PURE MATHEMATICS 2/P2

TOPIC- Coordinate geometry in the (x,y) plane

Sub-topic: Circle Eqs. & properties

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1.

The line joining the points $(-1, 4)$ and $(3, 6)$ is a diameter of the circle C.

Find an equation for C.

(6)

JA-7-3

2.

The circle C has centre (3, 1) and passes through the point $P(8, 3)$.

(a) Find an equation for C.

(4)

(b) Find an equation for the tangent to C at P, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(5)

JU-8-5

3.

The points A and B have coordinates $(-8, -8)$ and $(12, 2)$ respectively.
AB is the diameter of a circle C.

(a) Find an equation for the circle C.

(6)

The point $(4, 8)$ also lies on C.

(b) Find an equation of the tangent to C at the point $(4, 8)$, giving your answer in the form $ax + by + c = 0$

(4)

JA-16-I-15

4.

The circle C, with centre at the point A, has equation $x^2 + y^2 - 10x + 9 = 0$.

Find

(a) the coordinates of A,

(2)

(b) the radius of C,

(2)

(c) the coordinates of the points at which C crosses the x-axis.

(2)

Given that the line l with gradient $\frac{7}{2}$ is a tangent to C, and that l touches C at the point T,

(d) find an equation of the line which passes through A and T.

(3)

JU-5-8

5.

A circle, with centre C and radius r, has equation

$$x^2 + y^2 - 8x + 4y - 12 = 0$$

Find

(a) the coordinates of C,

(2)

(b) the exact value of r.

(2)

The circle cuts the y-axis at the points A and B.

(c) Find the coordinates of the points A and B.

(3)

JA-17-I-2

6.

The circle C has equation

$$x^2 + y^2 + 10x - 6y + 18 = 0$$

Find

(a) the coordinates of the centre of C,

(2)

(b) the radius of C.

(2)

The circle C meets the line with equation $x = -3$ at two points.

(c) Find the exact values for the y coordinates of these two points, giving your answers as fully simplified surds.

(4)

JA-15-I-7

7.

The circle C has equation

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

(a) Find the centre and the radius of C.

(5)

The point $P(-1, 1)$ and the point $Q(7, -5)$ both lie on C.

(b) Show that PQ is a diameter of C.

(2)

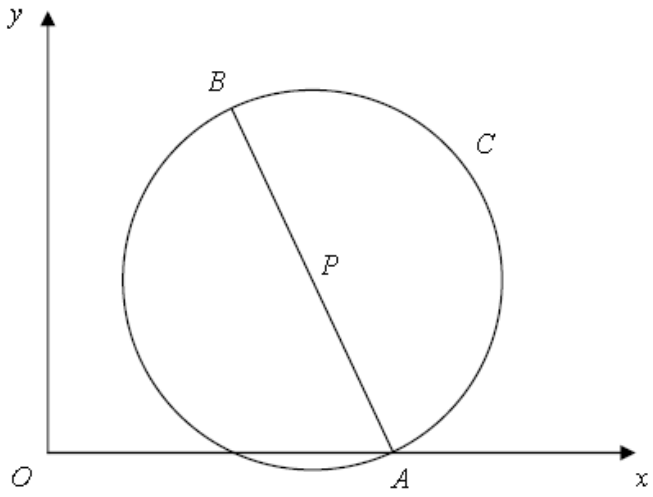
The point R lies on the positive y-axis and the angle $PRQ = 90°$.

(c) Find the coordinates of R.

(4)

JU-9-6

8.



In Figure 1, $A(4, 0)$ and $B(3, 5)$ are the end points of a diameter of the circle C.

Find

(a) the exact length of AB,

(2)

(b) the coordinates of the midpoint P of AB,

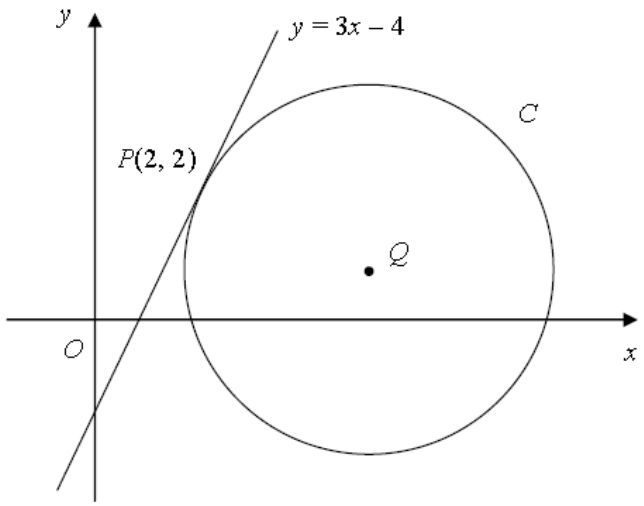
(2)

(c) an equation for the circle C.

(3)

JA-6-3

9.



The line $y = 3x - 4$ is a tangent to the circle C, touching C at the point P(2, 2), as shown in Figure 1.

The point Q is the centre of C.

(a) Find an equation of the straight line through P and Q.

(3)

Given that Q lies on the line $y = 1$,

(b) show that the x-coordinate of Q is 5,

(1)

(c) find an equation for C.

(4)

JU-6-7

10.

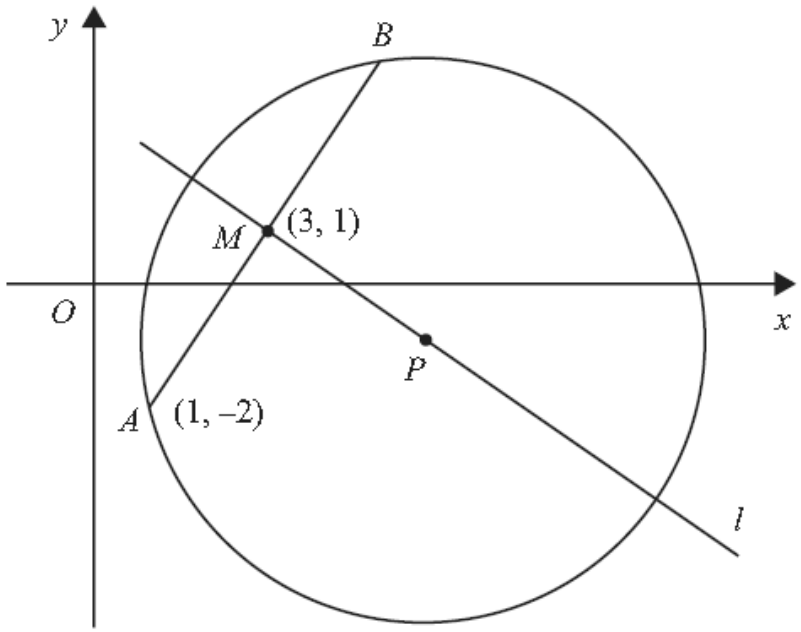


Figure 3

The points A and B lie on a circle with centre P, as shown in Figure 3.
The point A has coordinates $(1, -2)$ and the mid-point M of AB has coordinates $(3, 1)$.
The line l passes through the points M and P.

(a) Find an equation for l.

(4)

Given that the x-coordinate of P is 6,

(b) use your answer to part (a) to show that the y-coordinate of P is -1,

(1)

(c) find an equation for the circle.

(4)

JU-7-7

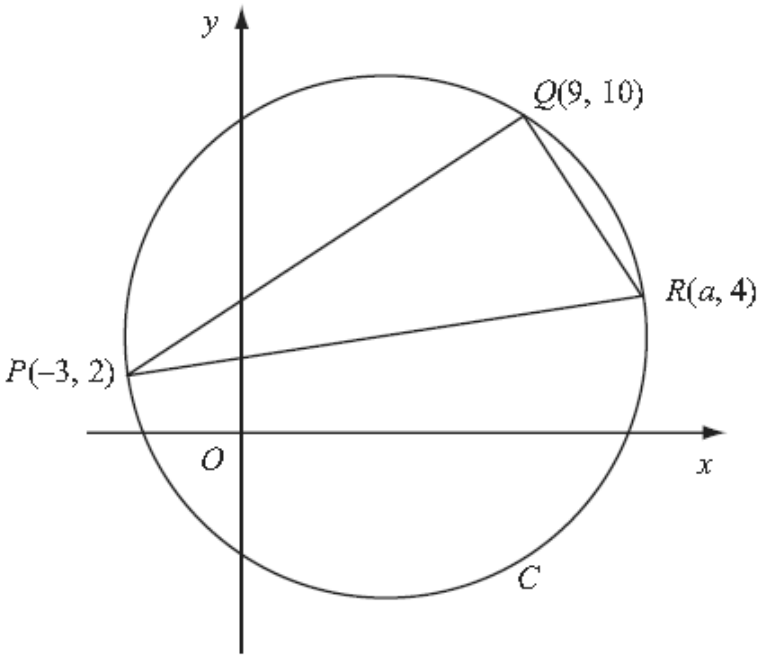


Figure 2

The points $P(-3, 2)$, $Q(9, 10)$ and $R(a, 4)$ lie on the circle C, as shown in Figure 2. Given that PR is a diameter of C,

(a) show that $a = 13$,

(3)

(b) find an equation for C.

(5)

JA-9-5

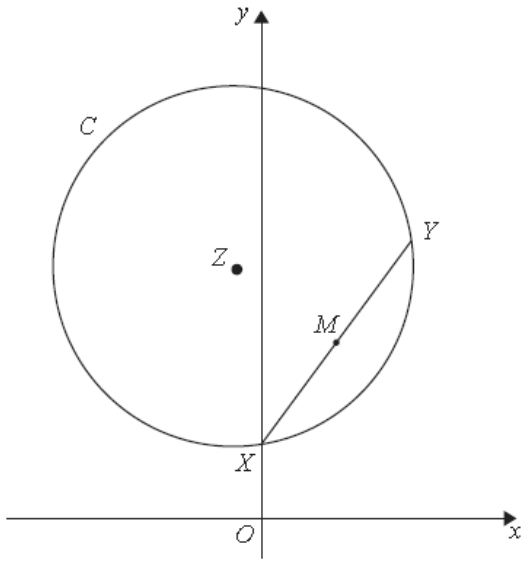


Diagram NOT drawn to scale

Figure 3

The points X and Y have coordinates (0, 3) and (6, 11) respectively. XY is a chord of a circle C with centre Z, as shown in Figure 3.

(a) Find the gradient of XY.

(2)

The point M is the midpoint of XY.

(b) Find an equation for the line which passes through Z and M.

(5)

Given that the y coordinate of Z is 10,

(c) find the x coordinate of Z,

(2)

(d) find the equation of the circle C, giving your answer in the form

$$x^2 + y^2 + ax + by + c = 0$$

where a, b and c are constants.

(5)

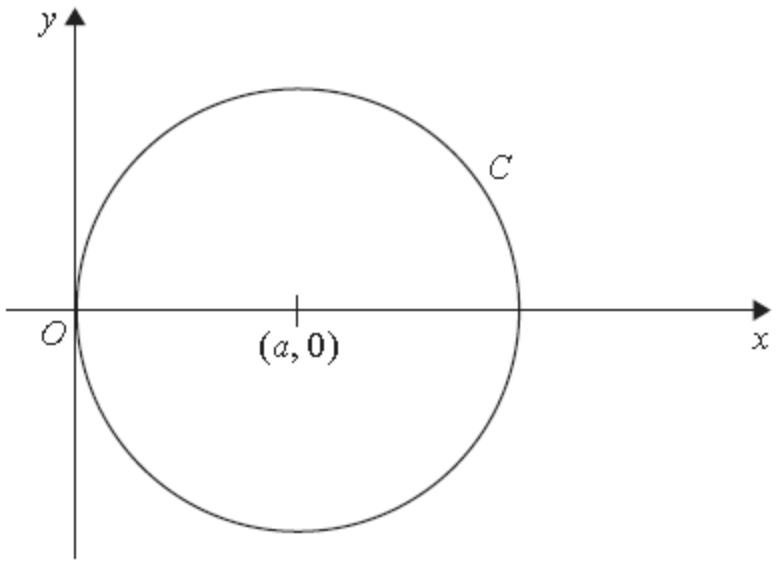


Figure 3

Figure 3 shows a circle C

C touches the y-axis and has centre at the point $(a, 0)$ where a is a positive constant.

(a) Write down an equation for C in terms of a

(2)

Given that the point $P(4, -3)$ lies on C,

(b) find the value of a

(3)

JA-16-I-12-12

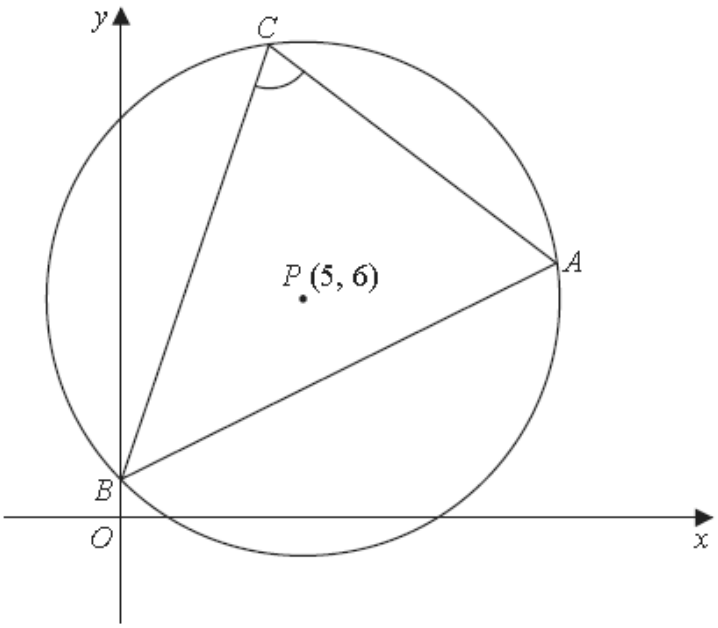


Diagram not drawn to scale

Figure 4

The circle shown in Figure 4 has centre P (5, 6) and passes through the point A (12, 7).

Find

(a) the exact radius of the circle,

(2)

(b) an equation of the circle,

(3)

(c) an equation of the tangent to the circle at the point A.

(4)

The circle also passes through the points B (0, 1) and C (4, 13).

(d) Use the cosine rule on triangle ABC to find the size of the angle BCA, giving your answer in degrees to 3 significant figures.

(5)

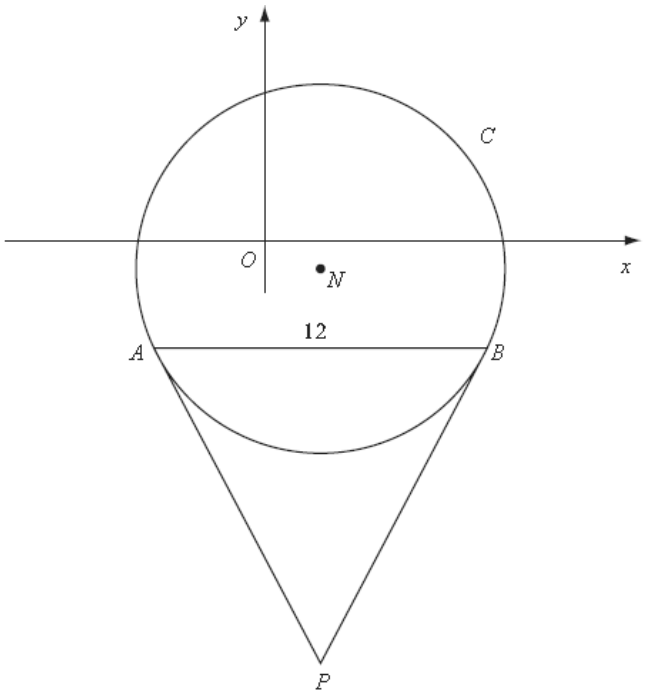


Figure 3

Figure 3 shows a sketch of the circle C with centre N and equation

$$(x \quad 2)^2 + (y+1)^2 - \frac{169}{4}$$

(a) Write down the coordinates of N.

(2)

(b) Find the radius of C.

(1)

The chord AB of C is parallel to the x-axis, lies below the x-axis and is of length 12 units as shown in Figure 3.

(c) Find the coordinates of A and the coordinates of B.

(5)

(d) Show that angle $ANB = 134.8°$, to the nearest 0.1 of a degree.

(2)

The tangents to C at the points A and B meet at the point P.

(e) Find the length AP, giving your answer to 3 significant figures.

(2)

The circle C has centre $A(2, 1)$ and passes through the point $B(10, 7)$.

(a) Find an equation for C.

(4)

The line l_1 is the tangent to C at the point B.

(b) Find an equation for l_1.

(4)

The line l_2 is parallel to l_1 and passes through the mid-point of AB.

Given that l_2 intersects C at the points P and Q,

(c) find the length of PQ, giving your answer in its simplest surd form.

(3)

JU-10-10