and Y. Suppose that another circle $C_3: (x-h)^2 + (y-k)^2 = r^2$ satisfies the following conditions:

(i) centre of C_3 is collinear with the centres of C_1 and C_2

(ii) C_1 and C_2 both lie inside C_3, and

(iii) C_3 touches C_1 at M and C_2 at N.

Let the line through X and Y intersect C_3 at Z and W, and let a common tangent of C_1 and C_3 be a tangent to the parabola $x^2 = 8\alpha y$.

There are some expression given in the List-I whose values are given in List-II below :

	List-I		List-II
(I)	$2h + k$	(P)	6
(II)	$\frac{\text{Length of } ZW}{\text{Length of } XY}$	(Q)	$\sqrt{6}$
(III)	$\frac{\text{Area of triangle } MZN}{\text{Area of triangle } ZMW}$	(R)	$\frac{5}{4}$
(IV)	α	(S)	$\frac{21}{5}$
		(T)	$2\sqrt{6}$
		(U)	$\frac{10}{3}$

11. Which of the following is the only INCORRECT combination? **[JEE (Advanced) 2019]**

(A) (IV), (S) (B) (IV), (U) (C) (III), (R) (D) (I), (P)

MCR077

12. Which of the following is the only CORRECT combination? **[JEE (Advanced) 2019]**

(A) (II), (T) (B) (I), (S) (C) (I), (U) (D) (II), (Q)

MCR078

13. Let O be the centre of the circle $x^2 + y^2 = r^2$, where $r > \frac{\sqrt{5}}{2}$. Suppose PQ is a chord of this circle and the equation of the line passing through P and Q is $2x + 4y = 5$. If the centre of the circumcircle of the triangle OPQ lies on the line $x + 2y = 4$, then the value of r is **[JEE (Advanced) 2020]**

MCR079

14. Consider a triangle Δ whose two sides lie on the x-axis and the line $x + y + 1 = 0$. If the orthocenter of Δ is $(1, 1)$, then the equation of the circle passing through the vertices of the triangle Δ is **[JEE (Advanced) 2021]**

(A) $x^2 + y^2 - 3x + y = 0$ (B) $x^2 + y^2 + x + 3y = 0$

(C) $x^2 + y^2 + 2y - 1 = 0$ (D) $x^2 + y^2 + x + y = 0$

MCR080

Paragraph (Q.15 & 16)

Let $M = \{(x, y) \in \mathbb{R} \times \mathbb{R} : x^2 + y^2 \le r^2\}$, where r > 0. Consider the geometric progression $a_n = \frac{1}{2^{n-1}}$, $n = 1, 2, 3, \ldots$. Let $S_0 = 0$ and, for $n \ge 1$, let S_n denote the sum of the first n terms of this progression. For $n \ge 1$, let C_n denote the circle with center $(S_{n-1}, 0)$ and radius a_n, and D_n denote the circle with center (S_{n-1}, S_{n-1}) and radius a_n.

15. Consider M with $r = \frac{1025}{513}$. Let k be the number of all those circles C_n that are inside M. Let l be the maximum possible number of circles among these k circles such that no two circles intersect. Then **[JEE (Advanced) 2021]**

(A) $k + 2l = 22$ (B) $2k + l = 26$ (C) $2k + 3l = 34$ (D) $3k + 2l = 40$

MCR081

16. Consider M with $r=\frac{(2^{199}-1)\sqrt{2}}{2^{198}}$. The number of all those circles D_n that are inside M is

[JEE (Advanced) 2021]

(A) 198 (B) 199 (C) 200 (D) 201

MCR082

17. Let ABC be the triangle with $AB=1, AC=3$ and $\angle BAC=\frac{\pi}{2}$. If a circle of radius $r>0$ touches the sides AB, AC and also touches internally the circumcircle of the triangle ABC, then the value of r is _____.

[JEE (Advanced) 2022]

MCR083

18. Let G be a circle of radius $R>0$. Let $G_1, G_2, \ldots, G_n$ be n circles of equal radius $r>0$. Suppose each of the n circles $G_1, G_2, \ldots, G_n$ touches the circle G externally. Also, for $i=1,2,\ldots,n-1$, the circle G_i touches G_{i+1} externally, and G_n touches G_1 externally. Then, which of the following statements is/are TRUE?

[JEE (Advanced) 2022]

(A) If $n=4$, then $(\sqrt{2}-1)r<R$ (B) If $n=5$, then $r<R$

(C) If $n=8$, then $(\sqrt{2}-1)r<R$ (D) If $n=12$, then $\sqrt{2}\,(\sqrt{3}+1)r>R$

MCR084

19. Let C_1 be the circle of radius 1 with center at the origin. Let C_2 be the circle of radius r with center at the point $A=(4,1)$, where $1<r<3$. Two distinct common tangents PQ and ST of C_1 and C_2 are drawn. The tangent PQ touches C_1 at P and C_2 at Q. The tangent ST touches C_1 at S and C_2 at T. Mid points of the line segments PQ and ST are joined to form a line which meets the x-axis at a point B. If $AB=\sqrt{5}$, then the value of r^2 is

[JEE (Advanced) 2023]

MCR085

JEE (Main) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION–A

- This section contains **TWENTY** questions.
- Each question has **FOUR** options (1), (2), (3) and (4). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:

Full Marks : +4, if only the bubble corresponding to the correct option is darkened.
Zero Marks : 0, if none of the bubbles is darkened.
Negative Marks : –1 in all other cases.

---

1. If $\left(a, \frac{1}{a}\right), \left(b, \frac{1}{b}\right), \left(c, \frac{1}{c}\right)$ & $\left(d, \frac{1}{d}\right)$ are four distinct points on a circle of radius 4 units, then $abcd$ is equal to:

(1) 4 (2) 16 (3) 1 (4) 2

MCR091

2. From the point $A(0, 3)$ on the circle $x^2 + 4x + (y-3)^2 = 0$ a chord AB is drawn & extended to a point M such that $AM = 2AB$. The equation of the locus of M is :

(1) $x^2 + 8x + y^2 = 0$ (2) $x^2 + 8x + (y-3)^2 = 0$
(3) $(x-3)^2 + 8x + y^2 = 0$ (4) $x^2 + 8x + 8y^2 = 0$

MCR092

3. If tangent at (1, 2) to the circle $c_1: x^2 + y^2 = 5$ intersects the circle $c_2: x^2 + y^2 = 9$ at A & B and tangents at A & B to the second circle meet at point C, then the co–ordinates of C is

(1) (4, 5) (2) $\left(\frac{9}{15}, \frac{18}{5}\right)$ (3) (4, –5) (4) $\left(\frac{9}{5}, \frac{18}{5}\right)$

MCR093

4. A circle passes through point $\left(3, \sqrt{\frac{7}{2}}\right)$ touches the line pair $x^2 - y^2 - 2x + 1 = 0$. Centre of circle lies inside the circle $x^2 + y^2 - 8x + 10y + 15 = 0$. Co-ordinate of centre of circle is

(1) (4, 0) (2) (5, 0) (3) (6, 0) (4) (0, 4)

MCR094

5. The length of the tangents from any point on the circle $15x^2 + 15y^2 - 48x + 64y = 0$ to the two circles $5x^2 + 5y^2 - 24x + 32y + 75 = 0$ and $5x^2 + 5y^2 - 48x + 64y + 300 = 0$ are in the ratio

(1) 1 : 2 (2) 2 : 3 (3) 3 : 4 (4) 2 : 1

MCR095

6. The distance between the chords of contact of tangents to the circle; $x^2 + y^2 + 2gx + 2fy + c = 0$ from the origin & the point (g, f) is:

(1) $\sqrt{g^2 + f^2}$ (2) $\frac{\sqrt{g^2 + f^2 - c}}{2}$ (3) $\frac{g^2 + f^2 - c}{2\sqrt{g^2 + f^2}}$ (4) $\frac{\sqrt{g^2 + f^2 + c}}{2\sqrt{g^2 + f^2}}$

MCR096

7. If from any point P on the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, tangents are drawn to the circle $x^2 + y^2 + 2gx + 2fy + csin^2\alpha + (g^2 + f^2)\cos^2\alpha = 0$, then the angle between the tangents is:

(1) α (2) 2α (3) $\frac{\alpha}{2}$ (4) $\frac{\alpha}{3}$

MCR097

8. If the two circles, $x^2 + y^2 + 2g_1x + 2f_1y = 0$ & $x^2 + y^2 + 2g_2x + 2f_2y = 0$ touch each other then :

(1) $f_1 g_1 = f_2 g_2$ (2) $\frac{f_1}{g_1} = \frac{f_2}{g_2}$ (3) $f_1 f_2 = g_1 g_2$ (4) $f_1 + f_2 = g_1 + g_2$

MCR098

9. A circle touches a straight line $\ell x + my + n = 0$ & cuts the circle $x^2 + y^2 = 9$ orthogonally. The locus of centres of such circles is:

(1) $(\ell x + my + n)^2 = (\ell^2 + m^2)(x^2 + y^2 - 9)$ (2) $(\ell x + my - n)^2 = (\ell^2 + m^2)(x^2 + y^2 - 9)$

(3) $(\ell x + my + n)^2 = (\ell^2 + m^2)(x^2 + y^2 + 9)$ (4) $(\ell x + my - n)^2 = (\ell^2 + m^2)(x^2 + y^2 - 9)$

MCR099

10. The circle $x^2 + y^2 = 4$ cuts the circle $x^2 + y^2 + 2x + 3y - 5 = 0$ in A & B. Then the equation of the circle on AB as a diameter is:

(1) $13(x^2 + y^2) - 4x - 6y - 50 = 0$ (2) $9(x^2 + y^2) + 8x - 4y + 25 = 0$

(3) $x^2 + y^2 - 5x + 2y + 72 = 0$ (4) $13(x^2 + y^2) - 4x - 6y + 50 = 0$

MCR100

11. In the xy-plane, the length of the shortest path from (0, 0) to (12, 16) that does not go inside the circle $(x - 6)^2 + (y - 8)^2 = 25$ is

(1) $10\sqrt{3}$ (2) $10\sqrt{5}$ (3) $10\sqrt{3} + \frac{5\pi}{3}$ (4) $10 + 5\pi$

MCR101

12. The points $(x_1, y_1), (x_2, y_2), (x_1, y_2)$ and (x_2, y_1) are always

(1) collinear (2) concyclic

(3) vertices of a square (4) vertices of a rhombus

MCR102

13. Locus of all point $P(x, y)$ satisfying $x^3 + y^3 + 3xy = 1$ consists of union of

(1) a line and an isolated point (2) a line pair and an isolated point

(3) a line and a circle (4) a circle and a isolated point.

MCR103

14. If a circle of constant radius 3k passes through the origin 'O' and meets co-ordinate axes at A and B then the locus of the centroid of the triangle OAB is -

(1) $x^2 + y^2 = (2k)^2$ (2) $x^2 + y^2 = (3k)^2$ (3) $x^2 + y^2 = (4k)^2$ (4) $x^2 + y^2 = (6k)^2$

MCR104

15. B and C are fixed points having co-ordinates (3, 0) and (–3, 0) respectively. If the vertical angle BAC is 90°, then the locus of the centroid of the ΔABC has the equation :

(1) $x^2 + y^2 = 1$ (2) $x^2 + y^2 = 2$ (3) $9(x^2 + y^2) = 1$ (4) $9(x^2 + y^2) = 4$

MCR105

16. Tangents are drawn from (4, 4) to the circle $x^2 + y^2 - 2x - 2y - 7 = 0$ to meet the circle at A and B. The length of the chord AB is

(1) $2\sqrt{3}$ (2) $3\sqrt{2}$ (3) $2\sqrt{6}$ (4) $6\sqrt{2}$

MCR106

17. Tangents are drawn to a unit circle with centre at the origin from each point on the line $2x + y = 4$. Then the equation to the locus of the middle point of the chord of contact is -

(1) $2(x^2 + y^2) = x + y$ (2) $2(x^2 + y^2) = x + 2y$

(3) $4(x^2 + y^2) = 2x + y$ (4) $x^2 + y^2 = 2x + y$

MCR107

18. Chord AB of the circle $x^2 + y^2 = 100$ passes through the point (7, 1) and subtends an angle of 60° at the circumference of the circle. If m_1 and m_2 are the slopes of two such chords then the value of $m_1 m_2$, is

(1) –1 (2) 1 (3) 7/12 (4) –3

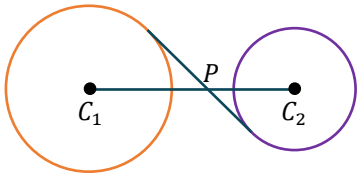
MCR108

19. Sum of the abscissa and ordinate of the centre of the circle touching the line $3x + y + 2 = 0$ at the point (–1,1) and passing through the point (3,5) is-

(1) 2 (2) 3 (3) 4 (4) 5

MCR109

20. In the figure given, two circles with centres C_1 and C_2 are 35 units apart, i.e. $C_1C_2 = 35$. The radii of the circles with centres C_1 and C_2 are 12 and 9 respectively. If P is the intersection of C_1C_2 and a common internal tangent to the circles, then $l(C_1P)$ equals-



(1) 18 (2) 20 (3) 12 (4) 15

MCR110

SECTION-B

- This section will have **TEN** questions. Candidate can choose to attempt any 5 question out of these 10 questions. In case if candidate attempts more than 5 questions, first 5 attempted questions will be considered for marking.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value (Answer should be rounded off to the nearest integer).
- Answer to each question will be evaluated according to the following marking scheme:

  Full Marks : +4, if only correct answer is given.

  Zero Marks : 0, if no answer is given.

  Negative Marks : -1 for incorrect answer

1. Find the sum of co-ordinates of the centre of the smallest circle touching the circles $x^2 + y^2 - 2y - 3 = 0$ and $x^2 + y^2 - 8x - 18y + 93 = 0$.

MCR111

2. A line meets the co–ordinate axes in A and B. A circle is circumscribed about the triangle OAB. If d_1 and d_2 are the distances of the tangent to the circle at the origin O from the points A and B respectively and diameter of the circle is $\lambda_1 d_1 + \lambda_2 d_2$, then find the value of $\lambda_1 + \lambda_2$.

MCR112

3. Let x & y be the real numbers satisfying the equation $x^2 - 4x + y^2 + 3 = 0$. If the maximum and minimum values of $x^2 + y^2$ are M & m respectively, then find the numerical value of $(M + m)$.

MCR113

4. A rhombus is inscribed in the region common to the two circles $x^2 + y^2 - 4x - 12 = 0$ and $x^2 + y^2 + 4x - 12 = 0$ with two of its vertices on the line joining the centres of the circles and the area of the rhombus is $a\sqrt{3}$ sq. units, then find the value of a.

MCR114

5. Find the greatest integer values of a for which the point $(2a, a + 1)$ is an interior point of the larger segment of the circle $x^2 + y^2 - 2x - 2y - 8 = 0$ made by the chord whose equation is $x - y + 1 = 0$.

MCR115

6. A circle with center in the first quadrant is tangent to $y = x + 10$, $y = x - 6$, and the y-axis. Let (h, k) be the center of the circle. If the value of $(h + k) = a + b\sqrt{a}$ where $\sqrt{a}$ is a surd, find the value of $a + b$.

MCR116

7. One of the diameters of the circle circumscribing the rectangle $ABCD$ is $4y = x + 7$. If A & B are the points (–3, 4) & (5,4) respectively, then find the area of the rectangle. (in square unit)

MCR117

8. Real number x, ysatisfies $x^2 + y^2 = 1$. If the maximum and minimum value of the expression $z = \frac{4-y}{7-x}$ are M and m respectively, then find the value $(2M + 6m)$.

MCR118

9. Let $S_1 = 0$ and $S_2 = 0$ be two circles intersecting at $P(6, 4)$ and both are tangent to x-axis and line $y = mx$ (where $m > 0$). If product of radii of the circles $S_1 = 0$ and $S_2 = 0$ is $\frac{52}{3}$, then the value of m^2 is

MCR119

10. If the circle $x^2 + y^2 + 4x + 22y + a = 0$ bisects the circumference of the circle $x^2 + y^2 - 2x + 8y - b = 0$ (where $a, b > 0$), then find the maximum value of (ab).

MCR120

JEE (Advanced) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION-I

- This section contains **SIX** questions.
- Each question has **FOUR** options for correct answer(*s*). **ONE OR MORE THAN ONE** of these four option(*s*) is (are) correct option(*s*).
- For each question, choose the correct option(*s*) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 if only (all) the correct option(*s*) is (are) chosen.
Partial Marks : +3 if all the four options are correct but ONLY three options are chosen.
Partial Marks : +2 if three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks : +1 if two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks : 0 if none of the options is chosen (i.e. the question is unanswered).
Negative Marks : –2 in all other cases.

For Example : If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(*s*) (second option in this case), with or without selection of any correct option(*s*) will result in –2 marks.

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1. Two circles, each of radius 5 units, touch each other at (1, 2). If the equation of their common tangent is $4x + 3y = 10$. The equations of the circles are

(A) $x^2 + y^2 + 6x + 2y - 15 = 0$ (B) $x^2 + y^2 - 10x - 10y + 25 = 0$

(C) $x^2 + y^2 - 6x + 2y - 15 = 0$ (D) $x^2 + y^2 - 10x + 10y + 25 = 0$

MCR121

2. $x^2 + y^2 = a^2$ and $(x - 2a)^2 + y^2 = a^2$ are two equal circles touching each other. Find the equation of circle (or circles) of the same radius touching both the circles.

(A) $x^2 + y^2 + 2ax + 2\sqrt{3}\,ay + 3a^2 = 0$ (B) $x^2 + y^2 - 2ax + 2\sqrt{3}\,ay + 3a^2 = 0$

(C) $x^2 + y^2 + 2ax - 2\sqrt{3}\,ay + 3a^2 = 0$ (D) $x^2 + y^2 - 2ax - 2\sqrt{3}\,ay + 3a^2 = 0$

MCR122

3. The circle $x^2 + y^2 - 2x - 3ky - 2 = 0$ passes through two fixed points, (k is the parameter)

(A) $\left(1 + \sqrt{3}\,,\, 0\right)$ (B) $\left(-1 + \sqrt{3}\,,\, 0\right)$

(C) $\left(-\sqrt{3} - 1\,,\, 0\right)$ (D) $\left(1 - \sqrt{3}\,,\, 0\right)$

MCR123

4. Curves $ax^2 + 2hxy + by^2 - 2gx - 2fy + c = 0$ and $a'x^2 - 2hxy + (a' + a - b)y^2 - 2g'x - 2f'y + c = 0$ intersect at four concyclic point A, B, C and D. If P is the point $\left(\frac{g'+g}{a'+a}, \frac{f'+f}{a'+a}\right)$, then which of the following is/are true

(A) P is also concyclic with points A, B, C, D (B) PA, PB, PC in G.P.

(C) $PA^2 + PB^2 + PC^2 = 3PD^2$ (D) PA, PB, PC in A.P.

MCR124

5. If $(a, 0)$ is a point on a diameter segment of the circle $x^2 + y^2 = 4$, then $x^2 - 4x - a^2 = 0$ has

(A) exactly one real root in $(-1, 0]$ (B) Exactly one real root in $[2, 5]$

(C) distinct roots greater than-1 (D) Distinct roots less than 5

MCR125

6. Consider two circles $C_1: x^2 + y^2 - 1 = 0$ and $C_2: x^2 + y^2 - 2 = 0$. Let $A(1,0)$ be a fixed point on the circle C_1 and B be any variable point on the circle C_2. The line BA meets the curve C_2 again at C. Which of the following alternative(s) is/are correct ?

(A) $OA^2 + OB^2 + BC^2 \in [7, 11]$, where O is the origin.

(B) $OA^2 + OB^2 + BC^2 \in [4, 7]$, where O is the origin.

(C) Locus of midpoint of AB is a circle of radius $\frac{1}{\sqrt{2}}$.

(D) Locus of midpoint of AB is a circle of area $\frac{\pi}{2}$.

MCR126

SECTION–II

- This section contains **TWO** paragraphs.
- Based on each paragraph, there are **THREE** questions.
- Each question has **FOUR** options (A), (B), (C) and (D) **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +3 if only the bubble corresponding to the correct answer is darkened.

Zero Marks : 0 in all other cases.

Comprehension # 1 (Q. No. 7 to 9)

Let S_1, S_2, S_3 be the circles $x^2 + y^2 + 3x + 2y + 1 = 0$, $x^2 + y^2 - x + 6y + 5 = 0$ and $x^2 + y^2 + 5x - 8y + 15 = 0$, then

7. Point from which length of tangents to these three circles is same is

(A) (1, 0) (B) (3, 2)

(C) (10, 5) (D) (– 2, 1)

MCR127

8. Equation of circle $S4$ which cut orthogonally to all given circle is

(A) $x^2 + y^2 - 6x + 4y - 14 = 0$ (B) $x^2 + y^2 + 6x + 4y - 14 = 0$

(C) $x^2 + y^2 - 6x - 4y + 14 = 0$ (D) $x^2 + y^2 - 6x - 4y - 14 = 0$

MCR128

9. Radical centre of circles $S_1, S_2, \& S_4$ is

(A) $\left(-\frac{3}{5},-\frac{8}{5}\right)$ (B) (3, 2) (C) (1, 0) (D) $\left(-\frac{4}{5},-\frac{3}{2}\right)$

MCR129

Comprehension # 2 (Q. No. 10 to 12)

Two circles are $S_1 \equiv (x+3)^2 + y^2 = 9$

$S_2 \equiv (x-5)^2 + y^2 = 16$

with centres C_1 & C_2

10. A direct common tangent is drawn from a point P (on x-axis) which touches S_1 & S_2 at Q & R, respectively. Find the ratio of area of ΔPQC_1 & ΔPRC_2.

(A) 3 : 4 (B) 9 : 16 (C) 16 : 9 (D) 4 : 3

MCR130

11. From point 'A' on S_2 which is nearest to C_1, a variable chord is drawn to S_1. The locus of mid point of the chord.

(A) circle (B) Diameter of s_1

(C) Arc of a circle (D) chord of s_1 but not diameter

MCR131

12. Locus obtained in question 5 cuts the circle S_1 at B & C, then line segment BC subtends an angle on the major arc of circle S_1 is

(A) $\cos^{-1}\frac{3}{4}$ (B) $\frac{\pi}{2} - \tan^{-1}\frac{4}{3}$ (C) $\frac{\pi}{2} - \frac{1}{2}\tan^{-1}\frac{3}{4}$ (D) $\frac{\pi}{2}\cot^{-1}\left(\frac{4}{3}\right)$

MCR132

SECTION–III

- This section contains **ONE** question.
- Each question contains two columns, Column-I and Column-II.
- Column-I has four entries (A), (B), (C) and (D).
- Column-II has four entries (p), (q), (r), (s).
- Match the entries in Column-I with the entries in Column-II.
- For each question, marks will be awarded in one of the following categories:

Full Marks	: +4	If only correct answer is given.
Zero Marks	: 0	If no answer is given.
Negative Marks	: –1	For incorrect answer

13.

	Column – I	**Column – II**
(A)	Number of values of a for which the common chord of the circles $x^2 + y^2 = 8$ and $(x-a)^2 + y^2 = 8$ subtends a right angle at the origin is	(p) 0
(B)	The number of circles touching all the three lines $3x + 7y = 2$, $21x + 49y = 5$ and $9x + 21y = 0$ are	(q) 2
(C)	The length of common chord of circles $x^2 + y^2 - x - 11y + 18 = 0$ and $x^2 + y^2 - 9x - 5y + 14 = 0$ is	(r) 5
(D)	Number of common tangents of the circles $x^2 + y^2 - 2x = 0$ and $x^2 + y^2 + 6x - 6y + 2 = 0$ is	(s) 3

MCR133

SECTION-IV

- This section contains **FIVE** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+3	**ONLY** if the correct numerical value is entered;
Zero Marks	:	0	In all other cases.

14. A circle is inscribed (i.e. touches all four sides) into a rhombous $ABCD$ with one angle 60°. The distance from the centre of the circle to the nearest vertex is equal to 1. If P is any point of the circle, then $|PA|^2 + |PB|^2 + |PC|^2 + |PD|^2$ is equal to :

MCR134

15. Find number of values of 'c' for which the set, $\{(x, y) \mid x^2 + y^2 + 2x \le 1\} \cap \{(x, y) \mid x - y + c \ge 0\}$ contains only one point is common.

MCR135

16. A variable circle passes through the point $A(a, b)$ & touches the x–axis and the locus of the other end of the diameter through A is $(x - a)^2 = \lambda by$, then find the value of λ

MCR136

17. A circle touches the line $y = x$ at a point P such that $OP = 4\sqrt{2}$ where O is the origin. The circle contains the point $(-10, 2)$ in its interior and the length of its chord on the line $x + y = 0$ is $6\sqrt{2}$. If the equation of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, then $\frac{g + c + f}{10}$ equals to

MCR137

18. Find maximum number of points having integer coordinates (both x, y integer) which can lie on a circle with centre at $\left(\sqrt{2}, \sqrt{3}\right)$ is (are)

MCR138

ANSWER KEY

EXERCISE - O

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	D	B	A	A	B	D	A	B	B	A
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	A	B	D	C	B	C	A	C	C	C
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	A,B	A,B,C,D	A,B,C	C,D	A,D	A,C	A,C	A,C,D	A,C	A,C,D
Que.	31	32	33	34	35	36	37		38	
Ans.	D	C	A	B	C	A	A→S;B→R; C→Q;D→P		A→S;B→R; C→Q;D→P	

EXERCISE - S

1.	4	**2.**	19	**3.**	63	**4.**	4	**5.**	215
6.	6	**7.**	16	**8.**	75	**9.**	0	**10.**	10

EXERCISE - JEE (Main) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	1	4	2	4	2	1	4	3	2	4
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	2	36	3	2	9	3	1	7	4	16
Que.	21	22	23							
Ans.	3	1	4							

EXERCISE - JEE (Advanced) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	A,C	B,C	A,C	A,B,C	2.00	A	D	B,D	B	10.00
Que.	11	12	13	14	15	16	17		18	19
Ans.	A	D	2.00	B	D	B	0.83 or 0.84		C,D	2.00

JEE (Main) Practice Paper

Section-A	Q.	1	2	3	4	5	6	7	8	9	10
	A.	3	2	4	1	1	3	2	2	1	1
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	3	2	1	1	1	2	3	1	3	2
Section-B	Q.	1	2	3	4	5	6	7	8	9	10
	A.	7	2	10	8	1	10	32	4	3	625

JEE (Advanced) Practice Paper

Section-I	**Q.**	**1**	**2**	**3**	**4**	**5**	**6**
	A.	A,B	B,D	A,D	B,C,D	A,B,C,D	A,C,D
Section-II	**Q.**	**7**	**8**	**9**	**10**	**11**	**12**
	A.	B	D	A	B	C	A
Section-III	**Q.**	**13**					
	A.	$A \rightarrow q; B \rightarrow p; C \rightarrow r; D \rightarrow s$					
Section-IV	**Q.**	**14**	**15**	**16**	**17**	**18**	
	A.	11	1	4	4	1	