IGCSE
Chapter 13
Quadratic equations

The quadratic formula

In general a quadratic equation takes the form $ax^2 + bx + c = 0$ where a, b *and* c are integers. Quadratic equations can be solved by the use of the quadratic formula which states that:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Example 1: Solve the quadratic equation $x^2 + 7x + 3 = 0$

$$\boldsymbol{x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$$

$$a = 1, b = 7, c = 3$$

$$x = \frac{-7 \pm \sqrt{7^2 - 4 \times 1 \times 3}}{2 \times 1}$$

$$x_1 = \frac{-7 + \sqrt{37}}{2} \qquad x_1 = -0.459$$

$$x_2 = \frac{-7 - \sqrt{37}}{2} \qquad x_2 = -6.54$$

Example 2: Solve the quadratic equation $x^2 - 4x - 2 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 1, b = -4, c = -2$$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4 \times 1 \times (-2)}}{2 \times 1}$$

$$x_1 = \frac{4 + \sqrt{24}}{2} \qquad x_1 = 4.45$$

$$x_2 = \frac{4 - \sqrt{24}}{2} \qquad x_2 = -0.449$$

Exercise 13.10

Solve the following quadratic equations using either the quadratic formula or by completing the square. Give your answers to 2 d.p.

1 **a** $x^2 - x - 13 = 0$ **b** $x^2 + 4x - 11 = 0$
c $x^2 + 5x - 7 = 0$ **d** $x^2 + 6x + 6 = 0$
e $x^2 + 5x - 13 = 0$ **f** $x^2 - 9x + 19 = 0$

2 **a** $x^2 + 7x + 9 = 0$ **b** $x^2 - 35 = 0$
c $x^2 + 3x - 3 = 0$ **d** $x^2 - 5x - 7 = 0$
e $x^2 + x - 18 = 0$ **f** $x^2 - 8 = 0$

3 **a** $x^2 - 2x - 2 = 0$ **b** $x^2 - 4x - 11 = 0$
c $x^2 - x - 5 = 0$ **d** $x^2 + 2x - 7 = 0$
e $x^2 - 3x + 1 = 0$ **f** $x^2 - 8x + 3 = 0$

4 **a** $2x^2 - 3x - 4 = 0$ **b** $4x^2 + 2x - 5 = 0$
c $5x^2 - 8x + 1 = 0$ **d** $-2x^2 - 5x - 2 = 0$
e $3x^2 - 4x - 2 = 0$ **f** $-7x^2 - x + 15 = 0$