lesson link: parkermaths.com/y1circles

### Objective

- Understand and use the equation of a circle.
- Find the equation of a circle given two points that form a diameter.
- To sketch a circle given the equation of the circle.
- To determine the location of a point relative to a circle (inside, on or outside).



The circle with centre (a, b) and radius r has equation  $(x-a)^2 + (y-b)^2 = r^2$ 

# **Examples**

- 2.2e. Write down the equation of a circle with
- (a) centre (2,5), radius 8,
- (b) centre (-3,1), radius 5.

(a) 
$$(x-2)^2 + (y-5)^2 = 64$$

(b) 
$$(x+3)^2 + (y-1)^2 = 25$$

2.3e. Find the centre and radius of the circle with equation

$$x^2 + y^2 - 12x + 6y - 4 = 0.$$

$$x^{2} - 12x + y^{2} + 6y - 4 = 0$$

$$(x - 6)^{2} - 36 + (y + 3)^{2} - 9 - 4 = 0$$

$$(x - 6)^{2} + (y + 3)^{2} = 49$$

Complete the square for x and y separately.

Centre 
$$(6,-3)$$

Radius = 7

2.4e. Verify that the point (3,8) does not lie on the circle with equation

$$x^2 + y^2 - 4x + 6y - 20 = 0.$$

When 
$$x = 3$$
 and  $y = 8$ ,

LHS = 
$$3^2 + 8^2 - 4(3) + 6(8) - 20$$
  
=  $9 + 64 - 12 + 48 - 20$   
=  $89$ 

- :. LHS ≠ RHS
- :. The point does not lie on the circle.

- 2.2p. Write down the equation of a circle with
- centre (4,-5), radius 3, (a)
- (b) centre (0,8), radius 7.

equation

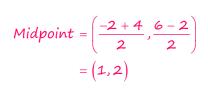
2.3p. Find the centre and radius of the circle with equation

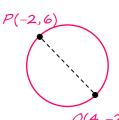
$$x^2 + y^2 + 10x + 4y - 71 = 0$$

**2.4p.** Verify that the point (-1, -5) lies on the circle with

$$x^2 + y^2 + 8x + 2y - 8 = 0.$$

**2.5e.** The line PQ forms the diameter of a circle where P(-2,6) and Q(4,-2). Find an equation of the circle.





:. Center at (1,2)

Diameter = 
$$\sqrt{(-2-4)^2 + (6+2)^2}$$
  
= 10

 $\therefore$  radius = 5

## Equation of circle:

$$(x-1)^2 + (y-2)^2 = 25$$

2.6e. Sketch the circle with equation

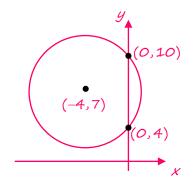
$$x^2 + y^2 + 8x - 14y + 40 = 0$$

showing any intercepts with the coordinate axes.

$$(x + 4)^2 - 16 + (y - 7)^2 - 49 = 40$$
  
 $(x + 4)^2 + (y - 7)^2 = 25$   
Centre (-4,7)  
Radius = 5

When x = 0,

$$4^{2} + (y - 7)^{2} = 25$$
$$(y - 7)^{2} = 9$$
$$y - 7 = \pm 3$$
$$y = 4 \text{ or } y = 10$$



E(-4, 18) and F(12,6).
Find an equation of the circle.

**2.5p.** The line *EF* forms the diameter of a circle where

**2.6p.** Sketch the circle with equation

$$x^2 + y^2 - 20x - 12y + 55 = 0$$

showing any intercepts with the coordinate axes.