

# Completing the Square

## Mark Scheme

Level	GCSE
Subject	Maths
Exam Board	Edexcel GCSE
Topic	Completing the Square
Grade Level	Grade 8/9
Booklet	Mark Scheme

**Time Allowed:** 33 minutes

**Score:** /27

**Percentage:** /100

**Grade Boundaries:**

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

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

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

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

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

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

(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  $(x + a)^2 + b$

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

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

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

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

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

(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.

$$(\dots\dots\dots 4 \dots\dots\dots), (\dots\dots\dots 5 \dots\dots\dots)$$

(Total 3 marks)

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

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

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

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

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

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

(Total 3 marks)

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

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

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

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

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

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

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

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

$$x = -2 \pm 4$$

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

.....

(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)