

# COORDINATE GEOMETRY: CIRCLES

## AS Unit 1: Pure Mathematics A

### WJEC past paper questions: 2010 – 2017

**Total marks available 126 (approximately 2 hours 30 minutes)**

1. The circle C has centre A and equation

$$x^2 + y^2 + 4x - 8y + 10 = 0.$$

- a) Find the coordinates of A and the radius of C. (3)

- b) The line L has equation

$$x - 3y + 4 = 0.$$

- Show that L is a tangent to the circle C. (4)

(January 10)

2. The circle C has centre A and equation

$$x^2 + y^2 - 8x + 2y + 7 = 0.$$

- a) Find the coordinates of A and the radius of C. (3)

- b) The point P has coordinates (7, -2).

- i) Verify that P lies on C.

- ii) Given that the point Q is such that PQ is a diameter of C, find the coordinates of Q. (4)

- c) The line L has equation

$$y = 2x - 4.$$

- Find the coordinates of the points of intersection of L and C. (4)

(Summer 10)

3. The circle C has centre A and equation

$$x^2 + y^2 - 2x + 6y - 15 = 0.$$

- a) i) Write down the coordinates of A.

- ii) The point P has coordinates (4, -7) and lies on C. Find the equation of the tangent to C at P. (5)

- b) The line L has equation

$$y = x + 4.$$

- Show that L and C do not intersect. (4)

(January 11)

4. The circle  $C_1$  has centre A and equation

$$x^2 + y^2 - 4x + 2y - 20 = 0 .$$

- a) Find the coordinates of A and the radius of  $C_1$ . (3)

- b) A second circle  $C_2$  has centre B (8, -9) and radius 15.

i) Show that  $C_1$  and  $C_2$  touch, justifying your answer.

ii) Given that the circles touch at the point P (-1, 3), find the equation of the common tangent. (7)

(Summer 11)

5. The circle C has centre A and radius  $r$ . The points P (3, -8) and Q (5, 6) are at either end of a diameter of C.

- a) i) Write down the coordinates of A.

ii) Show that  $r = \sqrt{50}$ .

iii) Write down the equation of C. (4)

- b) Verify that the point R (9, -6) lies on C. (2)

- c) Find PQR (3)

(January 12)

6. The circle C has centre A and equation

$$x^2 + y^2 - 4x + 6y + 1 = 0 .$$

- a) Find the coordinates of A and the radius of C. (3)

b) The point R lies on the circle C. The tangent to the circle at R passes through the point T (8, 2). Find the length of RT. (3)

(Summer 12)

7. The circle C has centre A and equation

$$x^2 + y^2 + 6x - 10y + 14 = 0 .$$

- a) i) Find the coordinates of A and the radius of C.

ii) The point P has coordinates (-6, 2). Determine whether P lies inside C, on C, or outside C. (5)

- b) The line L has equation

$$y = 2x + 1 .$$

i) Show that L is a tangent to the circle C and find the coordinates of Q, the point of contact of L and C.

ii) The point R has coordinates (4, 9) and R lies on L. Find ARQ. (8)

(January 13)

8. The circle  $C_1$  has centre A and equation

$$x^2 + y^2 + 2x - 6y - 15 = 0.$$

- a) Find the coordinates of A and the radius of  $C_1$ . (3)

- b) The line L has equation

$$y = -x + 9.$$

- i) Show that L is not a diameter of  $C_1$ .

- ii) Find the coordinates of the point of intersection of L and  $C_1$ . (5)

- c) The circle  $C_2$  has centre B (11, 8) and radius 6. Find the shortest distance between the circles  $C_1$  and  $C_2$ . (3)

(Summer 13)

9. The circle C has centre A and equation

$$x^2 + y^2 - 4x + 8y - 5 = 0.$$

- a) i) Write down the coordinates of A.

- ii) The point P has coordinates (6, -7) and lies on C. Find the equation of the tangent to C at P. (5)

- b) The line L has equation  $y = x + 3$ . Show that L and C do not intersect. (4)

(January 14)

10. a) The circle  $C_1$  has centre A (-2, 9) and radius 5. The circle  $C_2$  has centre B (10, -7) and radius 15.

- i) Show that  $C_1$  and  $C_2$  touch, justifying your answer.

- ii) Given that the circles touch at the point P (1, 5), find the equation of the common tangent at P. (7)

- b) Gareth, who has been asked by his teacher to investigate the properties of another circle  $C_3$ , claims that the equation of this circle  $C_3$  is given by

$$x^2 + y^2 + 4x - 6y + 20 = 0.$$

- Show that Gareth cannot possibly be correct. (3)

(Summer 14)

11. The circle C has centre A and radius  $r$ . The points P (-2, -3) and Q (8, 1) are at opposite ends of a diameter of C.

- a) i) Write down the coordinates of A.

- ii) Show that  $r = \sqrt{29}$ . (3)

- b) Given that the point R (5, 4) lies on the circle C, find  $\angle PQR$ . Give your answer in degrees, correct to one decimal place. (3)

- d) The point S lies on the circle C. The tangent to the circle at S passes through the point T (11, 0). Find the length of ST. (3)

(Summer 15)

12. The circle  $C_1$  has centre A and equation

$$x^2 + y^2 + 6x - 20y + 59 = 0 .$$

- a) i) Find the coordinates of A and the radius of  $C_1$ .  
 ii) Find the shortest distance from the origin to the circle  $C_1$ . Give your answer correct to two decimal places. (5)
- b) The line L has equation  $y = 3x - 1$  . The line L and the circle  $C_1$  intersect at the points P and Q.  
 i) Find the coordinates of P and Q.  
 ii) The circle  $C_2$  has centre B (6, 7) and is such that PQ is the common chord of  $C_1$  and  $C_2$ . Find the equation of  $C_2$ . (7)

(Summer 16)

13. The circle C has centre A and equation

$$x^2 + y^2 + 10x - 8y + 21 = 0 .$$

- a) i) Find the coordinates of A and the radius of C.  
 ii) The point P has coordinates (-2, 0). Determine whether P lies inside C, on C, or outside C. (5)
- b) The line L has equation  $y = 2x + 4$ . Show that L is a tangent to the circle C and find the coordinates of the point of contact of L and C. (5)

(Summer 17)