AQA, OCR, Edexcel

GCSE

GCSE Maths

Completing the Square Answers

Name:

MME
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Total Marks: /37

Completing the Square

1. a. Express $x^2 + 10x - 3$ in the form $(x + p)^2 + q$.

$$(x + 5)^2 - 28$$

   b. Hence, or otherwise, solve $x^2 + 10x - 3 = 0$

$$x = -5 - 2\sqrt{7}, \ x = 2\sqrt{7} - 5$$

(4 Marks)

2. Given that $(x + 8)^2 - 62 = ax^2 + bx + c$, find values of $a, b,$ and c.

$$a = 1, b = 16, c = 2$$

(3 Marks)

3. Solve the following quadratic equations through completing the square. Leave your answer is surd form where necessary:

   a. $x^2 + 4x = 4$

$$x = -2(1 + \sqrt{2}), \qquad x = 2(\sqrt{2} - 1)$$

   b. $x^2 + 6x = 1$

$$x = -3 - \sqrt{10}, \ x = \sqrt{10} - 3$$

   c. $x^2 + 10x + 3 = 0$

$$x = -5 - \sqrt{22}, \ x = \sqrt{22} - 5$$

   d. $2x^2 + 20x + 30 = 0$

$$x = -5 - \sqrt{10}, \ x = \sqrt{10} - 5$$

   e. $\dfrac{(x^2 + 2x)}{2} = 1$

$$x = -1 - \sqrt{3}, \ x = \sqrt{3} - 1$$

(15 Marks)
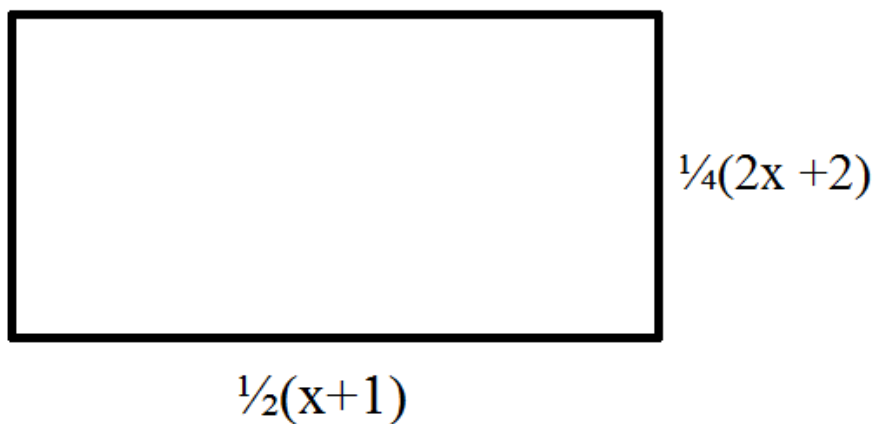
4. Express $3 - 10x - x^2$ in the form $n - (x - m)^2$.

$$28 - (x + 5)^2$$

a. Hence, solve $3 - 10x - x^2 = 0$.

$$x = -5 - 2\sqrt{7}, \ \ x = 2\sqrt{7} - 5$$

(5 Marks)

5. The diagram below shows a rectangle with area equal to $\frac{4x+12}{4}$.

¼(2x +2)

½(x+1)

a. Show that $x^2 - 2x - 11 = 0$

$$\frac{1}{4}(2x + 2) \times \frac{1}{2}(x + 1) = \frac{4x + 12}{4}$$

$$\frac{1}{4}(x + 1)^2 = \frac{4x + 12}{4}$$

$$x^2 + 2x + 1 = 4x + 12$$

$$x^2 - 2x - 11 = 0$$

b. Hence solve for x
   (Hard)

$$x = 1 - 2\sqrt{3}, \ \ x = 1 + 2\sqrt{3}$$

(5 Marks)

6. a. Write $2x^2 + 3x - 2$ in the form $r(x + p)^2 + q$

$$2\left(x + \frac{3}{4}\right)^2 - \frac{25}{8}$$

b. Use your answer to part a to give the coordinates for the minimum point on the graph of $2x^2 + 3x - 2$.
(Hard)

$$\left(-\frac{3}{4}, -\frac{25}{8}\right)$$

(5 Marks)