

Solving Quadratic Equations ($ax^2 + bx + c = 0$)

★ Method #1: Factoring

Example 1: $x^2 + 6x + 8 = 0$ ← "Simple Trinomial"

Add Multiply
↓ ↓

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

Either $x + 2 = 0$ or $x + 4 = 0$

$$x = -2 \qquad x = -4$$

The roots of this quadratic equation are -2 and -4.

★ 2 x-intercepts!

② $y = x^2 + 7x$

Find the roots: ($y=0$)

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

$$0 = (x)(x+7)$$

$$\begin{array}{l|l} x=0 & x+7=0 \\ (0,0) & x=-7 \\ & (-7,0) \end{array}$$

③ $y = x^2 - 7x + 12$

Find the roots: ($y=0$)

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

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

$$\begin{array}{l|l} x-3=0 & x-4=0 \\ x=3 & x=4 \end{array}$$

simple trinomial

$$\underline{-3} \times \underline{-4} = 12$$

$$\underline{-3} + \underline{-4} = -7$$

Example 2: $7x^2 + 4x = 0$

"Common Factor"

$$x(7x + 4) = 0$$

Either $x = 0$ or $7x + 4 = 0$

$$(0, 0)$$

$$\frac{7x}{7} = \frac{-4}{7}$$

$$x = \frac{-4}{7}$$

$$\left(-\frac{4}{7}, 0\right)$$

The roots of this quadratic equation are 0 and $\frac{-4}{7}$.

★ 2 x-intercepts!

Example 3: $10x^2 = 100$

"Simple Solving"

*Since there is only 1 variable we can solve for "x" very easily.

$$\frac{10x^2}{10} = \frac{100}{10}$$

$$x^2 = 10$$

$$x = \sqrt{10}$$

$$x = +\sqrt{10} \text{ and } -\sqrt{10}$$

The roots of this quadratic equation are $+\sqrt{10}$ and $-\sqrt{10}$.

★ 2 x-intercepts!

Example 4: $2x^2 + x - 15 = 0$

$$(2x^2 + 6x) - 5x - 15 = 0$$

$$2x(x + 3) - 5(x + 3) = 0$$

$$(x + 3)(2x - 5) = 0$$

Either $x + 3 = 0$ or $2x - 5 = 0$

$$x + 3 = 0 \quad 2x - 5 = 0$$

$$x = -3 \quad \frac{2x}{2} = \frac{5}{2}$$

$$x = \frac{5}{2}$$

$$x = \frac{5}{2}$$

$$2$$

"Decomposition"

Multiply $\Rightarrow -30$ Add $\Rightarrow 1$

★ + 6 and -5

The roots of this quadratic equation are -3 and $\frac{5}{2}$.

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★ 2 x-intercepts!

② $y = 3x^2 + 7x - 6$

Find the roots: ($y=0$)

$$0 = 3x^2 + 7x - 6$$

$$0 = (3x^2 + 9x) - 2x - 6$$

$$0 = 3x(x+3) - 2(x+3)$$

$$0 = (x+3)(3x-2)$$

$$x+3=0$$

$$x=-3$$

$$(-3, 0)$$

$$3x-2=0$$

$$3x=2$$

$$x = \frac{2}{3}$$

$$(\frac{2}{3}, 0)$$

Trinomial Decomposition

$$\frac{9}{9}x - \frac{2}{9} = -18$$

$$-9 + -2 = 7$$

$$\textcircled{4} \quad m^2 - 7m = 18$$

$$m^2 - 7m - 18 = 0$$

$$(m - 9)(m + 2) = 0$$

Simple Trinomial

$$\underline{-9} \times \underline{2} = -18$$

$$\underline{-9} + \underline{2} = -7$$