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

Forming and solving quadratic equations by factorising on the non-calculator paper, including problems where a worded or geometric setup must first be

REVISE
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2.25 – Quadratic equations by factorisation

Spec 2.2.5 – Unit 2 (no calculator)

Forming and solving quadratic equations by factorising on the non-calculator paper, including problems where a worded or geometric setup must first be reduced to a quadratic in standard form. Sourced from legacy WJEC GCSE Mathematics Higher non-calculator papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~21 minutes

Derived from the GCSE Higher pace of ~1.5 min/mark (14 marks across 4 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 **not** permitted on any question in this pack (Unit 2 is the non-calculator paper).*

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Quadratic equations by factorisation – what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 2: non-calculator.

Factorising quadratics 2.2.5

- Look for two numbers that multiply to ac and add to b .
- Split the middle term and factor by grouping when $a \neq 1$.
- Each linear factor set to 0 gives a root.

Solving by factorisation 2.2.5

- Standard form first: $ax^2 + bx + c = 0$.
- Apply the zero-product principle: $AB = 0 \Rightarrow A = 0$ or $B = 0$.
- State both roots.

Forming the equation 2.2.5

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

Non-calc strategy 2.2.5

- Unit 2 is non-calculator – integer or simple fractional roots are expected.
- If the numbers look ugly, recheck your standard-form rearrangement.
- Keep fractions in lowest terms; don't approximate.

Quadratic equations by factorisation in one page

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

Standard form

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

Rearrange so one side is 0 before factorising.

Expand, collect like terms, sort signs – $a > 0$ is easier to factorise.

Factorise (simple)

When $a = 1$: find two numbers that multiply to c and add to b .

$$x^2 + 4x - 21 = (x + 7)(x - 3).$$

Set each bracket to 0: $x = -7$ or $x = 3$.

Factorise ($a \neq 1$)

Find two numbers that multiply to ac and add to b .

$2x^2 + x - 6$: need product -12 , sum 1 \rightarrow -3 and 4.

$$2x^2 - 3x + 4x - 6 = x(2x - 3) + 2(2x - 3) = (x + 2)(2x - 3).$$

Zero-product principle

If $AB = 0$ then $A = 0$ or $B = 0$.

From $(x + 2)(2x - 3) = 0$: $x = -2$ or $x = 3/2$.

This is why factorising works.

Worked example

Solve $4x^2 + 12x - 27 = 0$.

$ac = -108$, $b = 12 \rightarrow 18, -6$.

$$(2x + 9)(2x - 3) = 0 \Rightarrow x = -9/2 \text{ or } x = 3/2.$$

'Show that' & hence solve

Multi-part questions often ask: (a) show that ... = 0, (b) hence solve.

Use the result of (a) verbatim – don't re-derive.

Then factorise and apply the zero-product principle.

When factorisation fails

If you can't spot integer factors, the equation likely needs the formula (Unit 3) or completing the square.

On the non-calculator paper, factorisation should always be feasible – recheck your arithmetic.

Common traps

- Forgetting to move everything to one side first.
- Sign slip when reading b and c .
- Solving $(x + a)(x + b) = 0$ as $x + a + x + b = 0$.
- Forgetting one of the two roots.

Examiner
only

14. Aled has three concrete slabs.
Two of the slabs are square, with each side of length x metres.
The third slab is rectangular and measures 1 metre by $(x + 1)$ metres.
The three concrete slabs cover an area of 7 m^2 .

(a) Show that $2x^2 + x - 6 = 0$. [1]

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(b) Solve the equation to find the length of each side of the square slabs.
You must justify any decisions that you make. [4]

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Examiner
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16. The diagram shows two rectangles.

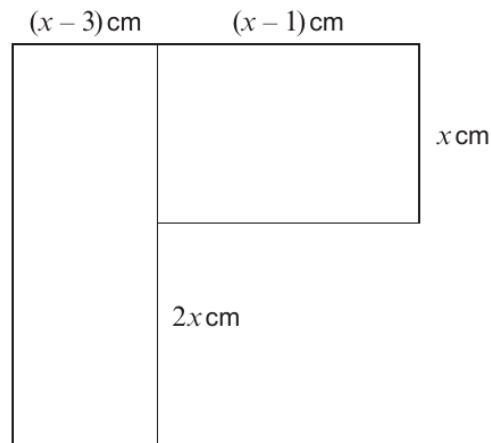


Diagram not drawn to scale

The combined area of both rectangles is 50 cm^2 .

By considering the areas of the two rectangles, show that $2x^2 - 5x - 25 = 0$ and hence find the value of x . [6]

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Examiner
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12. Two different squares are constructed.
The side length of the smaller square is x cm.
The side length of the larger square is 3 cm longer than the side length of the smaller square.
The combined area of the two squares is 22.5 cm^2 .

(a) Show that $4x^2 + 12x - 27 = 0$. [4]

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(b) Find the dimensions of each of the squares.
Do **not** use a trial and improvement method.
You must show all your working and **justify** any decision that you make. [5]

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Side length of smaller square = cm
Side length of larger square = cm



Examiner
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8. (a) Factorise $x^2 + 4x - 21$. Hence, solve $x^2 + 4x - 21 = 0$. [3]

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(b) Solve the equation $\frac{2x-3}{5} + \frac{4x+5}{2} = \frac{11}{2}$. [4]

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