

Simultaneous equations

Question Paper 2

Level	A Level
Subject	Mathematics (Pure)
Exam Board	AQA
Module	Core 1
Topic	Algebra
Sub Topic	Simultaneous equations
Booklet	Question Paper 2

Time Allowed: 62 minutes

Score: /53

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1

A circle has equation $x^2 + y^2 - 4x - 14 = 0$.

(a) Find:

(i) the coordinates of the centre of the circle;

(3)

(ii) the radius of the circle in the form $p\sqrt{2}$, where p is an integer.

(3)

(b) A chord of the circle has length 8. Find the perpendicular distance from the centre of the circle to this chord.

(3)

(c) A line has equation $y = 2k - x$, where k is a constant.

(i) Show that the x -coordinate of any point of intersection of the line and the circle satisfies the equation

$$x^2 - 2(k + 1)x + 2k^2 - 7 = 0$$

(3)

(ii) Find the values of k for which the equation

$$x^2 - 2(k + 1)x + 2k^2 - 7 = 0$$

has equal roots.

(4)

(iii) Describe the geometrical relationship between the line and the circle when k takes either of the values found in part (c)(ii).

(1)

(Total 17 marks)

2

The point A has coordinates $(11, 2)$ and the point B has coordinates $(-1, -1)$.

(a) (i) Find the gradient of AB .

(2)

(ii) Hence, or otherwise, show that the line AB has equation

$$x - 4y = 3$$

(2)

- (b) The line with equation $3x + 5y = 26$ intersects the line AB at the point C . Find the coordinates of C .

(3)
(Total 7 marks)

3 A circle has equation $x^2 + y^2 - 12x - 6y + 20 = 0$.

- (a) By completing the square, express the equation in the form

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

(3)

- (b) Write down:

(i) the coordinates of the centre of the circle;

(1)

(ii) the radius of the circle.

(1)

- (c) The line with equation $y = x + 4$ intersects the circle at the points P and Q .

(i) Show that the x -coordinates of P and Q satisfy the equation

$$x^2 - 5x + 6 = 0$$

(2)

(ii) Find the coordinates of P and Q .

(4)

(Total 11 marks)

4 The point A has coordinates $(6, 5)$ and the point B has coordinates $(2, -1)$.

- (a) Find the coordinates of the midpoint of AB .

(2)

(b) Show that AB has length $k\sqrt{13}$, where k is an integer.

(3)

(c) (i) Find the gradient of the line AB .

(2)

(ii) Hence, or otherwise, show that the line AB has equation $3x - 2y = 8$.

(2)

- (d) The line AB intersects the line with equation $2x + y = 10$ at the point C . Find the coordinates of C .

(3)
(Total 12 marks)

5

A line has equation $y = mx - 1$, where m is a constant.

A curve has equation $y = x^2 - 5x + 3$.

- (a) Show that the x -coordinate of any point of intersection of the line and the curve satisfies the equation

$$x^2 - (5 + m)x + 4 = 0$$

(1)

- (b) Find the values of m for which the equation $x^2 - (5 + m)x + 4 = 0$ has equal roots.

(4)

- (c) Describe geometrically the situation when m takes either of the values found in part (b).

(1)

(Total 6 marks)