

Solve Quadratic Equations by Using the Formula - PDF Copy

The presentation contains the slides below with the objective of showing how to: **Solve quadratic equations by using the formula.** There are animated explanations and problems with answers,

Solving Quadratics with the Formula

Objective
Solve quadratic equations by using the formula

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


1

Recap of solving quadratics by factorising...



2

$0 = x^2 + 8x + 12$

List of the factor pairs of 12

$0 = (x \quad)(x \quad)$

$1 \times 12 = 12$
 $3 \times 4 = 12$
 $6 \times 2 = 12$

To factorise, we need the two numbers that fit in the brackets

From these, choose the pair that have a sum of 8

$6 + 2 = 8$



3

$0 = x^2 + 8x + 12$

$0 = (x + 6)(x + 2)$

$1 \times 12 = 12$
 $3 \times 4 = 12$
 $6 \times 2 = 12$

These are the two numbers that fit into the brackets

$6 + 2 = 8$



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$0 = x^2 + 8x + 12$

$0 = (x + 6)(x + 2)$

This equation is true when the terms in either pair of brackets is zero so...

$x + 6 = 0 \rightarrow x = -6$

and $x + 2 = 0 \rightarrow x = -2$



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Solve these by factorising

- $x^2 + 6x + 8 = 0$
- $x^2 + 4x - 12 = 0$
- $x^2 - 3x - 10 = 0$
- $x^2 - 5x + 6 = 0$
- $x^2 + 2x - 12 = 0$

You will probably find problem number 6 a bit tricky!



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- $x^2 + 6x + 8 = 0 \rightarrow (x + 2)(x + 4) \rightarrow x = -2 \text{ \& } -4$
- $x^2 + 4x - 12 = 0 \rightarrow (x + 6)(x - 4) \rightarrow x = -6 \text{ \& } 4$
- $x^2 - 3x - 10 = 0 \rightarrow (x - 5)(x + 2) \rightarrow x = 5 \text{ \& } -2$
- $x^2 - 5x + 6 = 0 \rightarrow (x - 2)(x - 3) \rightarrow x = 2 \text{ \& } 3$
- $x^2 + 2x - 12 = 0$

When we try to factorise problem number 5, this happens...



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Solve by factorising

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

$1 \times -12 = -12$
 $2 \times -6 = -12$
 $3 \times -4 = -12$
 $4 \times -3 = -12$
 $6 \times -2 = -12$
 $12 \times -1 = -12$

Find the factor pairs of -12

But there is not a pair with a sum (+) of 2

The answers will be decimal numbers and we can find this using a formula...



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Using the formula

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

To find solutions to quadratics

The formula will 'sort out' any quadratic. Here is what you do...



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

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

Solve this quadratic with the formula

To do this, we substituted the equation's numbers into the formula like this...



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

$a = 1$
 $b = 2$
 $c = -12$

'b' is the number that multiplies x^2

'b' is the number that multiplies x

'c' is the number term



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Substituting into the formula gives...

$x = \frac{-2 \pm \sqrt{2^2 - 4 \times 1 \times -12}}{2 \times 1}$

Working out gives...

$x = \frac{-2 \pm \sqrt{4 - 48}}{2}$

$x = \frac{-2 \pm \sqrt{52}}{2}$

To 2 dp, $+\sqrt{52}$ gives...

$x = \frac{-2 + 7.21}{2}$
 $x = 2.61$



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Substituting into the formula gives...

$$x^2 + 2x - 12 = 0 \quad a=1 \quad b=2 \quad c=-12$$

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

Working out gives...

$$x = \frac{-2 \pm \sqrt{(2^2 - 4 \times 1 \times -12)}}{2 \times 1}$$

$$x = \frac{-2 \pm \sqrt{4 - (-48)}}{2}$$

To 2 dp, $-\sqrt{52}$ gives...

$$x = \frac{-2 + \sqrt{52}}{2} \quad x = 2.6$$

$$x = \frac{-2 - \sqrt{52}}{2} \quad \text{and}$$

$$x = -4.61 \quad x = -4.6$$


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Here is another example...



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Solve this quadratic with the formula

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

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


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'a' is the number that multiplies x^2

'b' is the number that multiplies x

'c' is the number term

$$x^2 - 5x + 2 = 0 \quad a=1 \quad b=-5 \quad c=2$$

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


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Substitute into the formula...

$$x^2 - 5x + 2 = 0 \quad a=1 \quad b=-5 \quad c=2$$

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

Working out gives...

$$x = \frac{-(-5) \pm \sqrt{((-5)^2 - 4 \times 1 \times 2)}}{2 \times 1}$$

$$x = \frac{5 \pm \sqrt{(25 - 8)}}{2}$$

Notice that $-(-5)$ is plus 5

And $-(-5)^2$ is plus 25



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Working out gives...

$$x^2 - 5x + 2 = 0 \quad a=1 \quad b=-5 \quad c=2$$

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

$$x = \frac{-(-5) \pm \sqrt{((-5)^2 - 4 \times 1 \times 2)}}{2 \times 1}$$

$$x = \frac{5 \pm \sqrt{(25 - 8)}}{2} \quad x = 4.12$$

$+\sqrt{(17)}$ gives...

$$x = \frac{5 + \sqrt{17}}{2} \quad x = 4.56$$

$$x = \frac{5 - \sqrt{17}}{2} \quad x = 0.44$$


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Working out gives...

$$x^2 + 2x - 12 = 0 \quad a=1 \quad b=2 \quad c=-12$$

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

$$x = \frac{-2 \pm \sqrt{(2^2 - 4 \times 1 \times -12)}}{2 \times 1}$$

$$x = \frac{-2 \pm \sqrt{4 - (-48)}}{2}$$

$-\sqrt{(17)}$ gives...

$$x = \frac{5 + \sqrt{17}}{2} \quad x = 4.12$$

and

$$x = \frac{5 - \sqrt{17}}{2} \quad x = 0.44$$


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Using the formula, solve these quadratics giving the answer to 2 d.p. when necessary

- $x^2 + 6x + 5 = 0$
- $x^2 + 5x + 3 = 0$
- $x^2 + 4x - 4 = 0$
- $x^2 + 6x - 7 = 0$
- $x^2 - 4x + 2 = 0$
- $x^2 - 4x + 1 = 0$
- $x^2 - 4x - 3 = 0$
- $x^2 - 6x - 5 = 0$

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


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Using the formula, solve these quadratics giving the answer to 2 d.p. when necessary

- $x^2 + 6x + 5 = 0$ $x = -1$ and -5
- $x^2 + 5x + 3 = 0$ $x = -0.70$ and -4.30
- $x^2 + 4x - 4 = 0$ $x = -4.83$ and -0.83
- $x^2 + 6x - 7 = 0$ $x = -7$ and 1
- $x^2 - 4x + 2 = 0$ $x = 0.59$ and 3.41
- $x^2 - 4x + 1 = 0$ $x = 0.27$ and 3.73
- $x^2 - 4x - 3 = 0$ $x = 0.65$ and 4.65
- $x^2 - 6x - 5 = 0$ $x = -0.74$ and 6.74



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