

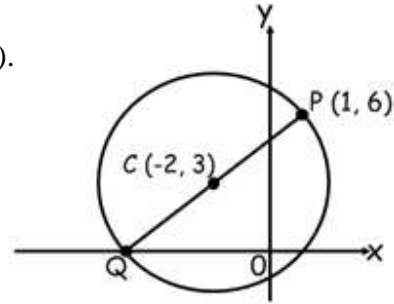
Higher Ink Exercise Block 3 – The Circle

Calculators should only be used when necessary

1. A circle has centre $(-2, 3)$ and passes through $P(1, 6)$.

a) Find the equation of the circle. (2)

b) PQ is a diameter of the circle. Find the equation of the tangent to this circle at Q . (4)



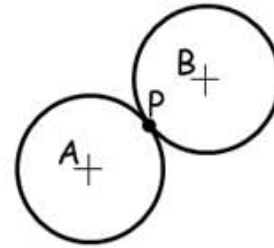
2. Two congruent circles, with centres A and B , touch at P .
Relative to suitable axes, their equations are:

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

$$x^2 + y^2 - 6x - 12y + 20 = 0$$

a) Find the coordinates of P . (3)

b) Find the length of AB . (2)



3. The line $y + 2x = k$ where $k > 0$ is a tangent to the circle with equation $x^2 + y^2 - 2x - 4 = 0$.

a) Find the value of k . (7)

b) Deduce the coordinates of the point of contact. (2)

4. Circle P has equation $x^2 + y^2 - 8x - 10y + 9 = 0$.

Circle Q has centre $(-2, -1)$ and radius $2\sqrt{2}$.

a) (i) show that the radius of P is $4\sqrt{2}$. (2)
(ii) hence, show that the circles P and Q touch. (2)

b) Find the equation of the tangent to the circle Q at the point $(-4, 1)$. (3)

- c) The tangent in part (b) intersects circle P at two points.
Find the x-coordinates of the points of intersection, expressing your answers
in the form $a \pm b\sqrt{3}$. (3)

5. If $f(x) = 4 - 7x$ and $g(x) = 3x - 2$, solve the equation:

$$f(g(x)) - g(f(x)) = 6x + 5. \quad (6)$$

6. $f(x) = 2x^3 + px^2 + qx + 4$.

Given that $(x - 2)$ is a factor of $f(x)$, and the remainder when $f(x)$ is divided by
 $(x + 1)$ is 9, find the values of p and q . (7)

Total 43 marks