MATHS

BOOKS - KC SINHA ENGLISH

CIRCLES - FOR BOARDS

Solved Examples

1. Find the equation of circle whose centre is $\left(\frac{1}{2}, \frac{1}{2}\right)$ and radius is $\frac{1}{\sqrt{2}}$.

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2. Find the equation of the circle whose centre is (1,2) and which passes through the point (4,6).

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3. If the equations of two diameters of a circles are $x + y = 6 \, and \, x + 2y = 4$ and the radius is 10, find the equation of the circle.

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4. If the line $2x - y + 1 = 0$ touches the circle at the point $(2, 5)$ and the centre of the circle lies in the line $x + y - 9 = 0$. Find the equation of the circle.

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5. Find the equation of the circle which passes through the origin and cuts off intercepts 6 and 8 from the positive parts of x and y axes respectively.

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6. Find the equation of the circle which touches : y-axis and has centre at (2, 3)`

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7. Find the equation of the circle which touches : y-axis at the origin and has radius 4.

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8. Find the equation of the circle which touches the lines $x = 0, y = 0$ and $x = 4$ and lies in the first quadrant.

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9. Find the equation of a circle which touches both the axes and whose radius is 2 units

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10. Find the equation of the circle which has its centre at the point (3,4) and touches the straight line $5x + 12y - 1 = 0$.

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11. Find the equations of the circles passing through two points on y-axis at distance 3 from the origin and having radius 5.

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12. 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

$3x + 5y = 1 and (2 + c)x + 5c^2 y = 1 asc \overrightarrow{1}$.

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13. Find the equation of the circle with radius 5 whose center lies on the x-axis and passes through the point (2, 3).

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14. A circle has radius $3 units$ 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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15. Find the equation of the circle passing through the points $(1, -2) and (4, -3)$ and whose centre lies on the $3x + 4y = 7$.

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16. One diameter of the circle circumscribing the rectangle ABCD is $4y = x + 7$. If the coordinates of A and B are (-3,4) and (5,4) respectively, find the equation of the circle.

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17. 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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18. 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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19. Find the equation of a circle of radius 5 which is touching another circle$x^2 + y^2 - 2x - 4y - 20 = 0$ at (5,5).

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

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21. 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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22. Find the equation of the circle which touches the axis of x at a distance 3 from the origin and cuts an intercept of length 6 on the axis

of y.

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

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24. Find the centre and radius of the circles $(x+5)^2+(y-3)^2=36$

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25. Find the centre and radius of each of the following circle: $x^2+y^2-x+2y-3=0$

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26. Find the centre and radius of the circle $3x^2 + 3y^2 - 8x - 10y + 3 = 0$

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

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30. Find the radius of the circle $\left(x\cos\alpha+y\sin\alpha-a^2\right)+\left(x\sin\alpha-y\cos\alpha-b^2\right)=k^2,$ if α varies, the locus of its centre is again a circle. Also, find its centre and radius.

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31. Find the equation of the circle whose centre is (h, k) and which passes through the point (p, q).

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32. The radius of the circle passing through the vertices of the triangle formed by the lines $x + y = 2, 3x - 4y = 6, x - y = 0$

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33. Find the equation of the circle passing through the origin and the points where the line $3x + 4y = 12$ meets the axes of coordinates.

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34. Find the equation of the circle passing through the points $(1, -2) and (4, -3)$ and whose centre lies on the $3x + 4y = 7$.

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36. Find the equation of the circle which passes through the centre of the circle $x^2 + y^2 + 8x + 10y - 7 = 0$ and is concentric with the circle $2x^2 + 2y^2 - 8x - 12y - 9 = 0$

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37. 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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38. The equation of circle which passes through (1, -1) and which touches the line $6x + y - 18 = 0$ at point $(3, 0)$ is

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39. Show that a cyclic quadrilateral is formed by the lines $5x + 3y = 9$, $x = 3y$, $2x = y$ and $x + 4y + 2 = 0$ taken in order. Find the equation of the circumcircle.

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40. Examine whether the following equation represents a circle or not :

$3x^2 + 3y^2 + 2xy + 3x + y = 0$

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41. Examine whether the following equation represents a circle or not :

$4x^2 + 4y^2 + 12x + 8y + 40 = 0$

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42. Examine whether that equations reprsent a circle, point or no circle : $x^2 + y^2 - 3x + 3y + 10 = 0$

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43. Examine whether that equations reprsent a circle, point or no circle : $x^2 + y^2 + 2x + 1 = 0$

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44. Examine whether that equations reprsent a circle, point or no circle : $x^2 + y^2 - 1 = 0$

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45. Find the equation of the circle when the end points of a diameter are $(5, -3)$ and $(2, -4)$. Also find its centre and radius.

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46. The abscissae of 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 and the radius of the circle with AB as diameter.

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47. Find the equation of the circle passing through the origin and the points where the line $3x + 4y = 12$ meets the axes of coordinates.

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48. Find the equation of the circle whose diameter is the portion of the line $3x + 4y - 14 = 0$, intercepted by the lines $y = x$ and $11x = 4y$.

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49. The sides of a square are $x = 1, x = 3, y = 2$ and $y = 4$.Find the equation of the circle drawn on the diagonal of the square as its diameter.

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50. Find the parametric equations of that circles : $3x^2 + 3y^2 = 4$

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

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52. Find the parametric equations of that circles : $2x^2 + 2y^2 - 5x - 7y - 3 = 0$

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53. Find the equation of a circle whose diameters are $2x - 3y + 12 and x + 4y - 5 = 0$ and area is $154 square units.$

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54. Find the Cartesian euqaiton of that curves whose parametric equation : $x = 7 + 4\cos\alpha, y = -3 + 4\sin\alpha$

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55. Find the Cartesian euqaiton of that curves whose parametric equation : $x = 5 + 3\cos\theta, y = 7 + 3\sin\theta$

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56. Find the Cartesian euqaiton of that curves whose parametric equation : $x = \cos\theta + \sin\theta + 1, y = \sin\theta - \cos\theta + 2$

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57. Show that equations $x = a\cos\theta + b\sin\theta, y = a\sin\theta - b\cos\theta$ represents a circle, wheter θ is a parameter.

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58. Show that the point (x,y) given by x=$\frac{2at}{1+t^2}$ and $y = \frac{a(1-t^2)}{1+t^2}$ lies on a circle

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Exercise

1. Find the equation of the circle with : $Centre(-3, 2)$ and $radius 5$.

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2. Find the equation of the circle with : $Centre(-3, -2)$ and $radius 7$.

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3. Find the equation of the circle with: Centre (a, a) and radius $\sqrt{2}a$.

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4. Find the equation of the circle with : $Centre(1, -5)$ and $radius 7$.

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5. Find the equation of the circle with centre at (0, 0) and radius 4.

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6. Find the equation of the circle with centre : (1, 1) and radius $\sqrt{2}$

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7. Find the equation of the circle with: centre (-2,3) and radius 4.

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8. Find the equation of the circle with centre : (0, 2) and radius 2

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9. Find the equation of the circle with centre : $\left(\frac{1}{2}, \frac{1}{4}\right)$ and radius $\frac{1}{12}$

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10.

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11. Find the equation of the circle with centre (-a, -b) and radius $\sqrt{a^2 - b^2}$.

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12. Find the equation of the circle with: Centre $(a\cos\alpha,\ a\ s \in \alpha)$ and radius a.

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13. Find the equation of the circle with : $Centre(-1, -2)$ and $diameter 25$.

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14. Find the equation of the circle passing through (0, 0) and making intercepts a and b on the coordinate axes.

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15. Find the equation of the circle passing through the origin and cutting intercepts 10 and 24 from the positive side of x and y axis respectively

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16. Find the equation of the circle touching : x-axis andhaving centre at (4, 3)`

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17. Find the equation of the circle touching : x-axis at the origin and having radius 10

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

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20. Find the equation of image of the circle $(x-1)^2+(y+2)^2=5^0$ in the x-axis.

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21. Find the equation of the circle passing through the point (2, 4) and centre at the point of intersection of the lines $x-y=4$ and $2x+3y=-7$.

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22. I the equations of two diameters of a circles are $2x+y=6$ *and* $3x+2y=4$ and the radius is 10, find the equation of the circle.

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23. Find the equation to the circle which passes through the point of intersection of $3x - 2y - 1 = 0$ and $4x + y - 27 = 0$ and whose centre is $(2, 3)$`

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24. Find the equation of the circle whose centre is $(2, -3)$ and which pass through the point of intersection of $3x + 2y = 11$ and $2x + 3y = 4$.

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25. Find the equation of the circle passing through the centre of the circle $x^2 + y^2 - 4x - 6y = 8$ and being concentric with the circle $x^2 + y^2 - 2x - 8y = 5$.

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26. Find the equation of the circle passing through the point of intersection of the lines $x + 3y = 0 \, and \, 2x - 7y = 0$ and whose centre is the point of intersection of the lines $x + y + 1 = 0 \, and \, x - 2y + 4 = 0.$

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27. Find the equation of circle whose centre is the point $(1, -3)$ and touches the line $2x - y - 4 = 0$

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28. Find the equation of the circle of radius 5 whose centre lies on y-axis and which passes through the point (3, 2).

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29. Find the equation of the circle whose radius is 5 and centre lies on the positive side of x-axis at a distance 5 from the origin.

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30. Find the equation of the circle which passes through the points $(-1, 2)$ and $(3, -2)$ and whose centre lies on the line $x - 2y = 0$.

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31. Find the equation of circle passing through the point (2,3) and (-1,1) and whose centre is on the line x - 3y - 11 = 0

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32. Find the equation of the circle which passes through the points $(2, -2)$, and (3,4) and whose centre lies on the line $x + y = 2$.

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33. Find the equation of the circle passing through the points (4,1) and (6,5) and whose centre lies on the line 4x+ y = 16.

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34. Find the equation of the circle which touches the y-axis at a distance of +4 from the origin and cuts off an intercept 6 from the x-axis.

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35. Does the point $(-2.5, 3.5)$ lie inside, outside or on the circle $x^2 + y^2 = 25$?

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36. Find the centre and radius of the circles $x^2 + y^2 - 8x + 10y - 12 = 0$

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37. Find the centre and the radius of the circle $x^2 + y^2 + 8x + 10y - 8 = 0.$

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38. Find the centre and radius of the circle $2x^2 + 2y^2 - x = 0$

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39. Find the centre and radius of the circles $x^2 + y^2 - 4x - 8y - 45 = 0$

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40. Find the centre and radius of each of that circles :

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

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41. Find the centre and radius of each of that circles :

$\left(x - \frac{1}{2}\right)^2 + \left(y + \frac{1}{3}\right)^2 = \frac{1}{4}$

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42. Find the centre and radius of each of that circles :

$x^2 + y^2 - 2x + 4y = 8$

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43. Find the centre and radius of each of the following circle:

$x^2 + y^2 - 4x + 6y = 5$

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44. Find the centre and radius of the circles :

$x^2 + y^2 - 8x - 12y - 48 = 0$

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45. Find the centre and radius of the circles : $x^2 + y^2 - ax - by = 0$

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46. Find the centre and radius of the circles :

$3x^2 + 3y^2 + 12x - 18y - 11 = 0$

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47. Find the centre and radius of the circles : $x^2 + y^2 - 2x + 4y = 8$

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48. Find the centre and radius of the circles : $\frac{1}{2}(x^2 + y^2) + x\cos\theta + y\sin\theta - 4 = 0$

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49. 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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50. Prove that the centres of the three circles $x^2 + y^2 - 4x - 6y - 12 = 0, x^2 + y^2 + 2x + 4y - 5 = 0$ and $x^2 + y^2 - 10x - 16y + 7 = 0$ are collinear.

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51. 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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52. Prove that the radii of the circles $x^2 + y^2 = 4, 4x^2 + 4y^2 - 8x - 24y + 15 = 0$ and $x^2 + y^2 - 4y - 5 = 0$ are in arithmetic progression.

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53. Find the equation of the circles passing through the three points : $(0, 0), (5, 0)$ and $(3, 3)$

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54. Find the equation of the circles passing through the three points : $(1, 0), (0, 1)$ and $(-1, 0)$

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55. Find the equation of the circles passing through the three points : $(1, -2), (5, 4)$ and $(10, 5)$

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56. Find the equation of the circle passing through the point: $(1, 2)$, $(3, -4)$ and $(5, -6)$.

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57. Find the equation of the circle circumscribing the triangle formed by the straight lines $x + y = 6, 2x + y = 4$ and $x - 2y = 5$.

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58. Find the equation of the circle which is concentric with the circle $x^2 + y^2 - 4x + 6y - 3 = 0$ and the double of its area.

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59. Find the equation of the circle concentric with the circle $2x^2 + 2y^2 - 6x + 8y + 1 = 0$ and of double its area.

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60. Find the equation. of the circle concentric with the $x^2 + y^2 + 4x - 8y - 6 = 0$ and having radius double of its radius.

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61. Find the equation of the circle concentric with the circle $x^2 + y^2 - 4x - 6y - 9 = 0$ and passing through the point $(-4, -5)$

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62. Find the equation of the circle passing through the points $(1, -1)$ and centre at the intersection of the lines $x - y = 4$ and $2x + 3y = -7$

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63. The line $5x - y = 3$ is a tangent to a circle at the point $(2, 7)$ and its centre is on theline $x + 2y = 19$. Find the equation of the circle.

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64. The line 4x-3y=-12 is tangent at the point (-3, 0) and the line 3x-4y=16 is tangent at the point (4, 1) to a circle. The equation of the circle is

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65. Find the equation of the circle circumscribing the quadrilateral formed by the straight lines $x - y = 0, 3x + 2y = 5, x - y = 10$ and $2x + 3y = 0$

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66. Find the equation of the circle passing through the points $(0, -1)$ and $(2, 0)$ and whose centre lies on the line $3x + y = 5$

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67. Find the equaiton of the circle passing through the points $(2, -3)$ and $(3, -2)$ and whose centre lies on the line $2x - 3y = 8.$

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68. Determine whether the equation represent a circle or not : $3x^2 - 3y^2 + 4x - 6y + 10=0$`

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69. Determine whether the equation represent a circle or not : $5x^2 + 5y^2 + 2xy + 4x - y + 2 = 0$

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70. Determine whether the equation represent a circle or not : $5x^2 + 5y^2 + 4x - 8y - 16 = 0$

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71. Determine whether the equation represent a circle or not : $x^2 + y^2 + 6x - 8y + 50 = 0$

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72. Determine whether the equation represent a circle, a point or no circle : $x^2 + y^2 + x - y = 0$

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73. Determine whether the equation represent a circle, a point or no circle : $x^2 + y^2 - 6x - 8y + 25 = 0$

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74. Determine whether the equation represent a circle, a point or no circle : $x^2 + y^2 + 2x + 10y + 26 = 0$

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75. Determine whether the equation represent a circle, a point or no circle : $2x^2 + 2y^2 - 24x + 8y + 120 = 0$

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76. Find the equation of the circle when the end points of a diameter of the circle are : $(3, 4)$ and $(-3, -4)$

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77. Find the equation of the circle when the end points of a diameter of the circle are : $(-2, 3)$ and $(3, -5)$

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78. Find the equation of the circle when the end points of a diameter of the circle are : $(0, 0)$ and $(2, -4)$

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79. Find the equation of the circle when the end points of a diameter of the circle are : $(-2, -3)$ and $(-3, 5)$

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80. Find the equation of the circle when the end points of a diameter of the circle are : (p, q) and (r, s)

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81. Find the equation of the circle when the end points of a diameter of the circle are : $(2, 3)$ and $(-1, -3)$

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82. Find the equation of the circle when the end points of a diameter of the circle are : $(3, 2)$ and $(2, 5)$

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83. Find the equation of the circle, the end points of whose diameter are $(2, -3)$ and $(-2, 4)$. Find its centre and radius.`

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84. Find the equaiton of the circle drawn on the intercept between the axes made by the line $3x + 4y = 12$ as a diameter.

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85. Find the equaiton of the circle drawn on the intercept between the axes made by the line $3x + 4y = 12$ as a diameter.

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86. Show that equation of the circle passing through the origin and cutting intercepts a and b on the coordinate axes is $x^2 + y^2 - ax - by = 0$

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87. Find the equation of the circle the end points of whose diameter are the centres of the circle : $x^2 + y^2 + 6x - 14y = 1$ and $x^2 + y^2 - 4x + 10y = 2$.

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88. The abscissae of two points A and B are the roots of the equaiton $x^2 + 2x - a^2 = 0$ and the ordinats are the roots of the equaiton $y^2 + 4y - b^2 = 0$. Find the equation of the circle with AB as its diameter. Also find the coordinates of the centre and the length of the radius of the circle.

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

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90. Find the equation of the circle drawn on the diagonal of the rectangle as its diameter whose sides are x=4,x=-2,y=5andy=-2.

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91. Find the equaiton of the circle drawn on a diagonal of the rectangle as its diameter whose sides are : $x = 5, x = 8, y = 4, y = 7$

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92. The sides of a square are $x = 6,\ x = 9,\ y = 3\ and\ y = 6.$ Find the equation of a circle drawn on the diagonal of the square as its diameter.

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93. Find the equation of the circle circumscribing the rectangle whose sides are : $x = 4, x = -5, y = 5, y = -3$

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94. Find the equation of the circle circumscribing the rectangle whose sides are : $x = 6, x = -3, y = 3, y = -1$

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95. Find the equation of the circle circumscribing the rectangle whose sides are $x - 3y = 4,\ 3x + y = 32,\ x - 3y = 14\ and\ 3x + y = 62.$

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96. Find the parametric equation of the circles : $x^2 + y^2 = 9$

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97. Find the parametric equation of the circles : $x^2 + y^2 + 2x - 4y - 1 = 0$

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98. Find the parametric equation of the circles : $x^2 + y^2 - 2x + 4y - 4 = 0$

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99. Find the parametric equation of the circles : $3x^2 + 3y^2 + 4x - 6y - 4 = 0$

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100. Find the Cartesian equation of the curves whose parametric equation are : $x = 5\cos\theta, y = 5\sin\theta$

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101. Find the Cartesian equation of the curves whose parametric equation are : $x = a + c\cos\alpha, y = b + c\sin\alpha$

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102. Find the Cartesian equation of the curves whose parametric equation are : $x = 3\cos\alpha, y = 3\sin\alpha$

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103. Find the Cartesian equation of the curves whose parametric equation are : $x = 1 + 3\cos\theta, y = 2 - 3\sin\theta$

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104. Find the Cartesian equation of the curves whose parametric equation are : $x = \cos\theta + \sin\theta, y = \sin\theta - \cos\theta$

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105. Find the Cartesian equation of the curves whose parametric equation are : $x = \frac{20t}{4+t^2}, y = \frac{5(4-t^2)}{4+t^2}$

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106. Prove that : $x\cos\theta + y\sin\theta = a$ and $x\sin\theta - y\cos\theta = b$ are the parametric equations of a circle for all θ satisfying $0 \leq \theta < 2\pi$

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107. Show that : $x = a\cos\theta - b\sin\theta$ and $y = a\sin\theta + b\cos\theta$, represent a circle where θ is the parameter.

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108. Show that the point (x, y) , where $x = 5\cos\theta, y = -3 + 5\sin\theta$, lies on a circle for all values of `theta

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109. Show that the point (x, y), where $x = a + r\cos\theta, y = b + r\sin\theta$, lies on a circle for all values of θ.

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