1 The circle C has centre (3, −2) and radius 5.

a Write down an equation of C in cartesian form.

The line $y = 2x - 3$ intersects C at the points A and B.

b Show that $AB = 4\sqrt{5}$.

2 The line AB is a diameter of circle C.

Given that A has coordinates (−5, 6) and B has coordinates (3, 8), find

a the coordinates of the centre of C,

b a cartesian equation for C,

c an equation of the tangent to C at A.

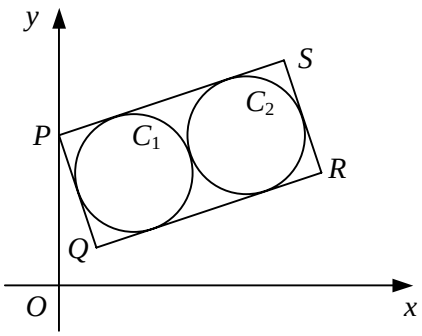
3 The circle C has equation $x^2 + y^2 + 8x - 16y + 62 = 0$.

a Find the coordinates of the centre of C and the exact radius of C.

The line l has equation $y = 2x + 1$.

b Show that the minimum distance between l and C is $3(\sqrt{5} - \sqrt{2})$.

4



The diagram shows rectangle $PQRS$ and circles C_1 and C_2.

Each circle touches the other circle and three sides of the rectangle. The coordinates of the corners of the rectangle are P (0, 4), Q (1, 1), R (7, 3) and S (6, 6).

a Find the radius of C_1.

b Find the coordinates of the point where the two circles touch.

c Show that C_1 has equation $2x^2 + 2y^2 - 8x - 12y + 21 = 0$.

5 The circle C touches the y-axis at the point A (0, 3) and passes through the point B (2, 7).

a Find an equation of the perpendicular bisector of AB.

b Find an equation for C.

c Show that the tangent to C at B has equation

$$3x - 4y + 22 = 0.$$

6 The point P (x, y) moves such that its distance from the point A (−3, 4) is twice its distance from the point B (0, −2).

Show that the locus of P is a circle and find the coordinates of the centre and the exact radius of this circle.

7 The points P (–4, 9) and Q (–2, –5) are such that PQ is a diameter of circle C.

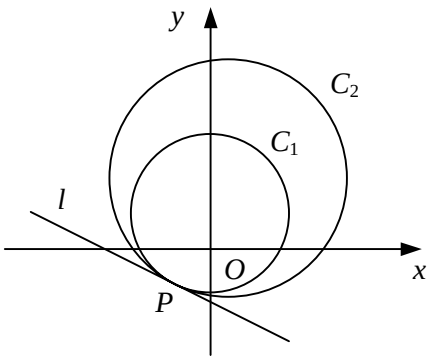
a Find the coordinates of the centre of C.

b Find an equation for C.

c Show that the point R (2, 7) lies on C.

d Hence, state the size of $\angle PRQ$, giving a reason for your answer.

8



The diagram shows circles C_1 and C_2, which both pass through the point P, and the common tangent to the circles at P, the line l.

Circle C_1 has the equation $x^2 + y^2 - 4y - 16 = 0$.

a Find the coordinates of the centre of C_1.

Circle C_2 has the equation $x^2 + y^2 - 2x - 8y - 60 = 0$.

b Find an equation of the straight line passing through the centre of C_1 and the centre of C_2.

c Find an equation of line l.

9 The circle C has equation $x^2 + y^2 - 8x + 4y + 12 = 0$.

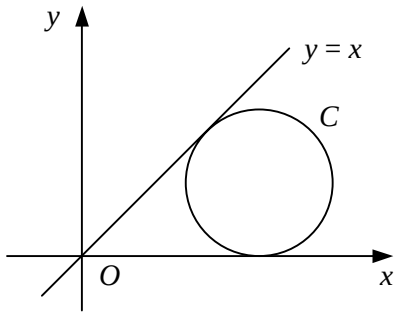
a Find the coordinates of the centre of C and the radius of C.

The point P has coordinates (3, 5) and the point Q lies on C.

b Find the largest and smallest values of the length PQ, giving your answers in the form $k\sqrt{2}$.

c Find the length of PQ correct to 3 significant figures when the line PQ is a tangent to C.

10



The diagram shows the circle C and the line $y = x$.

Given that circle C has centre (a, b), where a and b are positive constants, and that C touches the x-axis,

a find a cartesian equation for C in terms of a and b.

Given also that the line $y = x$ is a tangent to C,

b show that $a = (1 + \sqrt{2})b$.