

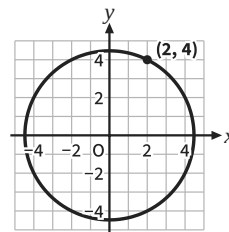
1 Equation of a circle

- a) A circle with centre $(0, 0)$ passes through $(2\sqrt{3}, -\sqrt{6})$. Find its equation.
- b) Find the exact circumference of the circle. Give your answer in terms of π .

$$\begin{aligned} \text{a) } 12 + 6 &= 18: x^2 + y^2 = 18 \\ \text{b) radius } \sqrt{18} &= 3\sqrt{2} \\ 2\pi \times 3\sqrt{2} &= 6\pi\sqrt{2} \end{aligned}$$

2 Equation of a circle

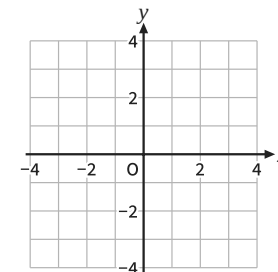
- The circle has centre $(0, 0)$.
- a) Write down the equation of the circle.
- b) The point $(k, k+2)$ is inside the circle. Find the range of values of k .



$$\begin{aligned} \text{a) } x^2 + y^2 &= 20 \\ \text{b) } k^2 + (k+2)^2 &< 20, (k+4)(k-2) < 0 \\ -4 &< k < 2 \end{aligned}$$

3 Equation of a circle

- a) On the grid, draw $x^2 + y^2 = 9$ and $y = 2x + 1$.
- b) Find the exact x coordinates of the points where they meet.



$$\text{b) } 5x^2 + 4x - 8 = 0, x = \frac{-2 \pm 2\sqrt{11}}{5}$$

4 Equation of a circle

Shapes with sides parallel to the axes have their four corners on the circle $x^2 + y^2 = 50$.

- a) Find the area of the square.
- b) A rectangle is twice as long as it is wide. Find its exact length and width.

$$\begin{aligned} \text{a) corners } (\pm 5, \pm 5): 10 \times 10 &= 100 \\ \text{b) corner } (2w, w): 5w^2 = 50, w &= \sqrt{10} \\ \text{length } 4\sqrt{10}, \text{ width } 2\sqrt{10} \end{aligned}$$

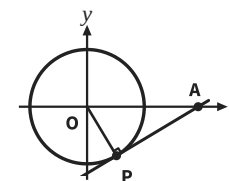
Equations of circles

revision mat answers

5 Equation of a tangent

$P(3, -5)$ is on the circle $x^2 + y^2 = 34$.

- a) Find the equation of the tangent at P , in the form $ax + by = c$.
- b) The tangent meets the x axis at A . Find the exact length PA .



$$\begin{aligned} \text{a) gradient } \frac{3}{5}: 3x - 5y &= 34 \\ \text{b) } A(\frac{34}{3}, 0), PA &= \frac{5\sqrt{34}}{3} \end{aligned}$$

6 Equation of a tangent

- a) Show that the line $y = 2x - 5$ meets the circle $x^2 + y^2 = 5$ at only one point.
- b) Find the coordinates of that point.

$$\begin{aligned} \text{a) } x^2 + (2x - 5)^2 &= 5, 5x^2 - 20x + 20 = 0 \\ x^2 - 4x + 4 &= 0, (x - 2)^2 = 0: \text{one root} \\ \text{b) } (2, -1) \end{aligned}$$

7 Equation of a tangent

The line $4x + 3y = 50$ is a tangent to a circle with centre $O(0, 0)$ at the point P .

- a) Find the coordinates of P .
- b) Find the equation of the circle.

$$\begin{aligned} \text{a) } OP \text{ is perpendicular: gradient } \frac{3}{4}, \text{ so } P \text{ is } (4t, 3t) \\ 16t + 9t &= 50, t = 2: P(8, 6) \\ \text{b) } 64 + 36: x^2 + y^2 &= 100 \end{aligned}$$

8 Equation of a tangent

The line $y = x + k$ is a tangent to the circle $x^2 + y^2 = 18$.

- a) Find the two possible values of k .
- b) Find the point of contact for each.

$$\begin{aligned} \text{a) } 2x^2 + 2kx + k^2 - 18 &= 0, \text{ one root:} \\ 4k^2 - 8(k^2 - 18) &= 0, k = \pm 6 \\ \text{b) } k = 6: (-3, 3), k = -6: (3, -3) \end{aligned}$$