**I will be able to develop and use an equation for a circle.**

**Minds on**

What do we know about a circle?

How can we connect this to what we know already?

**Action!**

2.3 Equation of a circle

**Consolidation**

FORMATIVE quiz

# The Assignment

I'm going to make the assignment optional.

If you want to complete it and hand it in, be sure to hand it in by Monday at the latest.

## Minds on

What do you already know?

- round
- 360°
- no corners/vertices

Circles

diameter = 2 × radius

$A = \pi r^2$

$C = \pi d$

or

$C = 2\pi r$

## Minds on

# 2.3 – Equation of a Circle

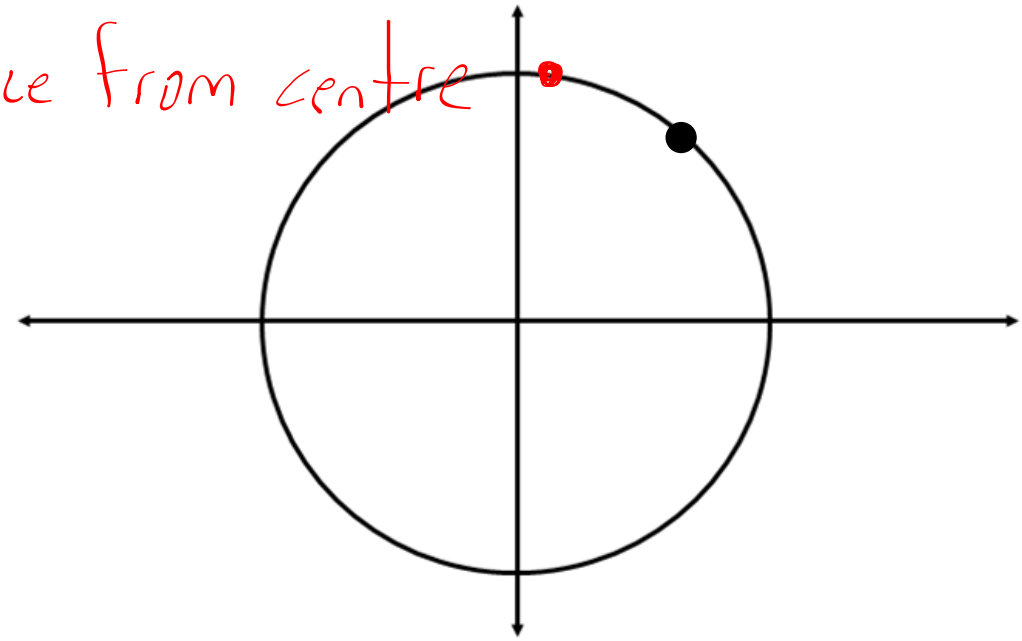
Consider a point, P, along the circumference of a circle. As this point moves around the circumference,

- What changes?

x and y coordinates

- What stays the same?

distance from centre



## Minds on

The Equation of a Circle with Centre (0, 0) is:

$$x^2 + y^2 = r^2$$

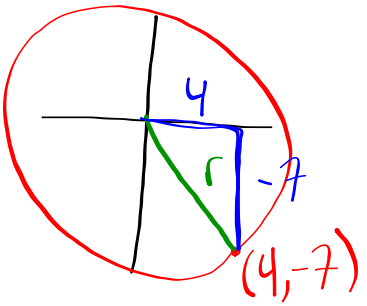
radius

## Action!

**Example 1)** Determine the equation of the circle with a radius of 10, centred at the origin.

$$x^2 + y^2 = 100$$

**Example 2)** Determine the equation of the circle centred at (0, 0) that goes through point (4, -7).




$$r^2 = 4^2 + (-7)^2$$
$$r^2 = 16 + 49$$
$$r^2 = 65$$

$$r = \sqrt{4^2 + (-7)^2}$$
$$r = \sqrt{65}$$

$$\boxed{x^2 + y^2 = 65}$$

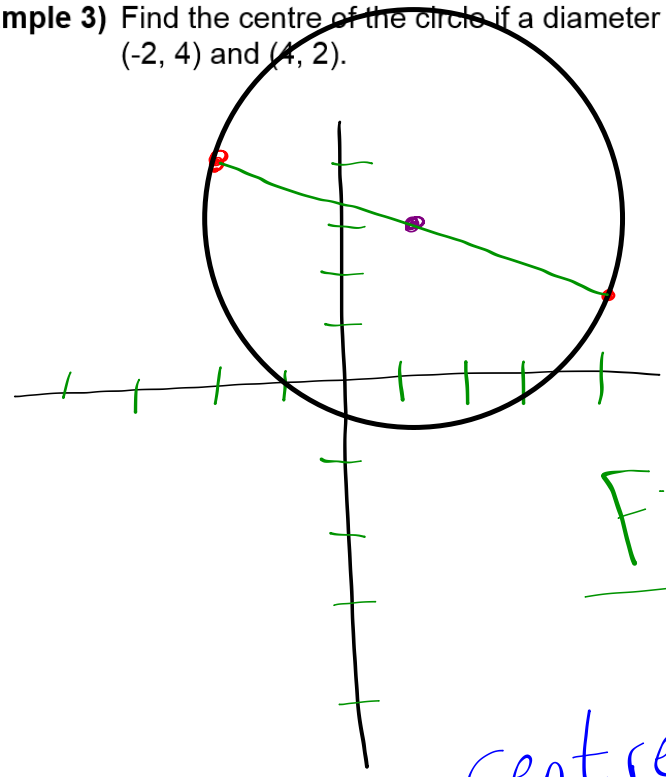
Determine the equation of the circle centered at (0, 0) through the point (-4, 10).

$r^2 = (-4)^2 + (10)^2$

$r^2 = 16 + 100$

$r^2 = 116 \quad \therefore x^2 + y^2 = 116$

**Example 3)** Find the centre of the circle if a diameter of the circle passes through the points (-2, 4) and (4, 2).



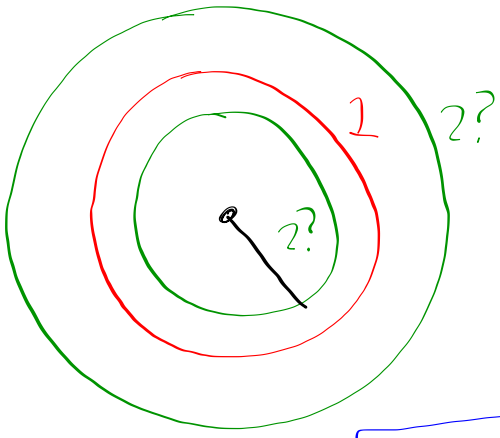
Find midpoint

$$\text{centre} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$= \left(\frac{-2+4}{2}, \frac{4+2}{2}\right)$$

$$= (1, 3)$$

**Example 4)** A satellite orbits Earth on a path with $x^2 + y^2 = \overset{r^2}{45\,000\,000}$. Another satellite, in the same plane, is currently located at $(12\,504, 16\,050)$. Determine whether the second satellite is inside or outside the orbit of the first satellite.




Radius satellite 1 = $\sqrt{45\,000\,000} \doteq 6706.2$

Radius satellite 2: Plug points into $x^2+y^2=r^2$

$(12504)^2+(16050)^2=r^2$

$156{,}350{,}016+257{,}602{,}500=r^2$

$\sqrt{413{,}952{,}516}=\sqrt{r^2}$

$r=20{,}345.6$

r is larger, ∴ outside

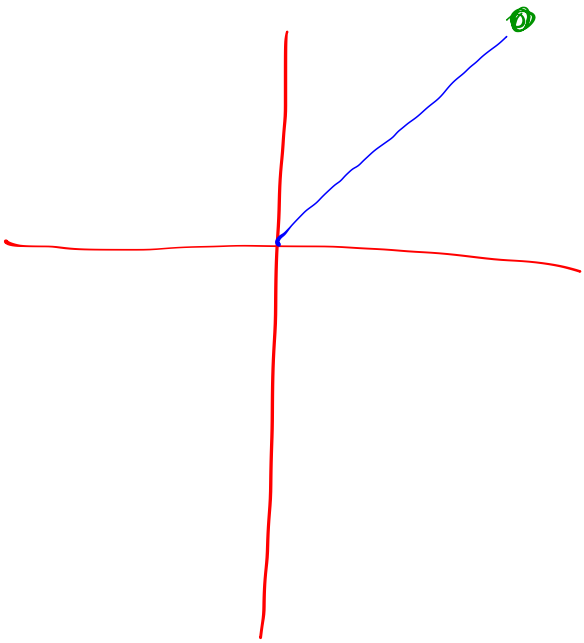
OR

Find r

$$r^2 = 12504^2 + 16050^2$$

$$r^2 = 413952516$$

$$r = 20,345.6$$



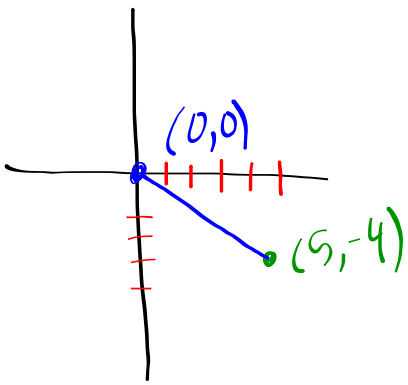
## Consolidation

Exit Question

Provide an ALGEBRAIC solution

A circle is centred at the origin and has a radius of 7. Does the point (5, -4) lay on the circle? If not is it inside or outside the circle?

Find distance from (0,0) to (5,-4)




$$d = \sqrt{(5-0)^2 + (-4-0)^2}$$

$$d = \sqrt{(5)^2 + (-4)^2}$$

$$d = \sqrt{25+16}$$

$$d = \sqrt{41}$$

$$d \doteq 6.4$$

less than 7, so the point is inside the circle.

## Consolidation

**PRACTICE**: Page 91 # 1, 4, 6, 7abc, 10, 14, 16, 18