

**Circles Exam Questions (from OCR 4721)**

**Q1, (Jun 2006, Q9)**

The points  $A$  and  $B$  have coordinates  $(4, -2)$  and  $(10, 6)$  respectively.  $C$  is the mid-point of  $AB$ . Find

- (i) the coordinates of  $C$ , [2]
- (ii) the length of  $AC$ , [2]
- (iii) the equation of the circle that has  $AB$  as a diameter, [3]
- (iv) the equation of the tangent to the circle in part (iii) at the point  $A$ , giving your answer in the form  $ax + by = c$ . [5]

**Q2, (Jan 2007, Q10)**

A circle has equation  $x^2 + y^2 + 2x - 4y - 8 = 0$ .

- (i) Find the centre and radius of the circle. [3]
- (ii) The circle passes through the point  $(-3, k)$ , where  $k < 0$ . Find the value of  $k$ . [3]
- (iii) Find the coordinates of the points where the circle meets the line with equation  $x + y = 6$ . [6]

**Q3, (Jan 2010, Q8)**

A circle has equation  $x^2 + y^2 + 6x - 4y - 4 = 0$ .

- (i) Find the centre and radius of the circle. [3]
- (ii) Find the coordinates of the points where the circle meets the line with equation  $y = 3x + 4$ . [6]

**Q4, (Jan 2011, Q9)**

A circle with centre  $C$  has equation  $x^2 + y^2 - 8x - 2y - 3 = 0$ .

- (i) Find the coordinates of  $C$  and the radius of the circle. [3]
- (ii) Find the values of  $k$  for which the line  $y = k$  is a tangent to the circle, giving your answers in simplified surd form. [3]
- (iii) The points  $S$  and  $T$  lie on the circumference of the circle.  $M$  is the mid-point of the chord  $ST$ . Given that the length of  $CM$  is 2, calculate the length of the chord  $ST$ . [3]
- (iv) Find the coordinates of the point where the circle meets the line  $x - 2y - 12 = 0$ . [6]

**Q5, (Jun 2012, Q10)**

A circle has equation  $(x - 5)^2 + (y + 2)^2 = 25$ .

- (i) Find the coordinates of the centre  $C$  and the length of the diameter. [3]
- (ii) Find the equation of the line which passes through  $C$  and the point  $P(7, 2)$ . [4]
- (iii) Calculate the length of  $CP$  and hence determine whether  $P$  lies inside or outside the circle. [3]
- (iv) Determine algebraically whether the line with equation  $y = 2x$  meets the circle. [5]

**Q6, (Jun 2014, Q9)**

A circle with centre  $C$  has equation  $(x-2)^2 + (y+5)^2 = 25$ .

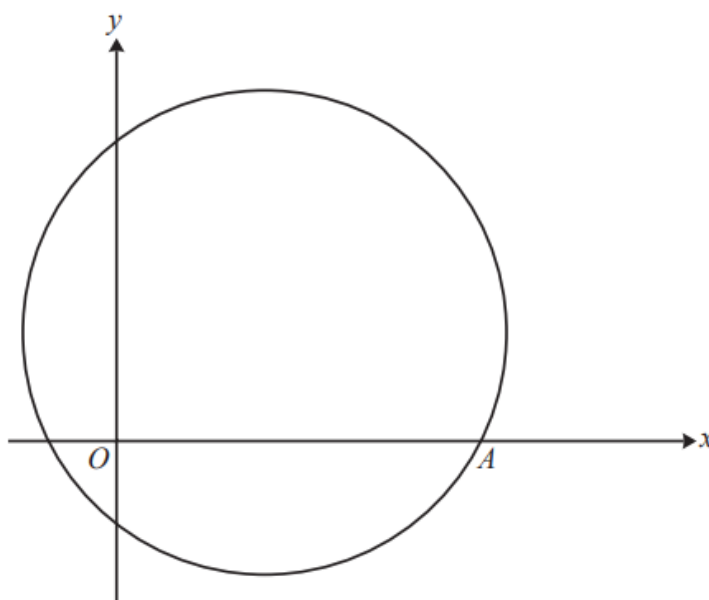
- (i) Show that no part of the circle lies above the  $x$ -axis. [3]
- (ii) The point  $P$  has coordinates  $(6, k)$  and lies inside the circle. Find the set of possible values of  $k$ . [5]
- (iii) Prove that the line  $2y = x$  does not meet the circle. [4]

**Q7, (Jun 2015, Q10)**

A circle with centre  $C$  has equation  $x^2 + y^2 - 10x + 4y + 4 = 0$ .

- (i) Find the coordinates of  $C$  and the radius of the circle. [3]
- (ii) Show that the tangent to the circle at the point  $P(8, 2)$  has equation  $3x + 4y = 32$ . [5]
- (iii) The circle meets the  $y$ -axis at  $Q$  and the tangent meets the  $y$ -axis at  $R$ . Find the area of triangle  $PQR$ . [4]

**Q8, (Jun 2016, Q10)**



The diagram shows the circle with equation  $x^2 + y^2 - 8x - 6y - 20 = 0$ .

- (i) Find the centre and radius of the circle. [3]
- The circle crosses the positive  $x$ -axis at the point  $A$ .
- (ii) Find the equation of the tangent to the circle at  $A$ . [6]
  - (iii) A second tangent to the circle is parallel to the tangent at  $A$ . Find the equation of this second tangent. [3]
  - (iv) Another circle has centre at the origin  $O$  and radius  $r$ . This circle lies wholly inside the first circle. Find the set of possible values of  $r$ . [2]