# Solving Quadratic Equations Using Different Methods

There are three algebraic methods for solving quadratic equations:    (a) By factorising    (b) Using the quadratic formula    (c) By completing the square

Solve each of the following quadratic equations using each of the three methods, remembering that sometimes it is not possible to solve by factorising. When using the quadratic formula, give your answers to 2 decimal places.

| Equation | By Factorising | By Formula | By Completing the Square | Equation | By Factorising | By Formula | By Completing the Square |
|---|---|---|---|---|---|---|---|
| $x^2 + 4x + 3 = 0$ | $(x+3)(x+1) = 0$<br><br>$x = -3$<br>$or\ x = -1$ | $a = 1, b = 4, c = 3$<br><br>$x = \dfrac{-4 \pm \sqrt{16-12}}{2}$<br><br>$x = -3\ or\ x = -1$ | $(x+2)^2 - 4 + 3 = 0$<br>$(x+2)^2 = 1$<br>$x = -2 \pm \sqrt{1}$<br>$x = -3\ or\ x = -1$ | $3x^2 - 12x = 0$ | $3x(x-4) = 0$<br><br>$x = 0\ or\ x = 4$ | $a = 3, b = -12, c = 0$<br><br>$x = \dfrac{12 \pm \sqrt{144-0}}{6}$<br><br>$x = 0\ or\ x = 4$ | $3(x-2)^2 - 12 = 0$<br>$(x-2)^2 = 4$<br>$x = 0\ or\ x = 4$ |
| $x^2 - 6x + 8 = 0$ | $(x-4)(x-2) = 0$<br><br>$x = 4\ or\ x = 2$ | $a = 1, b = -6, c = 8$<br><br>$x = \dfrac{6 \pm \sqrt{36-32}}{2}$<br><br>$x = 4\ or\ x = 2$ | $(x-3)^2 - 9 + 8 = 0$<br>$(x-3)^2 = 1$<br>$x = 3 \pm \sqrt{1}$<br>$x = 4\ or\ x = 2$ | $2x^2 - 9x - 5 = 0$ | $(2x+1)(x-5) = 0$<br><br>$x = -\dfrac{1}{2}\ or\ x = 5$ | $a = 2, b = -9, c = -5$<br><br>$x = \dfrac{9 \pm \sqrt{81+40}}{4}$<br><br>$x = -\dfrac{1}{2}\ or\ x = 5$ | $2\left(x - \dfrac{9}{4}\right)^2 = \dfrac{121}{8}$<br>$x = \dfrac{9}{4} \pm \sqrt{\dfrac{121}{16}}$<br>$x = -0.5\ or\ x = 5$ |
| $x^2 - x - 12 = 0$ | $(x-4)(x+3) = 0$<br><br>$x = 4\ or\ x = -3$ | $a = 1, b = -1, c = -12$<br><br>$x = \dfrac{1 \pm \sqrt{1+48}}{2}$<br><br>$x = 4\ or\ x = -3$ | $\left(x - \dfrac{1}{2}\right)^2 - \dfrac{1}{4} - 12 = 0$<br>$x = \dfrac{1}{2} \pm \sqrt{\dfrac{49}{4}}$<br>$x = 4\ or\ x = -3$ | $2x^2 + 8x - 1 = 0$ | $Doesn't$<br>$factorise$ | $a = 2, b = 8, c = -1$<br><br>$x = \dfrac{-8 \pm \sqrt{64+8}}{4}$<br><br>$x = 0.12\ or\ x = -4.12$ | $2(x+2)^2 - 8 - 1 = 0$<br>$(x+2)^2 = \dfrac{9}{2}$<br>$x = 0.12\ or\ x = -4.12$ |
| $x^2 + 4x - 2 = 0$ | $Doesn't$<br>$factorise$ | $a = 1, b = 4, c = -2$<br><br>$x = \dfrac{1 \pm \sqrt{16+8}}{2}$<br><br>$x = 0.45\ or\ x = -4.45$ | $(x+2)^2 - 4 - 2 = 0$<br>$(x+2)^2 = 6$<br>$x = -2 \pm \sqrt{6}$<br>$x = 0.45\ or\ x = -4.45$ | $x^2 + 3x = 18$ | $x^2 + 3x - 18 = 0$<br>$(x+6)(x-3) = 0$<br>$x = -6\ or\ x = 3$ | $a = 1, b = 3, c = -18$<br><br>$x = \dfrac{-3 \pm \sqrt{9+72}}{2}$<br><br>$x = -6\ or\ x = 3$ | $\left(x + \dfrac{3}{2}\right)^2 - \dfrac{9}{4} - 18 = 0$<br>$x = -\dfrac{3}{2} \pm \sqrt{\dfrac{81}{4}}$<br>$x = -6\ or\ x = 3$ |
| $x^2 + 2x - 5 = 0$ | $Doesn't$<br>$factorise$ | $a = 1, b = 2, c = -5$<br><br>$x = \dfrac{-2 \pm \sqrt{4+20}}{2}$<br><br>$x = 1.45\ or\ x = -3.45$ | $\left(x + \dfrac{1}{2}\right)^2 - \dfrac{1}{4} - 5 = 0$<br>$\left(x + \dfrac{1}{2}\right)^2 = \dfrac{21}{4}$<br>$x = 1.45\ or\ x = -3.45$ | $2x^2 = 4x + 1$ | $Doesn't$<br>$factorise$ | $a = 2, b = -4, c = -1$<br><br>$x = \dfrac{4 \pm \sqrt{16+8}}{4}$<br><br>$x = 2.22\ or\ x = -0.22$ | $2(x-1)^2 - 2 - 1 = 0$<br>$(x-1)^2 = \dfrac{3}{2}$<br>$x = 2.22\ or\ x = -0.22$ |