

Consider

$$\begin{aligned}
 &(x+a)(x+b) \\
 &= x^2 + ax + bx + ab \\
 &= x^2 + (a+b)x + ab
 \end{aligned}$$

Factorising is the reverse of this process

Example

$$\begin{aligned}
 x^2 + 5x + 6 & \quad \begin{array}{l} +1+6 \\ -1-6 \\ +2+3 \checkmark \\ -2-3 \end{array} \\
 = (x+2)(x+3)
 \end{aligned}$$

We can use this factorising method to solve some quadratic equations

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

If two brackets multiply to 0 then one of the brackets must be equal to 0

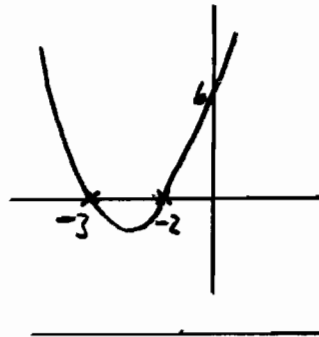
So either $x + 2 = 0$

$\Rightarrow \underline{x = -2}$

or $x + 3 = 0$

$\Rightarrow \underline{x = -3}$

Sketch of $y = x^2 + 5x + 6$



We will now work through 8 examples using the technique of factorising to solve quadratic equations. These examples will illustrate the various patterns that emerge from the different combinations of +/- signs of the terms in the equation

Example 1

Solve

$$x^2 + 11x + 10 = 0$$

+1 +10 ✓
-1 -10
+2 +5
-2 -5

$$(x + 1)(x + 10) = 0$$

Either $x + 1 = 0$

$$\Rightarrow \underline{x = -1}$$

or $x + 10 = 0$

$$\Rightarrow \underline{x = -10}$$

Example 2

Solve

$$x^2 - 6x + 8 = 0$$

+1 +8
-1 -8
+2 +4
-2 -4 ✓

$$(x - 2)(x - 4) = 0$$

Either $x - 2 = 0$

$$\Rightarrow \underline{x = +2}$$

or $x - 4 = 0$

$$\Rightarrow \underline{x = +4}$$

Example 3

Solve

$$x^2 + 7x + 12 = 0$$

+1 +12
-1 -12
+2 +6
-2 -6
+3 +4 ✓
-3 -4

$$(x + 3)(x + 4) = 0$$

Either $x + 3 = 0$

$$\Rightarrow \underline{x = -3}$$

or $x + 4 = 0$

$$\Rightarrow \underline{x = -4}$$

Example 4

Solve

$$x^2 - 9x + 14 = 0$$

+1 +14
-1 -14
+2 +7
-2 -7 ✓

$$(x - 2)(x - 7) = 0$$

Either $x - 2 = 0$

$$\Rightarrow \underline{x = +2}$$

or $x - 7 = 0$

$$\Rightarrow \underline{x = +7}$$

SOLVING QUADRATIC EQUATIONS BY FACTORISING (1) TRANSCRIPT

Example 5

Solve

$$x^2 + 3x - 10 = 0$$

+1 -10
-1 +10
+2 -5
-2 +5✓

$$(x + 5)(x - 2) = 0$$

$$\Rightarrow x = -5$$

$$\text{or } x = +2$$

Example 6

Solve

$$x^2 - x - 12 = 0$$

+1 -12
-1 +12
+2 -6
-2 +6
+3 -4✓
-3 +4

$$(x + 3)(x - 4) = 0$$

$$\Rightarrow x = -3$$

$$\text{or } x = +4$$

Example 7

Solve

$$x^2 + 5x - 6 = 0$$

+1 -6
-1 +6✓
+2 -3
-2 +3

$$(x - 1)(x + 6) = 0$$

$$\Rightarrow x = 1$$

$$\text{or } x = -6$$

Example 8

Solve

$$x^2 - 2x - 8 = 0$$

+1 -8
-1 +8
+2 -4 ✓
-2 +4

$$(x + 2)(x - 4) = 0$$

$$\Rightarrow x = -2$$

$$\text{or } x = +4$$

Summary:

$$x^2 + (a+b)x + ab$$
$$(x + a)(x + b)$$

The numbers a and b in the brackets must multiply to give the constant term, and add together to give the amount of x in the quadratic expression