Circles - Past Edexcel Exam Questions

1. The points A and B have coordinates (5,-1) and (13,11) respectively.

   (a) find the coordinates of the mid-point of AB. [2]

   Given that AB is a diameter of the circle C,

   (b) find an equation for C. [2]

   Question 2 - January 2005

2. 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]

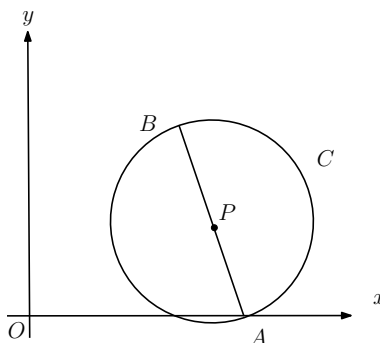   Given that the line l with gradient $\frac{7}{2}$ is a tangent to C, and that l touches C at the point T,

   (d) find an equation of the line which passes through A and T. [3]

   Question 8 - June 2005

3. .

Figure 1:

In Figure 1, $A(4,0)$ and $B(3,5)$ are the end points of a diameter of the circle C. Find
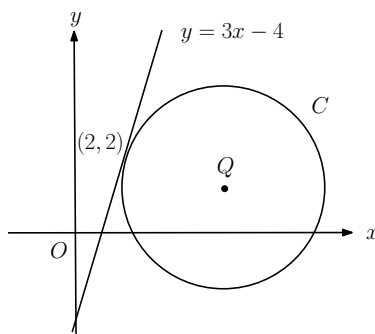
(a) the exact length of AB, [2]

(b) the coordinates of the mid-point P of AB, [2]

(c) an equation for the circle C. [3]

Question 3 - January 2006

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

Figure 2:

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]

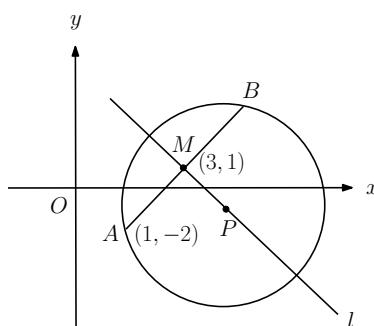**Question 7 - May 2006**

5. The line joining the points (-1,4) and (3,6) is a diameter of the circle C.
Find an equation for C. [6]

Question 3 - January 2007

6. 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.

Figure 3:

(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]

Question 7 - May 2007

7. A circle C has centre $M(6, 4)$ and radius 3.

   (a) Write down the equation of the circle in the form

$$(x - a)^2 + (y - b)^2 = r^2$$

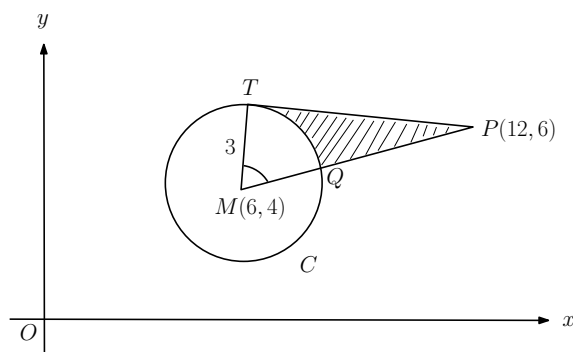   [2]

   Figure 4 shows the circle C. The point T lies on the circle and the tangent at T passes
   through the point $P(12, 6)$. The line MP cuts the circle at Q.

   (b) Show that the angle TMQ is 1.0766 radians to 4 decimal places.   [4]

   The shaded region TPQ is bounded by the straight lines TP, QP and the arc TQ,
   as shown in Figure 4.

Figure 4:

(c) Find the area of the shaded region TPQ. Give your answer to 3 decimal places.

. [5]

Question 8 - January 2008

8. 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]

   Question 5 - June 2008

9. The points $P(-3, 2)$, $Q(9, 10)$ and $R(a, 4)$ lie on the circle C, as shown in Figure 5. Given that PR is a diameter of C,
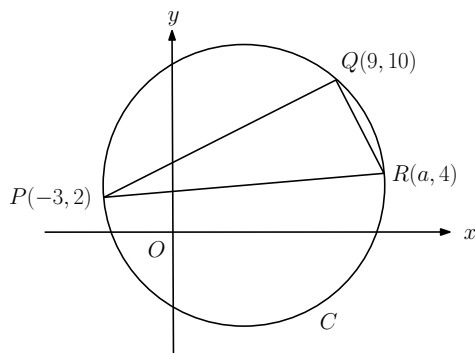
   (a) show that $a = 13$, [3]
   (b) find an equation for C. [5]

   Question 5 - January 2009

10. The circle C has equation

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

Figure 5:

(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]

Question 6 - June 2009

11. .

Figure 6 shows a sketch of the circle C with centre N and equation
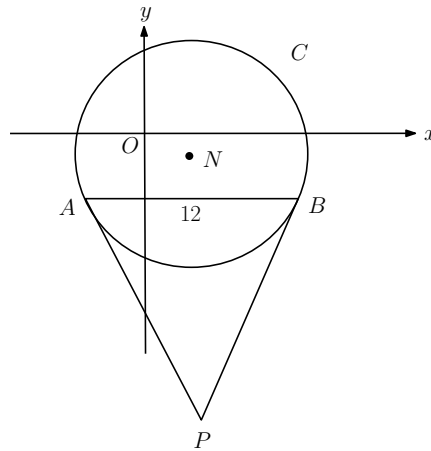
$$(x - 2)^2 + (y + 1)^2 = \frac{169}{4}$$

(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 6.

(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.

Figure 6:

(e) Find the length AP, giving your answer to 3 significant figures. [2]

Question 9 - January 2010

12. 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]

    Question 10 - June 2010

13. The points A and B have coordinates (-2,11) and (8,1) respectively.
    Given that AB is a diameter of the circle C,

    (a) show that the centre of C has coordinates (3,6), [1]

(b) find an equation for C, [4]

(c) Verify that the point (10,7) lies on C. [1]

(d) Find an equation of the tangent to C at the point (10,7), giving your answer in the form $y = mx + c$, where m and c are constants. [4]

Question 9 - January 2011

14. The circle C has equation

$$x^2 + y^2 + 4x - 2y - 11 = 0.$$

Find

(a) the coordinates of the centre of C, [2]

(b) the radius of C, [2]

(c) the coordinates of the points where C crosses the y-axis, giving your answers as simplified surds. [4]

Question 4 - May 2011

15. A circle C has centre (-1,7) and passes through the point (0,0). Find an equation for C. [4]
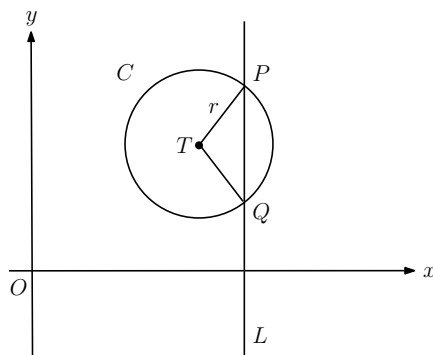
. **Question 2 - January 2012**

16. The circle C with centre T and radius r has equation

$$x^2 + y^2 - 20x - 16y + 139 = 0$$

(a) Find the coordinates of the centre of C. [3]

(b) Show that $r = 5$. [2]

The line L has equation $x = 13$ and crosses C at the points P and Q as shown in Figure 7.

Figure 7:

(c) Find the y coordinate of P and the y coordinate of Q. [3]

Given that, to 3 decimal places, the angle PTQ is 1.855 radians,

(d) find the perimeter of the sector PTQ. [3]

Question 3 - May 2012

17. The circle C has equation

$$x^2 + y^2 - 20x - 24y + 195 = 0.$$

The centre of C is at the point M.

(a) Find

    i. the coordinates of the point M.

    ii. the radius of the circle C. [5]

N is the point with coordinates (25,32).

(b) Find the length of the line MN. [2]

The tangent to C at a point P on the circle passes through N.
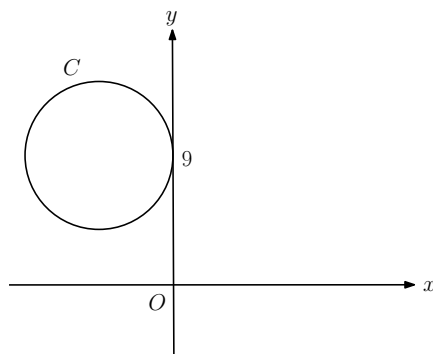
(c) Find the length of the line NP. [2]

Question 5 - January 2013

18. The circle C has radius 5 and touches the y-axis at the point $(0, 9)$, as shown in Figure 8.

Figure 8:

(a) Write down an equation for the circle C, that is shown in Figure 8. [3]

A line through the point $P(8, -7)$ is a tangent to the circle C at the point T.

(b) Find the length of PT. [3]
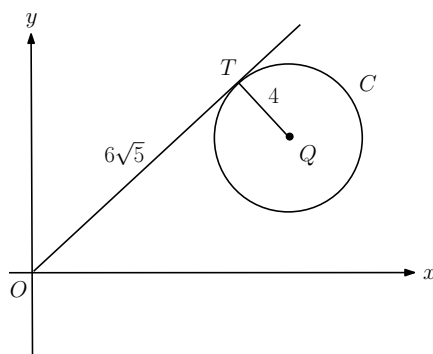
Question 10 - May 2013

19. .

Figure 9:

Figure 9 shows a circle C with centre Q and radius 4 and the point T which lies on C. The tangent to C at the point T passes through the origin O and $OT = 6\sqrt{5}$. Given that the coordinates of Q are $(11, k)$, where k is a positive constant,

(a) find the exact value of k, [3]

(b) find an equation for C. [2]

Question 9 - May 2014

Solutions

1. (a) (9,5)

   (b) $(x-9)^2 + (y-5)^2 = 52$

2. (a) (5,0)

   (b) 4

   (c) (1,0), (9,0)

   (d) $y = -\frac{2}{7}x + \frac{10}{7}$

3. (a) $\sqrt{26}$

   (b) $\left(\frac{7}{2}, \frac{5}{2}\right)$

   (c) $\left(x - \frac{7}{2}\right)^2 + \left(y - \frac{5}{2}\right)^2 = \frac{13}{2}$

4. (a) $y = -\frac{1}{3}x + \frac{8}{3}$

   (b) -

   (c) $(x-5)^2 + (y-1)^2 = 10$

5. $(x-1)^2 + (y-5)^2 = 5$

6. (a) $y = -\frac{2}{3}x + 3$

   (b) -

   (c) $(x-6)^2 + (y+1)^2 = 26$

7. (a) $(x-6)^2 + (y-4)^2 = 9$

   (b) -

   (c) 3.507

8. (a) $(x-3)^2 + (y-1)^2 = 29$

   (b) $5x + 2y - 46 = 0$

9. (a) -

   (b) $(x-5)^2 + (y-3)^2 = 65$

10. (a) centre=(-3,2), radius=5

    (b) -

(c) $(0,2)$

11. (a) $(2,-1)$

    (b) $\frac{13}{2}$

    (c) $A\left(-4,-\frac{7}{2}\right), B\left(8,-\frac{7}{2}\right)$

    (d) -

    (e) 15.6

12. (a) $(x-2)^2 + (y-1)^2 = 100$

    (b) $y = -\frac{4}{3}x + \frac{61}{3}$

    (c) $10\sqrt{3}$

13. (a) -

    (b) $(x-3)^2 + (y-6)^2 = 50$

    (c) -

    (d) $y = -7x + 77$

14. (a) $(-2,1)$

    (b) 4

    (c) $(0, 1 \pm 2\sqrt{3})$

15. $(x+1)^2 + (y-7)^2 = 50$

16. (a) $(10,8)$

    (b) -

    (c) 12, 4

    (d) 19.3

17. (a) i. $(10,12)$

         ii. 7

    (b) 25

    (c) 24

18. (a) $(x+5)^2 + (y-9)^2 = 25$

    (b) 20

19. (a) $k = 5\sqrt{3}$

    (b) $(x-11)^2 + \left(y-5\sqrt{3}\right)^2 = 16$