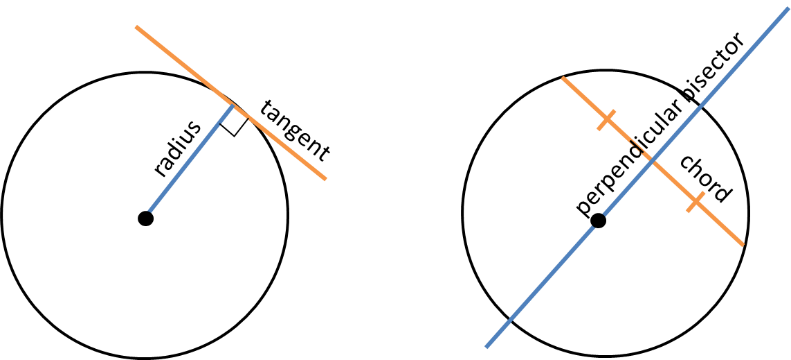
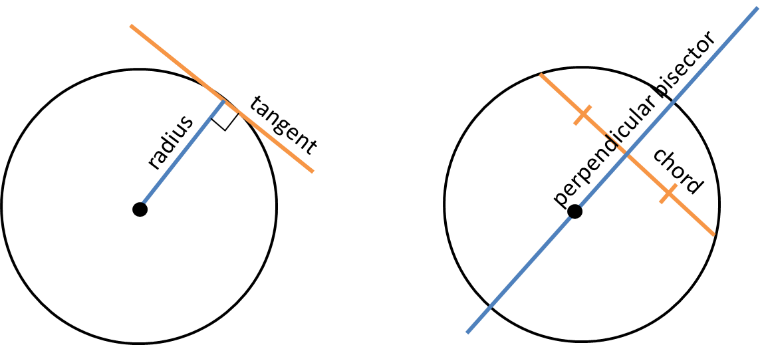
Tangents, chords and perpendicular bisectors

Reminder:

The perpendicular bisector of any chord passes through the centre of the circle.

The tangent is perpendicular to the radius (at the point of intersection).

Why are these useful?

Examples

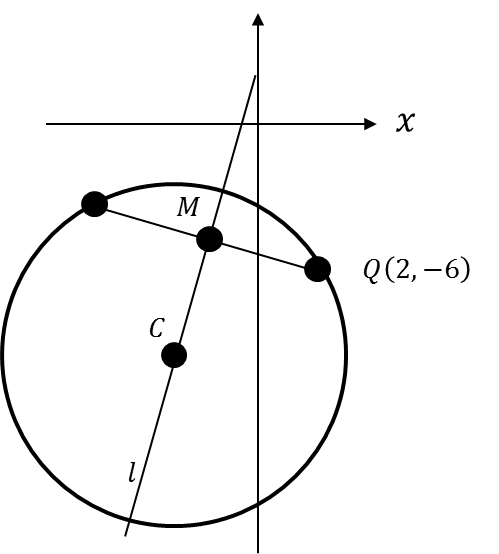
1. The circle has equation .

1. Verify the point lies on .
2. Find an equation of the tangent to at the point , giving your answer in the form

2. A circle has equation . The line is a tangent to the circle and has gradient -3. Find two possible equations for , giving your answers in the form .

Finding the centre of a circle

Example:

The points and lie on a circle with centre , as shown in the diagram. The point has coordinates and the point has coordinates . is the midpoint of the line segment .

The line passes through the points and .

a) Find an equation for .

b) Given that the -coordinate of is -9:  
 i) show that the -coordinate of is -5.  
 ii) find an equation of the circle.

Test Your Understanding

1. A circle has centre , and goes through the point . Find the equation of the tangent of the circle at the point , giving your equation in the form where are integers.

2. A circle passes through the points and . The centre of the circle has value -1. Determine the equation of the circle.

Extension

1. *MAT 2012 1A]* Which of the following lines is a tangent to the circle with equation

?



2. *[AEA 2006 Q4]* The line with equation is a tangent to the circle with equation

(a) Show that satisfies the equation

The tangents from the origin to touch at the points and .

(b) Find the coordinates of the points and .

Another circle has equation . The tangents from the point to touch it at the points and .

(c) Find the coordinates of either the point or the point .

3. *[STEP 2005 Q6]*

1. The point has coordinates and the point has coordinates . The variable has coordinates and moves on a path such that . Show that the Cartesian equation of the path of is .

The point has coordinates and the point has coordinates . The variable point moves on a path such that , where .

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