EQUATION OF A CIRCLE – PRACTICE QUESTIONS

1.
A circle has equation $x^2 + y^2 = 25$.

(a) Write down the co-ordinates of the centre of the circle.

(0,0)

(b) Write down the radius of the circle.

5

2.
A circle has equation $x^2 + y^2 = 100$.

(a) Write down the co-ordinates of the centre of the circle.

(0,0)

(b) Write down the radius of the circle.

10

3.
A circle has equation $x^2 + y^2 = 49$.

(a) Write down the co-ordinates of the centre of the circle.

(0,0)

(b) Write down the diameter of the circle.

14

4.
A circle has centre (0, 0) and radius 6.

Write down the equation of the circle.

$x^2 + y^2 = 36$

5.
A circle has centre (0, 0) and radius 11.

Write down the equation of the circle.

$x^2 + y^2 = 121$

6.
A circle has centre (0, 0) and diameter 16.

Write down the equation of the circle.

$x^2 + y^2 = 64$

7.
A circle has equation $x^2 + y^2 = 100$.

Does the point (8, -6) lie on the circumference of the circle?

$8^2 + (-6)^2 = 64 + 36 = 100$

Yes

8.
A circle has equation $x^2 + y^2 = 25$.

Does the point (-3, -4) lie on the circumference of the circle?

$(-3)^2 + (-4)^2 = 9 + 16 = 25$

Yes

9.
A circle has equation $x^2 + y^2 = 144$.

Does the point (9, 7) lie on the circumference of the circle?

$9^2 + 7^2 = 81 + 49 = 130$

No

10.
A circle has centre (0, 0) and radius 13.

Does the point (12, 5) lie on the circumference of the circle?

$13^2 = 169$

$12^2 + 5^2 = 144 + 25 = 169$

Yes

11.
A circle has centre (0, 0) and diameter 30.

Does the point (-9, 13) lie on the circumference of the circle?

$15^2 = 225$

$(-9)^2 + 13^2 = 81 + 169 = 250$

No

12.
A circle has centre (0, 0).
The point (7, 2) lies on the circumference of the circle.

Write down the equation of the circle.

$7^2 + 2^2 = 49 + 4 = 53$

$x^2 + y^2 = 53$

13.
A circle has centre (0, 0).
The point (-4, 6) lies on the circumference of the circle.

Write down the equation of the circle.

$(-4)^2 + 6^2 = 16 + 36 = 52$

$x^2 + y^2 = 52$

14.
A circle has centre (0, 0).
The point (-5, -5) lies on the circumference of the circle.

Write down the radius of the circle.

$(-5)^2 + (-5)^2 = 25 + 25 = 50$

$x^2 + y^2 = 50$

radius $= \sqrt{50}$

15.
A circle has centre (0, 0).
The point (16, -12) lies on the circumference of the circle.

Write down the diameter of the circle.

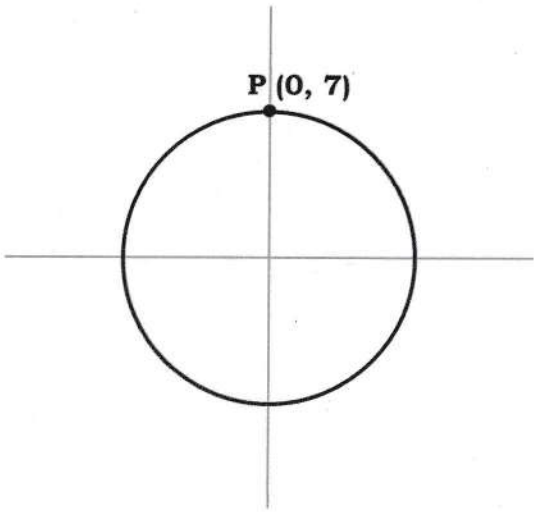
$(16)^2 + (-12)^2 = 256 + 144$

$= 400$

radius $= 20$

diameter $= 40$

16.
Pictured to the right is a circle with centre (0, 0).
The circle passes through the point P.

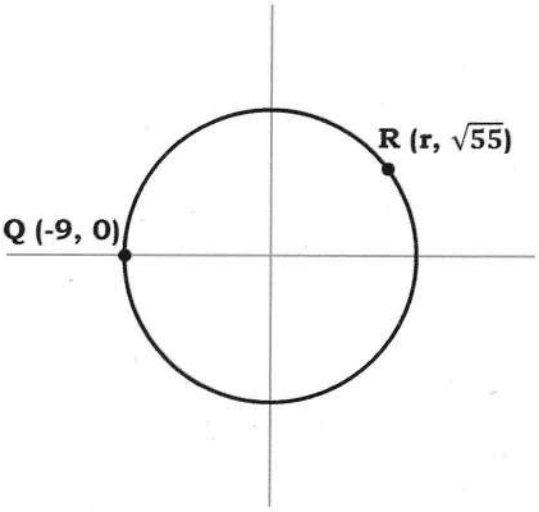


Find the equation of the circle.

radius = 7

$x^2 + y^2 = 49$

17.
Pictured to the right is a circle with centre (0, 0).
The circle passes through the points Q and R.



(a) Find the equation of the circle.

$x^2 + y^2 = 81$

(b) Find r.

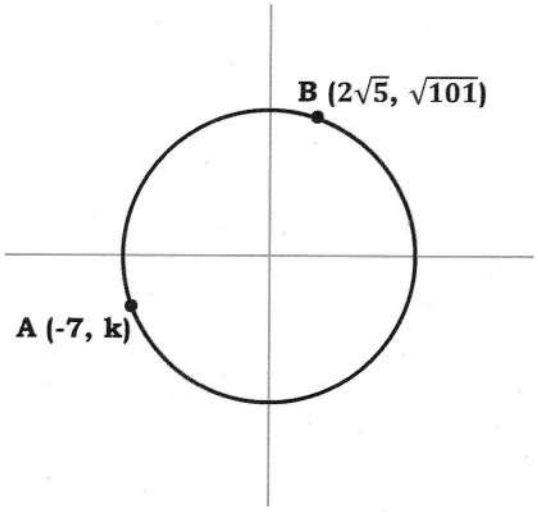
$r^2 + (\sqrt{55})^2 = 81$

$r^2 + 55 = 81$

$r^2 = 26$

$r = \sqrt{26}$

18.
Pictured to the right is a circle with centre (0, 0).
The circle passes through the points A and B.



(a) Find the area of the circle, in terms of π.

$(2\sqrt{5})^2 + (\sqrt{101})^2 = 20 + 101$

$= 121$

area $= 121\pi$

(b) Find k. Give your answer in the form $a\sqrt{2}$ where a is an integer.

$x^2 + y^2 = 121$

$(-7)^2 + y^2 = 121$

$49 + y^2 = 121$

$y^2 = 72$

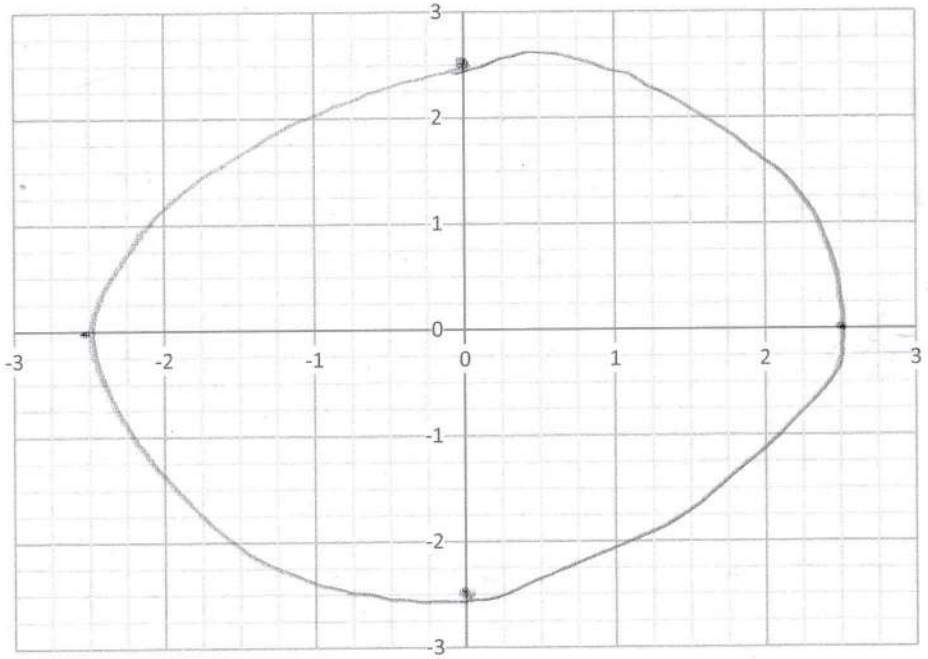
$y = -\sqrt{72}$

$-\sqrt{72} = -\sqrt{36} \times \sqrt{2}$

$= -6\sqrt{2}$

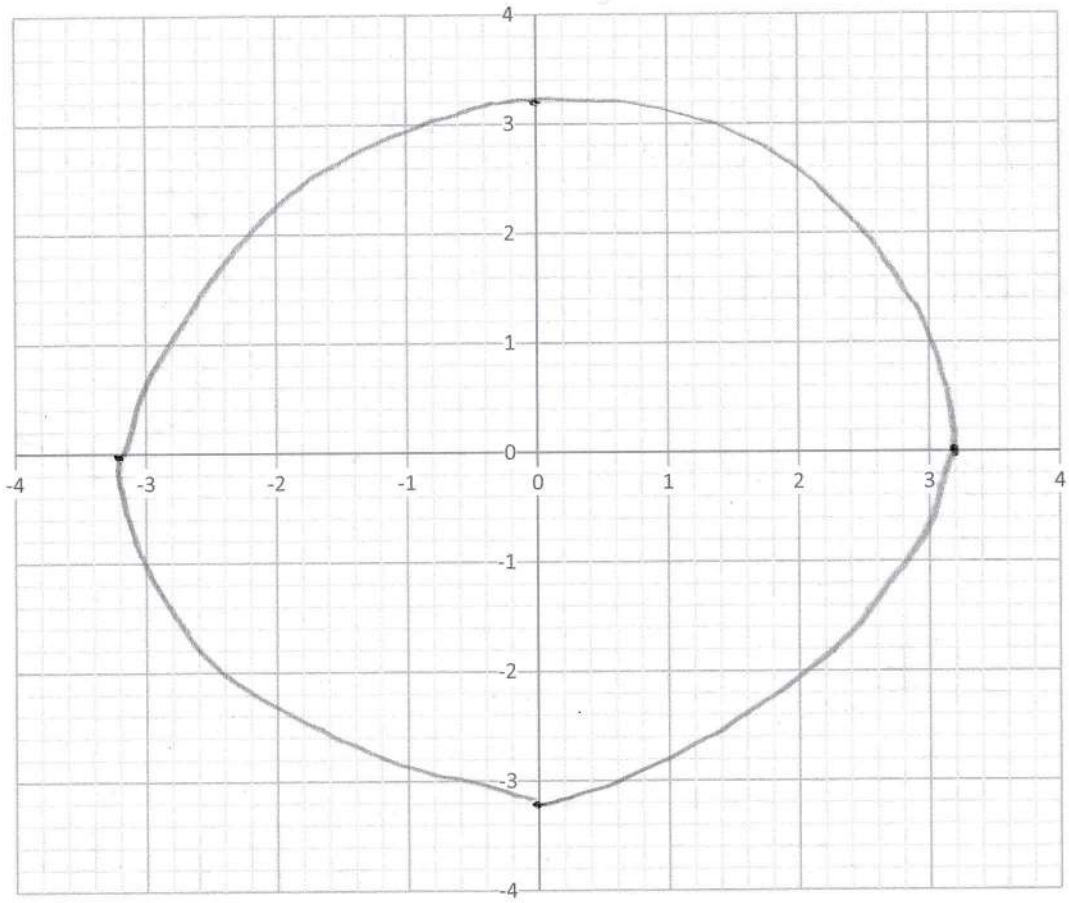
19.
On the axis below, plot the circle with equation $x^2 + y^2 = 6.25$.

radius = $\sqrt{6.25}$
= 2.5



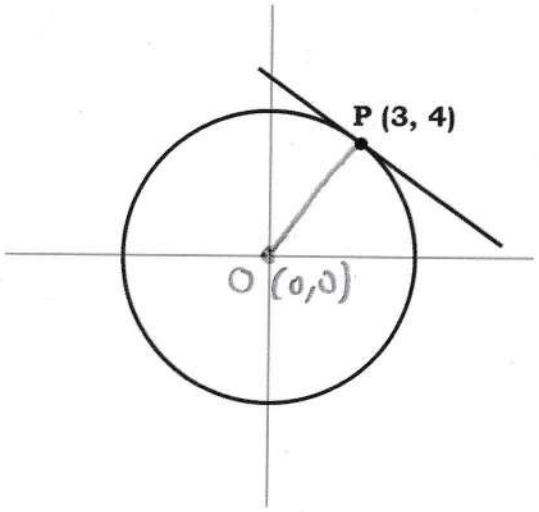
20.
On the axis below, plot the graph $x^2 + y^2 = 10.24$.

$\sqrt{10.24}$
= 3.2



21.
Pictured is a circle with centre (0, 0) and a tangent to the circle at the point P.

Find the equation of the tangent at P.



gradient of OP $= \frac{4}{3}$

gradient of tangent $= \frac{-3}{4}$

$y = \frac{-3}{4}x + c$

(3,4): $4 = -\frac{3}{4} \times 3 + c$

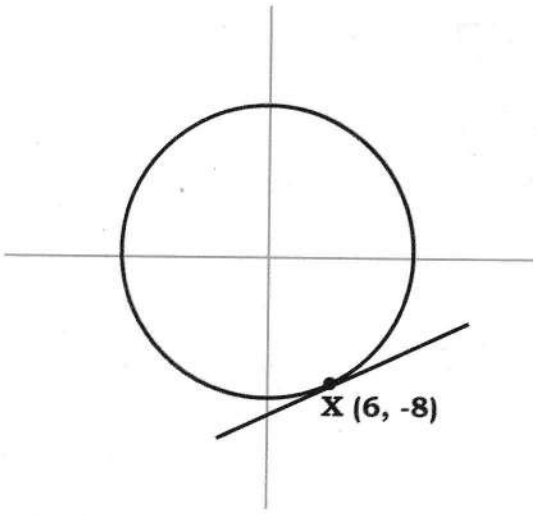
$4 = -\frac{9}{4} + c$

$\frac{16}{4} + \frac{9}{4} = \frac{25}{4} = c$

$y = \frac{-3}{4}x + \frac{25}{4}$

22.
Pictured is a circle with centre (0, 0) and a tangent to the circle at the point X.

Find the equation of the tangent at X.



gradient of OX $= \frac{-8}{6} = \frac{-4}{3}$

gradient of tangent $= \frac{3}{4}$

$y = \frac{3}{4}x + c$

(6,-8): $-8 = \frac{3}{4} \times 6 + c$

$-8 = \frac{18}{4} + c$

$-8 = \frac{9}{2} + c$

$-\frac{16}{2} - \frac{9}{2} = -\frac{25}{2}$

$y = \frac{3}{4}x - \frac{25}{2}$

23.
A circle has equation $x^2 + y^2 = 169$.

Find the equation of the tangent to the circle at (-5, 12).

gradient $= \frac{12}{-5}$

gradient of tangent $= \frac{5}{12}$

$y = \frac{5}{12}x + c$

(-5, 12): $12 = \frac{-25}{12} + c$

$\frac{144}{12} + \frac{25}{12} = \frac{169}{12} = c$

$y = \frac{5}{12}x + \frac{169}{12}$

24.
A circle has equation $x^2 + y^2 = 4$.

Y is a point on the circle with co-ordinates $\left(\frac{\sqrt{7}}{2}, \frac{3}{2}\right)$.

Find the equation of the tangent to the circle at Y.

gradient $= \frac{3}{2} \div \frac{\sqrt{7}}{2} = \frac{3}{2} \times \frac{2}{\sqrt{7}} = \frac{3}{\sqrt{7}}$

gradient of tangent $= \frac{-\sqrt{7}}{3}$

$y = \frac{-\sqrt{7}}{3}x + c$

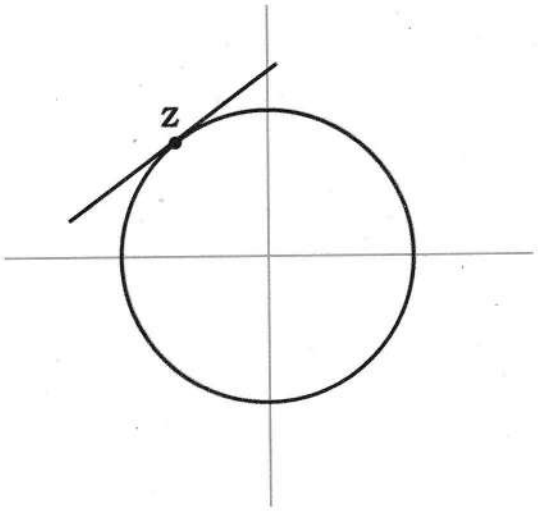
$\left(\frac{\sqrt{7}}{2}, \frac{3}{2}\right)$: $\frac{3}{2} = -\frac{\sqrt{7}}{3} \times \frac{\sqrt{7}}{2} + c$

$\frac{3}{2} = \frac{-7}{6} + c$

$\frac{9}{6} + \frac{7}{6} = \frac{16}{6} = \frac{8}{3} = c$

$y = -\frac{\sqrt{7}}{3}x + \frac{8}{3}$

25.
Pictured is a circle with equation $x^2 + y^2 = 58$ and a tangent to the circle at the point Z.
Z has x co-ordinate -7.



Find the equation of the tangent to the circle at Z.

$Z(-7, y)$ $(-7)^2 + y^2 = 58$

$49 + y^2 = 58$

$y^2 = 9$

$y = \pm 3$

gradient of OZ $= \frac{3}{-7}$

gradient of tangent $= \frac{7}{3}$

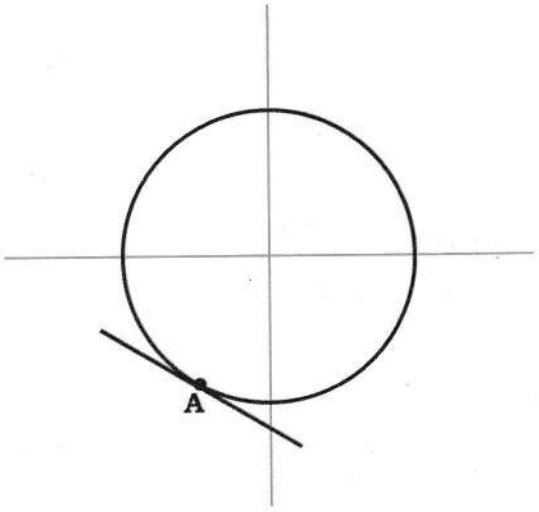
$(-7, 3)$: $y = \frac{7}{3}x + c$

$3 = \frac{7}{3} \times -7 + c$

$\frac{9}{3} = -\frac{49}{3} + c$ $\frac{9}{3} + \frac{49}{3} = \frac{58}{3} = c$

$y = \frac{7}{3}x + \frac{58}{3}$

26.
Pictured is a circle with equation $x^2 + y^2 = 89$ and a tangent to the circle at the point A.
A has y co-ordinate -8.



Find the equation of the tangent to the circle at A.

$A(x, -8)$ $x^2 + (-8)^2 = 89$

$x^2 = 25$

$x = -5$

gradient of OA $= \frac{-8}{-5} = \frac{8}{5}$

gradient of tangent $= -\frac{5}{8}$

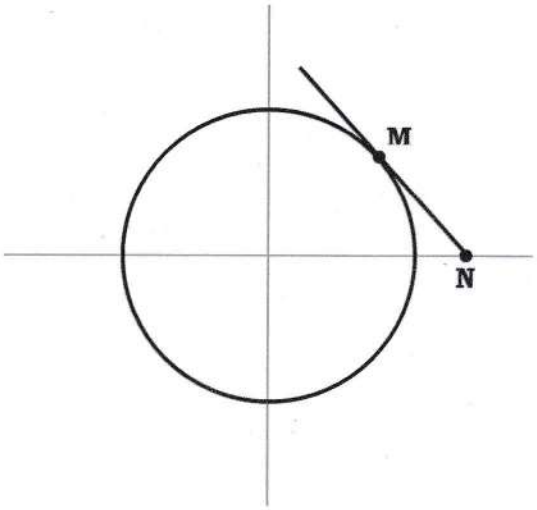
$(-5, -8)$: $y = -\frac{5}{8}x + c$

$-8 = \frac{25}{8} + c$

$-\frac{64}{8} - \frac{25}{8} = -\frac{89}{8} = c$

$y = -\frac{5}{8}x - \frac{89}{8}$

27.
Pictured is a circle with equation $x^2 + y^2 = 13$ and a tangent to the circle at the point M.
M has y co-ordinate 3.
The tangent at M intersects the x-axis at N.



Find the co-ordinates of N.

M $(x, 3)$ $\quad x^2 + 3^2 = 13$

$x^2 = 4$

$x = 2$

gradient of OM $= \frac{2}{3}$

gradient of tangent $= -\frac{3}{2}$

$(2,3)$: $\quad y = -\frac{3}{2}x + c$

$3 = -3 + c$

$c = 6$

$y = -\frac{3}{2}x + 6$

$y = 0$, $\quad 0 = -\frac{3}{2}x + 6$

$\frac{3}{2}x = 6$

$x = \frac{6 \times 2}{3} = 4$

$N = (4, 0)$

28.
The circle C has equation $x^2 + y^2 = 5$.
The line L has equation $y = 2x - 5$.

Prove algebraically that L is a tangent to C.

$x^2 + (2x - 5)^2 = 5$

$x^2 + 4x^2 + 10x - 10x + 25 = 5$

$5x^2 - 20x + 25 = 5$

$5x^2 - 20x + 20 = 0$

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

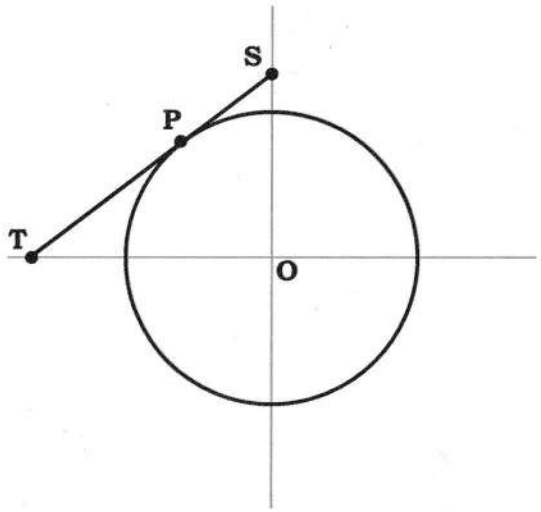
$(x - 2)(x - 2) = 0$

$x = 2$

Because there is only one value of x, L only touches C once. Therefore L is a tangent to C.

29.

Pictured is a circle with centre O and equation $x^2 + y^2 = 26$.
The line L is a tangent to the circle at point P with co-ordinates (-1, 5).
L passes the y-axis at point S and the x-axis at point T.



Show that the area of the triangle TSO is 67.6

gradient of PO $= \frac{-5}{1} = -5$

gradient of TPS $= \frac{1}{5}$

$y = \frac{1}{5}x + c$

(-1,5): $5 = \frac{1}{5} \times -1 + c$

$5 = -\frac{1}{5} + c$

$\frac{25}{5} + \frac{1}{5} = \frac{26}{5} = c$

$y = \frac{1}{5}x + \frac{26}{5}$

Find co-ordinates of T:

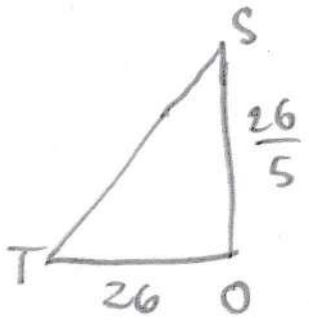
y=0, $0 = \frac{1}{5}x + \frac{26}{5}$

$-\frac{26}{5} = \frac{1}{5}x$

$-26 = x$

(-26, 0)

co-ordinates of S $= (0, \frac{26}{5})$



area of TSO $= 26 \times \frac{26}{5} \times \frac{1}{2}$

$= \frac{26 \times 26}{10}$

$= \frac{676}{10}$

$= 67.6$