

Quadratic equation

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Root (zero)

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First step when factorising

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Zero product rule

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Why not divide both sides by x ?

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Solve $x^2 + 6x = 0$

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Solve $3x^2 - 12x = 0$

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$a^2 - b^2$

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a solution of the equation; where the graph crosses the x-axis

an equation that can be written $ax^2 + bx + c = 0$ with $a \neq 0$

if $p \times q = 0$ then $p = 0$ or $q = 0$

rearrange so that one side is 0

$x(x + 6) = 0$, so $x = 0$ or $x = -6$

you lose the solution $x = 0$; factorise instead

$(a + b)(a - b)$: difference of two squares

$3x(x - 4) = 0$, so $x = 0$ or $x = 4$

Solve $x^2 - 49 = 0$

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Solve $4x^2 - 25 = 0$

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Factorise $x^2 + bx + c$

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

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Solve $x^2 - 2x - 15 = 0$

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If c is negative, the two numbers...

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Factorise $ax^2 + bx + c$ when $a \neq 1$

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Solve $2x^2 + 7x + 3 = 0$

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$$(2x + 5)(2x - 5) = 0, \text{ so } x = \pm \frac{5}{2}$$

$$(x + 7)(x - 7) = 0, \text{ so } x = \pm 7$$

$$(x + 2)(x + 3) = 0, \text{ so } x = -2 \text{ or } x = -3$$

find two numbers with product c and sum b

have different signs

$$(x - 5)(x + 3) = 0, \text{ so } x = 5 \text{ or } x = -3$$

$$2x^2 + x + 6x + 3 = 0, (2x + 1)(x + 3) = 0, \text{ so } x = -\frac{1}{2} \text{ or } x = -3$$

multiply $a \times c$, find two numbers with that product and sum b, split the middle term, factorise in pairs

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

The quadratic formula

Name a, b and c in $3x^2 - 5x + 1 = 0$

Solve $2x^2 + 3x - 4 = 0$

Solve $x^2 - 4x + 1 = 0$

Which method should I try first?

A root that makes no sense in context

Completing the square: $x^2 + bx$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$(2x - 3)(3x + 2) = 0, \text{ so } x = \frac{3}{2} \text{ or } x = -\frac{2}{3}$$

$$x = \frac{-3 \pm \sqrt{41}}{4}, \text{ so } x = 0.851 \text{ or } x = -2.35 \text{ (3 s.f.)}$$

$$a = 3, b = -5, c = 1$$

rearrange to 0, then look for a common factor, a difference of two squares, or product and sum; otherwise use the formula

$$x = \frac{4 \pm \sqrt{12}}{2} = 2 \pm \sqrt{3}$$

$$\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2$$

reject it, e.g. a negative length

Solve $x^2 + 6x + 2 = 0$ by completing the square

Solve $2x^2 + 8x + 1 = 0$ by completing the square

Why use $\pm$ when taking a square root?

Discriminant

$$\Delta > 0$$

$$\Delta = 0$$

$$\Delta < 0$$

**$x^2 + 6x + k = 0$ has one solution.
Find k**

$$2(x + 2)^2 = 7, \text{ so } x = -2 \pm \sqrt{\frac{7}{2}}$$



$$(x + 3)^2 = 7, \text{ so } x = -3 \pm \sqrt{7}$$



$\Delta = b^2 - 4ac$, the part under the square root
in the formula



both a positive and a negative number
square to the same value



one repeated real solution; the graph
touches the x-axis



two different real solutions



$$36 - 4k = 0, \text{ so } k = 9$$



no real solutions; the graph does not reach
the x-axis

