

Write your name here

Surname

Other Names

AS/A Level Mathematics

Completing the Square

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled..
- Answer the questions in the spaces provided
– there may be more space than you need.
- You should show sufficient working to make your methods clear.
Answers without working may not gain full credit.
- Answers should be given to three significant figures unless otherwise stated.

Information

- The marks for **each** question are shown in brackets
– use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

1 Show that $x^2 - 6x + 11 > 0$ for all real values of x .

(Total for question 1 is 3 marks)

2 Prove that, for all values of x ,

$$x^2 + 4x + 12 > x + 3$$

(Total for question 2 is 4 marks)

3 (a) By completing the square, find in terms of the constant p the roots of the equation (3)

$$x^2 + px + 4 = 0$$

(b) Hence find the set of values of p for which the equation has no real roots. (1)

(Total for question 3 is 4 marks)

4 The curve C has the equation

$$x^2 + ax + b = 0$$

Where a and b are constants

Given that the minimum point of C has coordinates $(4, -3)$ find the values of a and b .

(Total for question 4 is 4 marks)

5 $f(x) = 2x^2 + 8x + 1$

Find the values of the constants a , b and c such that

$$f(x) = a(x + b)^2 + c$$

(Total for question 5 is 4 marks)

6 (a) Express $x^2 + 9x + 3$ in the form $(x + a)^2 + b$ (2)

(b) State the coordinates of the minimum point of the curve $y = x^2 + 9x + 3$ (2)

(Total for question 6 is 4 marks)

7 (a) By completing the square, find in terms of the constant k the roots of the equation (4)

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

(b) Hence find the exact roots of the equation $x^2 + 4x - 6 = 0$ (2)

(Total for question 7 is 6 marks)
