A* A B C D

The quadratic formula

This is how the quadratic formula will appear on the formula sheet in your exam.

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

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

If you're going for an A or A*, you may need to use this in a problem-solving question.

Safe substituting

- Equation is in the form $ax^2 + bx + c = 0$. ✓
- Write down your values of a, b and c before you substitute. ✓
- Use brackets when you are substituting negative numbers. ✓
- Show what you have substituted in the formula. ✓
- Simplify what is under the square root and write this down. ✓
- The $\pm$ symbol means you need to do two calculations. ✓

Worked example

grade A

Solve $5x^2 + x + 11 = 14$

Give your solutions correct to 3 significant figures.

$5x^2 + x - 3 = 0$

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

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

$$= \frac{-1 + \sqrt{61}}{10} \text{ or } \frac{-1 - \sqrt{61}}{10}$$

$= 0.681024...$ or $-0.881024...$

$= 0.681$ or -0.881 (to 3 s.f.)

You are asked to find 'solutions'. This tells you that you are solving a quadratic equation.
You must give your answer 'correct to 3 significant figures'. This tells you that you need to use the quadratic formula. Turn to the formula sheet.

Write down at least five figures after the decimal point on the calculator display before giving your final answer. You might need to use the S⇔D button on your calculator to get your answer as a decimal.

How many solutions?

A quadratic equation can have two solutions, one solution or no solutions. You can use $b^2 - 4ac$ (the part under the square root) to work out how many solutions a quadratic equation has.

If $b^2 - 4ac$ is negative, there are no solutions. — You can't calculate the square root of a negative number.

If $b^2 - 4ac = 0$, there is only one solution. — ± 0 appears in the formula, so you get the same answer whether you use + or −.

If $b^2 - 4ac > 0$, there are two different solutions.

Now try this

edexcel

grade A

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places. **(3 marks)**

2. Solve $x^2 + x + 11 = 14$
Give your solutions correct to 3 significant figures. **(3 marks)**

grade A