MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

THE CIRCLE

Solved Examples And Exercises

1. Find the equation of the circle whose centre is at the point $(4, 5)$ and which passes through the centre of the circle $x^2 + y^2 - 6x + 4y - 12 = 0.$

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

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3. If $(-3, 2)$ lie on the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ which is concentric with the circle $x^2 + y^2 + 6x + 8fy - 5 = 0 then =$ $(a) 11\ (b) -11\ (c) 24$ (d) none of these

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4. Find the equation of the circle drawn on the intercept made by the line $2x + 3y = 6$ between the coordinate axes as diameter.

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5. The straight line $\frac{x}{a} + \frac{y}{b} = 1$ cuts the coordinate axes at A and B. Find the equation of the circle passing through $O(0, 0), A and B$.

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6. Find the equation of the circle that passes through the points $(1, 0), (-1, 0) and (0, 1)$.

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7. The circle $x^2 + y^2 + 2gx + 2fy + c = 0$ does not intersect x-axis , if (a) $g^2 < c$ (b) $g^2 > c$ (c) $g^2 < 2c$ (d) none of these

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

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9. Show that the point (x, y) given by $x = \frac{2at}{1+t^2} and y = \left(\frac{1-t^2}{1+t^2}\right)$ lies on a circle for all real values of t such that $-1 \leq t \leq 1,$ where a is any given real number.

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10. If the line $lx + my - 1 = 0$ touches the circle $x^2 + y^2 = a^2$, then prove that (l, m) lies on a circle.

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

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12. In how many ways can the letters of the word PENCIL be arranged so that (i) N is always next to E ? (ii) $NandE$ are always together? .

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13. On the joining $(1, 0)$a n d$(3, 0)$ be and equilateral triangle is drawn, having its vertex in the first quadrant. Find the equation to the circles described on its sides as diameter.

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14. If the point $(\lambda, \lambda + 1)$ lies inside the region bounded by the curve $x = \sqrt{25 - y^2}$ and y-axis ,then λ belongs to the interval

(a) $(-1, 3)$ (b) $(-4, 3)$ (c) $(-\infty, -4) \cup (3, \infty)$ (d) none of these

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15. If the point $(2, k)$ lies outside the circles $x^2 + y^2 + x - 2y - 14 = 0 and x^2 + y^2 = 13$ then k lies in the interval

(a) $(-3, -2) \cup (3, 4)$ (b) $(-3, 4)$ (c) $(-\infty, -3) \cup (4, \infty)$ (d) $(-\infty - 2) \cup (3, \infty)$

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16. 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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17. Find the equation of the circle which touches both the axes and the line $3x - 4y + 8 = 0$ and lies in the third quadrant.

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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 lies within the circle $x^2 + y^2 + 14x + 10y - 26 = 0$ and which touches the given circle at the point $(-1, 3)$.

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20. Find the equation of the circle whose radius is $5 and$ which touches the circle $x^2 + y^2 - 2x - 4y - 20 = 0$ externally at the point $(5, 5)$.

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21. The circle $(x-a)^2+(y-a)^2=a^2$ is rolled on the y-axis in the positive direction through one complete revolution. Find the equation of the circle in its new-position.

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22. Find the equation of the image of the circle $x^2+y^2+8x-16+64=0$ in the line mirror $x=0$.

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

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24. 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 $(2 + \alpha)x + 5\alpha^2 y = 1$

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25. Find the equation of a circle which touches y-axis at a distance of 4units from the origin and cuts an intercept of 6units along the positive direction of x-a xis

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26. If the circle $x^2 + y^2 + 2ax + 8y + 16 = 0$ touch $x - a\xi s,$ then the value of a is ± 16 (b) ± 4 (c) ± 8 (d) ± 1

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27. If the abscissae and the ordinates of two point $AandB$ be the roots of $x^2 + 2ax - b^2$a n d $x^2 + 2px - q^2 = 0$ respectively, show that the equation of the circle described on AB as diameter is $x^2 + y^2 + 2ax + 2py - b^2 - q^2 = 0$

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28. 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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29. If $2x^2 + \lambda xy^+ 2y^2 + (\lambda - 4)x + 6y - 5 = 0,$ is the equation of a circle, then its radius is :

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30. If the equation of a circle is $\lambda x^2 + (2\lambda - 3)y^2 - 4x + 6y - 1 = 0$, then the coordinates of centre are

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31. If the line $lx + my + n = 0$ touches the circle $x^2 + y^2 = a^2$, then prove that $\left(l^2 + m^2\right)^2 = n^2.$

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32. Find the equation of the circle which passes through the origin and cut off equal chords of $\sqrt{2}$ units from the lines $y = xandy = -x.$

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33. Prove that the locus of a point which moves such that the sum of the square of its distances from the vertices of a triangle is constant is a circle having centre at the centroid of the triangle.

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34. Find the equation of the circle on the straight line joining the points of intersection of $ax^2 + 2hxy + by^2 = 0$ and $lx + my = 1$ as diameter.

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35. 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 $\triangle ABC$ is a circle of radius $2c$

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36. Find the equation to the circle which passes through the points $(1, 2)(2, 2)$ and whose radius is 1. Show that there are two such circles.

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37. Find the equation of the circle, the coordinates of the end points of whose diameter are $(-1, 2) and (4, -3)$.

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38. If the circles $x^2 + y^2 + 2ax + c = 0 and x^2 + y^2 + 2by + c = 0$ touch each other, then $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c}$ (b) $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$ (c) $a + b = 2c$ (d) $\frac{1}{a} + \frac{1}{b} = \frac{2}{c}$

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39. Find the equation of the circle which passes through the points $(1, -2), (4, -3)$ and whose center lies on the line $3x + 4y = 7$.

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40. 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

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41. Find the equation of the circle which passes through the points $(2, 3)(4, 2)$ and the centre lies on the straight line $y - 4x + 3 = 0$.

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

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43. Find the equation of the circle which touches the lines $4x - 3y + 10 = 0 and 4x - 3y - 30 = 0$ and whose centre lies on the line $2x + y = 0$.

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44. If the line $y = \sqrt{3}x + k$ touches the circle $x^2 + y^2 = 16$, then find the value of k.

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45. Find the equation of the circle having $(1, -2)$ as its centre and passing through the intersection of the lines $3x + y = 14$ and $2x + 5y = 18$.

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46. Find the locus of the centre of the circle touching the line $x + 2y = 0$ and $x = 2y$

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47. Let C be any circle with centre $(0, \sqrt{2})$. Prove that at most two rational points can be there on C. (A rational point is a point both of whose coordinates are rational numbers)

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48. Find the equation of the circle which touches the x-axis and passes through the two points(1, -2) and (3, -4).

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49. Find the equation of the circle which passes through the origin and cuts off intercepts $3 \text{ and } 4$ from the positive parts of the axes respectively.

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50. Find the equation of the circle whose centre is at $(3, -1)$ and which cuts off a chord of length $6units$ on the line $2x - 5y + 18 = 0$.

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51. A rectangle $ABCD$ is inscribed in a circle with a diameter lying along the line $3y = x + 10$. If A and B are the points $(-6, 7) and (4, 7)$ respectively, find the area of the rectangle and equation of the circle.

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52. Find the equation of a circle with origin as centre and which circumscribes and equilateral triangle whose median ids of length $3a$.

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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 squareunits dot

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54. Find the equation of a circle of radius 5 whose centre lies on x-axis and passes through the point $(2, 3)$.

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55. If $y = 2x$ is a chord of the circle $x^2 + y^2 - 10x = 0$, find the equation of a circle with this chord as diameter.

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56. Find the equation of the circle is $(2, -3)$ and radius is 8.

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

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58. Find the equation of the circle having centre at $(3, -4)$ and touching the line $5x + 12y - 12 = 0$.

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59. Find the circle and radius of the circle given by the equation $2x^2 + 2y^2 + 3x + 4y + \frac{9}{8} = 0$.

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60. 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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61. Find the equation of the circle concentric with the circle $2x^2 + 2y^2 - 8x + 10y - 39 = 0$.

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62. Find the equation of a circle whose centre is (2,-3) and radius 5.

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63. If the equations of the two diameters of a circle are $x - y = 5$ and $2x + y = 4$ and the radius of the circle is 5, find the equation of the circle.

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64. Find the equation of the circle which passes through two points on the x-axis which are at distances 4 from the origin and whose radius is 5.

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65. A circle of radius 6 units touches the coordinates axes in the first quadrant. Find the equation of its image in the line mirror $y = 0$.

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66. Show that the equation of the circle which touches the coordinates axes whose centre lies on the line $lx + my + n = 0$ *is* $(l + m)^2(x^2 + y^2) + 2n(x + y)(l + m) + n^2 = 0$.

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

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

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70. Find the equation of the circle with: centre (0,-1) and radius 1.

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71. Find the equation of the circle with: Center $(a\cos\alpha,\ a\sin\alpha)$ and radius a.

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

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73. Find the centre and radius of each of the following circle: $(x-1)^2+y^2=4$

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74. Find the centre and radius of each of the following circle: $(x+5)^2+(y+1)^2=9$

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75. Find the centre and radius of each of the following circle: $x^2 + y^2 - 4x + 6y = 5$

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

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

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78. 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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79. Find the equation of the circle whose centre lies on the positive direction of y-axis at as distance 6 from the origin and whose radius is 4.

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80. Find the equation of a circle:

1)Which touches both the axes at a distance of 6 units from the origin.

2)Which touches x-axis at a distance 5 from the origin and radius 6 units

3)Which touches both the axes and passes through the point (2,1)

4)Passing through the origin, radius 17 and ordinate of the centre is -15.

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81. If 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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82. 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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83. 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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84. A circle whose centre is the point of intersection of the lines $2x - 3y + 4 = 0 \, and \, 3x + 4y - 5 = 0$ passes through the origin. Find its equation.

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85. A circle of radius 4 units touches the coordinate axes in the first quadrant. Find the equation of its images with respect to the line mirrors $x = 0 \, and \, y = 0$.

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86. 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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87. 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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88. If the lines $3x - 4y - 7 = 0$ and $2x - 3y - 5 = 0$ are two diameters of a circle of area 49π square units, the equation of the circle is:

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89. The circle $x^2 + y^2 - 2x - 2y + 1 = 0$ is rolled along the positive direction of x-axis and makes one complete roll. Find its equation in new position.

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90. One of the diameters of the circle circumscribing the rectangle ABCD is $4y = x + y$. If A and B are the points $(-3, 4)$ and $(5, 4)$ respectively, find the area of the rectangle and equation of the circle.

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91. Find the equation of the circle which passes through the points $(5, -8), (2, -9)$ and $(2, 1)$. Find also the coordinates of its centre and radius.

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92. Find the area of equilateral triangle inscribed in a circle $x^2 + y^2 + 2gx + 2fy + c = 0$

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93. Find the coordinates of the centre and radius of each of the following circle: $x^2 + y^2 + 6x - 8y - 24 = 0$

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94. Find the coordinates of the centre and radius of each of the following circle: $2x^2 + 2y^2 - 3x + 5y = 7$

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95. Find the coordinates of the centre and radius of each of the following circle: $\frac{1}{2}\left(x^2+y^2\right)+x\cos\theta+y\sin\theta-4=0$

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96. Find the coordinates of the centre and radius of each of the following circle: $x^2+y^2-ax-by=0$

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97. Find the equation of the circle passing through the point: (5,7), (8, 1) and (1,3)

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

A. 9

B. 5

C. 1.5

D. 0

Answer: 0

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99. Find the equation of the circle passing through the point: $(5, -8), (-2, 9) and (2, 1)$

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100. Find the co-ordinates of the centre of the circle passing through the points $(0, 0),(-2, 1)$ and $(-3, 2)$. Also find its radius.

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101. Find the equation of the circle which passes through the points (3, -2), $(-2, 0)$ and has its centre on the line $2x - y = 3$.

A. 142

B. 130

C. 125

D. 145

Answer: 145

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102. Find the equation of the circle which passes through the points (3,7), (5,5) and has its centre on the line $x - 4y = 1$.

A. $x^2 + y^2 + 6x + 2y - 90 = 0$

B. $2x^2 + y^2 + 10 = 2$

C. $3x^2 + 3Y^2 - 15 = 20$

D. $x^2 + 3y^2 + Y^2 + 18 = 15$

Answer: $x^2 + y^2 + 6x + 2y - 90 = 0$

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103. Show that the poin-2) and (1,-4) are con-cyclic.

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104. Show that the points $A(5, 5), B(6, 4 \text{ and } D(7, 1)$ all lies on the circle. Find the centre, radius and equation of circle.

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105. Find the equation of the circle which circumscribes the triangle formed by the line: $x + y + 3 = 0,\ x - y + 1 = 0\, and\, x = 3$

A. $x^2 + y^2 - 6x + 2y - 15 = 0$

B. $3x^2 + 3y^2 + 9 = 10$

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

D. none of the above

Answer: $x^2 + y^2 - 6x + 2y - 15 = 0$

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106. Find the equation of the circle which circumscribes the triangle formed by the line:

$2x + y - 3 = 0,\ x + y - 1 = 0\ and\ 3x + 2y - 5 = 0$

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107. Prove that the centres of the three circles = 0,x^2+y^2 + 2x + 4y -5 = 0 and x^2 + y^2 - 10x – 16y +7 = 0` are collinear.

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108. Find the equation of the circle which circumscribes the triangle formed by the line: $x + y = 2,\ 3x - 4y = 6\ and\ x - y = 0.$

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109. Find the equation of the circle which circumscribes the triangle formed by the line: $y = x + 2, 3y = 4x \; and \; 2y = 3x$

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110. Find the equation of the circle which passes through the origin and cuts off chords of lengths 4 and 6 on the positive side of the x-axis and y-axis respectively.

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111. Find the equation of the circle concentric with the circle $x^2 + y^2 - 4x - 6y - 3 = 0$ and which touches the y axis

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

A. (b, a)

B. (a, b)

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

D. none of the above

Answer: $\left(\frac{a}{2}, \frac{b}{2}\right)$

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113. Find the equations of the circles drawn on the diagonals of the rectangle as its diameter whose sides are $x = 6,\ x = -3,\ y = 3\ and\ y = -1.$

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114. 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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115. Find the equation of the circle the end points of whose diameters are the centres of the circles $x^2 + y^2 + 16x - 14y = 1$ and $x^2 + y^2 - 4x + 10y = 2$

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116. 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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117. 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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118. 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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119. 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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120. 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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121. 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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122. $ABCD$ is a square in first quadrant whose side is a, taking AB and AD as axes, prove that the equation to the circle circumscribing the square is $x^2 + y^2 = a(x + y)$.

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

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

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

D. none of the above

Answer: $x^2 + y^2 = a(x + y)$

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123. The line $2x - y + 6 = 0$ meets the circle $x^2 + y^2 - 2y - 9 = 0$ at A and B. Find the equation of the circle on AB as diameter.

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124. Find the equation of the circle which circumscribes the triangle formed by the lines $x = 0,\ y = 0\ and\ lx + my = 1.$

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125. Write the length of the intercept made by the circle $x^2 + y^2 + 2x - 4y - 5 = 0$ on y-axis.

A. 6

B. $\sqrt{8}$

C. 9

D. $2\sqrt{14}$

Answer: $2\sqrt{14}$

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126. Write the coordinates of the centre of the circle passing through (0,0), (4,0) and (0,-6).

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127. Write the area of the circle passing through (-2, 6) and having its centre at (1,2).

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128. If the abscissa and ordinates of two points $PandQ$ are the roots of the equations $x^2 + 2ax - b^2 = 0$ and $x^2 + 2px - q^2 = 0$, respectively, then find the equation of the circle with PQ as diameter.

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129. Write the equation of the unit circle concentric with $x^2 + y^2 - 8x + 4y - 8 = 0.$

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130. 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.

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131. Write the equation of the circle passing through (3,4) and touching y-axis at the origin.

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132. If the line $y = mx$ does not intersect the circle $(x + 10)^2 + (y + 10)^2 = 180$ then write the set of values of taken by m.

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133. Write the coordinates of the center of the circle inscribed in the square formed by the lines $x = 2,\ x = 6,\ y = 5$ and $y = 9$.

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134. The equation $x^2 + y^2 + 2x - 4y + 5 = 0$ represents a. a point b. a pair of straight lines c. a circle of non zero radius d. none of these

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135. If the equation $(4a - 3)x^2 + ay^2 + 6x - 2y + 2 = 0$ represents a circle, then its centre is a. (3,-1) b. (3,1) c. (-3,1) d. none of these

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136. If the centroid of an equilateral triangle is (1,1) and its one vertex is (-1, 2), then the equation of its circumcircle is: is

$x^2 + y^2 - 2x - 2y - 3 = 0$ b. $x^2 + y^2 + 2x - 2y - 3 = 0$ c. $x^2 + y^2 + 2x + 2y - 3 = 0$ d. none of these

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137. The equation of the incircle formed by the coordinate axes and the line x^2+y^2-6x-6y+9=04(x^2+y^2-x-y)+1=04(x^2+y^2+x+y)+1=0`

None o these

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138. The equation of a circle with radius 5 and touching both the coordinate axes is y^2+-10 x+-10 y+5=0x^2+y^2+-10 x+-10 y=0 x^2+y^2+-10 x+-10 y+25=0x^2+y^2+-10 x+-10 y+51=0`

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139. The equation of the circle passing through the origin which cuts of intercept of length 6 and 8 from the axes is $x^2+y^2-12x-16y=0$ b. $x^2+y^2+12x+16y=0$ c. $x^2+y^2+6x+8y=0$ d. $x^2+y^2-6x-8y=0$

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140. The area of an equilateral triangle inscribed in the circle $x^2+y^2-6x-8y-25=0$ is $\frac{225(3)}{6}$ b. 25π c. $50\pi-100$ d. none of these

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141. If the circles y^2=a\ a n d\ x^2+y^2-6x-8y+9=0 $\rightarrow uchexternallythen$a=$a$. 1$b$. -1$c$. 21` d. 16

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142. If $(x, 3) and (3, 5)$ are the extremities of a diameter of a circle with centre at $(2, y)$ then the values of $x and y$ are a. (3,1) b. $x = 1, y = 4$ c. $x = 8, y = 2$ d. none of these

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143. Equation of the diameter of the circle $x^2 + y^2 - 2x + 4y = 0$ which passes through the origin is $x + 2y = 0$ b. $x - 2y = 0$ c. $2x + y = 0$ d. $2x - y = 0$

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144. Equation of the circle through origin which cuts intercepts of length $a and b$ on axes is ^2=a x+b y=0b. x^2+y^2-a x-b y=0c. x^2+y^2+b x+a y=0` d. none of these

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Others

1. The equation of the circle passing through the point (1,1) and having two diameters along the pair of lines $x^2 - y^2 - 2x + 4y - 3 = 0$ is $x^2 + y^2 - 2x - 4y + 4 = 0$ b. $x^2 + y^2 + 2x + 4y - 4 = 0$ c. $x^2 + y^2 - 2x + 4y + 4 = 0$ d. none of these

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

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

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

D. None of these

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

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