

Examples - Solving Quadratic Equations by completing the square

Example 1 Solve $x^2 + 6x + 4 = 0$. Give your solutions in surd form.

$x^2 + 6x + 4 = 0$ $(x + 3)^2 - 9 + 4 = 0$ $(x + 3)^2 - 5 = 0$ $(x + 3)^2 = 5$ $x + 3 = \pm\sqrt{5}$ $x = \pm\sqrt{5} - 3$ $\text{So } x = -\sqrt{5} - 3 \text{ or } x = \sqrt{5} - 3$	1 Write $x^2 + bx + c = 0$ in the form $\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$ 2 Simplify. 3 Rearrange the equation to work out x. First, add 5 to both sides. 4 Square root both sides. Remember that the square root of a value gives two answers. 5 Subtract 3 from both sides to solve the equation. 6 Write down both solutions.
--	---

Example 2 Solve $2x^2 - 7x + 4 = 0$. Give your solutions in surd form.

$2x^2 - 7x + 4 = 0$ $2\left(x^2 - \frac{7}{2}x\right) + 4 = 0$ $2\left[\left(x - \frac{7}{4}\right)^2 - \left(\frac{7}{4}\right)^2\right] + 4 = 0$ $2\left(x - \frac{7}{4}\right)^2 - \frac{49}{8} + 4 = 0$ $2\left(x - \frac{7}{4}\right)^2 - \frac{17}{8} = 0$ $2\left(x - \frac{7}{4}\right)^2 = \frac{17}{8}$ $\left(x - \frac{7}{4}\right)^2 = \frac{17}{16}$ $x - \frac{7}{4} = \pm\frac{\sqrt{17}}{4}$ $x = \pm\frac{\sqrt{17}}{4} + \frac{7}{4}$ $\text{So } x = \frac{7}{4} - \frac{\sqrt{17}}{4} \text{ or } x = \frac{7}{4} + \frac{\sqrt{17}}{4}$	1 Before completing the square write $ax^2 + bx + c$ in the form $a\left(x^2 + \frac{b}{a}x\right) + c$ 2 Now complete the square by writing $x^2 - \frac{7}{2}x$ in the form $\left(x + \frac{b}{2a}\right)^2 - \left(\frac{b}{2a}\right)^2$ 3 Expand the square brackets. 4 Simplify. 5 Rearrange the equation to work out x. First, add $\frac{17}{8}$ to both sides. 6 Divide both sides by 2. 7 Square root both sides. Remember that the square root of a value gives two answers. 8 Add $\frac{7}{4}$ to both sides. 9 Write down both the solutions.
---	---