Circles - Past Edexcel Exam Questions

1.   **(Question 5 - C2 May 2018)**

The circle C has equation

$$x^2 + y^2 - 2x + 14y = 0.$$

Find

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

(b) the exact value of the radius of C,   [2]

(c) the y coordinates of the points where the circle C crosses the y-axis.   [2]

(d) Find an equation of the tangent to C at the point $(2, 0)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.   [4]

2.   **(Question 5 - C2 May 2017)**

The circle C has equation

$$x^2 + y^2 - 10x + 6y + 30 = 0.$$

Find

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

(b) the radius of C,   [2]

(c) the y coordinates of the points where the circle C crosses the line with equation $x = 4$, giving your answers as simplified surds.   [3]

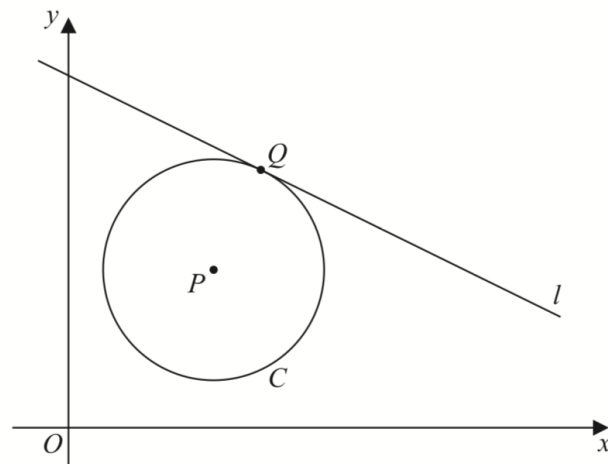3. <div style="text-align: right">(**Question 3 - C2 May 2016**)</div>

Diagram not drawn to scale

Figure 2

The circle C has centre $P(7, 8)$ and passes through the point $Q(10, 13)$, as shown in Figure 2.

(a) Find the length PQ, giving your answer as an exact value.

(2)

(b) Hence write down an equation for C.

(2)

The line l is a tangent to C at the point Q, as shown in Figure 2.

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

(4)

4. **(Question 2 - C2 May 2015)**

A circle C with centre at the point $(2, -1)$ passes through the point A at $(4, -5)$.

(a) Find the equation of the circle C. [3]

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

5. **(Question 9 - C2 May 2014)**
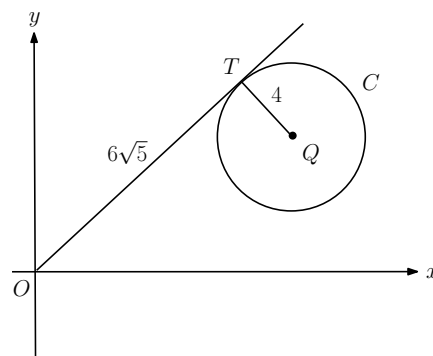
The figure shows a circle C with centre Q and radius 4 and the point T which lies on C.
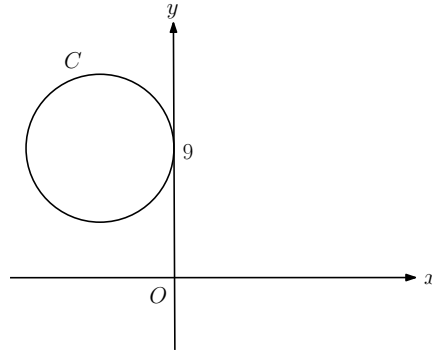
The tangent to C at the point T passes through the origin O and $OT = 6\sqrt{5}$.

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]

6. **(Question 10 - C2 May 2013)**

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

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

7. **(Question 5 - C2 Jan 2013)**

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]

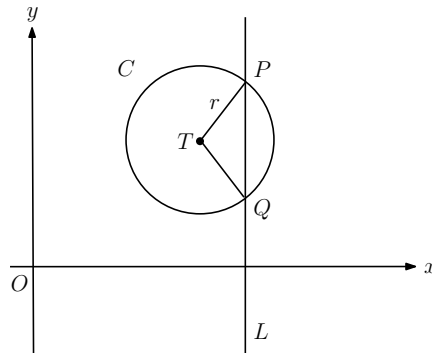The tangent to C at a point P on the circle passes through N.

(c) Find the length of the line NP. [2]

8. **(Question 3 - C2 May 2012)**

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 the figure above.

(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]

9. **(Question 2 - C2 Jan 2012)**

A circle C has centre $(-1, 7)$ and passes through the point $(0,0)$. Find an equation for C. [4]

10.   **(Question 4 - C2 May 2011)**

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]

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11.   **(Question 9 - C2 Jan 2011)**

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]

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12.   **(Question 10 - C2 Jun 2010)**

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]

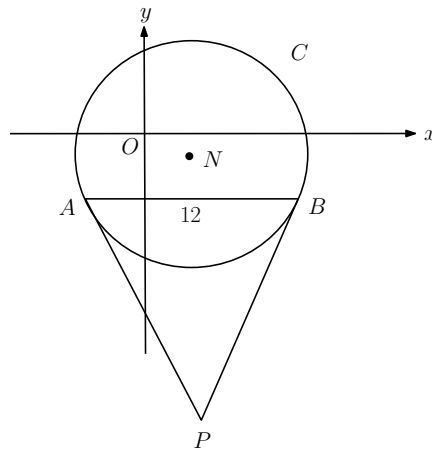The line l_2 is parallel to l_1 and passes through the mid-point of AB.
Given that l_2 intersects C at the points P and Q,

(c) find the length of PQ, giving your answer in its simplest surd form. [3]

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13. **(Question 8 - C2 Jan 2010)**

The figure below 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 the figure.

(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]

14. **(Question 6 - C2 Jun 2009)**

The circle C has equation

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

(a) Find the centre and the radius of C. [5]

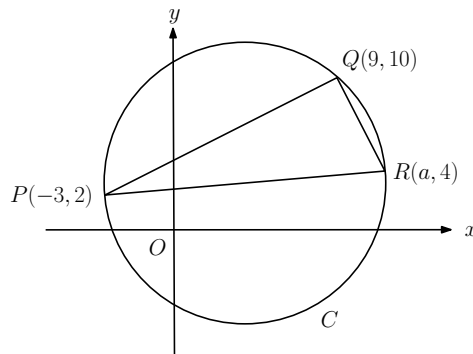The point $P(-1, 1)$ and the point $Q(7, -5)$ both lie on C.

(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]

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15. **(Question 5 - C2 Jan 2009)**

The points $P(-3, 2)$, $Q(9, 10)$ and $R(a, 4)$ lie on the circle C, as shown in the figure below.

Given that PR is a diameter of C,

(a) show that $a = 13$, [3]

(b) find an equation for C. [5]

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16.   **(Question 5 - C2 Jun 2008)**

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

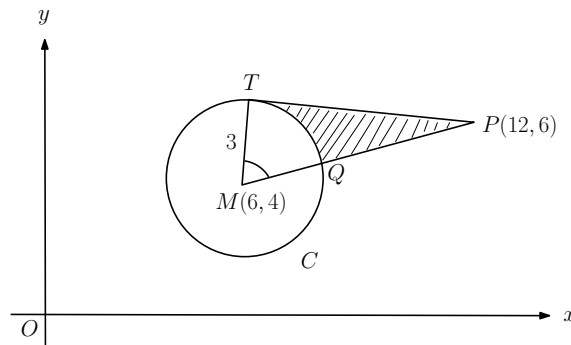(a) Find an equation for C.   [4]

(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]

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17.   **(Question 8 - C2 Jan 2008)**

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

(a) Write down the equation of the circle in the form   [2]

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

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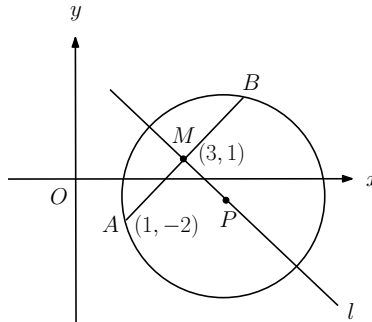
(b) Show that the angle TMQ is 1.0766 radians to 4 decimal places.   [4]

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

(c) Find the area of the shaded region TPQ. Give your answer to 3 d.p.   [5]

18. **(Question 7 - C2 May 2007)**

The points A and B lie on a circle with centre P, as shown in the figure below.

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]
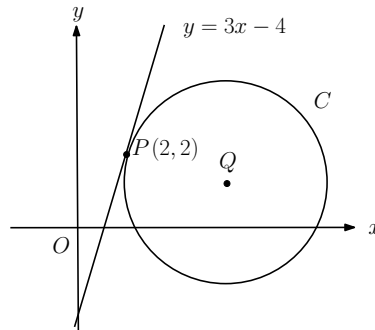
(c) find an equation for the circle. [4]

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19. **(Question 3 - C2 Jan 2007)**

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

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20. **(Question 7 - C2 May 2006)**

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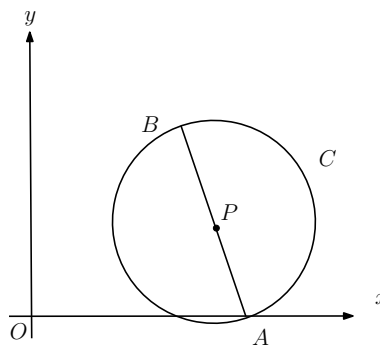
The point Q is the centre of C.

(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]

21.

(Question 3 - C2 Jan 2006)

In the figure, $A(4, 0)$ 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]

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22. **(Question 8 - C2 Jun 2005)**

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]

Solutions

1. (a) $(1, -7)$

   (b) $\sqrt{50}$

   (c) $y = 0, -14$

   (d) $x + 7y - 2 = 0$

2. (a) $(5, -3)$

   (b) 2

   (c) $y = -3 \pm \sqrt{3}$

3. (a) $\sqrt{34}$

   (b) $(x - 7)^2 + (y - 8)^2 = 34$

   (c) $3x + 5y - 95 = 0$

4. (a) $(x - 2)^2 + (y + 1)^2 = 20$

   (b) $x - 2y - 14 = 0$

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

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

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

   (b) 20

7. (a) i. (10,12)

       ii. 7

   (b) 25

   (c) 24

8. (a) (10,8)

   (b) -

   (c) $12, 4$

(d) 19.3

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

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

    (b) 4

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

11. (a) -

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

    (c) -

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

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

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

    (c) $10\sqrt{3}$

13. (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

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

    (b) -

    (c) (0,2)

15. (a) -

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

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

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

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

(b) -

(c) 3.507

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

(b) -

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

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

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

(b) -

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

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

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

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

22. (a) (5,0)

(b) 4

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

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