



Quadratic equations

Quadratic equations can be written in the form $ax^2 + bx + c = 0$ where a , b and c are numbers.

If a quadratic equation is given in a different form you should rearrange it before solving it.

If you can factorise the left-hand side of a quadratic equation, you can solve it without a calculator.

For a reminder about factorising quadratic expressions have a look at page 22.

Two to watch

- When $c = 0$:
 $x^2 - 10x = 0$
 $x(x - 10) = 0$
 Solutions are $x = 0$ and $x = 10$.
- When $b = 0$ (difference of two squares):
 $9x^2 - 4 = 0$
 $(3x + 2)(3x - 2) = 0$
 Solutions are $x = \frac{2}{3}$ and $x = -\frac{2}{3}$.

Worked example

grade B

Solve $x^2 + 8x - 9 = 0$

$$(x + 9)(x - 1) = 0$$

$$\begin{array}{l} x + 9 = 0 \\ x = -9 \end{array} \qquad \begin{array}{l} x - 1 = 0 \\ x = 1 \end{array}$$

Quadratic equations questions can go up to A*. You might have to form the equation before solving the problem.

EXAM ALERT!

Just over half of students got this question wrong. To solve by factorising, look for two numbers which add up to 8 and multiply to make -9. The numbers are 9 and -1.

Set each factor to 0 then solve to find the solutions.

Check it!

$$(1)^2 + 8(1) - 9 = 1 + 8 - 9 = 0 \quad \checkmark$$

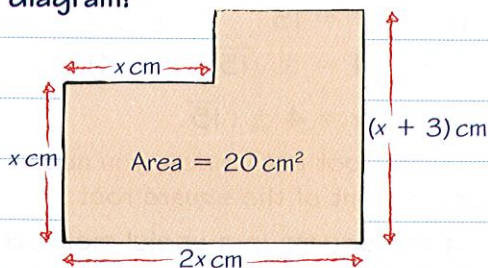
$$(-9)^2 + 8(-9) - 9 = 81 - 72 - 9 = 0 \quad \checkmark$$

This was a real exam question that caught students out – be prepared!

ResultsPlus

Quadratic equations sometimes appear when you are solving problems.

What is the value of x in this diagram?



$$x^2 + x(x + 3) = 20$$

$$x^2 + x^2 + 3x = 20$$

$$2x^2 + 3x - 20 = 0$$

$$(2x - 5)(x + 4) = 0$$

$$2x - 5 = 0 \qquad x + 4 = 0$$

$$x = 2\frac{1}{2} \qquad x = -4$$

So $x = 2\frac{1}{2}$

Only one of these solutions makes sense. Lengths can't be negative numbers.

Now try this

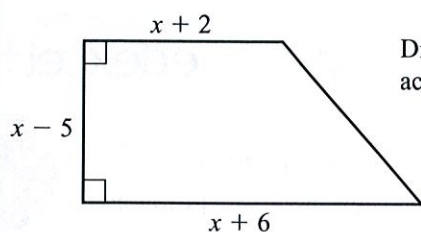


Diagram NOT accurately drawn

The diagram shows a trapezium. All measurements are given in centimetres. The area of the trapezium is 36 cm^2 .

- Show that $x^2 - x - 56 = 0$ (2 marks)
- (i) Solve the equation $x^2 - x - 56 = 0$ (3 marks)
 (ii) Hence find the length of the shortest side of the trapezium. (1 mark)

edexcel

grade A