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WJEC GCSE Mathematics and Numeracy (Double Award) – Question Pack

Solving quadratic equations using the quadratic formula on the calculator-allowed paper, including problems where a real-world setup first has to be r

REVISE
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3.01 – Quadratic equations by formula

Spec 2.2.8 – Unit 3 (calculator allowed)

Solving quadratic equations using the quadratic formula on the calculator-allowed paper, including problems where a real-world setup first has to be reduced to a quadratic in standard form. Sourced from legacy WJEC GCSE Mathematics Higher calculator-allowed papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~54 minutes

Derived from the GCSE Higher pace of ~1.5 min/mark (36 marks across 8 questions).

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. Questions are organised against the 2025 specification. Questions are ordered chronologically by sitting, with custom-written and SAM questions at the end.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working – method marks are awarded for clear setup.

A calculator is allowed on every question in this pack (Unit 3 is the calculator-allowed paper).

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Quadratic equations by formula – what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 3: calculator-allowed.

Quadratic formula 2.2.8

- $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.
- Use when factorisation isn't clean or the question requires decimal answers.
- Calculator allowed in Unit 3 – answer to required d.p.

Standard form 2.2.8

- Rearrange to $ax^2 + bx + c = 0$ before substituting.
- Read a, b, c straight off – mind the signs.
- If $a < 0$, multiply through by -1 to keep things tidy.

Discriminant 2.2.8

- $\Delta = b^2 - 4ac$ controls the number of real roots.
- $\Delta > 0$: two real; $\Delta = 0$: one repeated; $\Delta < 0$: none.
- Useful for 'explain whether there are real roots' questions.

Forming the equation 2.2.8

- Translate worded / geometric setups into a quadratic in standard form.
- Expand brackets, collect terms, and move everything to one side.
- Sanity-check answers against the context – reject negative lengths or impossible cases.

Quadratic equations by formula in one page

Quick-reference notes – revisit before each question. Don't use during the questions.

Standard form

$$ax^2 + bx + c = 0$$

Always rearrange so one side is 0 before solving.

Expand brackets, move everything to one side, and tidy signs so $a > 0$ where possible.

Factorisation method

If $ax^2 + bx + c$ factorises into $(px + q)(rx + s)$, set each bracket to 0.

$$(x + a)(x + b) = 0 \Rightarrow x = -a \text{ or } x = -b.$$

Quickest route – try this first when the coefficients are small integers.

Quadratic formula

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

Use when factorisation isn't obvious or when the question asks for decimal answers.

Read a, b, c straight off the standard form – mind the signs.

Discriminant

$$\Delta = b^2 - 4ac$$

$\Delta > 0$: two distinct real roots.

$\Delta = 0$: one repeated root.

$\Delta < 0$: no real roots.

Worked example (factor)

Solve $x^2 + 4x - 21 = 0$.

$$(x + 7)(x - 3) = 0.$$

$$x = -7 \text{ or } x = 3.$$

Worked example (formula)

Solve $2x^2 + 3x - 50 = 0$ to 2 d.p.

$$x = \frac{-3 \pm \sqrt{9 + 400}}{4} = \frac{-3 \pm \sqrt{409}}{4}.$$

$$x = 4.31 \text{ or } x = -5.81 \text{ (2 d.p.)}.$$

'Show that' questions

Multi-part 'show that ... = 0' questions expect you to expand, collect, and verify the standard form.

Don't jump to solving until you've clearly arrived at the quoted equation.

Often the second part says 'hence solve' – use whichever method (factorise or formula) fits.

Common traps

- Forgetting the \pm in the formula – you should always get two values (or recognise $\Delta < 0$).

- Sign errors when reading b and c off the equation.

- Rounding too early – keep surds or exact values until the final step.

- Solving $(x + a)(x + b) = 0$ as $x + a + x + b = 0$.

Examiner only

12. Five quadratic equations are listed below.
 Draw a line connecting each equation to its solution.
 One has been completed for you.

[4]

Equation	Solution
$x^2 - 4 = 0$	$x = 1, x = -\frac{3}{2}$
	$x = 2, x = -2$
	$x = 1, x = \frac{3}{2}$
$x(2x + 3) = 0$	$x = \frac{4}{9}$
	$x = -1, x = -\frac{2}{3}$
	$x = -\frac{2}{3}, x = \frac{2}{3}$
$(x - 1)(2x - 3) = 0$	$x = \frac{3}{2}, x = -\frac{3}{2}$
	$x = 1, x = -\frac{2}{3}$
	$x = -\frac{9}{4}$
$(2x - 3)(2x + 3) = 0$	$x = 0, x = \frac{2}{3}$
	$x = \frac{81}{16}$
	$x = 0, x = -\frac{3}{2}$
	$x = \frac{3}{2}$
$(4x + 9)^2 = 0$	$x = -\frac{9}{4}, x = 0$

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Examiner only

11. (a) The area of the trapezium $ABCD$ is 25 cm^2 .

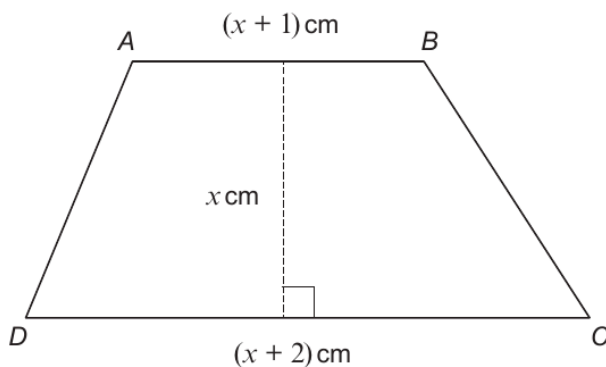


Diagram not drawn to scale

(i) Show that $2x^2 + 3x - 50 = 0$. [3]

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(ii) Solve the equation $2x^2 + 3x - 50 = 0$ to calculate the lengths AB and DC . Give your answers correct to 1 decimal place. [4]

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Length of AB = cm Length of DC = cm



(b) A rhombus has an area of 36.8 cm^2 .
The rhombus is enlarged by a scale factor of 7.
Calculate the area of the enlarged rhombus.

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Examiner
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19. Use the quadratic formula to solve $(5x + 3)(5x - 3) = 19x$.
Give your answers correct to 2 decimal places.
You must show all your working.

[5]

Examiner
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Examiner
only

(b) Solve the equation

$$2x^2 + x - 27 = 0.$$

You must use an algebraic method and show all your working.
Give your answers correct to 2 decimal places.

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(c) Evaluate the length of AC.
You must justify any decision that you make.

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14. Factorise $(2x + 3)^2 - 16$.

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Examiner
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15. Use the quadratic formula to solve the equation $11x^2 = 23x + 19$.
Give your answer correct to 2 decimal places.
You **must** show all your working.

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