

# 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.

**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  $O(0,0), AandB_{\cdot}$ 

**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.



**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  $-1 \le t \le 1$ , 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  $\alpha$  varies, the locus of its centre is again a circle. Also, find its centre and radius.

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? .

**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.



14. If the point  $(\lambda, \lambda + 1)$  lies inside the region bounded by the curve  $x = \sqrt{25 - y^2}$  and y-axis , then  $\lambda$  belongs to the interval (a) (-1, 3) (b) (-4, 3) (c)  $(-\infty, -4) \cup (3, \infty)$  (d) none of these

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.



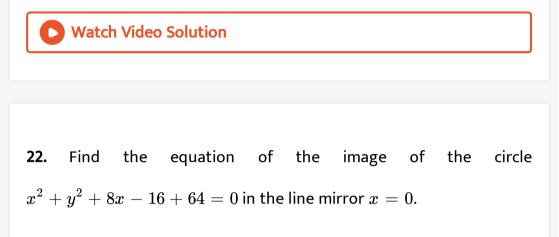
**18.** A circle of radius 2 lies in the first quadrant and touches both the axes. Find the equation of the circle with centre at (6, 5) and touching the above circle externally.

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

**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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**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.



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



**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

**26.** If the circle  $x^2 + y^2 + 2ax + 8y + 16 = 0$  touch  $x - a\xi s$ , then

the value of a is  $\pm 16$  (b)  $\pm 4$  (c)  $\pm 8$  (d)  $\pm 1$ 

27. If the abscissae and the ordinates of two point AandB be the roots of  $x^2 + 2ax - b^2a$  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 :



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  $\left(l^2+m^2
ight)^2=n^2$ .

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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.



**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.



**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

**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.

**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)  $\frac{1}{a} + \frac{1}{b} = \frac{2}{c}$ 

**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.



**42.** The number of integral values of  $\lambda$  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



**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.



**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.



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



**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)



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 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.

**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.

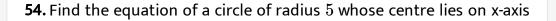
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**52.** Find the equation of a circle with origin as centre and which circumscribes and equilateral triangle whose median ids of length 3a.

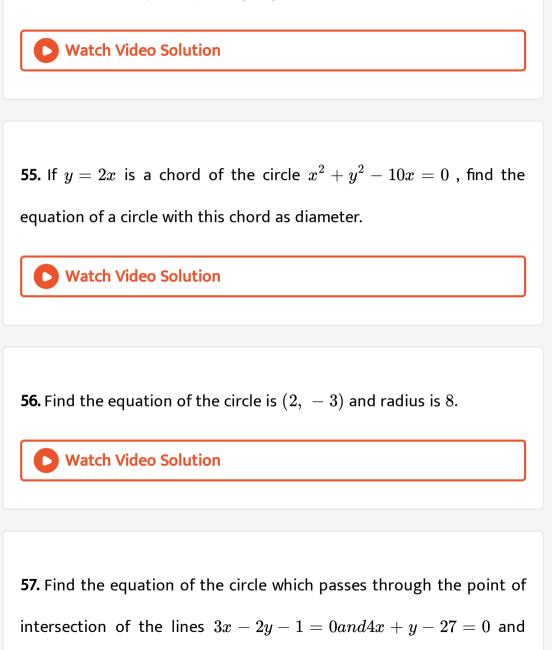


**53.** Find the equation of a circle whose diameters are 2x - 3y + 12andx + 4y - 5 = 0 and area is 154squareunits dot





and passes through the point (2,3).



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.

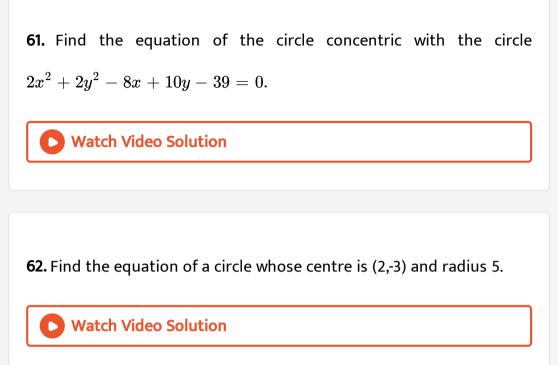
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59. Find the circle and radius of the circle given by the equation

$$2x^2 + 2y^2 + 3x + 4y + \frac{9}{8} = 0.$$

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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.



**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.



**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.

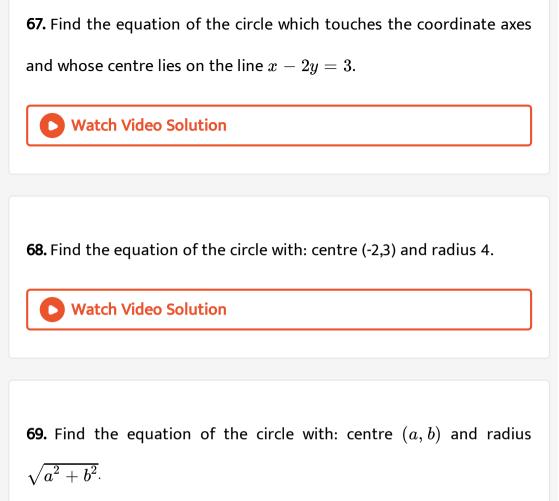
**65.** A circle of radius 6 units touches the coordinates axes in the first quadrant. Find the equation of its image in the line mirror y = 0.

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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  $(l + m)^2 (x^2 + y^2) + 2n(x + y)(l + m) + n^2 = 0$ .



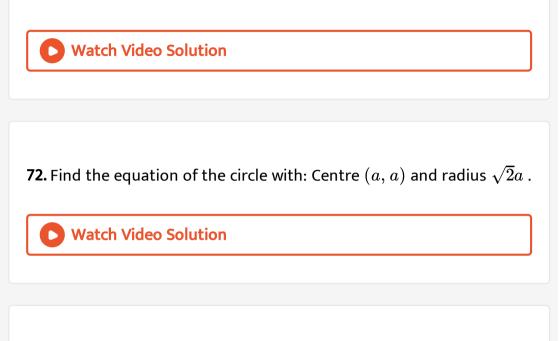


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**70.** Find the equation of the circle with: centre (0,-1) and radius 1.

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

radius a.



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

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and a second second

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

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).

**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.



**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.

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

**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.



**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.



**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  $49\pi$  square units, the equation of the circle is:



**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.

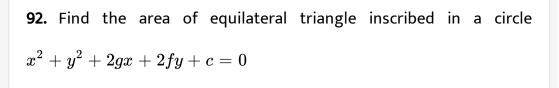
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**90.** One of the diameters of the circle circumscribing the rectangle ABCD is 4y = x + y. If A and B are the points (-3, 4) and (5, 4) respectively, find the area of the rectangle and equation of the circle.

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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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**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:  $2x^{2} + 2y^{2} - 3x + 5y = 7$ 

**95.** Find the coordinates of the centre and radius of each of the following circle:  $rac{1}{2} ig(x^2+y^2ig)+x\cos heta+y\sin heta-4=0$ 

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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)



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

A. 9

 $\mathsf{B.}\,5$ 

**C**. 1.5

 $\mathsf{D}.0$ 

Answer: 0

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

**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.

**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

**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.

**104.** Show that the points A(5,5), B(6,4 and D(7,1) all lies on the

circle. Find the centre, radius and equation of circle.

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

106. Find the equation of the circle which circumscribes the triangle

formedbytheline:2x + y - 3 = 0, x + y - 1 = 0 and 3x + 2y - 5 = 0Vatch Video Solution

**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.

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



**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 xaxis and y-axis respectively.



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

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

A. (b, a)

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

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

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.

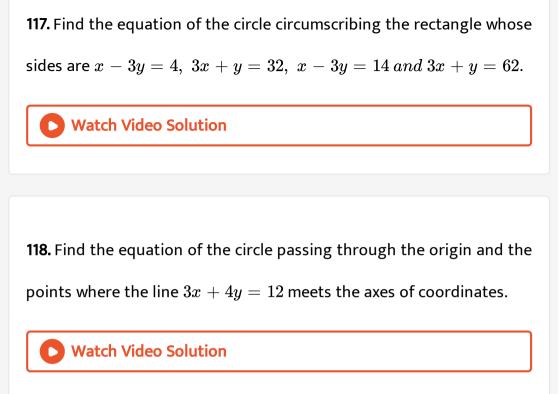
**114.** Find the equation of the circle the end point of whose diameter are (2,-3) and (2,4). Find its centre and radius.

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  $x^2+y^2-4x+10y=2$ 



**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.





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

 $\mathsf{B.}\, 2x + y^2 = 3xy$ 

$$\mathsf{C.}\,x^2+3y^2=xy^2$$

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.



124. Find the equation of the circle which circumscribes the triangle

formed by the lines x = 0, y = 0 and lx + my = 1.

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).

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

centre at (1,2).



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.



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

**130.** Find the number of integral values of  $\lambda$  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.



**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

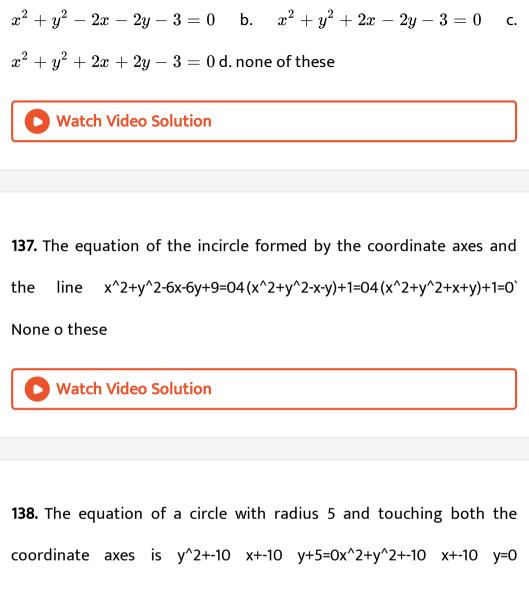
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**135.** If the equation  $(4a - 3)x^2 + ay^2 + 6x - 2y + 2 = 0$  represents

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<sup>2</sup>+y<sup>2</sup>+-10 x+-10 y+25=0x<sup>2</sup>+y<sup>2</sup>+-10 x+-10 y+51=0`

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.  $25\pi$  c.  $50\pi-100$  d. none of these

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**141.** If the circles y<sup>2</sup>=a\ a n d\ x<sup>2</sup>+y<sup>2</sup>-6x-8y+9=0

ightarrow uchexternallythena=a.~1b.~-1c.~21`d. 16

**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

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

View Text Solution