What is a quadratic?

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What is a root (or solution, or zero)?

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The null factor law

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First step when solving by factorising?

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Factorise $x^2 + bx + c$

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$x^2 + bx + c$ with c positive: which signs?

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$x^2 + bx + c$ with c negative: which signs?

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Factorise $x^2 + 5x$

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A value of x that makes the quadratic equal 0
On a graph it is an **x-intercept**

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The highest power of x is 2

$ax^2 + bx + c$

where a is not 0

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Make one side of the equation **equal to 0**

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If A × B = 0
then **A = 0 or B = 0**

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Both numbers have the **same sign**, the same as b

$x^2 + 8x + 15 = (x + 3)(x + 5)$

$x^2 - 8x + 15 = (x - 3)(x - 5)$

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Find two numbers that **multiply to c** and **add to b**

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Common factor x

$x(x + 5)$

Always look for a common factor first

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One number is + and one is –
The **larger** number has the sign of b

$x^2 + 2x - 15 = (x + 5)(x - 3)$

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Difference of two squares: the rule

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How do you spot a difference of two squares?

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Factorise $x^2 - 49$

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Factorise $4x^2 - 25$

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Is $x^2 + 49$ a difference of two squares?

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Perfect squares: the rules

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Factorise $x^2 + 6x + 9$

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Factorise $x^2 - 10x + 25$

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Exactly **two terms**
Both are **perfect squares**
A **minus** between them
No x term

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$$a^2 - b^2 = (a + b)(a - b)$$

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

Square roots: 2x and 5

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$$(x + 7)(x - 7)$$

Square roots: x and 7

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$$a^2 + 2ab + b^2 = (a + b)^2$$
$$a^2 - 2ab + b^2 = (a - b)^2$$

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No
There is a plus sign, not a minus
It does not factorise

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$$(x - 5)^2$$

Check: $2 \times x \times 5 = 10x$

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$$(x + 3)^2$$

Check: $2 \times x \times 3 = 6x$

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Factorise $2x^2 + 7x + 3$ (the ac method)

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Factorise $2x^2 + 5x + 2$

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Factorise $3x^2 + 12x$

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Solve $x^2 = 25$

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Complete the square: $x^2 + 6x$

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Completing the square: the rule

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The quadratic formula

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The discriminant

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$(2x + 1)(x + 2)$

$a \times c = 4$, numbers 1 and 4

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$a \times c = 6$, so find two numbers that multiply to 6 and add to 7: 1 and 6

$2x^2 + x + 6x + 3$

$x(2x + 1) + 3(2x + 1)$

$(2x + 1)(x + 3)$

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$x = 5$ or $x = -5$

Remember the ±

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$3x(x + 4)$

Common factor $3x$

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$x^2 + bx + c$

$=$

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

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Half of 6 is 3

$(x + 3)^2 - 9$

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$b^2 - 4ac$

It is the part under the square root in the formula

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

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

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What does the discriminant tell you?

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

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Solve $2x^2 - 18 = 0$

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Why not divide both sides by x in $x^2 = 3x$?

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Where is the axis of symmetry?

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How do you check a solution?

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Expand $(x + 3)^2$

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What if it does not factorise?

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

$x = -5$ or $x = 3$

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Greater than 0: **two** solutions
Equal to 0: **one** solution
Less than 0: **no** real solutions

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You lose the solution $x = 0$
Write $x^2 - 3x = 0$, then $x(x - 3) = 0$
$x = 0$ or $x = 3$

Y11
Quadratics

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$2x^2 = 18$, so $x^2 = 9$

$x = 3$ or $x = -3$

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Substitute it back into the original equation
Both sides should match, or give 0

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Halfway between the two roots
The vertex is on this line

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Use the **quadratic formula**
or **complete the square**
Check with a calculator

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$x^2 + 6x + 9$

Not $x^2 + 9$

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