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The Quadratic Formula

Solutions & Answer Key

Full worked solutions, marking scheme & answer key

IGCSE Mathematics

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Companion to the *Student Worksheet*

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Note

About this booklet. These are the complete solutions to every question in *The Quadratic Formula — Student Worksheet*. Question numbers match exactly: standard form S1–S6, using the formula F1–F6, decimal answers D1–D6, surd answers E1–E6, the discriminant N1–N5, unknown coefficients U1–U5, graphical interpretation G1–G6, word problems A1–A6, the Mixed Review MR1–MR12, and the examination questions Q1–Q8 of Part III.
Every solution states a, b and c first, then the discriminant, then the two roots — exactly the layout that earns method marks. Part V collects the common mistakes to watch for, and Part VI is a quick answer key for fast marking.

4 Part IV — Complete Solutions

Note

Where an answer is a surd or a fraction it is given exactly; decimal answers are rounded only on the final line. Several solutions include a substitution check, since checking one root takes a few seconds and catches almost every sign error.

4.1 Solutions — Standard Form and Coefficients

Solution S1

(a) $\boxed{a = 2,\ b = 7,\ c = -4}$ **(b)** $\boxed{a = 1,\ b = -6,\ c = 9}$
In (b) the coefficient of x^2 is an invisible 1, and the sign in front of the $6x$ belongs to b.

Solution S2

(a) There is no constant term, so $c = 0$: $\boxed{a = 5,\ b = -1,\ c = 0}$.
(b) There is no x term, so $b = 0$: $\boxed{a = 3,\ b = 0,\ c = -12}$.

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Solution S3

(a) Move every term to the left:

$$6x^2 - 5x - 4 = 0, \qquad \boxed{a = 6,\ b = -5,\ c = -4}.$$

(b) Move every term to the left:

$$-2x^2 + 9x - 3 = 0.$$

Multiplying through by -1 gives the tidier form

$$2x^2 - 9x + 3 = 0, \qquad \boxed{a = 2,\ b = -9,\ c = 3}.$$

Both versions give the same roots, but it is easier to work with a positive a.

Solution S4

Expand, then subtract 18 from both sides:

$$x^2 + 7x = 18 \implies x^2 + 7x - 18 = 0, \qquad \boxed{a = 1,\ b = 7,\ c = -18}.$$

Solution S5

Expand the brackets:

$$(2x - 1)(x + 5) = 2x^2 + 10x - x - 5 = 2x^2 + 9x - 5.$$

Now set the equation to zero:

$$2x^2 + 9x - 5 = 4 \implies 2x^2 + 9x - 9 = 0, \qquad \boxed{a = 2,\ b = 9,\ c = -9}.$$

Solution S6

The error: the student ignored the minus sign. The coefficient b is the *whole* term in front of x, sign included.

$$\boxed{a = 4,\ b = -9,\ c = 2}$$

This matters: with $b = -9$ the formula begins $-(-9) = +9$, whereas $b = 9$ would give -9 and both roots would come out wrong.

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Preview ends here

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