COORDINATE GEOMETRY

1 A circle has the equation $x^2 + y^2 - 8x + 7 = 0$.

a Find the coordinates of the centre of the circle. **(2)**

b Find the radius of the circle. **(2)**

2 A circle has the equation $x^2 + y^2 - 6x + 2y - 15 = 0$.

a Find the coordinates of the centre of the circle. **(2)**

b Find the radius of the circle. **(1)**

c Show that the tangent to the circle at the point (7, 2) has equation

$$4x + 3y - 34 = 0.$$ **(4)**

3 A circle has the equation $x^2 + y^2 + 6x - 8y + 21 = 0$.

a Find the coordinates of the centre and the radius of the circle. **(3)**

The point P lies on the circle.

b Find the greatest distance of P from the origin. **(2)**

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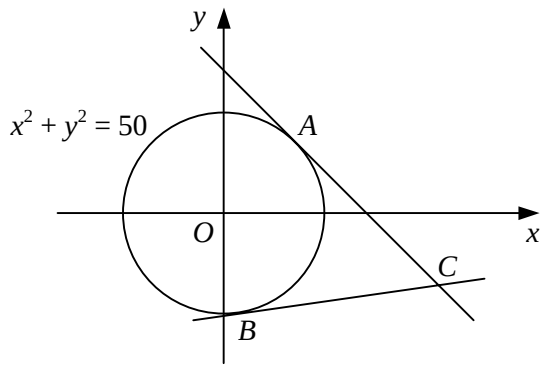

The diagram shows the circle with equation $x^2 + y^2 = 50$ and the tangents to the circle at the points A (5, 5) and B (1, −7).

a Find an equation of the tangent to the circle at A. **(3)**

b Show that the tangent to the circle at B has the equation

$$x - 7y - 50 = 0.$$ **(3)**

c Find the coordinates of the point C where the tangents to the circle at A and B intersect. **(2)**

5 Circle has the equation $x^2 + y^2 - 2ay = 0$, where a is a positive constant.

a Find the coordinates of the centre and the radius of **(4)**

Circle has the equation $x^2 + y^2 - 2bx = 0$, where b is a constant and $b > a$.

b Sketch and on the same diagram. **(4)**

6 The circle C has the equation $x^2 + y^2 + 2x - 14y + 30 = 0$.

a Find the coordinates of the centre of C. **(2)**

b Find the radius of C, giving your answer in the form $k\sqrt{5}$. **(2)**

c Show that the line $y = 2x - 1$ is a tangent to C and find the coordinates of the point of contact. **(4)**

7 The circle C has equation $x^2 + y^2 - 6x - 12y + 28 = 0$.

a Find the coordinates of the centre of C. **(2)**

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

b Find the length AB in the form $k\sqrt{2}$. **(6)**

8 The circle C has centre $(8, -1)$ and passes through the point $(4, 1)$.

a Find an equation for C. **(3)**

b Show that the line with equation $x + 2y + 4 = 0$ is a tangent to C. **(3)**

9 The points P $(-10, 2)$, Q $(8, 14)$ and R $(-2, -10)$ all lie on circle C.

a Show that PR is perpendicular to PQ. **(2)**

b Hence, show that C has the equation $x^2 + y^2 - 6x - 4y - 156 = 0$. **(5)**

10 A circle has the equation $x^2 + y^2 - 2x - 7y - 16 = 0$.

a Find the coordinates of the centre of the circle. **(2)**

b Show that the radius of the circle is $k\sqrt{13}$, where k is an exact fraction to be found. **(2)**

c Find an equation of the tangent to the circle at the point $(4, 8)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(4)**

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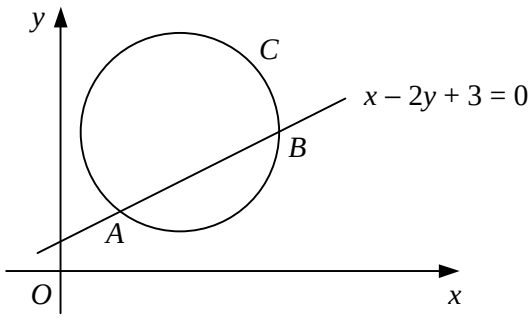

The line with equation $x - 2y + 3 = 0$ intersects the circle C at the points A and B as shown in the diagram above. Given that the centre of C has coordinates $(6, 7)$,

a find the coordinates of the mid-point of the chord AB. **(6)**

Given also that the x-coordinate of the point A is 3,

b find the coordinates of the point B, **(3)**

c find an equation for C. **(2)**

12 The circle C has equation $x^2 + y^2 - 8x - 16y + 72 = 0$.

a Find the coordinates of the centre and the radius of C. **(3)**

b Find the distance of the centre of C from the origin in the form $k\sqrt{5}$. **(2)**

The point A lies on C and the tangent to C at A passes through the origin O.

c Show that $OA = 6\sqrt{2}$. **(3)**

13 The circle C has equation $x^2 + y^2 - 4x - 6 = 0$ and the line l has equation $y = 3x - 6$.

a Show that l passes through the centre of C. **(3)**

b Find an equation for each tangent to C that is parallel to l. **(6)**