MATHS

BOOKS - ARIHANT MATHS (ENGLISH)

CIRCLE

Examples

1. Find the centre and radius of the circle $2x^2+2y^2=3x-5y+7$

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2. Prove that the radii of the circles $x^2+y^2=1, x^2+y^2-2x-6y=6$ and $x^2+y^2-4x-12y=9$ are in AP.

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3. Find the equation of the circle whose centre is the point of intersection of the lines $2x - 3y + 4 = 0$ and $3x + 4y - 5 = 0$ and passes through the origin.

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4. Find the equation of the circle concentric with the circle $x^2 + y^2 - 8x + 6y - 5 = 0$ and passing through the point (-2, -7).

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5. A circle has radius $3units$ and its centre lies on the line $y = x - 1$. Find the equation of the circle, if it passes through $(7, 3)$.

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7. Find the parametric form of the equation of the circle $x^2 + y^2 + px + py = 0$.

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8. If the parametric of form of a circle is given by

(a) $x = -4 + 5\cos\theta$ and $y = -3 + 5\sin\theta$

(b) $x = a\cos\alpha + b\sin\alpha$ and $y = a\sin\alpha - b\cos\alpha$ find its cartesian form.

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9. The equation of the locus of the mid-points of chords of the circle $4x^2 + 4y^2 - 12x + 4y + 1 = 0$ that substend an angle $\frac{2\pi}{3}$ at its centre, is

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11. The sides of a square are $x = 2, x = 3, y = 1$ and $y = 2$. Find the equation of the circle drawn on the diagonals of the square as its diameter.

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12. The abscissa of the two points A and B are the roots of the equation $x^2 + 2ax - b^2 = 0$ and their ordinates are the roots of the equation $x^2 + 2px - q^2 = 0$. Find the equation of the circle with AB as diameter. Also, find its radius.

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13. find the equation circle which is passes through the points $(4, 1), (6, 5)$ and centre lies on $4x + y = 16$ is

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14. Show that the points $A(1, 0), B(2, -7), C(8, 1)$ and $D(9, -6)$ all lie on the same circle. Find the equation of this circle, its centre and radius.

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15. Find the equation of the circle whose diameter is the line segment joining (-4,3) and (12,1). Find also the intercept made by it on y-axis.

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16. Find the equation of a circle which touches $y - a\xi s$ at a distance of $4units$ from the origin and cutsan intercept of $6units$ along the positive direction of $x - a\xi s$.

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17. Find the equation of the circle which passes through the origin and cuts off intercepts $a\ and\ b$ respectively from $x\ and\ y - axes$.

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18. Find the equation of the circle which touches the coordinate axes and whose centre lies on the line $x - 2y = 3$.

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19. A circle of radius 2 lies in the first quadrant and touches both the axes. Find the equation of the circle with centre at $(6, 5)$ and touching the above circle externally.

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20. A circle of radius $5units$ touches the coordinate axes in the first quadrant. If the circle makes one complete roll on x-axis along he positive direction of x-axis , find its equation in new position.

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21. Discuss the position of the points (1,2) and (6,0) with respect to the circle $x^2 + y^2 - 4x + 2y - 11 = 0$

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22. The circle $x^2 + y^2 - 6x - 10y + k = 0$ does not touch or intersect the coordinate axes, and the point (1, 4) is inside the circle. Find the range of value of k.

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23. The shortest distance from the point (2,-7) to thwe circe $x^2 + y^2 - 14x - 10y - 151 = 0$ is equal to 5.

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24. Find the point on the circle $x^2 + y^2 - 2x + 4y - 20 = 0$ which are farthest and nearest to the point(-5,6).

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25. Find the points of intersection of the line 2x+3y=18 and the cricle $x^2 + y^2 = 25.$

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26. Find the length of the intercept on the straight line 4x-3y-10=0 by the circle $x^2 + y^2 - 2x + 4y - 20 = 0.$

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27. Find the coordinates of the middle point of the chord which the circle $x^2 + y^2 + 4x - 2y - 3 = 0$ cuts-off the line x-y+2=0.

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28. For what value of λ will the line $y = 2x + \lambda$ be tangent to the circle $x^2 + y^2 = 5?$

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29. Prove that the tangents to the circle $x^2 + y^2 = 25$ at (3,4) and (4,-3) are perpendicular to each other.

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30. Find the equation of tangent to the circle $x^2 + y^2 - 2ax = 0$ at the point $[a(1 + \cos\alpha), a\sin\alpha]$

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31. Prove that the circles $x^2 + y^2 - 4x + 6y + 8 = 0$ and $x^2 + y^2 - 10x - 6y + 14 = 0$ touch at the point (3,-1)

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32. The angle between a pair of tangents from a point P to the circle $x^2 + y^2 = 25$ is $\frac{\pi}{3}$. Find the equation of the locus of the point P.

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33. The angle between a pair of tangents from a point P to the circle $x^2 + y^2 = 16$ is $\frac{\pi}{3}$ and locus of P is $x^2 + y^2 = r^2$, then value of r is

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34. Find the equations of the tangents to the circle $x^2 + y^2 = 9$, which

(i) are parallel to the line 3x+4y-5=0

(ii) are perpendicular to the line 2x+3y+7=0

(iii) make on angle of 60° with the X-axis

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35. Prove that the line lx+my+n=0 toches the circle $(x-a)^2+(y-b)^2=r^2$ if $(al+bm+n)^2=r^2(l^2+m^2)$

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36. Show that the line 3x-4y=1 touches the circle $x^2+y^2-2x+4y+1=0$. Find the coordinates of the point of contact.

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37. Show that the line $(x-2)\cos\theta+(y-2)\sin\theta=1$ touches a circle for all values of θ .Find the circle.

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38. Find the equation of the normal to the circle $x^2+y^2-2x=0$ parallel to the line $x+2y=3$.

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39. Find the equation of the normals to the circle $x^2 + y^2 - 8x - 2y + 12 = 0$ at the point whose ordinate is -1

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40. Find the equations of the tangents to the circle $x^2 + y^2 = 16$ drawn from the point (1,4).

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41. The angle between a pair of tangents from a point P to the circe $x^2 + y^2 + 4x - 6y + 9\sin^2\alpha + 13\cos^2\alpha = 0$ is 2α. Find the equation of the locus of the point P.

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42. Find the length of the tangents drawn from the point (3,-4) to the circle

$2x^2 + 2y^2 - 7x - 9y - 13 = 0.$

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43. If the length of the tangent drawn from (f, g) to the circle $x^2 + y^2 = 6$ be twice the length of the tangent drawn from the same point to the circle $x^2 + y^2 + 3(x + y) = 0$ then show that $g^2 + f^2 + 4g + 4f + 2 = 0.$

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44. Find the area of the triangle formed by the tangents from the point (4, 3) to the circle $x^2 + y^2 = 9$ and the line joining their points of contact.

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45. Show that the length of the tangent from anypoint on the circle : $x^2 + y^2 + 2gx + 2fy + c = 0$ to the circle $x^2 + y^2 + 2gx + 2fy + c_1 = 0$ is $\sqrt{c_1 - c}$.

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46. Find the power of point (2,4) with respect to the circle $x^2 + y^2 - 6x + 4y - 8 = 0$

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47. Show that the locus of the point, the powers of which with respect to two given circles are equal, is a staight line.

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48. If the pair of tangents are drawn from the point (4,5) to the circle $x^2 + y^2 - 4x - 2y - 11 = 0$, then

(i) Find the length of chord of contact.

(ii) Find the area of the triangle fromed by a pair of tangents and their chord of contact.

(iii) Find the angle between the pair of tangents.

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49. Tangents PQ, PR are drawn to the circle $x^2 + y^2 = 36$ from the point p(-8,2) touching the circle at Q,R respectively. Find the equation of the circumcircle of ΔPQR.

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50. If the chord of contact of tangents drawn from a point (α, β) to the circle $x^2 + y^2 = a^2$ subtends a right angle at the centre of the circle, then

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51. If the chord of contact of the tangents drawn from a point on the circle $x^2 + y^2 = a^2$ to the circle $x^2 + y^2 = b^2$ touches the circle $x^2 + y^2 = c^2$, then prove that a, b and c are in GP.

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52. Find the equation of the chord of $x^2 + y^2 - 6x + 10y - 9 = 0$ which is bisected at (-2,4)

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53. Find the middle point of the chord intercepted on line $lx + my + n = 0$ by circle $x^2 + y^2 = a^2$.

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54. Through a fixed point (h,k), secant are drawn to the circle $x^2 + y^2 = r^2$. Show that the locus of the midpoints of the secants by the circle is $x^2 + y^2 = hx + ky$.

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55. Find the locus of mid points of chords of the cirlce. $x^2 + y^2 = a^2$ which subtend angle 90° at the point (c,o).

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56. Find the equation of the chord of the circle $x^2 + y^2 = a^2$ passing through the point (2, 3) farthest from the center.

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57. Find the equations of the tangents from the point A(3,2) to the circle $x^2 + y^2 + 4x + 6y + 8 = 0$.

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58. The angle between the tangents drawn from a point on the director circle $x^2 + y^2 = 50$ to the circle $x^2 + y^2 = 25$, is

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59. The equation of the diameter of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ which corresponds to the chord $ax + by + d = 0$ is $\lambda x - ay + \mu g + k = 0$ then $\lambda + \mu$ is

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60. Two circles $x^2 + y^2 + 2x - 4y = 0$ and $x^2 + y^2 - 8y - 4 = 0$ (A) touch each other externally (B) intersect each other (C) touch each other internally (D) none of these

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61. Prove that the circle $x^2 + y^2 + 2ax + c^2 = 0$ and $x^2 + y^2 + 2by + c^2 = 0$ touch each other if

$$\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}.$$

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63. The common tangents to the circles $x^2 + y^2 + 2x = 0$ and $x^2 + y^2 - 6x = 0$ form a triangle which is

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64. Find the number of common tangents to the circles $x^2+y^2-8x+2y+8=0$ and $x^2+y^2-2x-6y-15=0.$

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65. The length of the common chord of the circles $(x-a)^2+(y-b)^2=c^2$ and $(x-b)^2+(y-a)^2=c^2$, is

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66. Find the equation of the circle passing throught (1,1) and the points of intersection of the circles $x^2+y^2+13x-3y=0$ and $2x^2+2y^2+4x-7y-25=0$

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67. Find the equation of the circle passing through the point of intersection of the circles $x^2 + y^2 - 6x + 2y + 4 = 0, x^2 + y^2 + 2x - 4y - 6 = 0$ and with its centre on the line $y = x$.

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68. Find the equation of the circle passing through the points of intersection of the circles $x^2 + y^2 - 2x - 4y - 4 = 0$ and $x^2 + y^2 - 10x - 12y + 40 = 0$ and whose radius is 4.

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69. Find the equation of the circle through points of intersection of the circle $x^2 + y^2 - 2x - 4y + 4 = 0$and the line $x + 2y = 4$ which touches the line $x + 2y = 0$.

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70. If the circle $x^2 + y^2 + 2x + 3y + 1 = 0$ cuts $x^2 + y^2 + 4x + 3y + 2 = 0$ at A and B, then find the equation of the circle on AB as diameter.

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71. If two curves whose equations are $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ and $a'x^2 + 2h'xy + b'y^2 + 2g'x + 2f'y + c = 0$ intersect in four concyclic point., then prove that a-b/h = a'-b'/h'

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72. Find the angle between the circles $S: x^2 + y^2 - 4x + 6y + 11 = 0$ and $S': x^2 + y^2 - 2x + 8y + 13 = 0$

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73. Show that the circles

$x^2 + y^2 - 6x + 4y + 4 = 0$ and $x^2 + y^2 + x + 4y + 1 = 0$ cut orthogonally.

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74. Find the equation of the circle which cuts the circle $x^2 + y^2 + 5x + 7y - 4 = 0$ orthogonally, has its centre on the line x=2 and passes through the point (4,-1).

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75. Find the equations of the two circles which intersect the circles

$x^2 + y^2 - 6y + 1 = 0$ and $x^2 + y^2 - 4y + 1 = 0$

orthogonally and touch the line 3x+4y+5=0`.

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76. The two circles which pass through $(0, a) and (0, -a)$ and touch the line $y = mx + c$ will intersect each other at right angle if

$a^2 = c^2(2m + 1)$ $a^2 = c^2(2 + m^2)$ $c^2 = a^2(2 + m^2)$ (d) $c^2 = a^2(2m + 1)$

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77. Equation of the circle cutting orthogonal these circles $x^2 + y^2 - 2x - 3y - 7 = 0, x^2 + y^2 + 5x - 5y + 9 = 0$ and $x^2 + y^2 + 7x - 9y + 29 = 0$ is:

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78. If two circle $x^2 + y^2 + 2gx + 2fy = 0$ and $x^2 + y^2 + 2g'x + 2f'y = 0$ touch each other then proove that f'g =fg'.

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79. A and B are two fixed points and P moves so that PA=nPB. Show that locus of P is a circle and for different values of n all the circles have a common radical axis.

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80. Shwo that the difference of the squares of the tangents to two coplanar circles from any point P in the plane of the circles varies as the perpendicular from P on their radical axis. Also, prove that the locus of a point such that the difference of the squares of the tangents from it to two given circles is constant is a line parallel to their radical axis.

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81. If the quadrilateral formed by the lines ax+bc+c=0. a'x+b'y+c=0, ax+by+c'=0, a'x+b'y+c'=0 has perpendicular diagonal, then

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82. Find the equation of the system of circles co-axial with the circles $x^2 + y^2 + 4x + 2y + 1 = 0$ and $x^2 + y^2 - 2x + 6y - 6 = 0$ Also, find the equation of that particular circle whose cneter lies on the radical axis.

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83. Prove that the tangents from any point of a fixed circle of co-axial system to two other fixed circles of the system are in a constant ratio.

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84. If A, B, C, be the centres of three co-axial circles and t_1, t_2, t_3 be the lengths of the tangents of them any piont, prove that

$\overline{BC}.\, t_1^2 + \overline{CA}.\, t_2^2 + \overline{AB}.\, t_3^2 = 0$

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85. Find the coordinates of the limiting points of the system of circles determined by the two cricles

$x^2 + y^2 + 5x + y + 4 = 0$ and $x^2 + y^2 + 10x - 4y - 1 = 0$

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86. If the origin be one limiting point of system of co-axial circles of which $x^2 + y^2 + 3x + 4y + 25 = 0$ is a member ,find the other limiting point.

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87. The lines joining the origin to the point of intersection of $x^2 + y^2 + 2gx + c = 0$ and $x^2 + y^2 + 2fy - c = 0$ are at right angles if

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88. Find the radical axis of co-axial system of circles whose limiting points are (1,2) and (2,3).

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89. Find the equation of the circle which passes through the origin and belonges to the co-axial of circles whose limiting points are (1,2) and (4,3).

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90. Equation of circle symmetric to the circle $x^2 + y^2 + 16x - 24y + 183 = 0$ about the line $4x + 7y + 13 = 0$ is

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91. If two distinct chords, drawn from the point (p, q) on the circle $x^2 + y^2 = px + qy$ (where $pq \neq q$) are bisected by the x-axis, then

$p^2 = q^2$ (b) $p^2 = 8q^2$ $p^2 < 8q^2$ (d) $p^2 > 8q^2$

A. $|p| = |q|$

B. $p^2 = 8q^2$

C. $p^2 < 8q^2$

D. $p^2 > 8q^2$

Answer: $p^2 > 8q^2$

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92. The values of λ for which the circle $x^2 + y^2 + 6x + 5 + \lambda(x^2 + y^2 - 8x + 7) = 0$ dwindles into a point are

A. $1 \pm \frac{\sqrt{2}}{3}$

B. $2 \pm \frac{2\sqrt{2}}{3}$

C. $2 \pm \frac{4\sqrt{2}}{3}$

D. $1 \pm \frac{4\sqrt{2}}{3}$

Answer: $\lambda = 2 \pm \frac{4\sqrt{2}}{3}$

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93. If f(x+y)=f(x).f(y) for all x and y, f(1) =2 and $\alpha_n = f(n), n \in N$, then the equation of the circle having (α_1, α_2) and (α_3, α_4) as the ends of its one diameter is

A. $(x-2)(x-8)+(y-4)(x-16)=0$

B. $(x-4)(x-8)+(y-2)(x-16)=0$

C. $(x-2)(x-16)+(y-4)(y-8)=0$

D. $(x-6)(x-8)+(y-5)(y-6)=0$

Answer: $(x-2)(x-8)+(y-4)(x-16)=0$

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94. Two circles of radii a and b touching each other externally, are inscribed in the area bounded by $y=\sqrt{1-x^2}$ and the x-axis. If $b=\frac{1}{2}$, then a is equal to (a) $\frac{1}{4}$ (b) $\frac{1}{8}$ (c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$

A. $(x-2)(x-8)+(y-4)(x-16)=0$

B. $\frac{1}{8}$

C. $\frac{1}{2}$

D. $\frac{1}{\sqrt{2}}$

Answer: $a=\frac{1}{4}$

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95. There are two circles whose equation are $x^2+y^2=9$ and $x^2+y^2-8x-6y+n^2=0, n\in Z$. If the two circles have exactly two common tangents, then the number of possible values of n is (a)2 (b) 8 (c) 9 (d) none of these

A. 2

B. 7

C. 8

D. 9

Answer: Hence, number of possible values of n is 9.

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96. Suppose f(x,y)=0 is the equation of a circle such that f(x,1)=0 has equal roots (each equal to 2) and f(1,x)=0 also has equal roots (each equal to zero). The equation of circle is

A. $x^2+y^2+4x+3=0$

B. $x^2+y^2+4y+3=0$

C. $x^2+y^2+4x-3=0$

D. $x^2+y^2-4x+3=0$

Answer: $x^2 + y^2 - 4x + 3 = 0$

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97. A variable circle C has the equation $x^2 + y^2 - 2(t^2 - 3t + 1)x - 2(t^2 + 2t)y + t = 0$, where t is a parameter.The locus of the centre of the circle is

A. $\left(\frac{1}{10}, -\frac{1}{10}\right)$

B. $\left(\frac{1}{10}, \frac{1}{10}\right)$

C. $\left(-\frac{1}{10}, \frac{1}{10}\right)$

D. $\left(-\frac{1}{10}, -\frac{1}{10}\right)$

Answer: Hence, required ordered pair is $\left(-\frac{1}{10}, \frac{1}{10}\right)$

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98. If the radii of the circles $(x-1)^2+(y-2)^2+(y-2)^2=1$ and $(-7)^2+(y-10)^2=4$ are increasing uniformly w.r.t. time as 0.3 units/s and 0.4 unit/s, respectively, then at what value of t will they touch each other?

A. 45s

B. 90s

C. 11s

D. 135s

Answer: $\Rightarrow$ **t=10 or t=90 " "** $[\because t>0]$

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99. A light ray gets reflected from the x=-2. If the reflected ray touches the circle $x^2+y^2=4$ and point of incident is (-2,-4), then equation of incident ray is

A. $4y + 3x + 22 = 0$

B. $3y + 4x + 20 = 0$

C. $4y + 2x + 20 = 0$

D. $y + x + 6 = 0$

Answer: 4y+3x+22=0

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100. If a circle having centre at (α, β) radius r completely lies with in two lines x+y=2 and x+y=-2, then, min. $(|\alpha + \beta + 2|, |\alpha + \beta - 2|$ is

A. greater than $\sqrt{2}r$

B. less than $\sqrt{2}r$

C. greater than 2r

D. less than 2r

Answer: or min. $\{|\alpha + \beta + 2|, |\alpha + \beta - 2|\} > \sqrt{2}r$

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101. If point $P(x, y)$ is called a lattice point if $x, y \in I$. Then the total number of lattice points in the interior of the circle $x^2 + y^2 = a^2, a \neq 0$ can not be:

A. 202

B. 203

C. 204

D. 205

Answer: $\therefore$ **Number of such points must be of the form 4n+1, where n=0,1,2,.....**

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102. Let $x and y$ be real variables satisfying $x^2 + y^2 + 8x - 10y - 40 = 0$. Let $a = \max\left\{\sqrt{(x+2)^2 + (y-3)^2}\right\}$ and

$b = \min\left\{\sqrt{(x+2)^2 + (y-3)^2}\right\}$. Then (a)$a + b = 18$ (b) $a + b = \sqrt{2}$ (c) $a - b = 4\sqrt{2}$ (d) $a\dot{b} = 73$

A. a+b=18

B. $a - b = 4\sqrt{2}$

C. $a + b = 4\sqrt{2}$

D. a.b=73

Answer: $\therefore a + b = 18, a - b = 4\sqrt{2}, ab = 73$

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103. The equation 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. $\left(h^2-r^2\right)x+2rhy=0$

Answer: $\left(h^2-r^2\right)x-2rhy=0$

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A. $\left(\frac{42}{5},\frac{36}{5}\right)$

B. $\left(-\frac{2}{5},\frac{44}{5}\right)$

C. (6,4)

D. (2,4)

Answer: Therefore, the points are (6,4) and $\left(-\frac{2}{5},\frac{44}{5}\right)$

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105. The equation of four circles are $(x \pm a)^2 + (y \pm a2 = a^2$. The radius of a circle touching all the four circles is $(\sqrt{2} + 2)a$ (b) $2\sqrt{2}a$ $(\sqrt{2} + 1)a$ (d) $(2 + \sqrt{2})a$

A. $(\sqrt{2} - 1)a$

B. $2\sqrt{2}a$

C. $(\sqrt{2} + 1)a$

D. $(2 + \sqrt{2})a$

Answer: $= a\sqrt{2} + a = a(\sqrt{2} + 1)$

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106. Consider the relation $4l^2 - 5m^2 + 6l + 1 = 0$, where l, m $\in R$.

The line lx+my+1=0 touches a fixed circle whose equation is

A. $x^2 + y^2 - 4x - 5 = 0$

B. $x^2 + y^2 + 6x + 6 = 0$

C. $x^2 + y^2 - 6x + 4 = 0$

D. $x^2 + y^2 + 4x - 4 = 0$

Answer: $x^2 + y^2 - 6x + 4 = 0$

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107. Consider the relation $4l^2 - 5m^2 + 6l + 1 = 0$, where $l, m \in R$

The number of tangents which can be drawn from the point (2,-3) to the above fixed circle are

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

B. $\left(\frac{1}{3}, \frac{4}{3}\right)$

C. $\left(-\frac{1}{2}, \frac{3}{2}\right)$

D. $\left(\frac{1}{2}, \frac{5}{2}\right)$

Answer: $\therefore$ **Fixed piont is** $\left(\frac{1}{2}, \frac{-5}{2}\right)$

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108. Consider the relation $4l^2 - 5m^2 + 6l + 1 = 0$, where $l, m \in R$

The number of tangents which can be drawn from the point (2,-3) to the above fixed circle are

A. 0

B. 1

C. 2

D. 1 or 2

Answer: Therefore, point (2,-3) lies outside the circle from which two tangents can drawn.

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109. Let α chord of a circle be that chord of the circle which subtends an angle α at the center.

If $x + y = 1$ is a chord of $x^2 + y^2 = 1$, then α is equal to

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{2}$

D. $\frac{3\pi}{4}$

Answer: $\alpha = \frac{\pi}{2}$

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110. Let α chord of a circle be that chord of the circle which subtends an angle α at the center.

If the slope of a $\pi/3$ chord of $x^2 + y^2 = 4$ is 1, then its equation is

A. $x - y + \sqrt{6} = 0$

B. $x - y + \sqrt{3} = 0$

C. $x - y - \sqrt{3} = 0$

D. $x - y - 2\sqrt{3} = 0$

Answer: $x - y \pm \sqrt{6} = 0$

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111. Let α chord of a circle be that chord of the circle which subtends an angle α at the center.

The distance of $2\pi/3$ chord of $x^2 + y^2 + 2x + 4y + 1 = 0$ from the center is

A. $\frac{1}{\sqrt{2}}$

B. 1

C. $\sqrt{2}$

D. 2

Answer: $OM = 2\cos\left(\frac{\pi}{3}\right) = 1$

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112. A circle with center in the first quadrant is tangent to y=x+10,y=x-6 and the Y-axis. Let (p,q) be the centre of the circle. If the value oif $(p+q)=a+b\sqrt{a}$ when a, $b \in Q$, then the value of |a-b| is

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114. C_1 is a circle of radius 2 touching X-axis and Y-axis. C_2 is another circle of radius greater than 2 and touching the axes as well as the circle C_1

Statemnet I Radius of Circle $C_2=\sqrt{2}(\sqrt{2}+1)(\sqrt{2}+2)$

Statement II Centres of both circles always lie on the line y=x.

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

Answer: $\therefore$ **Statements I is true and Statements II is always not true (where circles in II of IV quadrants)**

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115. From the point $P(\sqrt{2}, \sqrt{6})$, tangents $PAandPB$ are drawn to the circle $x^2 + y^2 = 4$ Statement 1 :The area of quadrilateral $OAPB(O$ being the origin) is 4. Statement 2 : The area of square is a^2, where a is the length of side.

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

Answer: $\therefore$ **Both statements are true and statement II is correct explanation of statement. I**

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116. Find the equation of the circle having the lines $x^2 + 2xy + 3x + 6y = 0$ as its normal and having size just sufficient to contain the circle $x(x-4) + y(y-3) = 0$

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117. Let a circle be given by $2x(x-1) + y(2y-b) = 0, (a \neq 0, b \neq 0)$. Find the condition on $aandb$ if two chords each bisected by the x-axis, can be drawn to the circle from $\left(a, \frac{b}{2}\right)$

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118. Let $C_1$and C_2 be two circles with C_2 lying inside C_1 A circle C lying inside C_1 touches C_1 internally and C_2 externally. Identify the locus of the centre of C

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119. A circle of constant radius a passes through the origin O and cuts the axes of coordinates at points P and Q . Then the equation of the locus of the foot of perpendicular from O to PQ is $\left(x^2+y^2\right)\left(\frac{1}{x^2}+\frac{1}{y^2}\right)=4a^2$ $\left(x^2+y^2\right)^2\left(\frac{1}{x^2}+\frac{1}{y^2}\right)=a^2$ $\left(x^2+y^2\right)^2\left(\frac{1}{x^2}+\frac{1}{y^2}\right)=4a^2$ $\left(x^2+y^2\right)\left(\frac{1}{x^2}+\frac{1}{y^2}\right)=a^2$

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120. The circle $x^2 + y^2 - 4x - 4y + 4 = 0$ is inscribed in a triangle which has two of its sides along the coordinate axes. The locus of the circumcenter of the triangle is $x + y - xy + k(x^2 + y^2)^{\frac{1}{2}} = 0$. Find k.

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121. P is variable point on the line $y = 4$. tangents are drawn to the circle $x^2 + y^2 = 4$ from the points touch it at A and B. The parallelogram PAQB be completed.If locus of Q is $(y + a)(x^2 + y^2) = by^2$,the value of $a + b$ Is:

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122. If four points P, Q, R, S in the plane be taken and the square of the length of the tangents from P to the circle on QR as diameter be denoted by $\{P, QR\}$, show that $\{P, RS\} - \{P, QS\} + \{Q, PR\} - \{Q, RS\} = 0$

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123. Let T_1, T_2 and be two tangents drawn from (-2, 0) onto the circle $C: x^2 + y^2 = 1$. Determine the circles touching C and having T_1, T_2 as their pair of tangents. Further, find the equations of all possible common tangents to these circles when taken two at a time

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124. The minimum radius of the circle which contains the three circles, $x^2 + y^2 - 4y - 5 = 0, x^2 + y^2 + 12x + 4y + 31 = 0$ and $x^2 + y^2 + 6x + 12y + 36 = 0$ is

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125. Find the point P on the circle $x^2 + y^2 - 4x - 6y + 9 = 0$ such that (i) $\angle POX$ is minimum (ii) OP is maximum, where O is the origin and OX is the x-axis.

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126. If the circle $x^2 + y^2 - 4x - 8y + 16 = 0$ rolls up the tangent to it at $(2 + \sqrt{3}, 3)$ by 2 units (assumes x-axis as horizontal), then the centre of the circle in the new position is

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127. Find the intervals of the values of a for which the line $y + x = 0$ bisects two chords drawn from the point $\left(\frac{1 + \sqrt{2}a}{2}, \frac{1 - \sqrt{2}a}{2}\right)$ to the circle $2x^2 + 2y^2 - (1 + \sqrt{2}a)x - (1 - \sqrt{2}a)y = 0$

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128. A ball moving around the circle $x^2 + y^2 - 2x - 4y - 20 = 0$ in anti-clockwise direction leaves it tangentially at the point P(-2,-2). After getting reflected from a straingt line, it passes through the centre of the circle. Find the equation of the straight line if its perpendicular distance from P is 5/2. You can assume that the angle of incidence is equal to the angle of reflection.

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129. Find the limiting points of the circles $\left(x^2 + y^2 + 2gx + c\right) + \lambda\left(x^2 + y^2 + 2fy + d\right) = 0$ and show that the square of the distance between them is

$$\frac{(c-d)^2 - 4f^2g + 4cf^2 + 4dg^2}{f^2 + g^2}$$

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130. One vertex of a triangle of given species is fixed and another moves along circumference of a fixed circle. Prove that the locus of the remaining vertex is a circle and find its radius.

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Exercise For Session 1

1. If $x^2 + y^2 - 2x + 2ay + a + 3 = 0$ represents the real circle with nonzero radius, then find the values of a.

A. $a \in (-\infty, -1)$

B. $a \in (-1, 2)$

C. $a \in (2, \infty)$

D. $a \in (-\infty, -1) \cup (2, \infty)$

Answer: D

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2. If the equation $px^2 + (2 - q)xy + 3y^2 - 6qx + 30y + 6q = 0$ represents a circle, then find the values of p and q.

A. 5

B. 13

C. 25

D. 41

Answer: B

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3. The equation of circle having centre at (2,2) and passes through the point (4,5) is

A. $x^2 + y^2 + 4x + 4y - 5 = 0$

B. $x^2 + y^2 - 4x - 4y - 5 = 0$

C. $x^2 + y^2 - 4x - 13 = 0$

D. $x^2 + y^2 - 4x - 4y + 5 = 0$

Answer: B

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4. One of the diameters of the circle $x^2 + y^2 - 12x + 4y + 6 = 0$ is given by

A. x+y=0

B. x+3y=0

C. x=y

D. 3x+2y=0

Answer: B

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5. If the lines $3x - 4y + 4 = 0$ and $6x - 8y - 7 = 0$ are tangents to a circle, then find the radius of the circle.

A. $\frac{3}{2}$

B. 3

C. $\frac{5}{2}$

D. 5

Answer: A

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6. Area of the circle in which a chord of length $\sqrt{2}$ makes an angle $\frac{\pi}{2}$ at the centre,

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. π

D. 2π

Answer: C

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7. The lines $2x - 3y = 5$ and $3x - 4y = 7$ are the diameters of a circle of area 154 sq. units. Then the equation of the circle is $x^2 + y^2 + 2x - 2y = 62$ $x^2 + y^2 + 2x - 2y = 47$ $x^2 + y^2 - 2x + 2y = 47$ $x^2 + y^2 - 2x + 2y = 62$

A. $x^2 + y^2 + 2x - 2y - 62 = 0$

B. $x^2 + y^2 + 2x - 2y - 47 = 0$

C. $x^2 + y^2 + 2x - 2y - 62 = 0$

D. $x^2 + y^2 + 2x - 2y - 47 = 0$

Answer: D

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8. If the lines 2x + 3y + 1 = 0 and 3x - y-4 = 0 lie along two diameters of a circle of circumference 10π, then the equation of circle is (i) $x^2 + y^2 + 2x + 2y + 23 = 0$ (ii) $x^2 + y^2 - 2x - 2y - 23 = 0$ (iii) $x^2 + y^2 - 2x + 2y - 23 = 0$ (iv) $x^2 + y^2 + 2x - 2y + 23 = 0$

A. $x^2 + y^2 + 2x - 2y - 23 = 0$

B. $x^2 + y^2 - 2x - 2y - 23 = 0$

C. $x^2 + y^2 + 2x + 2y - 23 = 0$

D. $x^2 + y^2 + 2x - 2y - 23 = 0$

Answer: A

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A. $\frac{\pi}{2}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{4}$

D. (pi)/(6)`

Answer: C

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10. If a circle is concentric with the circle $x^2 + y^2 - 4x - 6y + 9 = 0$ and passes through the point (-4,-5) then its equation is

A. $x^2 + y^2 + 4x + 6y - 87 = 0$

B. $x^2 + y^2 + 4x + 6y + 87 = 0$

C. $x^2 + y^2 - 4x - 6y - 87 = 0$

D. $x^2 + y^2 - 4x - 6y + 87 = 0$

Answer: C

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A. a parabola

B. a circle

C. an ellipse

D. a pair of straight lines

Answer: B

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12. Let $PQandRS$ be tangent at the extremities of the diameter PR of a circle of radius r. If $PSandRQ$ intersect at a point X on the circumference of the circle, then prove that $2r = \sqrt{PQxRS}$.

A. $\sqrt{PQ.\ RS}$

B. $\frac{PQ + RS}{2}$

C. $\frac{2PQ.\ RS}{PQ + RS}$

D. $\sqrt{\frac{(PQ)^2 + (RS)^2}{2}}$

Answer: A

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13. Find the centre and radius of circle $5x^2 + 5y^2 + 4x - 8y = 16$.

A. $\left(\frac{2}{5}, \frac{4}{5}\right)$

B. $\left(-\frac{2}{5}, \frac{4}{5}\right)$

C. 3

D. 2

Answer: B::D

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14. Prove that the centres of the circles $x^2 + y^2 = 1$, $x^2 + y^2 + 6x - 2y - 1 = 0$ and $x^2 + y^2 - 12x + 4y = 1$ are collinear

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15. Find the equation of the circle having $(1, -2)$ as its centre and passing through the intersection of the lines

$3x + y = 14adn2x + 5y = 18.$

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16. Equation of circle passing through the centre of the circle $x^2 + y^2 - 4x - 6y - 8 = 0$ and being concentric with the circle $x^2 + y^2 - 2x - 8y - 5 = 0$ is

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17. Prove that the locus of the centre of the circle $\frac{1}{2}(x^2 + y^2) + x\cos\theta + y\sin\theta - 4 = 0$ is $x^2 + y^2 = 1$

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18. Find the equation of the following curves in cartesian form. If the curve is a circle find the centres and radii. (i) $x = -1 + 2\cos\alpha, y = 3 + 2\sin\alpha.$

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Exercise For Session 2

1. If the line $x+2by+7=0$ is a diameter of the circle $x^2+y^2-6x+2y=0$, then find the value of b.

A. 1

B. 3

C. 5

D. 7

Answer: C

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2. If one end of a diameter of the circle $2x^2+2y^2-4x-8y+2=0$ is (-1,2), then the other end of the diameter is

A. (2,1)

B. (3,2)

C. (4,3)

D. (5,4)

Answer: B

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3. If a circle passes through the point $(0, 0), (a, 0) and (0, b)$, then find its center.

A. (a,b)

B. $\left(\frac{a}{2}, \frac{b}{2}\right)$

C. $\left(\frac{a}{2}, \frac{b}{4}\right)$

D. $\left(\frac{a}{4}, \frac{b}{2}\right)$

Answer: B

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4. A circle passes through the points (-1,3) and (5,11) and its radius is 5. Then, its centre is

A. (-5,0)

B. (-5,7)

C. (2,7)

D. (5,0)

Answer: C

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5. The radius of the circle, having centre at $(2, 1)$, whose one of the chord is a diameter of the circle $x^2 + y^2 - 2x - 6y + 6 = 0$

A. 3

B. 2

C. 1

D. $\sqrt{3}$

Answer: A

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6. The centre of circle inscribed in a square formed by lines $x^2 - 8x + 12 = 0$ and $y^2 - 14y + 45 = 0$ is a.$(4, 7)$ b.$(7, 4)$ c.$(9, 4)$ d.$(4, 9)$

A. (4,7)

B. (7,4)

C. (9,4)

D. (4,9)

Answer: A

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A. $x^2 + y^2 + ax - ay = 0$

B. $x^2 + y^2 - ax + ay = 0$

C. $x^2 + y^2 - ax - ay = 0$

D. $x^2 + y^2 + ax - ay = 0$

Answer: C

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8. The locus of the centre of the circle for which one end of the diameter is (3,3) while the other end lies on the line x+y=4 is

A. x+y=3

B. x+y=5

C. x+y=7

D. x+y=9

Answer: B

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9. Find the equation of the circle which passes through (1, 0) and (0, 1) and has its radius as small as possible.

A. $x^2+y^2+x+y=0$

B. $x^2+y^2-x+y=0$

C. $x^2+y^2+x-y=0$

D. $x^2+y^2-x-y=0$

Answer: D

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10. If the point (2,0) ,(0,1) , (4,5) and (0,c) are concyclic, then the value of c is :

A. 1

B. -1

C. $\frac{14}{3}$

D. $\frac{-14}{3}$

Answer: C

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11. The point on a circle nearest to the point $P(2, 1)$ is at a distance of 4 units and the farthest point is (6, 5). Then find the equation of the circle.

A. $(3+\sqrt{2}, 2+\sqrt{2})$

B. $(2+\sqrt{2}, 3+\sqrt{2})$

C. $(4+\sqrt{2}, 3+\sqrt{2})$

D. $(3+\sqrt{2}, 4+\sqrt{2})$

Answer: C

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12. The intercept on line $y=x$ by circle $x^2+y^2-2x=0$ is AB. Find equation of circle with AB as a diameter.

A. $x^2+y^2-x-y=0$

B. $x^2+y^2-x+y=0$

C. $x^2+y^2+x+y=0$

D. $x^2+y^2+x-y=0$

Answer: A

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13. Find the equation of the circle the end point of whose diameter are (2,-3) and (2,4). Find its centre and radius.

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14. If (4, 1) be an end of a diameter of the circle $x^2 + y^2 - 2x + 6y - 15 = 0$, find the coordinates of the other end of the diameter.

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15. The sides of a rectangle are given by the equations x=-2, x = 4, y=-2 andy=5. Find the equation of the circle drawn on the diagonal of this rectangle as its diameter.

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16. Find the equation to the circle which passes through the points $(1, 2)(2, 2)$ and whose radius is 1.

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17. Find the equation of the circle which passes through the points (3,4), (3,-6) and (1,2).

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Exercise For Session 3

1. Find the length of intercept, the circle $x^2 + y^2 + 10x - 6y + 9 = 0$ makes on the x-axis.

A. 2

B. 4

C. 6

D. 8

Answer: D

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2. The circle $x^2 + y^2 + 4x - 7y + 12 = 0$ cuts an intercept on y-axis equal to

A. 1

B. 3

C. 5

D. 7

Answer: A

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3. Find the locus of the centre of a circle which passes through the origin and cuts off a length $2b$ from the line $x = c$.

A. $y^2 + 2cx = b^2 + c^2$

B. $x^2 + cx = b^2 + c^2$

C. $y^2 + 2cy = b^2 = b^2 + c^2$

D. $x^2 + cy = b^2 + c^2$

Answer: A

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4. If a straight line through $C(-\sqrt{8}, \sqrt{8})$ makes an angle 135° with the x-axis , cuts the circle $x = 5\cos\theta, y = 5\sin\theta$ in points A and B , find length of segment AB.

A. (a) 3

B. (b) 5

C. (c) 8

D. (d) 10

Answer: D

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5. If a circle of constant radius $3c$ passes through the origin and meets the axes at $A and B$, prove that the locus of the centroid of ABC is a circle of radius $2 \cdot$

A. $x^2 + y^2 = k^2$

B. $x^2 + y^2 = 2k^2$

C. $x^2 + y^2 = 3k^2$

D. $x^2 + y^2 = 4k^2$

Answer: D

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6. Centre of the circle toucing y-axis at (0,3) and making an intercept 2 units on positive X-axis is

A. $(10, \sqrt{3})$

B. $(\sqrt{3}, 10)$

C. $(\sqrt{10}, 3)$

D. $(3, \sqrt{10})$

Answer: C

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7. A circle passes through the points $A(1, 0)$ and $B(5, 0)$, and touches the y-axis at $C(0, h)$.. If $\angle ACB$ is maximum, then (a)$h = 3\sqrt{5}$ (b) $h = 2\sqrt{5}$ (c)$h = \sqrt{5}$ (d) $h = 2\sqrt{10}$

A. $|\lambda| = \sqrt{5}$

B. $|\lambda| = 2\sqrt{5}$

C. $|\lambda| = 3\sqrt{5}$

D. $|\lambda| = 4\sqrt{5}$

Answer: A

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8. Find the equation of the circle with center at $(3, -1)$ and which cuts off an intercept of length 6 from the line $2x - 5y + 18 = 0$

A. $x^2 + y^2 - 6x + 2y - 28 = 0$

B. $x^2 + y^2 + 6x - 2y - 28 = 0$

C. $x^2 + y^2 + 4x - 2y + 24 = 0$

D. $x^2 + y^2 + 2x - 2y - 12 = 0$

Answer: A

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A. $x^2 + 6x - 10y + 14 = 0$

B. $x^2 - 10x - 6y + 14 = 0$

C. $y^2 - 6x - 10y + 14 = 0$

D. $y^2 - 10x - 6y + 14 = 0$

Answer: D

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10. Locus of centre of a circle of radius 2, which rolls on the outside of circle $x^2 + y^2 + 3x - 6y - 9 = 0$ is

A. a) $x^2 + y^2 + 3x - 6y - 5 = 0$

B. b) $x^2 + y^2 + 3x - 6y - 31 = 0$

C. c) $x^2 + y^2 + 3x - 6y - 11 = 0$

D. d) $x^2 + y^2 + 3x - 6y - 36 = 0$

Answer: B

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11. The point $\binom{p+1}{p}$ is lying inside the circle $x^2 + y^2 - 2x - 15 = 0$.

Then the set of all values of p is (where [.] represents the greatest integer

function) $[-2, 3)$ (b) $(-2, 3)$ $[-2, 0) \cup (0, 3)$ (d) $[0, 3)$

A. [-2,3]

B. (-2,3)

C. $[-2, 3) \cup (0, 3)$

D. [0,3)

Answer: A

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12. Find the greatest distance of the point $P(10, 7)$ from the circle $x^2 + y^2 - 4x - 2y - 20 = 0$

A. 5

B. 10

C. 15

D. 20

Answer: C

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13. Find the equations of the circles touching y-axis at (0,3) and making an intercept of 8 units on the x-axis.

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14. Show that the circle $x^2 + y^2 - 2ax - 2ay + a^2 = 0$ touches both the coordinate axes.

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15. If the points $(\lambda, -\lambda)$ lies inside the circle $x^2 + y^2 - 4x + 2y - 8 = 0$, then find the range of λ.

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16. Find the equation of the circle which passes through the origin and cuts off chords of lengths 4 and 6 on the circle concentric with the circle $x^2 + y^2 - 6x + 12y + 15 = 0$ and double of its area.

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Exercise For Session 4

1. Find the length of the chord cut-off by $y = 2x + 1$ from the circle $x^2 + y^2 = 2$

A. $\frac{5}{6}$

B. $\frac{6}{5}$

C. $\frac{6}{\sqrt{5}}$

D. $\frac{\sqrt{5}}{6}$

Answer: C

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2. The line $3x - 4y = k$ will cut the circle $x^2 + y^2 - 4x - 8y - 5 = 0$ at distinct points if

A. $-10 < \lambda < 5$

B. $9 < \lambda < 20$

C. $-35 < \lambda < 15$

D. $-16 < \lambda < 30$

Answer: C

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3. If the line $3x - 4y - \lambda = 0$ touches the circle $x^2 + y^2 - 4x - 8y - 5 = 0$ at (a, b) then which of the following is not the possible value of $\lambda + a + b$?

A. 20

B. -28

C. -30

D. none of these

Answer: B

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4. Locus of mid points of chords to the circle $x^2 + y^2 - 8x + 6y + 20 = 0$ which are parallel to the line $3x + 4y + 5 = 0$ is

A. (1,-2)

B. (-1,2)

C. (3,4)

D. (3,-4)

Answer: D

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5. If a circle, whose centre is (-1,1) touches the straight line x+2y = 12, then the co-ordinates of the point of contact are

A. $\left(-\frac{7}{2}, -4\right)$

B. $\left(\frac{6}{5}, \frac{27}{5}\right)$

C. (2,-7)

D. (-2,-5)

Answer: B

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6. The area of the triangle formed by the tangent at the point (a, b) to the circle $x^2 + y^2 = r^2$ and the coordinate axes, is

A. $\frac{r^4}{2ab}$

B. $\frac{r^2}{2|ab|}$

C. $\frac{r^2}{ab}$

D. $\frac{r^4}{|ab|}$

Answer: B

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7. Find the equation of the tangent to the circle $x^2 + y^2 + 4x - 4y + 4 = 0$ which makes equal intercepts on the positive coordinates axes.

A. x+y=2

B. $x + y = 2\sqrt{2}$

C. x+y=4

D. x+y=8

Answer: B

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8. If $a > 2b > 0$, then find the positive value of m for which $y = mx - b\sqrt{1 + m^2}$ is a common tangent to $x^2 + y^2 = b^2$ and $(x - a)^2 + y^2 = b^2$.

A. $\dfrac{2b}{\sqrt{(a^2 - 4b^2)}}$

B. $\dfrac{\sqrt{(a^2 - 4b^2)}}{2b}$

C. $\dfrac{2b}{a - 2b}$

D. $\dfrac{b}{a - 2b}$

Answer: A

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9. The angle between a pair of tangents from a point P to the circle $x^2 + y^2 - 6x - 8y + 9 = 0$ is $\dfrac{\pi}{3}$. Find the equation of the locus of the point P.

A. 5

B. 6

C. 7

D. 8

Answer: D

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10. The normal at the point (3,4) on a circle cuts the circle at the poins $(-1, -2)$. Then the equation of the circle is

A. $x^2+y^2+2x-2y-13=0$

B. $x^2+y^2-2x-2y-11=0$

C. $x^2+y^2-2x+2y+12=0$

D. $x^2+y^2+2x-2y+14=0$

Answer: B

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11. The line ax +by+c=0 is an normal to the circle $x^2+y^2=r^2$. The portion of the line ax +by +c=0 intercepted by this circle is of length

A. $\sqrt{r}$

B. r

C. r^2

D. 2r

Answer: D

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12. If the straight line $ax + by = 2; a, b \neq 0,$ touches the circle $x^2 + y^2 - 2x = 3$ and is normal to the circle $x^2 + y^2 - 4y = 6$, then the values of 'a' and 'b' are ?

A. (1,3)

B. (3,1)

C. (1,2)

D. (2,1)

Answer: A

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13. Show that the for all values of θ, $x \sin\theta - y = \cos\theta = a$ touches the circle $x^2 + y^2 = a^2$

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14. Find the equation of the family of circles touching the lines $x^2 - y^2 + 2y - 1 = 0.$

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15. The line $4y - 3x + \lambda = 0$ touches the circle $x^2 + y^2 - 4x - 8y - 5 = 0$ then $\lambda =$

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Exercise For Session 5

1. about to only mathematics

A. 4

B. $2\sqrt{5}$

C. 5

D. $3\sqrt{5}$

Answer: C

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2. If the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is touched by $y = x$ at P such that $OP = 6\sqrt{2}$, then the value of c is 36 (b) 144 (c) 72 (d) none of these

A. 36

B. 72

C. 144

D. 288

Answer: B

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3. The chord of contact of tangents from a point P to a circle passes through Q. If $l_1 and l_2$ are the length of the tangents from $P and Q$ to the circle, then PQ is equal to $\frac{l_1 + l_2}{2}$ (b) $\frac{l_1 - l_2}{2}$ $\sqrt{l12 + l22}$ (d) $2\sqrt{l12 + l22}$

A. $\frac{l_1 + l_2}{2}$

B. $\frac{l_1 - l_2}{2}$

C. $\sqrt{(l_1^2 + l_2^2)}$

D. $\sqrt{(l_1^2 - l_2^2)}$

Answer: C

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4. If the chord of contact of tangents from a point (x_1, y_1) to the circle $x^2 + y^2 = a^2$ touches the circle $(x - a)^2 + y^2 = a^2$, then the locus of (x_1, y_1) is

A. a circle

B. a parabola

C. an ellipse

D. hyperbola

Answer: D

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5. The locus of the midpoint of a chord of the circle $x^2 + y^2 = 4$ which subtends a right angle at the origins is (a) $x + y = 2$ (b) $x^2 + y^2 = 1$ (c) $x^2 + y^2 = 2$ (d) $x + y = 1$

A. x+y=1

B. $x^2 + y^2 = 1$

C. x+y=2

D. $x^2 + y^2 = 2$

Answer: D

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6. If the angle between the tangents drawn to $x^2+y^2+2gx+2fy+c=0$ from (0, 0) is $\frac{\pi}{2}$, then $g^2+f^2=3c$ $g^2+f^2=2c$ $g^2+f^2=5c$ $g^2+f^2=4c$

A. $g^2+f^2=3c$

B. $g^2+f^2=2c$

C. $g^2+g^2=5c$

D. $g^2+f^2=4c$

Answer: B

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7. The chrods of contact of the pair of tangents to the circle $x^2+y^2=1$ dravwm from any point on the line 2x+y=4 paas through the point (α, β) then find α and β.

A. (2,4)

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

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

D. $(-2, -4)$

Answer: C

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8. The length of the tangent from (0, 0) to the circle $2(x^2+y^2)+x-y+5=0$, is

A. $\sqrt{5}$

B. $\sqrt{\left(\frac{5}{2}\right)}$

C. $\frac{\sqrt{5}}{2}$

D. $\sqrt{2}$

Answer: B

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9. Two perpendicular tangents to the circle $x^2 + y^2 = a^2$ meet at P. Then the locus of P has the equation

A. $x^2 + y^2 = 2a^2$

B. $x^2 + y^2 = 3a^2$

C. $x^2 + y^2 = 4a^2$

D. $x^2 + y^2 = 5a^2$

Answer: A

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10. The tangents to $x^2 + y^2 = a^2$ having inclinations α and β intersect at P. If $\cot \alpha \cot \beta = 0$, then find the locus of P.

A. x+y=0

B. x-y=0

C. xy=0

D. xy=1

Answer: C

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11. The exhaustive range of value of a such that the angle between the pair of tangents drawn from (a, a) to the circle $x^2 + y^2 - 2x - 2y - 6 = 0$ lies in the range $\left(\frac{\pi}{3}, \pi\right)$ is

A. (-1,3)

B. $(-5, -3) \cup (3, 5)$

C. $(-3, 5)$

D. $(-3, -1) \cup (3, 5)$

Answer: D

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12. If the distances from the origin of the centers of three circles $x^2 + y^2 + 2\lambda x - c^2 = 0, (i = 1, 2, 3)$, are in GP, then prove that the lengths of the tangents drawn to them from any point on the circle $x^2 + y^2 = c^2$ are in GP.

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14. If the length of the tangent from a point (f,g) to the circle $x^2 + y^2 = 4$ be four times the length of the tangent from it to the circle $x^2 + y^2 = 4x$, show that $15f^2 + 15g^2 - 64f + 4 = 0$

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15. Find the equation of that chord of the circle $x^2 + y^2 = 15$, which is bisected at the point $(3, 2)$

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16. The chrods of contact of the pair of tangents to the circle $x^2 + y^2 = 1$ dravwm from any point on the line 2x+y=4 paas through the point (α, β) then find α and β.

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Exercise For Session 6

1. The point of tangency of the circles $x^2 + y^2 - 2x - 4y = 0$ and $x^2 + y^2 - 8y - 4 = 0$, is

A. touch each other intermally

B. touch each other externally

C. cuts each other at two points

D. None of these

Answer: A

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2. Find the number of common tangents that can be drawn to the circles $x^2+y^2-4x-6y-3=0$ and $x^2+y^2+2x+2y+1=0$

A. 1

B. 2

C. 3

D. 4

Answer: C

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A. $ab > 0, c > 0$

B. $ab > 0, c < 0$

C. $ab < 0, c > 0$

D. $ab < 0, c < 0$

Answer: A

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4. Find the condition that the circle $(x-3)^2 + (y-4)^2 = r^2$ lies entirely within the circle $x^2 + y^2 = R^2$.

A. $R + r \leq 7$

B. $R^2 + r^2 < 49$

C. $R^2 - r^2 < 25$

D. $R - r > 5$

Answer: D

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5. Find the condition if the circle whose equations are $x^2+y^2+c^2=2ax$ and $x^2+y^2+c^2-2by=0$ touch one another externally.

A. $\frac{1}{b^2}+\frac{1}{c^2}+\frac{1}{a^2}$

B. $\frac{1}{c^2}+\frac{1}{a^2}=\frac{1}{b^2}$

C. $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{c^2}$

D. $\frac{1}{b^2}+\frac{1}{c^2}+\frac{2}{a^2}$

Answer: C

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6. Two circles with radii a and b touch each other externally such that θ is the angle between the direct common tangents, $(a > b \geq 2)$. Then prove that $\theta = 2\sin^{-1}\left(\frac{a-b}{a+b}\right)$.

A. $\theta = \sin^{-1}\left(\frac{r_1 + r_2}{r_1 - r_2}\right)$

B. $\theta = 2\sin^{-1}\left(\frac{r_1 - r_2}{r_1 + r_2}\right)$

C. $\theta = \sin^{-1}\left(\frac{r_1 - r_2}{r_1 + r_2}\right)$

D. None of these

Answer: B

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7. The two circles $x^2 + y^2 = r^2$ and $x^2 + y^2 - 10x + 16 = 0$ intersect at two distinct points. Then

A. $r < 2$

B. $r > 8$

C. $2 < r < 8$

D. $2 \leq r \leq 8$

Answer: C

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8. If the circle $x^2 + y^2 + 4x + 22y + c = 0$ bisects the circumference of the circle $x^2 + y^2 - 2x + 8y - d = 0$,then $(c + d)$is equal to

A. 40

B. 50

C. 60

D. 70

Answer: B

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9. Two circle $x^2+y^2=6$ and $x^2+y^2-6x+8=0$ are given. Then the equation of the circle through their points of intersection and the point (1, 1) is $x^2+y^2-6x+4=0$ $x^2+y^2-3x+1=0$ $x^2+y^2-4y+2=0$ none of these

A. $x^2+y^2-6x+4=0$

B. $x^2+y^2-3x+1=0$

C. $x^2+y^2-4x+2=0$

D. $x^2+y^2-2x+1=0$

Answer: B

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10. The equation of the circle described on the common chord of the circles $x^2+y^2+2x=0$ and $x^2+y^2+2y=0$ as diameter, is

A. `

B.

C.

D.

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11. The equation of the diameter of the circle $3(x^2 + y^2) - 2x + 6y - 9 = 0$ which is perpendicular to the line 2x+3y=12 is

A. 3x-2y+3=0

B. 3x-2y-3=0

C. 3x-2y+1=0

D. 3x-2y-1=0

Answer: B

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12. consider two curves $ax^2 + 4xy + 2y^2 + x + y + 5 = 0$ and $ax^2 + 6xy + 5y^2 + 2x + 3y + 8 = 0$ these two curves intersect at four cocyclic points then find out a

A. -6

B. -4

C. 4

D. 6

Answer: B

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13. Find the equation of the circle passing throught (1,1) and the points of intersection of the circles $x^2 + y^2 + 13x - 3y = 0$ and $2x^2 + 2y^2 + 4x - 7y - 25 = 0$

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14. Show that the common chord of the circles $x^2 + y^2 - 6x - 4y + 9 = 0$ and $x^2 + y^2 - 8x - 6y + 23 = 0$ paas through the centre of the second circle and find its length.

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15. If two circle $x^2 + y^2 + 2gx + 2fy = 0$ and $x^2 + y^2 + 2g'x + 2f'y = 0$ touch each other then proove that f'g =fg'.

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16. The point of intersection of common transverse tangents of two circles $x^2 + y^2 - 24x + 2y + 120 = 0$ and $x^2 + y^2 + 20x - 6y - 116 = 0$ is

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Exercise For Session 7

1. Find the angle at which the circles $x^2 + y^2 + x + y = 0$ and $x^2 + y^2 + x - y = 0$ intersect.

A. $\pi/6$

B. $\pi/4$

C. $\pi/3$

D. $\pi/2$

Answer: D

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2. If the circles of same radius a and centers at (2, 3) and 5, 6) cut orthogonally, then find $a\cdot$

A. 1

B. 2

C. 3

D. 4

Answer: C

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3. about to only mathematics

A. $2 \text{ or } -\frac{3}{2}$

B. $-2 \text{ or } -\frac{3}{2}$

C. $2 \text{ or } \frac{3}{2}$

D. $-2 \text{ or } \frac{3}{2}$

Answer: A

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4. If a circle Passes through a point (1,0) and cut the circle $x^2 + y^2 = 4$ orthogonally,Then the locus of its centre is

A. $2ax + 2by + (a^2 + b^2 + 4) = 0$

B. $2ax + 2by - (a^2 + b^2 + 4) = 0$

C. $2ax - 2by + (a^2 + b^2 + 4) = 0$

D. $2ax - 2by - (a^2 + b^2 + 4) = 0$

Answer: D

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5. The loucs of the centre of the circle which cuts orthogonally the circle $x^2 + y^2 - 20x + 4 = 0$ and which touches x=2 is

A. $x^2 = 16y$

B. $x^2 = 16y + 4$

C. $y^2 = 16x$

D. $y^2 = 16x + 4$

Answer: C

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6. Find the equation of the circle which cuts the three circles $x^2 + y^2 - 3x - 6y + 14 = 0$, $x^2 + y^2 - x - 4y + 8 = 0$, and $x^2 + y^2 + 2x - 6y + 9 = 0$ orthogonally.

A. $x^2 + y^2 - 2x - 4y + 1 = 0$

B. $x^2 + y^2 + 2x + 4y + 1 = 0$

C. $x^2 + y^2 - 2x + 4y + 1 = 0$

D. $x^2 + y^2 - 2x - 4y - 1 = 0$

Answer: A

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7. Find the equation of the radical axis of circles $x^2 + y^2 + x - y + 2 = 0$ and $3x^2 + 3y^2 - 4x - 12 = 0$

A. $2x^2 + 2y^2 - 5x + y - 14 = 0$

B. $7x - 3y + 18 = 0$

C. $5x - y + 14 = 0$

D. None of these

Answer: B

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8. The radius and centre of the circles $x^2 + y^2 = 1$, $x^2 + y^2 + 10y + 24 = 0$ and $x^2 + y^2 - 8x + 15 = 0$ is

A. (2,5/2)

B. (-2,5/2)

C. (-2,-5/2)

D. (2,-5/2)

Answer: D

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9. If (1, 2) is a limiting point of a coaxial system of circles containing the circle $x^2 + y^2 + x - 5y + 9 = 0$, then the equation of the radical axis, is

A. x-9y+4=0

B. 3x-y-1=0

C. x+3y-4=0

D. 9x+y-4=0

Answer: B

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10. The limiting points of the system of circles represented by the equation $2(x^2+y^2)+\lambda x+\frac{9}{2}=0$, are

A. $\left(\pm\frac{3}{2}, 0\right)$

B. $(0, 0)$ and $\left(\frac{9}{2}, 0\right)$

C. $\left(\pm\frac{9}{2}, 0\right)$

D. $(\pm 3, 0)$

Answer: A

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11. One of the limiting points of the co-axial system of circles containing the circles $x^2+y^2-4=0$ and $x^2+y^2-x-y=0$ is

A. $(\sqrt{2}, \sqrt{2})$

B. $(-\sqrt{2}, \sqrt{2})$

C. $(-\sqrt{2}-\sqrt{2})$

D. None of these

Answer: D

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12. The point (2,3) is a limiting point of a co-axial system of circles of which $x^2+y^2=9$ is a member. The coordinates of the other limiting point is given by

A. $\left(\frac{18}{13}, \frac{27}{13}\right)$

B. $\left(\frac{9}{13}, \frac{6}{13}\right)$

C. $\left(\frac{18}{13} - \frac{27}{13}\right)$

D. $\left(-\frac{18}{13} - \frac{9}{13}\right)$

Answer: A

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13. $P(a, 5a)$ and $Q(4a, a)$ are two points. Two circles are drawn through these points touching the axis of y.

Angle of intersection of these circles is

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14. Find the equation of the circle which cuts orthogonally the circle $x^2 + y^2 - 6x + 4y - 3 = 0$,passes through (3,0) and touches the axis of y.

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15. Tangents are drawn to the circles $x^2 + y^2 + 4x + 6y - 19 = 0, x^2 + y^2 = 9$ from any point on the 2x+3y=5. Prove that their lengths are equal.

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16. Find the coordinates of the point from which the lengths of the tangents to the following three circles be equal $3x^2 + 3y^2 + 4x - 6y - 1 = 0, 2x^2 + 2y^2 - 3x - 2y - 4 = 0$ and $2x^2 + 2y$

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17. Find the equation of a circle which is co-axial with the circles $x^2 + y^2 + 4x + 2y + 1 = 0$ and $x^2 + y^2 - x + 3y - \frac{3}{2} = 0$ and having its centre on the radical axis of these circles.

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18. Find the radical axis of a co-axial system of circles whose limiting points are (1,2) and (3,4).

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Exercise (Single Option Correct Type Questions)

1. The sum of the square of length of the chord intercepted by the line x+y=n,$n \in N$ on the circle $x^2 + y^2 = 4$is p then p/11

A. 11

B. 22

C. 33

D. None of these

Answer: B

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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 co-ordinates of 'P' so that area of triangle PP_1P_2 is minimum is/are -

A. (10,0)

B. $(10\sqrt{2}, 0)$

C. $(-10\sqrt{2}, 0)$

D. $(10\sqrt{3}, 0)$

Answer: A

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3. Equation of chord AB of the 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) Non of these

A. x=3y

B. x=y

C. $y - 2 = \sqrt{3}(x - 2)$

D. $y - 3 = \sqrt{3}(x - 1)$

Answer: B

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

A. $\frac{4}{41}$

B. $\frac{41}{4}$

C. $\frac{5}{41}$

D. $\frac{41}{5}$

Answer: B

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5. Equation of a 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. $x^2+y^2-4x+6y-7=0$

Answer: A

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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

Answer: D

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A. 6

B. $\sqrt{(a+1)^2+(b+2)^2}$

C. 3

D. $\sqrt{(a+1)^2+(b+2)^2}-3$

Answer: A

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8. The number of rational point(s) [a point (a, b) is called rational, if $a and b$ both are rational numbers] on the circumference of a circle having center (π, e) is at most one (b) at least two exactly two (d) infinite

A. atmost one

B. atleast two

C. exactly two

D. infinite

Answer: A

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9. Three sided of a triangle have equations $L_1 \equiv y - m_i x = o; i = 1, 2$ and 3. Then $L_1L_2 + \lambda L_2L_3 + \mu L_3L_1 = 0$ where $\lambda \neq 0, \mu \neq 0,$ is the equation of the circumcircle of the triangle if (a) $1 + \lambda + \mu = m_1m_2 + \lambda m_2m_3 + \lambda m_3m_1$ (b) $m_1(1 + \mu) + m_2(1 + \lambda) + m_3(\mu + \lambda) = 0$ (c) $\frac{1}{m_3} + \frac{1}{m_1} + \frac{1}{m_1} = 1 + \lambda + \mu$ (d)none of these

A. $\lambda(m_2 + m_3) + \mu(m_3 + m_1) + v(m_1 + m_2) = 0$

B. $\lambda(m_2m_3 - 1) + \mu(m_3m_1 - 1) + v(m_1m_2 - 1) = 0$

C. Both (a) and (b)

D. None of the above

Answer: C

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10. $f(x, y) = x^2 + y^2 + 2ax + 2by + c = 0$ represents 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 center 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

Answer: B

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11. If $(1+ax)^n = 1 + 8x + 24x^2 + \dots$ and a line through $P(a, n)$ cuts the circle $x^2 + y^2 = 4$ in A and B, then $PA.\ PB =$

A. 4

B. 8

C. 16

D. 32

Answer: C

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12. A region in the $x - y$ 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) $a \in (-\infty, -1)$ ∪ $(3, \infty)$ (c) $a \in (-1, 3)$ (d) none of these

A. $a \in (-4, 3)$

B. $a \in (-\infty, -1) \cup (3, \infty)$

C. $a \in (-1, 3)$

D. None of these

Answer: C

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13. $S(x, y) = 0$ represents a circle. The equation $S(x, 2) = 0$ gives two identical solutions: $x = 1$. The equation $S(1, y) = 0$ given two solutions: $y = 0, 2$. Find the equation of the circle.

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. $x^2 + y^2 - 2x - 2y + 1 = 0$

Answer: D

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14. Let $0 < \alpha < \frac{\pi}{2}$ be a fixed angle . If $p = (\cos\theta, \sin\theta)$ and $Q(\cos(\alpha - \theta))$, then Q is obtained from P by

A. (a)clockwise rotation around origin through an angle α

B. (b)anit-clockwise rotation around origin through an angle α

C. (c)reflection in the line through origin with slope $\tan\alpha$

D. (d)reflection in the line through origin which slope $\tan\left(\frac{\alpha}{2}\right)$

Answer: D

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15. Find the number of point (x, y) having integral coordinates satisfying the condition $x^2 + y^2 < 25$

A. 69

B. 80

C. 81

D. 77

Answer: A

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16. The point $\begin{pmatrix} P+1 \\ P \end{pmatrix}$ (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. a, $P \in [-1, 0) \cup [0, 1) \cup [1, 2)$

B. b. $P \in [-1, 2) - \{0, -1\}$

C. c. $P \in (-1, 2)$

D. d. None of these

Answer: D

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17. A point Plies inside the circles $x^2 + y^2 - 4 = 0$ and $x^2 + y^2 - 8x + 7 = 0$. The poirt P starts moving such that it is always inside the circles, its path enclosus greatest possible area and it is at a fixeddistance from an arbitrarily chosen point in its region. The locus of P is.

A. (a)$4x^2 + 4y^2 - 12x - 1 = 0$

B. (b)$4x^2 + 4y^2 + 12x + 1 = 0$

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

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

Answer: D

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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. $(-\infty, -4-5\sqrt{2}) \cup (5\sqrt{2}-4, \infty)$

Answer: D

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19. If a line segement $AM = a$ moves in the plane XOY remaining parallel to OX so that the left endpoint A slides along the circle $x^2 + y^2 = a^2$, then the locus of M.

A. $x^2 + y^2 = 4a^2$

B. $x^2 + y^2 = 2ax$

C. $x^2 + y^2 = 2ay$

D. $x^2 + y^2 - 2ax - 2ay = 0$

Answer: B

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20. Show that the four points of intersection of the lines : $(2x - y + 1)$

(x-2y+3) = 0`, with the axes lie on a circle and find its centre.

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. $\left(0, \frac{5}{4}\right)$

Answer: A

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21. Find 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 does not exceed 5.

A. 14

B. 18

C. 16

D. None of these

Answer: C

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22. Let $f(x, y) = 0$ be the equation of a circle. If $f(0, \lambda) = 0$ has equal roots $\lambda = 2, 2$ and $f(\lambda, 0) = 0$ 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

Answer: B

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23. about to only mathematics

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

Answer: D

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24. about to only mathematics

A. 16 sq units

B. 24 sq units

C. 32 sq units

D. None of these

Answer: C

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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

Answer: A

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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 $\frac{\cos\alpha}{2}, \frac{\cos\beta}{2}$ and $\frac{\cos\gamma}{2}$ are in

A. AP

B. GP

C. HP

D. None of these

Answer: B

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27. The equation of the circle passing through $(2, 0)$ and $(0, 4)$ and having 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

Answer: B

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28. about to only mathematics

A. (1,0)

B. (0,1)

C. (-1,0)

D. (0,-1)

Answer: C

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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 $B\frac{P}{P}A = \alpha$ and $B\frac{Q}{Q}A = \beta$. 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

Answer: B

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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) $(x+2)^2+(y+3)^2=18.75$

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. $(x+2)^2+(y+3)^2=18.75$

Answer: A

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Exercise (More Than One Correct Option Type Questions)

1. OA and OB are two perpendicular straight lines. A straight line AB is drawn in such a manner that $OA+OB=8$. Find the locus of the mid point of AB.

A. $x^2+y^2=a+b$

B. $x = \frac{a}{2}$

C. $x^2 - y^2 = a^2 - b^2$

D. $y = \frac{b}{2}$

Answer: B::D

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2. If P and Q 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) $P \equiv (2 - 2\sqrt{2}, -3 - 2\sqrt{2})$

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

(C) $P \equiv (2 + 2\sqrt{2}, -3 + 2\sqrt{2})$

(D) $Q \equiv (2 - 2\sqrt{2}, -3 + 2\sqrt{2})$

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

Answer: B::D

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3. Find the equation of the circle which cuts each of the circles $x^2 + y^2 = 4$, $x^2 + y^2 - 6x - 8y. + 10 = 0$ & $x^2 + y^2 + 2x - 4y - 2 = 0$ at the extremities of a diameter

A. c=-4

B. g+f=c=-1

C. $g^2 + f^2 - c = 17$

D. gf=6

Answer: A::B::C::D

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4. The range of values of $\lambda, (\lambda > 0)$ such that the angle θ between the pair of tangents drawn from $(\lambda, 0)$ to the circle $x^2 + y^2 = 4$ lies in $\left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$ is (a) $\left(\frac{4}{\sqrt{3}}, \frac{2}{\sqrt{2}}\right)$ (b) $(0, \sqrt{2})$ (c) $(1, 2)$ (d) none of these

A. $\left(\frac{4}{\sqrt{3}}, 2\sqrt{2}\right)$

B. $(0, \sqrt{2})$

C. (1,2)

D. $\left(-\frac{4}{\sqrt{3}}, \frac{4}{\sqrt{3}}\right)$

Answer: A

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5. If a chord of the circle $x^2 + y^2 - 4x - 2y - c = 0$ is trisected at the points $\left(\frac{1}{3}, \frac{1}{3}\right) \& \left(\frac{8}{3}, \frac{8}{3}\right)$, then $'c'$ equal to: 10 (b) 20 (c) 40 (d) none of these

A. c=10

B.

C. c=20

D. c=15

Answer: B::D

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6. about to only mathematics

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. $x^2 + y^2 + 6x - 4y + 4 = 0$

Answer: B::C

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

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

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

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

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

Answer: A::B::C::D

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

Answer: B::D

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9. The equation of the circle which touches the axes of coordinates and the line $\frac{x}{3}+\frac{y}{4}+\ =1$ and whose centres lie in the first quadrant is $x^2+y^2-2cx-2cy+c^2=0,$ where c is equal to 4 (b) 2 (c) 3 (d) 6

A. 1

B. 2

C. 3

D. 6

Answer: A::D

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10. Let P be a point on the circle $x^2 + y^2 = 9$, Q a point on the line $7x + y + 3 = 0$, and the perpendicular bisector of PQ be the line $x - y + 1 = 0$. Then the coordinates of P are

A. (3,0)

B. $\left(\frac{72}{25}, -\frac{21}{25}\right)$

C. (0,3)

D. $\left(-\frac{72}{25}, \frac{21}{25}\right)$

Answer: A::D

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

A. (4,0)

B. (4,2)

C. (6,0)

D. (7,9)

Answer: A::C

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12. 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 curver C_3 is 8π

C. C_2 and C_3 are circles with the same centre

D. None of the above

Answer: A::C

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13. The equation of the 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) $7x + 24y = 250$

A. 4x+3y=25

B. 3x+4y=38

C. 24x-7y+125=0

D. 7x+24y=230

Answer: A::C

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14. 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

Answer: A::C::D

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15. 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 :

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Exercise (Passage Based Questions)

1. Consider with 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 then Length of the chord AB is

A. $\sqrt{5}$

B. $\sqrt{10}$

C. $2\sqrt{5}$

D. $5\sqrt{2}$

Answer: B

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2. 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 & B. (i) Length of the chord

AB equal (i) The angle subtended by the chord AB in the minor arc of S is

(iii). Acute angle between the line L and the circle S is

A. $\frac{\pi}{4}$

B. $\frac{2\pi}{3}$

C. $\frac{3\pi}{4}$

D. $\frac{5\pi}{6}$

Answer: C

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3. Consider with 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 then Length of the chord AB is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: B

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

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

Answer: B

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5. 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 parallelogran PQSR is completed.

If P-=(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

Answer: D

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

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. $\left(-\frac{68}{25}, \frac{51}{25}\right)$

Answer: B

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7. 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.

$L_1 = 0, L_2 = 0$ be the 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. a curve passing through point of interesection of

$L_1 = 0, L_2 = 0 \text{ and } L_3 = 0$

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

Answer: A

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8. Equation of the circumcircle of a triangle formed by the lines $L_1 = 0, L_2 = 0 \text{ and } L_3 = 0$ 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.

$L_1L_2^2 + \lambda L_2L_3^2 + \mu L_1^2 = 0$ represents

A. $\lambda L_1L_4 + \mu L_2L_3 = 0$

B. $\lambda L_1 L_3 + \mu L_2 L_4 = 0$

C. $\lambda L_1 L_2 + \mu L_3 L_4 = 0$

D. $\lambda L_1^2 L_3 + \mu L_2^2 L_4 = 0$

Answer: C

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9. 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 $L_1 L_2 + \lambda L_2 L_3 + \mu L_3 L_1 = 0$, where λ and μ are such that coefficient of x^2 =coefficient of y^2 and coefficient of xy=0.

If $L_1 L_2 + \lambda L_2 L_3 + \mu L_3 L_1 = 0$ 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

Answer: B

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10. Give two circles intersecting orthogonally having the length of common chord $24/5$ units. The radius of one of the circles is 3 units. The angle between direct common tangents is

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11. 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. If radius of other circle is λ units then λ is

A. $\frac{4}{5}$

B. $\frac{4\sqrt{6}}{25}$

C. $\frac{12}{25}$

D. $\frac{24}{25}$

Answer: B

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12. 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. If radius of other circle is λ units then λ is

A. 12

B. 24

C. 36

D. 48

Answer: B

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13. 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.

If $(OA)^2 + (OB)^2 + (BC)^2 = \lambda, \quad \text{then} \quad \lambda \in$

A. (a) $\left(b^2 + a^2, 5b^2 + a^2\right]$

B. (b) $\left[4b^2, 4b^2 + a^2\right]$

C. (c) $\left[4a^2, 4b^2\right]$

D. (d) $\left[5b^2 - 3a^2, 5b^2 + 3a^2\right]$

Answer: A

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14. 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.

If $(BC)^2$ is maximum, then the locus of the mid-piont 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. $\left(x-\frac{b}{2}\right)^2+y^2=\frac{b^2}{4}$

Answer: A

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15. 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.

If $(BC)^2$ is maximum, then the locus of the mid-piont 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

Answer: D

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16. 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 midpoints of AB and BC, respectively, such that the line joining MN intersects the circles at P and Q, where P is closer to AB and O is the center of the circle.

$\angle OAB$ is

A. 15°

B. 30°

C. 45°

D. 60°

Answer: D

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17. 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 midpoints of AB and BC, respectively, such that the line joining MN intersects the circles at P and Q, where P is closer to AB and O is the center of the circle.

The locus of the points of intersection of tangents at A and C is

A. (a)60°

B. (b)90°

C. (c)120°

D. (d)150°

Answer: A

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18. 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 midpoints of AB and BC, respectively, such that the line joining MN intersects the circles at P and Q, where P is closer to AB and O is the center of the circle.

The locus of the points 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. $x^2 + y^2 = 8a^2$

Answer: C

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19. t_1, t_2, t_3 are lengths of tangents drawn from a point (h,k) to the circles $x^2 + y^2 = 4, x^2 + y^2 - 4 = 0$ and $x^2 + y^2 - 4y = 0$ respectively further, $t_1^4 = t_2^2 \quad t_3^2 + 16$. 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.

Equation of L_1 is

A. (a)x+y=0

B. (b)x-y=0

C. (c)2x+y=0

D. (d)x+2y=0

Answer: A

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20. 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, $t_1^4 = t_2^2 \quad t_3^2 + 16$. 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.

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. $x^2 + y^2 - 2x - 2y = 0$

Answer: D

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21. t_1, t_2, t_3 are lengths of tangents drawn from a point (h,k) to the circles $x^2 + y^2 = 4, x^2 + y^2 - 4x = 0 \text{ and } x^2 + y^2 - 4y = 0$ respectively further, $t_1^4 = t_2^2 \quad t_3^2 + 16$. 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.

The distance between the centres of $C_1 \text{ and } C_2$ is

A. $\sqrt{2}$

B. 2

C. $2\sqrt{2}$

D. 4

Answer: C

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Exercise (Single Integer Answer Type Questions)

1. If the point (1, 4) lies inside the circle $x^2 + y^2 - 6x - 10y + p = 0$ and the circle does not touch or intersect the coordinate axes, then which of the following must be correct :

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2. Consider the family of circles $x^2 + y^2 - 2x - 2\lambda - 8 = 0$ passing through two fixed points $AandB$. Then the distance between the points $AandB$ is_____

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3. If $C_1 : x^2 + y^2 = \left(3 + 2\sqrt{2}\right)^2$ be a circle. 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

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4. 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 is.

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5. 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

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6. 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 :

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7. A circle $x^2+y^2+4x-2\sqrt{2}y+c=0$ is the director circle of the circle $S_1 and S_1$ is the director circle of circle $S_2,$ and so on. If the sum of radii of all these circles is 2, then the value of c is $k\sqrt{2}$, where the value of k is__________

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9. 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 and passes through the centre of the circle C. If the length of this chord can be expressed as $\sqrt{x}$, find x.

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Exercise (Statement I And Ii Type Questions)

1. 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

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

Answer: D

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

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

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

Answer: A

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3. Statement 1 : The number of circles passing through (1, 2), (4, 8) and (0, 0) is one. Statement 2 : Every triangle has one circumcircle

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

Answer: D

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4. 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 $x^2 + y^2 = 25$.

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

Answer: D

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5. 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

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

Answer: B

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6. 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 II The angle of incidence = angle of reflection i.e. $\angle i = \angle r$,

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

Answer: B

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

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

Answer: A

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Exercise (Subjective Type Questions)

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

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2. 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, is

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3. A line meets the coordinate axes at A and B. A circle is circumscribed about the triangle OAB. If $d_1 and d_2$ are distances of the tangents to the circle at the origin O from the points $A and B$, respectively, then the diameter of the circle is (a) $\frac{2d_1 + d_2}{2}$ (b) $\frac{d_1 + 2d_2}{2}$ (c) $d_1 + d_2$ (d) $\frac{d_1 d_2}{d_1 + d_2}$

A. $\frac{2m + n}{2}$

B. $(m+n)$

C. $\frac{mn}{m+n}$

D. $\frac{m+2n}{2}$

Answer: B

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4. 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 eth lines $3x+5y=1 and (2+c)x+5c^2y=1 as c\overrightarrow{1}$.

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

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7. Find the radius of the smalles circle which touches the straight line $3x - y = 6$ at $(- , - 3)$ and also touches the line $y = x$. Compute up to one place of decimal only.

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9. about to only mathematics

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10. The circle $x^2 + y^2 = 1$ cuts the x-axis at $PandQ$. Another circle with center 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 triangle QSR.

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11. If the lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ cut the coordinae axes at concyclic points, then prove that $|a_1a_2| = |b_1b_2|$

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12. 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 $y = x$.

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13. Two straight lines rotate about two fixed points $(-a, 0)$ and $(a, 0)$ in anticlockwise sense. If they start from their position of coincidence such that one rotates at a rate double the other, then find the locus of curve.

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14. 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 $\frac{ak}{(1-k^2)}$, a being the length of the base AB.

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16. Tangents drawn from the point $P(1, 8)$ to the circle $x^2 + y^2 - 6x - 4y - 11 = 0$ touch the circle at points A and B. The equation of the cricumcircle of triangle PAB is

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. $x^2 + y^2 - 6x - 4y + 19 = 0$

Answer: B

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17. The centres of two circles C_1 and C_2 each of unit radius are at a distance of 6 unit 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

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18. 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

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

Answer: A

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19. If the circle $x^2 + y^2 - 4x - 8y - 5 = 0$ intersects the line $3x - 4y = m$ at two distinct points, then find the values of m.

A. $-35 < m < 15$

B. $15 < m < 65$

C. $35 < m < 85$

D. $-85 < m < -35$

Answer: A

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20. The circle passing through the point $(-1, 0)$ and touching the y-axis at (0,2) also passes through the point.

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)

Answer: D

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22. The two circles $x^2+y^2=ax$ and $x^2+y^2=c^2(c>0)$ touch each other , if

A. |a|=c

B. a=2c

C. |a|=2c

D. 2|a|=c

Answer: A

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23. 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 : (A) $20(x^2 + y^2) - 36x + 45y = 0$ (B) $20(x^2 + y^2) + 36x - 45y = 0$ (C) $20(x^2 + y^2) - 20x + 45y = 0$ (D) $20(x^2 + y^2) + 20x - 45y = 0$

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

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

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

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

Answer: A

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24. A tangent PT is drawn to the circle $x^2 + y^2 = 4$ at the point $P(\sqrt{3}, 1)$. A straight line L is perpendicular to PT is a tangent to the circle $(x-3)^2 + y^2 = 1$ Common tangent of two circle is: (A) $x = 4$ (B) $y = 2$ (C) $x + (\sqrt{3})y = 4$ (D) $x + 2(\sqrt{2})y = 6$

A. $x - \sqrt{3}y = 1$

B. $x + \sqrt{3}y = 1$

C. $x - \sqrt{3}y = -1$

D. $x + \sqrt{3}y = 5$

Answer: A

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25. A tangent PT is drawn to the circle $x^2 + y^2 = 4$ at the point $P(\sqrt{3}, 1)$. A straight line L is perpendicular to PT is a tangent to the circle $(x-3)^2 + y^2 = 1$ Common tangent of two circle is: (A) $x = 4$ (B) $y = 2$ (C) $x + (\sqrt{3})y = 4$ (D) $x + 2(\sqrt{2})y = 6$

A. x=4

B. y=2

C. $x+\sqrt{3}y=4$

D. $x+2\sqrt{2}y=6$

Answer: D

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26. 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 (1) $\frac{10}{3}$ (2) $\frac{3}{5}$ (3) $\frac{6}{5}$ (4) $\frac{5}{3}$

A. $\frac{10}{3}$

B. $\frac{3}{5}$

C. $\frac{6}{5}$

D. $\frac{5}{3}$

Answer: A

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27. The circle passing through (1, -2) and touching the axis of x at (3,0) also passes through the point :

A. (-5,2)

B. (2,-5)

C. (5,-2)

D. (-2,5)`

Answer: C

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28. 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)

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

Answer: A::C

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29. 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 (1) $\frac{\sqrt{3}}{\sqrt{2}}$ (2) $\frac{\sqrt{3}}{2}$ (3) $\frac{1}{2}$ (3) $\frac{1}{4}$

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{\sqrt{3}}{\sqrt{2}}$

D. $\frac{\sqrt{3}}{2}$

Answer: B

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30. 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 (A) radius of S is 8 (B) radius of S is 7 (C) center of S is (-7,1) (D) center of S is (-8,1)

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)

Answer: B::C

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31. Locus of the image of the point (2, 3) in the line $(2x-3y+4)+k(x-2y+3)=0, k\varepsilon R$, is a :

(1) straight line parallel to x-axis. (2) straight line parallel to y-axis (3) circle of radius $\sqrt{2}$ (4) circle of radius $\sqrt{3}$

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

Answer: A

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32. The number of common tangents to the circles $x^2+y^2-4x-6y-12=0$ and $x^2+y^2+6x+18y+26=0$, is

A. 3

B. 4

C. 1

D. 2

Answer: A

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33. 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 : (1) a circle. (2) an ellipse which is not a circle. (3) a hyperbola. (4) a parabola.

A. a hyperbola

B. a parabola

C. a circle

D. an ellipse which is not a circle

Answer: B

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34. 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 circles S, whose centre is at $(-3, 2)$, then the radius of S is

A. 5

B. 10

C. $5\sqrt{2}$

D. $5\sqrt{3}$

Answer: D

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

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

Answer: A::C

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36. 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 ?

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Exercise (Questions Asked In Previous 13 Years Exam)

1. about to only mathematics

A. $\{(x, y) : x^2 = 4y\} \cup \{(x, y) : y \leq 0\}$

B. $\left\{(x, y) : x^2 + (y - 1)^2 = 4\right\} \cup \{(x, y) : y \leq 0\}$

C. $\{(x, y) : x^2 = y\} \cup \{(0, y) : y \leq 0\}$

D. $\{(x, y) : x^2 = 4y\} \cup \{(0, y) : y \leq 0\}$

Answer: D

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2. If the circles $x^2 + y^2 + 2ax + cy + a = 0$ and points $PandQ$, then find the values of a for which the line $5x + by - a = 0$ passes through $PandQ$.

A. exactly one value of a

B. no value of a

C. infinitely many vaues of a

D. exactly two values of a

Answer: B

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3. A circle touches the x-axis and also touches the circle with center (0,3) and radius 2 externally. The locus of the center of the circle is

A. an ellipse

B. a circle

C. a hyperbola

D. a parabola

Answer: D

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4. about to only mathematics

A. $x^2 + y^2 - 3ax - 4by + \left(a^2 + b^2 - p^2\right) = 0$

B. $2ax + 2by - \left(a^2 - b^2 + p^2\right) = 0$

C. $x^2 + y^2 - 2ax - 3by + \left(a^2 - b^2 - p^2\right) = 0$

D. $2ax + 2by - \left(a^2 + b^2 + p^2\right) = 0$

Answer: D

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5. Let ABCD be a square of side length 2 units. C2 is the circle through vertices A, B, C, D and C1 is the circle touching all the sides of the square ABCD. L is a line through A. . If P is a point on C1 and Q in another point on C2, then (PA^2+ PB^2+ PC^2+PD^2)/ (QA^2+ QB^2+ QC^2+ QD^2) is equal to (A) 0.75 (B) 1.25 (C) 1 (D) 0.5

A. 0.75

B. 1.25

C. 1

D. 0.5

Answer: A

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6. 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 fixed point. 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. (a)ellipse

B. (b)hyperbola

C. (c)parabola

D. (d)pair of straight line

Answer: B

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7. 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 fixed point.

A line L' through a is drawn parallel to BD. Point S moves scuh that its distances from the line BD and the vertex A are equal. If loucs S cuts L' at T_2 and T_3 and AC at T_1, then area of $\Delta T_1T_2T_3$ is

A. (a) $\frac{1}{2}$ sq units

B. (b) $\frac{2}{3}$ sq units

C. (c)1 sq units

D. (d)2 sq units

Answer: C

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8. about to only mathematics

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. $x^2 + y^2 - 2x + 2y - 47 = 0$

Answer: D

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9. 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 $\frac{2\pi}{3}$ at its center is

A. $x^2 + y^2 = \frac{3}{2}$

B. $x^2 + y^2 = 1$

C. $x^2 + y^2 = \frac{27}{4}$

D. $x^2 + y^2 = \frac{9}{4}$

Answer: D

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10. Tangents are drawn from the point (17, 7) to the circle $x^2 + y^2 = 169$, Statement I The tangents are mutually perpendicular Statement, II The locus of the points frorn which mutually perpendicular tangents can be drawn to the given circle is $x^2 + y^2 = 338$

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

Answer: A

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11. Consider a family of circles which are passing through the point $(-1, 1)$ and are tangent to the x-axis. If (h, k) are the coordinates of the center of the circles, then the set of values of k is given by the interval.

(a)$k \geq \frac{1}{2}$ (b) $-\frac{1}{2} \leq k \leq \frac{1}{2}$ $k \leq \frac{1}{2}$ (d) $0<k<\frac{1}{2}$

A. $-\frac{1}{2} \leq k \leq \frac{1}{2}$

B. $k \leq \frac{1}{2}$

C. $0 \leq k \leq \frac{1}{2}$

D. $k \geq \frac{1}{2}$

Answer: D

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12. 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 (3 sqrt3/2, 3/2). Further, it is given that the origin and the centre of C are on the same side of the line PQ. (1)The equation of circle C is (2)Points E and F are given by (3)Equation of the sides QR, RP are

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. $y = \sqrt{3}x, y = 0$

A. $\left(x - 2\sqrt{3}\right)^2 + (y - 1)^2 = 1$

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

C. $\left(x - \sqrt{3}\right)^2 + (y + 1)^2 = 1$

D. $\left(x - \sqrt{3}\right)^2 + (y - 1)^2 = 1$

Answer: D

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13. 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 (3 sqrt3/2, 3/2). Further, it is given that the origin and the centre of C are on the same side of the line PQ. (1)The equation of circle C is (2)Points E and F are given by (3)Equation of the sides QR, RP are

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. $y = \sqrt{3}x, y = 0$

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

D. $\left(\frac{3}{2}, \frac{\sqrt{3}}{2}\right), \left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

Answer: A

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14. 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. (1)The equation of circle C is (2)Points E and F are given by (3)Equation of the sides QR, RP are

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. $y = \sqrt{3}x, y = 0$

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. $y = \sqrt{3}x, y = 0$

Answer: D

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15. 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 1 : If line L_1 is a chord of circle $C,$ then line L_2 is not always a diameter of circle C. Statement 2 : If line L_1 is a a diameter of circle $C,$ then line L_2 is not a chord of circle C. Both the statement are True and Statement 2 is the correct explanation of Statement 1. Both the statement are True but Statement 2 is not the correct explanation of Statement 1. Statement 1 is True and Statement 2 is False. Statement 1 is False and Statement 2 is True.

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

Answer: C

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16. The point diametrically opposite to the point P(1, 0) on the circle $x^2 + y^2 + 2x + 4y - 3 = 0$ is

A. (3,-4)

B. (-3,4)

C. (-3,-4)

D. (3,4)

Answer: C

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