

# Quadratic Formula

GCSE Maths · Written to the shared content for AQA, Edexcel and OCR

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## 1. Worked example

**Solve  $x^2 + 3x - 5 = 0$ , giving your answers to 2 decimal places.**

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

$$x = \frac{-3 \pm \sqrt{3^2 - 4 \times 1 \times (-5)}}{2}$$

Step 2 · Discriminant

$$9 + 20 = 29$$

Step 3 · Two values

$$(-3 + \sqrt{29})/2 = 1.192... \quad (-3 - \sqrt{29})/2 = -4.192...$$

**Answer:  $x = 1.19$  or  $x = -4.19$**

Check:  $1.19^2 + 3(1.19) - 5 \approx -0.014$ , close to 0 (the rounding) ✓

## 2. Now try one with the steps

**Solve  $2x^2 - 7x + 2 = 0$ . Give exact answers.**

Step 1 ·  $a = 2$ ,  $b = -7$ ,  $c = 2$ ; note  $-b = 7$

Step 2 · Simplify

**Answer:**

## 3. Practice

Show your working. The marks tell you how much is expected.

**1.** For  $2x^2 + 5x - 3 = 0$ , write down the values of  $a$ ,  $b$  and  $c$ . [1]

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**2.** Work out the discriminant of  $x^2 + 6x + 4$ . [1]

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**3.** How many real roots does  $x^2 - 4x + 4 = 0$  have? [1]

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4. Solve  $x^2 + 5x + 3 = 0$ , giving your answers to 2 decimal places. [3]

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5. Solve  $x^2 - 2x - 7 = 0$ . Give your answers in the form  $p \pm q\sqrt{2}$ . [3]

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6. Solve  $2x^2 + 3x - 4 = 0$ , giving your answers to 2 decimal places. [3]

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7. Solve  $3x^2 - x - 1 = 0$ , giving your answers to 2 decimal places. [3]

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8. Solve  $x^2 = 6x - 2$ . Give exact answers. [3]

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9. Solve  $5x^2 + 2x - 1 = 0$ . Give exact answers in their simplest form. [4]

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10. Show that  $x^2 + x + 3 = 0$  has no real solutions. [2]

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11.  $x^2 + kx + 9 = 0$  has exactly one solution and  $k$  is positive. Find  $k$ . [3]

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12. Solve  $x(x + 4) = 3$ , giving your answers to 2 decimal places. [3]

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13. Solve  $(2x - 1)(x + 3) = 5$ , giving your answers to 2 decimal places. [4]

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14. A rectangle is  $x$  cm wide and  $(x + 3)$  cm long. Its area is  $20 \text{ cm}^2$ . Find  $x$  to 2 decimal places. [4]

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15. A ball's height after  $t$  seconds is  $h = 2 + 20t - 5t^2$  metres. Find when it hits the ground, to 2 decimal places, in seconds. [4]

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#### 4. Before you hand it in

**$2x^2 - 7x + 2 = 0$ :  $x = \frac{-7 \pm \sqrt{33}}{4}$**

$b = -7$ , so  $-b = +7$ . Write the substitution with brackets:  $-(-7) = 7$ .

**$b^2$  with  $b = -5$  worked out as  $-25$**

$(-5)^2 = +25$ . Use brackets on the calculator, or square the size and keep it positive —  $b^2$  is never negative.

**$x = \frac{-3 \pm \sqrt{29}}{2}$**

The whole numerator is divided:  $x = \frac{-3 \pm \sqrt{29}}{2}$ . Draw one long fraction line.

**Using the formula on  $3x^2 = 5x + 1$  with  $a = 3$ ,  $b = 5$ ,  $c = 1$**

The formula needs  $ax^2 + bx + c = 0$ . Rearrange first:  $3x^2 - 5x - 1 = 0$ .