Y12 Pure Chapter 6—Circles

What do I need to be able to do?

By the end of this chapter you should be able to:

- Find the midpoint of a line segment
- Find the equation of the perpendicular bisector to a line segment
- Know how to find the equation of a circle
- Solve geometric problems involving straight lines and circles
- Use circle properties to solve problems
- Solve problems involving circles and triangles

Y12 – Chapter 6 Circles

Key words:

- Line segment – a finite part of a straight line with two distinct end points
- Perpendicular bisector– A line which cuts a line segment into two equal parts at 90°
- Tangent – A line that just touches a curve at a point, matching the curve's slope there
- Chord –A line segment connecting two points on a curve
- Circumcircle – a circle touching all the vertices of a triangle or polygon
- Circumcentre – The center of a triangle's circumcircle

Finding midpoint of a line segment

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

Equation of a circle

The equation of a circle with centre (a, b) and radius r is:

$$(x-a)^2+(y-b)^2=r^2$$

You may be given the equation of a circle in the form :

$$x^2+y^2-2ax-2by+a^2+b^2-r^2=0$$

In this case you need to complete the square for the x and y terms to find the radius and centre of the circle

Eg

$$x^2+y^2-14x+16y-12=0$$
$$x^2-14x+y^2+16y-12=0$$

Half the coefficient of x

Half the coefficient of y

$$(x-7)^2-7^2+(y+8)^2-8^2-12=0$$

Subtract back off

Subtract back off

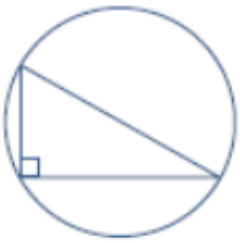
$$(x-7)^2+(y+8)^2=7^2+8^2+12$$

$$(x-7)^2+(y+8)^2=125$$

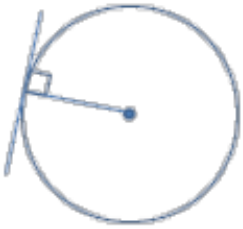
Centre (7, -8), radius $\sqrt{125}=5\sqrt{5}$

Circle properties

The angle in a semi circle is always a right angle



A tangent to a circle is perpendicular to the radius at the point of intersection



The perpendicular bisector of a chord will go through the centre of the circle