

## SOLVING QUADRATIC EQUATIONS USING THE QUADRATIC FORMULA

If you cannot solve a quadratic equation by factorising, then use the formula:

For the quadratic equation:  $ax^2 + bx + c = 0$

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

Worked example 1: Solve the equation  $x^2 - 2x - 7 = 0$ , to 2 d.p..

Solution 1: In this case,  $a = 1, b = -2, c = -7$ , so

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4 \times 1 \times (-7)}}{2 \times 1} = \frac{2 \pm \sqrt{4 + 28}}{2}$$
$$x = \frac{2 + \sqrt{32}}{2}, x = \frac{2 - \sqrt{32}}{2}$$
$$x = 3.83, x = -1.83 \quad (3\text{s.f.})$$

Worked example 2: Solve the equation  $3x^2 - 8x + 3 = 0$ , to 2 d.p.

Solution 2: In this case,  $a = 3, b = -8, c = 3$ , so

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \times 3 \times 3}}{2 \times 3} = \frac{8 \pm \sqrt{64 - 36}}{6}$$
$$x = \frac{8 + \sqrt{28}}{6}, x = \frac{8 - \sqrt{28}}{6}$$
$$x = 2.22, x = -0.45 \quad (2 \text{ d.p.})$$

[NB If questions on this topic come up in C1 (non-calculator) then your answers will have to be left as surds]

QUESTIONS: Solve the following quadratic equations using the quadratic formula, giving your answers correct to 2 decimal places where necessary.

a)  $x^2 - x - 5 = 0$       b)  $2x^2 - 7x - 1 = 0$       c)  $5x^2 + 2x - 4 = 0$

d)  $x^2 = 3x + 5$       e)  $-3x^2 + 2x + 1 = 0$

SOLUTIONS:

a)  $x = 2.79, x = -1.79$       b)  $x = 3.64, x = -0.14$       c)  $x = 0.72, x = -1.12$

d)  $x = 4.19, x = -1.19$       e)  $x = -\frac{1}{3}, x = 1$

[NB The last one could have been solved by factorising]