## COORDINATE GEOMETRY

**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**
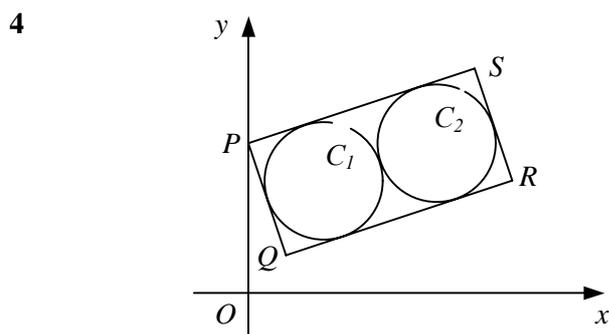


The diagram shows rectangle $PQRS$ and circles C1 and C2.

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 C1

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

  **c** Show that C1 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**
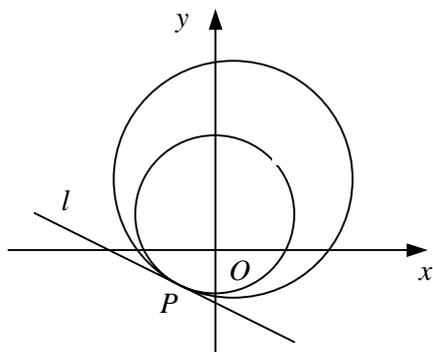


The diagram shows circles    and    which both pass through the point $P$, and the common tangent to the circles at $P$, the line $l$.

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

   **a** Find the coordinates of the centre of

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

   **b** Find an equation of the straight line passing through the centre of    and the centre of
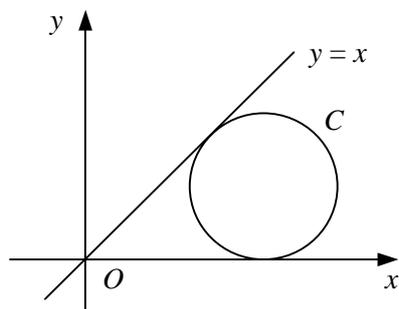
   **c** Find an equation of line $l$.

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