Circle Exercise 1 :
Single Option Correct Type Questions

- This section contains **30 multiple choice questions.** Each question has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct

1. The sum of the square of the length of the chord intercepted by the line $x+y=n, n \in N$ on the circle $x^2+y^2=4$ is
(a) 11 (b) 22
(c) 33 (d) None of these

2. 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
(a) $(10, 0)$ (b) $(10\sqrt{2}, 0)$ (c) $(-10\sqrt{2}, 0)$ (d) $(10\sqrt{3}, 0)$

3. Equation of chord AB of circle $x^2+y^2=2$ passing through $P(2,2)$ such that $\frac{PB}{PA}=3$, is given by
(a) $x=3y$ (b) $x=y$
(c) $y-2=\sqrt{3}(x-2)$ (d) $y-3=\sqrt{3}(x-1)$

4. If r_1 and r_2 are the radii of smallest and largest circles which passes through (5, 6) and touches the circle $(x-2)^2+y^2=4$, then r_1r_2 is
(a) $\frac{4}{41}$ (b) $\frac{41}{4}$ (c) $\frac{5}{41}$ (d) $\frac{41}{5}$

5. Equation of circle $S(x,y)=0$, $(S(2,3)=16)$ which touches the line $3x+4y-7=0$ at $(1,1)$ is given by
(a) $x^2+y^2+x+2y-5=0$
(b) $x^2+y^2+2x+2y-7=0$
(c) $x^2+y^2+4x-6y+13=0$
(d) $x^2+y^2-4x+6y-7=0$

6. If $P(2,8)$ is an interior point of a circle $x^2+y^2-2x+4y-\lambda=0$ which neither touches nor intersects the axes, then set for λ is
(a) $(-\infty,-1)$ (b) $(-\infty,-4)$
(c) $(96,\infty)$ (d) ϕ

7. The difference between the radii of the largest and smallest circles which have their centre on the circumference of the circle $x^2+y^2+2x+4y-4=0$ and pass through the point (a,b) lying outside the given circle is
(a) 6 (b) $\sqrt{(a+1)^2+(b+2)^2}$
(c) 3 (d) $\sqrt{(a+1)^2+(b+2)^2}-3$

8. The number of rational point(s) (a point (a,b) is rational if a and b both are rational numbers) on the circumference of a circle having centre (π, e) is
(a) atmost one (b) atleast two
(c) exactly two (d) infinite

9. Three sides of a triangle have the equations $L_r \equiv y-m_rx-c_r=0$; $r=1,2,3$. Then $\lambda L_2L_3+\mu L_3L_1+\nu L_1L_2=0$, where $\lambda \neq 0, \mu \neq 0, \nu \neq 0$ is the equation of circumcircle of triangle, if
(a) $\lambda(m_2+m_3)+\mu(m_3+m_1)+\nu(m_1+m_2)=0$
(b) $\lambda(m_2m_3-1)+\mu(m_3m_1-1)+\nu(m_1m_2-1)=0$
(c) Both (a) and (b)
(d) None of the above

10. $f(x,y) \equiv x^2+y^2+2ax+2by+c=0$ represent a circle. If $f(x,0)=0$ has equal roots, each being 2 and $f(0,y)=0$ has 2 and 3 as its roots, then the centre of the circle is
(a) $\left(2,\frac{5}{2}\right)$ (b) Data are not consistent
(c) $\left(-2,-\frac{5}{2}\right)$ (d) Data are inconsistent

11. If $(1+\alpha x)^n=1+8x+24x^2+\ldots$ and a line through $P(\alpha,n)$ cuts the circle $x^2+y^2=4$ in A and B, then $PA \cdot PB$ is equal to
(a) 4 (b) 8 (c) 16 (d) 32

12. A region in the xy-plane is bounded by the curve $y=\sqrt{(25-x^2)}$ and the line $y=0$. If the point $(a, a+1)$ lies in the interior of the region, then
(a) $a \in (-4,3)$ (b) $a \in (-\infty,-1) \cup (3,\infty)$
(c) $a \in (-1,3)$ (d) None of these

13. $S(x,y)=0$ represents a circle. The equation $S(x,2)=0$ gives two identical solutions $x=1$ and the equation $S(1,y)=0$ gives two distinct solutions $y=0,2$, then the equation of the circle is
(a) $x^2+y^2+2x-2y+1=0$ (b) $x^2+y^2-2x+2y+1=0$
(c) $x^2+y^2-2x-2y-1=0$ (d) $x^2+y^2-2x-2y+1=0$

14. Let $0<\alpha<\frac{\pi}{2}$ be a fixed angle. If $P=(\cos\theta, \sin\theta)$ and $Q=(\cos(\alpha-\theta), \sin(\alpha-\theta))$, then Q is obtained from P by
(a) clockwise rotation around origin through an angle α
(b) anti-clockwise rotation around origin through an angle α
(c) reflection in the line through origin with slope $\tan\alpha$
(d) reflection in the line through origin with slope $\tan\left(\frac{\alpha}{2}\right)$

15. The number of points (x, y) having integral coordinates satisfying the condition $x^2 + y^2 < 25$ is
(a) 69 (b) 80 (c) 81 (d) 77

16. The point $([P+1], [P])$, (where $[.]$ denotes the greatest integer function) lying inside the region bounded by the circle $x^2 + y^2 - 2x - 15 = 0$ and $x^2 + y^2 - 2x - 7 = 0$, then
(a) $P \in [-1,0) \cup [0,1) \cup [1,2)$ (b) $P \in [-1,2) - \{0,1\}$
(c) $P \in (-1,2)$ (d) None of these

17. A point P lies inside the circles $x^2 + y^2 - 4 = 0$ and $x^2 + y^2 - 8x + 7 = 0$. The point P starts moving under the conditions that its path encloses greatest possible area and it is at a fixed distance from any arbitrarily chosen fixed point in its region. The locus of P is
(a) $4x^2 + 4y^2 - 12x + 1 = 0$ (b) $4x^2 + 4y^2 + 12x - 1 = 0$
(c) $x^2 + y^2 - 3x - 2 = 0$ (d) $x^2 + y^2 - 3x + 2 = 0$

18. The set of values of 'c' so that the equations $y = |x| + c$ and $x^2 + y^2 - 8|x| - 9 = 0$ have no solution is
(a) $(-\infty, -3) \cup (3, \infty)$ (b) $(-3, 3)$
(c) $(-\infty, -5\sqrt{2}) \cup (5\sqrt{2}, \infty)$ (d) $(5\sqrt{2} - 4, \infty)$

19. If a line segment $AM = a$ moves in the plane XOY remaining parallel to OX so that the left end point A slides along the circle $x^2 + y^2 = a^2$, the locus of M is
(a) $x^2 + y^2 = 4a^2$ (b) $x^2 + y^2 = 2ax$
(c) $x^2 + y^2 = 2ay$ (d) $x^2 + y^2 - 2ax - 2ay = 0$

20. The four points of intersection of the lines $(2x - y + 1)(x - 2y + 3) = 0$ with the axes lie on a circle whose centre is at the point
(a) $\left(-\frac{7}{4}, \frac{5}{4}\right)$ (b) $\left(\frac{3}{4}, \frac{5}{4}\right)$ (c) $\left(\frac{9}{4}, \frac{5}{4}\right)$ (d) $\left(0, \frac{5}{4}\right)$

21. The number of integral values of λ for which $x^2 + y^2 + \lambda x + (1 - \lambda)y + 5 = 0$ is the equation of a circle whose radius cannot exceed 5, is
(a) 14 (b) 18 (c) 16 (d) None of these

22. Let $\phi(x, y) = 0$ be the equation of a circle. If $\phi(0, \lambda) = 0$ has equal roots $\lambda = 2, 2$ and $\phi(\lambda, 0) = 0$ has roots $\lambda = \frac{4}{5}, 5$, then the centre of the circle is
(a) $\left(2, \frac{29}{10}\right)$ (b) $\left(\frac{29}{10}, 2\right)$ (c) $\left(-2, \frac{29}{10}\right)$ (d) None of these

23. The locus of the point of intersection of the tangents to the circle $x = r\cos\theta, y = r\sin\theta$ at points whose parametric angles differ by $\frac{\pi}{3}$ is
(a) $x^2 + y^2 = 4(2 - \sqrt{3})r^2$ (b) $3(x^2 + y^2) = 1$
(c) $x^2 + y^2 = (2 - \sqrt{3})r^2$ (d) $3(x^2 + y^2) = 4r^2$

24. One of the diameter of the circle circumscribing the rectangle $ABCD$ is $4y = x + 7$. If A and B are the points $(-3, 4)$ and $(5, 4)$ respectively, then the area of the rectangle is
(a) 16 sq units (b) 24 sq units
(c) 32 sq units (d) None of these

25. A, B, C and D are the points of intersection with the coordinate axes of the lines $ax + by = ab$ and $bx + ay = ab$, then
(a) A, B, C, D are concyclic
(b) A, B, C, D form a parallelogram
(c) A, B, C, D form a rhombus
(d) None of the above

26. α, β and γ are parametric angles of three points P, Q and R respectively, on the circle $x^2 + y^2 = 1$ and A is the point $(-1, 0)$. If the lengths of the chords AP, AQ and AR are in GP, then $\cos\left(\frac{\alpha}{2}\right)$, $\cos\left(\frac{\beta}{2}\right)$ and $\cos\left(\frac{\gamma}{2}\right)$ are in
(a) AP (b) GP
(c) HP (d) None of these

27. The equation of the circle passing through (2, 0) and (0, 4) and having the minimum radius is
(a) $x^2 + y^2 = 20$
(b) $x^2 + y^2 - 2x - 4y = 0$
(c) $(x^2 + y^2 - 4) + \lambda(x^2 + y^2 - 16) = 0$
(d) None of the above

28. A circle of radius unity is centred at the origin. Two particles start moving at the same time from the point (1, 0) and move around the circle in opposite direction. One of the particle moves anticlockwise with constant speed v and the other moves clockwise with constant speed $3v$. After leaving (1, 0), the two particles meet first at a point P and continue until they meet next at point Q. The coordinates of the point Q are
(a) (1, 0) (b) (0, 1) (c) (−1, 0) (d) (0, −1)

29. The circle $x^2 + y^2 = 4$ cuts the line joining the points $A(1, 0)$ and $B(3, 4)$ in two points P and Q. Let $\frac{BP}{PA} = \alpha$ and $\frac{BQ}{QA} = \beta$, then α and β are roots of the quadratic equation
(a) $x^2 + 2x + 7 = 0$ (b) $3x^2 + 2x - 21 = 0$
(c) $2x^2 + 3x - 27 = 0$ (d) None of these

30. The locus of the mid-points of the chords of the circle $x^2 + y^2 + 4x - 6y - 12 = 0$ which subtend an angle of $\frac{\pi}{3}$ radians at its circumference is
(a) $(x + 2)^2 + (y - 3)^2 = 6.25$ (b) $(x - 2)^2 + (y + 3)^2 = 6.25$
(c) $(x + 2)^2 + (y - 3)^2 = 18.75$ (d) $(x + 2)^2 + (y + 3)^2 = 18.75$

Circle Exercise 2 :
More than One Correct Option Type Questions

This section contains **15 multiple choice questions**. Each question has four choices (a), (b), (c) and (d) out of which **MORE THAN ONE** may be correct.

31. If OA and OB are two perpendicular chords of the circle $r = a\cos\theta + b\sin\theta$ passing through origin, then the locus of the mid-point of AB is

(a) $x^2 + y^2 = a + b$ (b) $x = \frac{a}{2}$

(c) $x^2 - y^2 = a^2 - b^2$ (d) $y = \frac{b}{2}$

32. If A and B are two points on the circle $x^2 + y^2 - 4x + 6y - 3 = 0$ which are farthest and nearest respectively, from the point (7, 2), then

(a) $A \equiv (2 - 2\sqrt{2}, -3 - 2\sqrt{2})$

(b) $A \equiv (2 + 2\sqrt{2}, -3 + 2\sqrt{2})$

(c) $B \equiv (2 + 2\sqrt{2}, -3 + 2\sqrt{2})$

(d) $B \equiv (2 - 2\sqrt{2}, -3 - 2\sqrt{2})$

33. If the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ cuts each of the circles $x^2 + y^2 - 4 = 0$, $x^2 + y^2 - 6x - 8y + 10 = 0$ and $x^2 + y^2 + 2x - 4y - 2 = 0$ at the extremities of a diameter, then

(a) $c = -4$ (b) $g + f = c - 1$

(c) $g^2 + f^2 - c = 17$ (d) $gf = 6$

34. The possible value of $\lambda (\lambda > 0)$ such that the angle between the pair of tangents from point $(\lambda, 0)$ to the circle $x^2 + y^2 = 4$ lies in interval $\left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$ is

(a) $\left(\frac{4}{\sqrt{3}}, 2\sqrt{2}\right)$ (b) $(0, \sqrt{2})$

(c) $(1, 2)$ (d) $\left(\frac{4}{\sqrt{3}}, \frac{4}{\sqrt{3}}\right)$

35. If a chord of the circle $x^2 + y^2 - 4x - 2y - c = 0$ is trisected at the points $\left(\frac{1}{3}, \frac{1}{3}\right)$ and $\left(\frac{8}{3}, \frac{8}{3}\right)$, then

(a) $c = 10$ (b) $c = 20$

(c) $c = 15$ (d) $c^2 - 40c + 400 = 0$

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

(a) $x^2 + 6x + (y - 2)^2 = 0$

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

(c) $x^2 + y^2 + 8x - 6y + 9 = 0$

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

37. An equation of a circle touching the axes of coordinates and the line $x\cos\alpha + y\sin\alpha = 2$ can be

(a) $x^2 + y^2 - 2gx - 2gy + g^2 = 0$, where $g = \frac{2}{(\cos\alpha + \sin\alpha + 1)}$

(b) $x^2 + y^2 - 2gx - 2gy + g^2 = 0$, where $g = \frac{2}{(\cos\alpha + \sin\alpha - 1)}$

(c) $x^2 + y^2 - 2gx + 2gy + g^2 = 0$, where $g = \frac{2}{(\cos\alpha - \sin\alpha + 1)}$

(d) $x^2 + y^2 - 2gx + 2gy + g^2 = 0$, where $g = \frac{2}{(\cos\alpha - \sin\alpha - 1)}$

38. If α is the angle subtended at $P(x_1, y_1)$ by the circle $S \equiv x^2 + y^2 + 2gx + 2fy + c = 0$, then

(a) $\cot\alpha = \frac{\sqrt{S_1}}{\sqrt{(g^2 + f^2 - c)}}$ (b) $\cot\frac{\alpha}{2} = \frac{\sqrt{S_1}}{\sqrt{(g^2 + f^2 - c)}}$

(c) $\tan\alpha = \frac{2\sqrt{(g^2 + f^2 - c)}}{\sqrt{S_1}}$ (d) $\alpha = 2\tan^{-1}\left(\frac{\sqrt{(g^2 + f^2 - c)}}{\sqrt{S_1}}\right)$

39. The equation of the circle which touches the axis of coordinates and the line $\frac{x}{3} + \frac{y}{4} = 1$ and whose centre lies in the first quadrant is $x^2 + y^2 - 2\lambda x - 2\lambda y + \lambda^2 = 0$, then λ is equal to

(a) 1 (b) 2

(c) 3 (d) 6

40. If P is a point on the circle $x^2 + y^2 = 9$, Q is a point on the line $7x + y + 3 = 0$, and the line $x - y + 1 = 0$, is the perpendicular bisector of PQ, then the coordinates of P are

(a) (3, 0) (b) $\left(\frac{72}{25}, -\frac{21}{25}\right)$

(c) (0, 3) (d) $\left(-\frac{72}{25}, \frac{21}{25}\right)$

41. If a circle passes through the point $\left(3, \sqrt{\frac{7}{2}}\right)$ and touches $x + y = 1$ and $x - y = 1$, then the centre of the circle is

(a) (4, 0) (b) (4, 2) (c) (6, 0) (d) (7, 9)

42. The equation of a circle C_1 is $x^2 + y^2 = 4$. The locus of the intersection of orthogonal tangents to the circle is the curve C_2 and the locus of the intersection of perpendicular tangents to the curve C_2 is the curve C_3. Then,

(a) C_3 is a circle

(b) the area enclosed by the curve C_3 is 8π

(c) C_2 and C_3 are circles with the same centre

(d) None of the above

43. The equation of a tangent to the circle $x^2+y^2=25$ passing through $(-2, 11)$ is
(a) $4x+3y=25$ (b) $3x+4y=38$
(c) $24x-7y+125=0$ (d) $7x+24y=230$

44. Consider the circles
$C_1 \equiv x^2+y^2-2x-4y-4=0$ and
$C_2 \equiv x^2+y^2+2x+4y+4=0$
and the line $L \equiv x+2y+2=0$, then
(a) L is the radical axis of C_1 and C_2
(b) L is the common tangent of C_1 and C_2
(c) L is the common chord of C_1 and C_2
(d) L is perpendicular to the line joining centres of C_1 and C_2

45. A square is inscribed in the circle $x^2+y^2-10x-6y+30=0$. One side of the square is parallel to $y=x+3$, then one vertex of the square is
(a) $(3, 3)$ (b) $(7,3)$
(c) $(6,3-\sqrt{3})$ (d) $(6,3+\sqrt{3})$

Circle Exercise 3 : Paragraph Based Questions

This section contains **7 paragraphs** based upon each of the paragraph **3 multiple choice questions** have to be answered. Each of these questions has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

Paragraph I

(Q. Nos. 46 to 48)

Consider the circle $S: x^2+y^2-4x-1=0$ and the line $L: y=3x-1$. If the line L cuts the circle at A and B.

46. Length of the chord AB is
(a) $\sqrt{5}$ (b) $\sqrt{10}$ (c) $2\sqrt{5}$ (d) $5\sqrt{2}$

47. The angle subtended by the chord AB is the minor arc of S is
(a) $\frac{\pi}{4}$ (b) $\frac{2\pi}{3}$ (c) $\frac{3\pi}{4}$ (d) $\frac{5\pi}{6}$

48. Acute angle between the line L and the circle S is
(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

Paragraph II

(Q. Nos. 49 to 51)

P is a variable point on the line $L=0$. Tangents are drawn to the circle $x^2+y^2=4$ from P to touch it at Q and R. The parallelogram $PQSR$ is completed.

49. If $L \equiv 2x+y-6=0$, then the locus of the circumcenter of ΔPQR is
(a) $2x-y=4$ (b) $2x+y=3$
(c) $x-2y=4$ (d) $x+2y=3$

50. If $P \equiv (6,8)$, then area of ΔQRS is $\frac{192}{25}\sqrt{\lambda}$ sq units. The value of λ is
(a) 2 (b) 3 (c) 5 (d) 6

51. If $P \equiv (3,4)$, then the coordinates of S are
(a) $\left(-\frac{46}{25}, \frac{63}{25}\right)$ (b) $\left(-\frac{51}{25}, -\frac{68}{25}\right)$
(c) $\left(-\frac{46}{25}, \frac{68}{25}\right)$ (d) $\left(-\frac{68}{25}, \frac{51}{25}\right)$

Paragraph III

(Q. Nos. 52 to 54)

Equation of the circumcircle of a triangle formed by the lines $L_1=0$, $L_2=0$ and $L_3=0$ can be written as $L_1L_2+\lambda L_2L_3+\mu L_3L_1=0$, where λ and μ are such that coefficient of x^2 = coefficient of y^2 and coefficient of $xy=0$

52. $L_1L_2^2+\lambda L_2L_3^2+\mu L_3L_1^2=0$ represents
(a) a curve passing through point of intersection of $L_1=0$, $L_2=0$ and $L_3=0$
(b) a circle is coefficient of x^2 = coefficient of y^2 and coefficient of $xy=0$
(c) a parabola
(d) pair of straight lines

53. $L_1=0$, $L_2=0$ be the distinct parallel lines, $L_3=0$, $L_4=0$ be two other distinct parallel lines which are not parallel to $L_1=0$. The equation of a circle passing through the vertices of the parallelogram formed must be of the form
(a) $\lambda L_1L_4+\mu L_2L_3=0$ (b) $\lambda L_1L_3+\mu L_2L_4=0$
(c) $\lambda L_1L_2+\mu L_3L_4=0$ (d) $\lambda L_1^2L_3+\mu L_2^2L_4=0$

54. If $L_1L_2+\lambda L_2L_3+\mu L_3L_1=0$ is such that $\mu=0$ and λ is non-zero, then it represents
(a) a parabola
(b) a pair of straight lines
(c) a circle
(d) an ellipse

Paragraph IV

(Q. Nos. 55 to 57)

Given two circles intersecting orthogonally having the length of common chord $\frac{24}{5}$ unit. The radius of one of the circles is 3 units.

55. If radius of other circle is λ units, then λ is

(a) 2 (b) 4 (c) 5 (d) 6

56. If angle between direct common tangents is 2θ, then $\sin 2\theta$ is

(a) $\frac{4}{5}$ (b) $\frac{4\sqrt{6}}{25}$ (c) $\frac{12}{25}$ (d) $\frac{24}{25}$

57. If length of direct common tangent is λ units, then λ^2 is

(a) 12 (b) 24 (c) 36 (d) 48

Paragraph V

(Q. Nos. 58 to 60)

Consider the two circles $C_1 : x^2 + y^2 = a^2$ and $C_2 : x^2 + y^2 = b^2$ $(a > b)$. Let A be a fixed point on the circle C_1, say $A(a, 0)$ and B be a variable point on the circle C_2. The line BA meets the circle C_2 again at C. 'O' being the origin.

58. If $(OA)^2 + (OB)^2 + (BC)^2 = \lambda$, then $\lambda \in$

(a) $[5b^2 - 3a^2, 5b^2 + a^2]$ (b) $[4b^2, 4b^2 + a^2]$

(c) $[4a^2, 4b^2]$ (d) $[5b^2 - 3a^2, 5b^2 + 3a^2]$

59. The locus of the mid-point of AB is

(a) $\left(x - \frac{a}{2}\right)^2 + y^2 = \frac{b^2}{4}$ (b) $\left(x - \frac{a}{2}\right)^2 + y^2 = \frac{a^2}{4}$

(c) $\left(x - \frac{b}{2}\right)^2 + y^2 = \frac{a^2}{4}$ (d) $\left(x - \frac{b}{2}\right)^2 + y^2 = \frac{b^2}{4}$

60. If $(BC)^2$ is maximum, then the locus of the mid-point of AB is

(a) $x^2 + y^2 = b^2$ (b) $x^2 + y^2 = (a + b)^2$

(c) $x^2 + y^2 = (a - b)^2$ (d) None of these

Paragraph VI

(Q. Nos. 61 to 63)

Two variable chords AB and BC of a circle $x^2 + y^2 = a^2$ are such that $AB = BC = a$, M and N are the mid-points of AB and BC respectively such that line joining MN intersect the circle at P and Q, where P is closer to AB and O is the centre of the circle.

61. $\angle OAB$ is

(a) $15°$ (b) $30°$

(c) $45°$ (d) $60°$

62. Angle between tangents at A and C is

(a) $60°$ (b) $90°$

(c) $120°$ (d) $150°$

63. Locus of point of intersection of tangents at A and C is

(a) $x^2 + y^2 = a^2$ (b) $x^2 + y^2 = 2a^2$

(c) $x^2 + y^2 = 4a^2$ (d) $x^2 + y^2 = 8a^2$

Paragraph VII

(Q. Nos. 64 to 66)

t_1, t_2, t_3 are lengths of tangents drawn from a point (h, k) to the circles $x^2 + y^2 = 4$, $x^2 + y^2 - 4x = 0$ and $x^2 + y^2 - 4y = 0$ respectively further, $t_1^4 = t_2^2 t_3^2 + 16$. Locus of the point (h, k) consist of a straight line L_1 and a circle C_1 passing through origin. A circle C_2, which is equal to circle C_1 is drawn touching the line L_1 and the circle C_1 externally.

64. Equation of L_1 is

(a) $x + y = 0$ (b) $x - y = 0$

(c) $2x + y = 0$ (d) $x + 2y = 0$

65. Equation of C_1 is

(a) $x^2 + y^2 - x - y = 0$ (b) $x^2 + y^2 - 2x + y = 0$

(c) $x^2 + y^2 - x + 2y = 0$ (d) $x^2 + y^2 - 2x - 2y = 0$

66. The distance between the centres of C_1 and C_2 is

(a) $\sqrt{2}$ (b) 2

(c) $2\sqrt{2}$ (d) 4

Circle Exercise 4 :

Single Integer Answer Type Questions

- This section contains **10 questions**. The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).

67. The point (1, 4) lies inside the circle $x^2 + y^2 - 6x - 10y + \lambda = 0$. If the circle neither touches nor cuts the axes, then the difference between the maximum and the minimum possible values of λ is

68. Consider the family of circles $x^2 + y^2 - 2x - 2\lambda y - 8 = 0$ passing through two fixed points A and B. Then the distance between the points A and B is

69. If $C_1 : x^2 + y^2 = (3+2\sqrt{2})^2$ be a circle and PA and PB are pair of tangents on C_1, where P is any point on the director circle of C_1, then the radius of the smallest circle which touches C_1 externally and also the two tangents PA and PB, is

70. If a circle $S(x, y) = 0$ touches the point $(2, 3)$ of the line $x + y = 5$ and $S(1, 2) = 0$, then radius of such circle is $\frac{1}{\sqrt{\lambda}}$ units, then the value of λ^2 is.

71. If real numbers x and y satisfy $(x+5)^2 + (y-12)^2 = 196$, then the maximum value of $(x^2 + y^2)^{\frac{1}{3}}$ is

Must

72. If the equation of circle circumscribing the quadrilateral formed by the lines in order are $2x + 3y = 2$, $3x - 2y = 3$, $x + 2y = 3$ and $2x - y = 1$ is given by $x^2 + y^2 + \lambda x + \mu y + v = 0$. Then the value of $|\lambda + 2\mu + v|$ is

73. A circle $x^2 + y^2 + 4x - 2\sqrt{2}y + c = 0$ is the director circle of the circle C_1 and C_1 is the director circle of circle C_2 and so on. If the sum of radii of all these circles is 2 and if $c = \lambda\sqrt{2}$, then the value of λ is

74. If the area bounded by the circles $x^2 + y^2 = r^2, r = 1, 2$ and the rays given by $2x^2 - 3xy - 2y^2 = 0, y > 0$ is $\frac{\lambda\pi}{4}$ sq units, then the value of λ is

75. The length of a common internal tangent of two circles is 5 and that of a common external tangent is 13. If the product of the radii of two circles is λ, then the value of $\frac{\lambda}{4}$ is

76. Consider a circles 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 $\sqrt{\lambda}$, then the value of $\frac{\lambda}{9}$ is

Circle Exercise 5 : Matching Type Questions

- This section contains **4 questions**. Questions 77 and 78 have four statements (A, B, C and D) given in **Column I** and four statements (p, q, r and s) in **Column II**, and questions 79 and 80 have three statements (A, B and C) given in **Column I** and five statements (p, q, r, s and t) in **Column II**. Any given statement in **Column I** can have correct matching with one or more statement(s) given in **Column II**.

77. Consider the circles $S_1 : x^2 + y^2 - 4x - 6y + 12 = 0$ and $S_2 : (x-5)^2 + (y-6)^2 = r^2 > 1$

	Column I		Column II
(A)	S_1 and S_2 touch internally, then $(r-1)^2$ is divisible by	(p)	3
(B)	S_1 and S_2 touch externally, then $r^2 + 2r + 3$ is divisible by	(q)	4
(C)	S_1 and S_2 intersect orthogonally, then $r^2 - 1$ is divisible by	(r)	5
(D)	S_1 and S_2 intersect so that the common chord is longest, then $r^2 + 5$ is divisible by	(s)	6

78. Match the following

	Column I		Column II
(A)	If $ax + by - 5 = 0$ is the equation of the chord of the circle $(x-3)^2 + (y-4)^2 = 4$, which passes through $(2, 3)$ and at the greatest distance from the centre of the circle, then	(p)	$a + b = 1$
(B)	Let O be the origin and P be a variable point on the circle $x^2 + y^2 + 2x + 2y = 0$. If the locus of mid-point of OP is $x^2 + y^2 + 2ax + 2by = 0$, then	(q)	$a + b = 2$
(C)	If (a, b) be coordinates of the centre of the smallest circle which cuts the circle $x^2 + y^2 - 2x - 4y - 4 = 0$ and $x^2 + y^2 - 10x + 12y + 52 = 0$ orthogonally, then	(r)	$a^2 + b^2 = 2$
(D)	If a and b are the slope of tangents which are drawn to the circle $x^2 + y^2 - 6\sqrt{3}x - 6y + 27 = 0$ from the origin, then	(s)	$a^2 + b^2 = 3$

79. Match the following

Column I		Column I	
(A)	If the shortest and largest distance from the point (10,7) to the circle $x^2 + y^2 - 4x - 2y - 20 = 0$ are L and M respectively, then	(p)	$M + L = 10$
(B)	If the shortest and largest distance from the point (3, −6) to the circle $x^2 + y^2 - 16x - 12y - 125 = 0$ are L and M respectively, then	(q)	$M + L = 20$
(C)	If the shortest and largest distance from the point (6, −6) to the circle $x^2 + y^2 - 4x + 6y - 12 = 0$ are L and M respectively, then	(r)	$M + L = 30$
		(s)	$M - L = 10$
		(t)	$M - L = 26$

80. Match the following

Column I		Column II	
(A)	If the straight lines $y = a_1x + b$ and $y = a_2x + b$ $(a_1 \neq a_2)$ and $b \in R$ meet the coordinate axes in concyclic points, then	(p)	$a_1^2 + a_2^2 = 4$
(B)	If the chord of contact of the tangents drawn to $x^2 + y^2 = b^2$ and $b \in R$ from any point on $x^2 + y^2 = a_1^2$, touches the circle $x^2 + y^2 = a_2^2$ $(a_1 \neq a_2)$, then	(q)	$a_1 + a_2 = 3$
(C)	If the circle $x^2 + y^2 + 2a_1x + b = 0$ and $x^2 + y^2 + 2a_2x + b = 0$ $(a_1 \neq a_2)$ and $b \in R$ cuts orthogonally, then	(r)	$a_1a_2 = b$
		(s)	$a_1a_2 = 1$
		(t)	$a_1a_2 = b^2$

Circle Exercise 6 :
Statement I and II Type Questions

- **Directions** (Q. Nos. 81 to 88) are Assertion-Reason type questions. Each of these questions contains two statements:
Statement I (Assertion) and **Statement II** (Reason)
Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select the correct choice as given below :
  (a) Statement I is true, Statement II is true; Statement II is a correct explanation for Statement I
  (b) Statement I is true, Statement II is true; Statement II is not a correct explanation for Statement I
  (c) Statement I is true, Statement II is false
  (d) Statement I is false, Statement II is true

81. **Statement I** Only one tangent can be drawn from the point (1, 3) to the circle $x^2 + y^2 = 1$

Statement II Solving $\frac{|3-m|}{\sqrt{(1+m^2)}} = 1$, we get only one real value of m

82. **Statement I** Tangents cannot be drawn from the point $(1, \lambda)$ to the circle $x^2 + y^2 + 2x - 4y = 0$

Statement II $(1+1)^2 + (\lambda + 2)^2 < 1^2 + 2^2$

83. **Statement I** Number of circles passing through (1, 4), (2, 3), (−1, 6) is one

Statement II Every triangle has one circumcircle

84. **Statement I** Two tangents are drawn from a point on the circle $x^2 + y^2 = 50$ to the circle $x^2 + y^2 = 25$, then angle between tangents is $\frac{\pi}{3}$

Statement II $x^2 + y^2 = 50$ is the director circle of $x^2 + y^2 = 25$.

85. **Statement I** Circles $x^2 + y^2 = 4$ and $x^2 + y^2 - 6x + 5 = 0$ intersect each other at two distinct points

Statement II Circles with centres C_1, C_2 and radii r_1, r_2 intersect at two distinct points if $|C_1C_2| < r_1 + r_2$

86. **Statement I** The line $3x - 4y = 7$ is a diameter of the circle $x^2 + y^2 - 2x + 2y - 47 = 0$

Statement II Normal of a circle always pass through centre of circle

87. **Statement I** A ray of light incident at the point $(-3, -1)$ gets reflected from the tangent at $(0, -1)$ to the circle $x^2 + y^2 = 1$. If the reflected ray touches the circle, then equation of the reflected ray is $4y - 3x = 5$

Statement I The angle of incidence = angle of reflection i.e. $\angle i = \angle r$

88. **Statement I** The chord of contact of the circle $x^2 + y^2 = 1$ w.r.t. the points (2, 3), (3, 5) and (1, 1) are concurrent.

Statement II Points (1, 1), (2, 3) and (3, 5) are collinear.

Circle Exercise 7 :
Subjective Type Questions

- In this section, there are **16 subjective questions.**

89. Find the equation of the circle passing through $(1, 0)$ and $(0, 1)$ and having the smallest possible radius.

90. Find the equation of the circle which touches the circle $x^2 + y^2 - 6x + 6y + 17 = 0$ externally and to which the lines $x^2 - 3xy - 3x + 9y = 0$ are normals.

91. A line meets the coordinate axes at A and B. A circle is circumscribed about the triangle OAB. If the distance of the points A and B from the tangent at O, the origin, to the circle are m and n respectively, find the equation of the circle.

92. Find the equation of a circle which passes through the point $(2, 0)$ and whose centre is the limit of the point of intersection of the lines $3x + 5y = 1$ and $(2 + c)x + 5c^2y = 1$ as $c \to 1$.

93. Tangents are drawn from $P(6, 8)$ to the circle $x^2 + y^2 = r^2$. Find the radius of the circle such that the area of the Δ formed by tangents and chord of contact is maximum.

94. $2x - y + 4 = 0$ is a diameter of the circle which circumscribed a rectangle $ABCD$. If the coordinates of A and B are $A(4, 6)$ and $B(1, 9)$, find the area of rectangle $ABCD$.

95. Find the radius of smaller circle which touches the straight line $3x - y = 6$ at $(1, -3)$ and also touches the line $y = x$.

96. If the circle C_1, $x^2 + y^2 = 16$ intersects another circle C_2 of radius 5 in such a manner that the common chord is of maximum length and has a slope equal to (3/4), find the coordinates of centre C_2.

97. Let $2x^2 + y^2 - 3xy = 0$ be the equation of a pair of tangents drawn from the origin O to a circle of radius 3 with centre in the first quadrant. If A is one of the points of contact, find the length of OA.

98. The circle $x^2 + y^2 = 1$ cuts the X-axis at P and Q. another circle with centre at Q and variable radius intersects the first circle at R above the X-axis and the line segment PQ at S. Find the maximum area of the ΔQSR.

99. If the two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ cut the coordinate axes in concyclic points, prove that $a_1a_2 = b_1b_2$ and find the equation of the circle.

100. The centre of the circle $S = 0$ lie on the line $2x - 2y + 9 = 0$ and $S = 0$ cuts orthogonally the circle $x^2 + y^2 = 4$. Show that circle $S = 0$ passes through two fixed points and find their coordinates.

101. Find the condition on a, b, c such that two chords of the circle
$$x^2 + y^2 - 2ax - 2by + a^2 + b^2 - c^2 = 0$$
passing through the point $(a, b + c)$ are bisected by the line $y = x$.

102. Two straight lines rotate about two fixed points. If they start from their position of coincidence such that one rotates at the rate double that of the other. Prove that the locus of their point of intersection is a circle.

103. The base AB of a triangle is fixed and its vertex C moves such that $\sin A = k \sin B\,(k \neq 1)$. Show that the locus of C is a circle whose centre lies on the line AB and whose radius is equal to $\dfrac{ak}{(1-k^2)}$, a being the length of the base AB.

104. Consider a curve $ax^2 + 2hxy + by^2 = 1$ and a point P not on the curve. A line drawn from the point P intersects the curve at points Q and R. If the product $PQ \cdot PR$ is independent of the slope of the line, then show that the curve is a circle.

Circle Exercise 8 : Questions Asked in Previous 13 Year's Exams

- This section contains questions asked in **IIT-JEE, AIEEE, JEE Main & JEE Advanced** from year **2005** to **2017**.

105. A circle is given by $x^2+(y-1)^2=1$, another circle C touches it externally and also the X-axis, then the locus of its centre is **[IIT-JEE 2005, 3M]**

(a) $\{(x,y): x^2=4y\} \cup \{(x,y): y \le 0\}$

(b) $\{(x,y): x^2+(y-1)^2=4\} \cup \{(x,y): y \le 0\}$

(c) $\{(x,y): x^2=y\} \cup \{(0,y): y \le 0\}$

(d) $\{(x,y): x^2=4y\} \cup \{(0,y): y \le 0\}$

106. If 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 the line $5x+by-a=0$ passes through P and Q for **[AIEEE 2005, 6M]**

(a) exactly one value of a (b) no value of a
(c) infinitely many values of a (d) exactly two values of a

107. A circle touches the X-axis and also touches the circle with centre at (0, 3) and radius 2. The locus of the centre of the circle is **[AIEEE 2005, 3M]**

(a) an ellipse (b) a circle
(c) a hyperbola (d) a parabola

108. If a circle passes through the point (a,b) and cuts the circle $x^2+y^2=p^2$ orthogonally, then the equation of the locus of its centre is **[AIEEE 2005, 3M]**

(a) $x^2+y^2-3ax-4by+(a^2+b^2-p^2)=0$

(b) $2ax+2by-(a^2-b^2+p^2)=0$

(c) $x^2+y^2-2ax-3by+(a^2-b^2-p^2)=0$

(d) $2ax+2by-(a^2+b^2+p^2)=0$

Paragraph

(Q. Nos. 109 to 111)

ABCD is a square of side length 2 units. C_1 is the circle touching all the sides of the square ABCD and C_2 is the circumcircle of square ABCD. L is a fixed line in the same plane and R is a fixed point.

109. If P is any point of C_1 and Q is another point on C_2, then $\dfrac{PA^2+PB^2+PC^2+PD^2}{QA^2+QB^2+QC^2+QD^2}$ is equal to

Must

(a) 0.75 (b) 1.25 (c) 1 (d) 0.5

110. If a circle is such that it touches the line L and the circle C_1 externally, such that both the circles are on the same side of the line then the locus of centre of the circle is

(a) ellipse (b) hyperbola
(c) parabola (d) pair of straight line

111. A line L' through A is drawn parallel to BD. Point S moves such that its distances from the line BD and the vertex A are equal. If locus of S cuts L' at T_2 and T_3 and AC at T_1, then area of $\Delta T_1T_2T_3$ is **[IIT-JEE 2006, 5+5+5 M]**

(a) $\dfrac{1}{2}$ sq units (b) $\dfrac{2}{3}$ sq units
(c) 1 sq units (d) 2 sq units

112. If the lines $3x-4y-7=0$ and $2x-3y-5=0$ are two diameters of a circle of area 49π square units, the equation of the circle is **[AIEEE 2006, 6M]**

(a) $x^2+y^2+2x-2y-47=0$

(b) $x^2+y^2+2x-2y-62=0$

(c) $x^2+y^2-2x+2y-62=0$

(d) $x^2+y^2-2x+2y-47=0$

113. Let C be the circle with centre (0, 0) and radius 3 units. The equation of the locus of the mid-points of the chords of the circle C that subtend an angle of $\dfrac{2\pi}{3}$ at its centre is **[AIEEE 2006, 6M]**

(a) $x^2+y^2=\dfrac{3}{2}$ (b) $x^2+y^2=1$

(c) $x^2+y^2=\dfrac{27}{4}$ (d) $x^2+y^2=\dfrac{9}{4}$

114. Tangents are drawn from the point (17, 7) to the circle $x^2+y^2=169$.

Statement I The tangents are mutually perpendicular. because

Statement II The locus of the points from which mutually perpendicular tangents can be drawn to the given circle is $x^2+y^2=338$. **[IIT-JEE 2007, 3M]**

(a) Statement I is True, statement II is True; statement II is a correct explanation for statement I

(b) Statement I is True, statement II is True; statement II is not a correct explanation for statement I

(c) Statement I is True, statement II is False

(d) Statement I is False, statement II is True

115. Consider a family of circles which are passing through the point $(-1,1)$ and are tangent to X-axis. If (h,k) are the coordinate of the centre of the circles, then the set of values of k is given by the interval **[AIEEE 2007, 3M]**

(a) $-\dfrac{1}{2} \le k \le \dfrac{1}{2}$ (b) $k \le \dfrac{1}{2}$

(c) $0 \le k \le \dfrac{1}{2}$ (d) $k \ge \dfrac{1}{2}$

Paragraph

(Q. Nos. 116 to 118)

A circle C of radius 1 is inscribed in an equilateral triangle PQR. The points of contact of C with the sides PQ, QR, RP are D, E, F, respectively. The line PQ is given by the equation $\sqrt{3}x+y-6=0$ *and the point D is* $\left(\frac{3\sqrt{3}}{2},\frac{3}{2}\right)$*. Further, it is given that the origin and the centre of C are on the same side of the line PQ.*

116. The equation of circle C is → take mod in dist from a line

(a) $(x-2\sqrt{3})^2+(y-1)^2=1$ (b) $(x-2\sqrt{3})^2+\left(y+\frac{1}{2}\right)^2=1$

(c) $(x-\sqrt{3})^2+(y+1)^2=1$ (d) $(x-\sqrt{3})^2+(y-1)^2=1$

117. Points E and F are given by

(a) $\left(\frac{\sqrt{3}}{2},\frac{3}{2}\right),(\sqrt{3},0)$ (b) $\left(\frac{\sqrt{3}}{2},\frac{1}{2}\right),(\sqrt{3},0)$

(c) $\left(\frac{\sqrt{3}}{2},\frac{3}{2}\right),\left(\frac{\sqrt{3}}{2},\frac{1}{2}\right)$ (d) $\left(\frac{3}{2},\frac{\sqrt{3}}{2}\right),\left(\frac{\sqrt{3}}{2},\frac{1}{2}\right)$

118. Equations of the sides QR, RP are **[IIT-JEE 2008, (4 + 4 + 4) M]**

(a) $y=\frac{2}{\sqrt{3}}x+1,\ y=-\frac{2}{\sqrt{3}}x-1$ (b) $y=\frac{1}{\sqrt{3}}x,\ y=0$

(c) $y=\frac{\sqrt{3}}{2}x+1,\ y=-\frac{\sqrt{3}}{2}x-1$ (d) $y=\sqrt{3}x,\ y=0$

119. Consider $L_1: 2x+3y+p-3=0$; $L_2: 2x+3y+p+3=0$ where, p is a real number, and $C: x^2+y^2+6x-10y+30=0$

Statement I If line L_1 is a chord of circle C, then line L_2 is not always a diameter of circle C and

Statement II If line L_1 is a diameter of circle C, then line L_2 is not a chord of circle C. **[IIT-JEE 2008, 3M]**

(a) Statement I is True, statement II is True; statement II is a correct explanation for statement I

(b) Statement I is True, statement II is True; statement II is not a correct explanation for statement I

(c) Statement I is True, statement II is False

(d) Statement I is False, statement II is True

120. The point diametrically opposite to the point $P(1, 0)$ on the circle $x^2+y^2+2x+4y-3=0$ is **[AIEEE 2008, 3M]**

(a) $(3,-4)$ (b) $(-3,4)$ (c) $(-3,-4)$ (d) $(3,4)$

121. Tangents drawn from the point $P(1,8)$ to the circle $x^2+y^2-6x-4y-11=0$ touch the circle at the points A and B. The equation of the circumcircle of the triangle PAB is **[IIT-JEE 2009, 3M]**

Must

(a) $x^2+y^2+4x-6y+19=0$ (b) $x^2+y^2-4x-10y+19=0$

(c) $x^2+y^2-2x+6y-29=0$ (d) $x^2+y^2-6x-4y+19=0$

122. The centres of two circles C_1 and C_2 each of unit radius are at a distance of 6 units from each other. Let P be the mid point of the line segment joining the centres of C_1 and C_2 and C be a circle touching circles C_1 and C_2 externally. If a common tangent to C_1 and C passing through P is also a common tangent to C_2 and C, then the radius of the circle C is **[IIT-JEE 2009, 4M]**

123. If P and Q are the points of intersection of the circles $x^2+y^2+3x+7y+2p-5=0$ and $x^2+y^2+2x+2y-p^2=0$ then there is a circle passing through P, Q and $(1, 1)$ for : **[AIEEE 2009, 4M]**

(a) all except one value of p

(b) all except two values of p

(c) exactly one value of p

(d) all values of p

124. The circle $x^2+y^2=4x+8y+5$ intersects the line $3x-4y=m$ at two distinct points if **[AIEEE 2010, 4M]**

(a) $-35<m<15$ (b) $15<m<65$

(c) $35<m<85$ (d) $-85<m<-35$

125. The circle passing through the point $(-1,0)$ and touching the Y-axis at $(0, 2)$ also passes through the point. **[IIT-JEE 2011, 3M]**

(a) $\left(-\frac{3}{2},0\right)$ (b) $\left(-\frac{5}{2},2\right)$

(c) $\left(-\frac{3}{2},\frac{5}{2}\right)$ (d) $(-4, 0)$

126. The straight line $2x-3y=1$ divides the circular region $x^2+y^2\le 6$ into two parts.

If $S=\left\{\left(2,\frac{3}{4}\right),\left(\frac{5}{2},\frac{3}{4}\right),\left(\frac{1}{4},-\frac{1}{4}\right),\left(\frac{1}{8},\frac{1}{4}\right)\right\}$ then the number of point(s) in S lying inside the smaller part is **[IIT-JEE 2011, 4M]**

127. The two circles $x^2+y^2=ax$ and $x^2+y^2=c^2(c>0)$ touch each other if **[AIEEE 2011, 4M]**

(a) $|a|=c$ (b) $a=2c$

(c) $|a|=2c$ (d) $2|a|=c$

128. The locus of the mid-point of the chord of contact of tangents drawn from points lying on the straight line $4x-5y=20$ to the circle $x^2+y^2=9$ is **[IIT-JEE 2012, 3M]**

(a) $20(x^2+y^2)-36x+45y=0$

(b) $20(x^2+y^2)+36x-45y=0$

(c) $36(x^2+y^2)-20x+45y=0$

(d) $36(x^2+y^2)+20x-45y=0$

Paragraph

(Q. Nos. 129 and 130)

A tangent PT is drawn to the circle $x^2 + y^2 = 4$ at the point $P(\sqrt{3}, 1)$. A straight line L, perpendicular to PT is a tangent to the circle $(x-3)^2 + y^2 = 1$

129. A possible equation of L is

(a) $x - \sqrt{3}y = 1$ (b) $x + \sqrt{3}y = 1$

(c) $x - \sqrt{3}y = -1$ (d) $x + \sqrt{3}y = 5$

130. A common tangent of the two circles is **[IIT-JEE 2012, (3 + 3) M]**

(a) $x = 4$ (b) $y = 2$

(c) $x + \sqrt{3}y = 4$ (d) $x + 2\sqrt{2}y = 6$

131. The length of the diameter of the circle which touches the X -axis at the point (1, 0) and passes through the point (2, 3) is **[AIEEE 2012, 4M]**

(a) $\frac{10}{3}$ (b) $\frac{3}{5}$

(c) $\frac{6}{5}$ (d) $\frac{5}{3}$

132. The circle passing through $(1, -2)$ and touching the axis of x at (3, 0) also passes through the point **[JEE Main 2013, 4M]**

(a) $(-5, 2)$ (b) $(2, -5)$

(c) $(5, -2)$ (d) $(-2, 5)$

133. 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, 3M]**

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

134. Let C be the circle with centre at $(1, 1)$ and radius = 1. If T is the circle centred at $(0, y)$, passing through origin and touching the circle C externally, then the radius of T is equal to **[JEE Main 2014, 4M]**

Must

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$

(c) $\frac{\sqrt{3}}{\sqrt{2}}$ (d) $\frac{\sqrt{3}}{2}$

135. 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

it is point of inters like in plane.

[JEE Advanced 2014, 3M]

(a) radius of S is 8 (b) radius of S is 7

(c) centre of S is $(-7, 1)$ (d) centre of S is $(-8, 1)$

136. Locus of the image of the point (2, 3) in the line $(2x - 3y + 4) + k(x - 2y + 3) = 0$, $k \in R$, is a **[JEE Main 2015, 4M]**

(a) circle of radius $\sqrt{2}$

(b) circle of radius $\sqrt{3}$

(c) straight line parallel to X-axis

(d) straight line parallel to Y-axis

137. The number of common tangents to the circles $x^2 + y^2 - 4x - 6x - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$ is **[JEE Main 2015, 4M]**

(a) 3 (b) 4

(c) 1 (d) 2

138. The centres of those circles which touch the circle, $x^2 + y^2 - 8x - 8y - 4 = 0$, externally and also touch the X-axis, lie on **[JEE Main 2016, 4M]**

(a) a hyperbola

(b) a parabola

(c) a circle

(d) an ellipse which is not a circle

139. If one of the diameters of the circle, given by the equation, $x^2 + y^2 - 4x + 6y - 12 = 0$, is a chord of a circle S, whose centre is at $(-3, 2)$, then the radius of S is **[JEE Main 2016, 4M]**

(a) 5 (b) 10

(c) $5\sqrt{2}$ (d) $5\sqrt{3}$

140. 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, 4M]**

(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) $\left(\frac{1}{4}, -\frac{1}{2}\right)$

141. For how many values of p, the circle $x^2 + y^2 + 2x + 4y - p = 0$ and the co-ordinate axes have exactly three common points? **[JEE Advanced 2017, 3M]**

Answers

Exercise for Session 1

1. (d) 2. (b) 3. (b) 4. (b) 5. (a)
6. (c) 7. (d) 8. (a) 9. (c) 10. (c)
11. (b) 12. (a) 13. $\left(\frac{-2}{5}, \frac{4}{5}\right)$; 2

15. $x^2 + y^2 - 2x - 4y - 4 = 0$
16. $x^2 + y^2 - 2x - 8y + 15 = 0$
18. $(x+1)^2 + (y-3)^2 = 4$; $(-1, 3)$; 2

Exercise for Session 2

1. (c) 2. (b) 3. (b) 4. (c) 5. (a)
6. (a) 7. (c) 8. (b) 9. (d) 10. (c)
11. (c) 12. (a) 13. $x^2 + y^2 - y - 16 = 0$; $\left(0, \frac{1}{2}\right)$; $\frac{\sqrt{65}}{2}$
14. $(-2, -7)$ 15. $x^2 + y^2 - 2x - 3y - 18 = 0$
16. $(x^2 + y^2 - 4x - 2y + 4) = 0$
17. $x^2 + y^2 - 6x + 2y - 15 = 0$

Exercise for Session 3

1. (d) 2. (a) 3. (a) 4. (d) 5. (d)
6. (c) 7. (a) 8. (a) 9. (d) 10. (b)
11. (a) 12. (c) 13. $x^2 + y^2 \pm 10x - 6y + 9 = 0$
15. $\lambda \in (-1, 4)$ 16. $x^2 + y^2 - 4x - 6y = 0$

Exercise for Session 4

1. (c) 2. (c) 3. (c) 4. (d) 5. (b)
6. (b) 7. (b) 8. (a) 9. (d) 10. (b)
11. (d) 12. (a)
14. (i) $3x - 4y + 20 = 0$ and $3x - 4y - 10 = 0$ (ii) $4x + 3y + 5 = 0$ and $4x + 3y - 25 = 0$,
15. centre of the circle $(0, 1, \pm r\sqrt{2})$, where r is radius
16. 15, -35

Exercise for Session 5

1. (c) 2. (b) 3. (c) 4. (b) 5. (d)
6. (d) 7. (b) 8. (c) 9. (b) 10. (a)
11. (c) 12. (d) 14. 8 sq units
16. $3x + 2y - 13 = 0$ 17. $\left(\frac{5}{16}\right)$

Exercise for Session 6

1. (a) 2. (c) 3. (a) 4. (d) 5. (c) 6. (b)
7. (c) 8. (b) 9. (b) 10. (d) 11. (b) 12. (b)
13. $4x^2 + 4y^2 + 30x - 13y - 25 = 0$ 14. $2\sqrt{2}$
16. Direct common tangents are $3x + 4y = 57$, $7x - 24y = 233$, Transverse common tangents are $4x - 3y = 26$, $24x + 7y = 156$

Exercise for Session 7

1. (d) 2. (c) 3. (a) 4. (b) 5. (c)
6. (a) 7. (b) 8. (d) 9. (b) 10. (a) 11. (d)
12. (a) 14. $x^2 + y^2 - 6x - 6y + 9 = 0$ 16. $\left(\frac{-16}{21}, \frac{-31}{63}\right)$
17. $4x^2 + 4y^2 + 6x + 10y - 1 = 0$ 18. $x + y - 5 = 0$

Chapter Exercises

1. (b) 2. (a) 3. (b) 4. (b) 5. (a) 6. (d)
7. (a) 8. (a) 9. (c) 10. (b) 11. (c) 12. (c)
13. (d) 14. (d) 15. (a) 16. (d) 17. (d) 18. (d)
19. (b) 20. (a) 21. (c) 22. (b) 23. (d) 24. (c)
25. (a) 26. (b) 27. (b) 28. (c) 29. (b) 30. (a)
31. (b,d) 32. (b,d) 33. (a,b,c,d) 34. (a,d) 35. (b,d)
36. (b,c) 37. (a,b,c,d) 38. (b,d) 39. (a,d) 40. (a,d)
41. (a,c) 42. (a,c) 43. (a,c) 44. (a,c,d) 45. (a,b) 46. (b)
47. (c) 48. (b) 49. (b) 50. (d) 51. (b) 52. (a)
53. (c) 54. (b) 55. (b) 56. (b) 57. (b) 58. (a)
59. (a) 60. (d) 61. (d) 62. (a) 63. (c) 64. (a)
65. (d) 66. (c) 67. (4) 68. (6) 69. (1) 70. (4)
71. (9) 72. (3) 73. (4) 74. (3) 75. (9) 76. (7)
77. (A) $\rightarrow$ (p, s); (B) $\rightarrow$ (q, r); (C) $\rightarrow$ (q); (D) $\rightarrow$ (p, q, s)
78. (A) $\rightarrow$ (q, r) ; (B) $\rightarrow$ (p); (C) $\rightarrow$ (p) (D) $\rightarrow$ (s)
79. (A) $\rightarrow$ (q, s); (B) $\rightarrow$ (r,t); (C) $\rightarrow$ (p,s)
80. (A) $\rightarrow$ (p, q, s); (B) $\rightarrow$ (p, q, s, t); (C) $\rightarrow$ (p, q, r, s)
81. (d) 82. (a) 83. (d) 84. (d) 85. (c) 86. (b)
87. (b) 88. (a) 89. $(x^2 + y^2 - x - y) = 0$
90. $x^2 + y^2 - 6x - 2y + 1 = 0$
91. $x^2 + y^2 \pm \sqrt{m(m+n)}\,x \pm \sqrt{n(m+n)}\,y = 0$
92. $25x^2 + 25y^2 - 20x + 2y - 60 = 0$
93. (5) 94. 18 sq units
95. 1.5 units 96. $\left(\frac{9}{5}, \frac{-12}{5}\right)$ or $\left(\frac{-9}{5}, \frac{12}{5}\right)$
97. $3(3 + \sqrt{10})$ 98. $\frac{4\sqrt{3}}{9}$ sq units
99. $a_1 a_2 (x^2 + y^2) + (a_1 c_2 + a_2 c_1) x + (b_1 c_2 + b_2 c_1) y = 0$
100. $(-4, 4)$ or $\left(\frac{-1}{2}, \frac{1}{2}\right)$
101. $4a^2 + 4b^2 - c^2 - 8ab + 4bc - 4ca < 0$
105. (d) 106. (b) 107. (d) 108. (d) 109. (a) 110. (b)
111. (c) 112. (d) 113. (d) 114. (a) 115. (d) 116. (d)
117. (a) 118. (d) 119. (c) 120. (c) 121. (b) 122. (8)
123. (a) 124. (a) 125. (d) 126. (2) 127. (a) 128. (a)
129. (a) 130. (d) 131. (a) 132. (c) 133. (a,c) 134. (b)
135. (b,c) 136. (a) 137. (a) 138. (b) 139. (d) 140. (a,c)
141. (2)