

# Edexcel GCSE

## Mathematics (Linear) – 1MA0

# Completing the Square

**Materials required for examination**  
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

**Items included with question papers**  
Nil

### Instructions

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Use black ink or ball-point pen.

Fill in the boxes at the top of this page with your name, centre number and candidate number.

Answer all questions.

Answer the questions in the spaces provided – there may be more space than you need.

Calculators must not be used.

### Information

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The total mark for this paper is 100.

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

Questions labelled with an **asterisk (\*)** are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

### Advice

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Read each question carefully before you start to answer it.

Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

1. For all values of  $x$ ,  $x^2 + 6x - 2 = (x + p)^2 + q$

Find the value of  $p$  and the value of  $q$ .

$$(x + 3)^2 - 3^2 - 2$$

$$(x + 3)^2 - 9 - 2$$

$$(x + 3)^2 - 11$$

$$p = \dots 3 \dots q = \dots -11 \dots$$

(Total 2 marks)

2. Write  $x^2 + 10x + 3$  in the form  $(x + a)^2 + b$ , where  $a$  and  $b$  are constants.

$$(x + 5)^2 - 25 + 3$$

$$(x + 5)^2 - 22$$

$$(x + 5)^2 - 22$$

.....

(Total 3 marks)

3. (a) Express  $x^2 - 4x - 10$  in the form  $(x + a)^2 + b$

$$(x - 2)^2 - 4 - 10$$

$$(x - 2)^2 - 14$$

$$\underline{\underline{(x - 2)^2 - 14}}$$

- (b) Hence write down the minimum value of  $y = x^2 - 4x - 10$

$$\underline{\underline{(2), (-14)}}$$

(Total 3 marks)

4. The expression  $x^2 - 8x + 21$  can be written in the form  $(x - a)^2 + b$  for all values of  $x$ .

(a) Find the value of  $a$  and the value of  $b$ .

$$(x-4)^2 - 16 + 21$$

$$(x-4)^2 + 5$$

$$\dots\dots\dots(x-4)^2 + 5$$

The equation of a curve is  $y = f(x)$  where  $f(x) = x^2 - 8x + 21$ .

(b) Write down the coordinates of the minimum point of this curve.

$$\dots\dots\dots(4)\dots\dots\dots,(\dots\dots\dots5)\dots\dots\dots$$

(Total 3 marks)

5. (a) Express  $x^2 - 6x + 10$  in the form  $(x + a)^2 + b$

$$(x - 3)^2 - 9 + 10$$

$$(x - 3)^2 + 1$$

$$\underline{\underline{(x - 3)^2 + 1}}$$

- (b) Hence write down the minimum value of  $y = x^2 - 6x + 10$

$$\underline{\underline{(3), (-1)}}$$

(Total 3 marks)

6. (a) Express  $x^2 + 4x - 12$  in the form  $(x + a)^2 + b$

$$(x+2)^2 - 4 = -12$$
$$(x+2)^2 = -12 + 4$$

$$\underline{\underline{(x+2)^2 - 16}}$$

- (b) Hence, or otherwise, solve  $x^2 + 4x - 12 = 0$

$$(x+2)^2 - 16 = 0$$

$$(x+2)^2 = 16$$

$$x+2 = \pm\sqrt{16}$$

$$x = -2 \pm 4$$

$$x = -6 \text{ or } 2$$

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(Total 4 marks)

7. By completing the square solve  $x^2 + 8x + 13 = 0$

Give your answers in surd form.

$$(x+4)^2 - 16 + 13 = 0$$

$$(x+4)^2 - 3 = 0$$

$$(x+4)^2 = 3$$

$$x+4 = \pm\sqrt{3}$$

$$x = -4 \pm \sqrt{3}$$

$$x = -4 + \sqrt{3} \text{ or } x = -4 - \sqrt{3}$$

(Total 5 marks)

8. By completing the square find the minimum point of the curve  $y = x^2 + 10x + 3$

$$y = (x + 5)^2 - 25 + 3$$

$$y = (x + 5)^2 - 22$$

$$\dots\dots\dots(-5, -22)$$

(Total 4 marks)