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 $AB$.  

   Given that $AB$ is a diameter of the circle $C$,

   (b) find an equation for $C$.  

   [2]

   [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 $A$,

   (b) the radius of $C$,

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

   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:

   ![Figure 1](image)

   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:](image)

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 $P$.

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

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

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

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 $PRQ = 90^\circ$.

(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 $ANB = 134.8^\circ$, to the nearest 0.1 of a degree. [2]

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

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(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.
(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]

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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]

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Question 3 - May 2012

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.

(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]

19. .

Question 10 - May 2013
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 $k$, 

(b) find an equation for $C$. 

Question 9 - May 2014
Circle Questions

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

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) -
Circle Questions

11. (a) (2,-1)
    (b) \( \frac{13}{2} \)
    (c) \( A (-4, -\frac{7}{2}), B (8, -\frac{7}{2}) \)
    (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) \((x - 11)^2 + (y - 5\sqrt{3})^2 = 16\)