



Algebra: Solving quadratic equations using factorisation



Overview

This presentation will cover:

- ▶ quadratic equations
- ▶ solving quadratic equations using factorisation



Quadratic equations

Quadratic equations have a general form of

$$ax^2 + bx + c = 0$$

where a , b and c are constant terms.

Quadratic equations are used in many disciplines and can be solved by a number of methods.

This presentation will focus on using factorisation.

For a different method, please see the next presentation.



Using factorisation

If the expression $x^2 + bx + c$ (note: $a = 1$) can be factorised as $(x + d)(x + e)$, the solution of the equation can be found as follows:

$$\begin{aligned}x^2 + bx + c &= 0, \\(x + d)(x + e) &= 0.\end{aligned}$$

Since the product of two factors is 0 then at least one of the factors is 0, thus

$$(x + d) = 0 \quad \text{or} \quad (x + e) = 0.$$

That is,

$$x = -d \quad \text{or} \quad x = -e.$$



Example

Solve the quadratic $x^2 + 3x + 2 = 0$

$$\begin{aligned}x^2 + 3x + 2 &= 0, \\(x + 1)(x + 2) &= 0, \\x &= -1 \text{ or } x = -2.\end{aligned}$$

If you need to brush up on your factorising skills, please see the recording for factorisation.



Exercise

Solve these quadratic equations (using factorisation):

1. $x^2 - 5x + 6 = 0$
2. $x^2 - x - 2 = 0$
3. $x^2 - 4 = 0$
4. $x^2 + 5x = 6$



Example

Solve: $6x^2 + 7x + 2 = 0$

$$\begin{aligned}6x^2 + 7x + 2 &= 0, \\6x^2 + 4x + 3x + 2 &= 0, \\2x(3x + 2) + (3x + 2) &= 0, \\(3x + 2)(2x + 1) &= 0, \\3x + 2 = 0 \text{ or } 2x + 1 = 0, \\x &= -\frac{2}{3} \text{ or } x = -\frac{1}{2}.\end{aligned}$$




Solutions

1.

$$\begin{aligned}x^2 - 5x + 6 &= 0, \\(x - 3)(x - 2) &= 0, \\x &= 3 \text{ or } x = 2.\end{aligned}$$

2.

$$\begin{aligned}x^2 - x - 2 &= 0, \\(x - 2)(x + 1) &= 0, \\x &= 2 \text{ or } x = -1.\end{aligned}$$



Solutions (continued)

3.

$$\begin{aligned}x^2 - 4 &= 0, \\(x + 2)(x - 2) &= 0, \\x &= -2 \text{ or } x = 2.\end{aligned}$$

4.

$$\begin{aligned}x^2 + 5x &= 6, \\x^2 + 5x - 6 &= 0, \\(x + 6)(x - 1) &= 0, \\x &= -6 \text{ or } x = 1.\end{aligned}$$



Summary

This presentation covered how to solve quadratic equations using the factorisation method.