

# Chapter 6 – Circles

## ? Example 1 – Finding the centre of a circle

The line segment  $AB$  is a diameter of a circle, where  $A$  and  $B$  are  $(-3, 8)$  and  $(5, 4)$  respectively.

Find the coordinates of the centre of the circle.

## ? Example 2 – Problem solving with midpoints

The line segment  $PQ$  is a diameter of the circle centre  $(2, -2)$ . Given that  $P$  is  $(8, -5)$ , find the coordinates of  $Q$ .

## ? Example 3 – Problem solving with lines and circles

The line segment  $AB$  is a diameter of the circle centre  $C$ , where  $A$  and  $B$  are  $(-1, 4)$  and  $(5, 2)$  respectively. The line  $l$  passes through  $C$  and is perpendicular to  $AB$ . Find the equation of  $l$ .

## ? Example 4 – Finding the equation of a circle

Write down the equation of the circle with centre  $(5, 7)$  and radius 4.

## ? Example 5 – The equation of a circle

A circle has equation  $(x - 3)^2 + (y + 4)^2 = 20$ .

- Write down the centre and radius of the circle.
- Show that the circle passes through  $(5, -8)$ .

## ? Example 6 – Finding the equation of a circle

The line segment  $AB$  is a diameter of a circle, where  $A$  and  $B$  are  $(4, 7)$  and  $(-8, 3)$  respectively. Find the equation of the circle.

## ? Example 7 – Finding the equation of a circle

Find the centre and the radius of the circle with the equation  $x^2 + y^2 - 14x + 16y - 12 = 0$ .

## ? Example 8 – Intersection of linear graphs and circles

Find the coordinates of the points where the line  $y = x + 5$  meets the circle  $x^2 + (y - 2)^2 = 29$ .

## ? Example 9 – Problem solving with lines and circles

Show that the line  $y = x - 7$  does not meet the circle  $(x + 2)^2 + y^2 = 33$ .

## ? Example 10 – Finding the equation of a tangent to a circle

The circle  $C$  has equation  $(x - 2)^2 + (y - 6)^2 = 100$ .

- Verify that the point  $P(10, 0)$  lies on  $C$ .
- Find an equation of the tangent to  $C$  at the point  $(10, 0)$ , giving your answer in the form  $ax + by + c = 0$ .

## ? Example 11 – Problem solving using tangents and circles

A circle  $C$  has equation  $(x - 5)^2 + (y + 3)^2 = 10$ .

The line  $l$  is a tangent to the circle and has gradient  $-3$ .

Find two possible equations for  $l$ , giving your answers in the form  $y = mx + c$ .

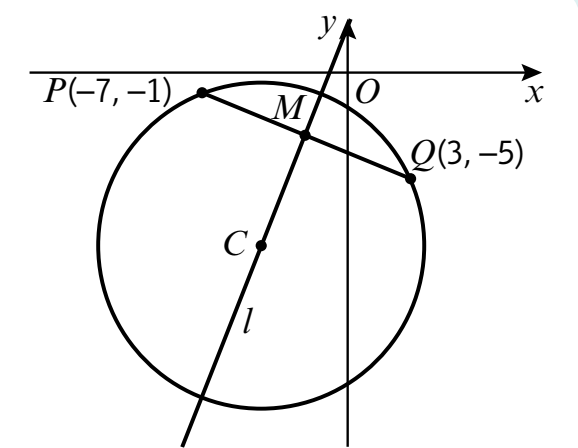
## ? Example 12 – Problem solving using chords and circles

The points  $P$  and  $Q$  lie on a circle with centre  $C$ , as shown in the diagram. The point  $P$  has coordinates  $(-7, -1)$  and the point  $Q$  has coordinates  $(3, -5)$ .

$M$  is the midpoint of the line segment  $PQ$ .

The line  $l$  passes through the points  $M$  and  $C$ .

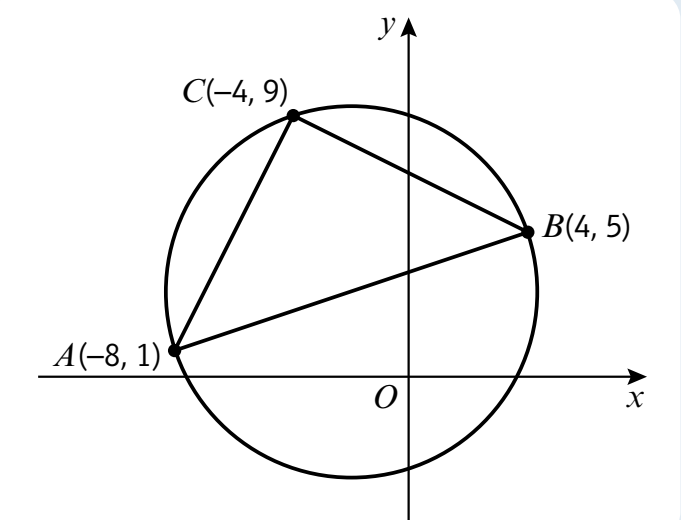
- Find an equation for  $l$ .
- show that the  $x$ -coordinate of  $C$  is  $-4$
- find an equation of the circle.



## ? Example 13 – Problem solving using circle theorems

The points  $A(-8, 1)$ ,  $B(4, 5)$  and  $C(-4, 9)$  lie on the circle, as shown in the diagram.

- Show that  $AB$  is a diameter of the circle.
- Find an equation of the circle.



## ? Example 14 – Finding the equation of a circle using chords

The points  $P(3, 16)$ ,  $Q(11, 12)$  and  $R(-7, 6)$  lie on the circumference of a circle. The equation of the perpendicular bisector of  $PQ$  is  $y = 2x$ .

- Find the equation of the perpendicular bisector of  $PR$ .
- Find the centre of the circle.
- Work out the equation of the circle.