Name	Date started	Target end date

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

Algebraic vocabulary, substituting numbers into expressions and formulae, and simplifying by collecting like terms. Sourced from legacy WJEC GCSE Math

REVISE
.wales

2.07 — Algebraic vocab, substitution & simplifying

Spec 2.1.1, 2.1.2, 2.1.3, 2.1.7 — Unit 2 (no calculator)

Algebraic vocabulary, substituting numbers into expressions and formulae, and simplifying by collecting like terms. 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: ~1 hours 6 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (44 marks across 14 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).*

Algebraic vocab, substitution & simplifying — what the new spec asks

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

Vocabulary 2.1.1

- Distinguish expression, equation, formula, identity.
- Recognise terms, factors and coefficients.
- Read $\equiv$ as ‘identically equal to’.

Substitution 2.1.2

- Substitute numerical values into expressions and formulae.
- Apply BIDMAS; wrap negatives in brackets before powers.
- Give exact answers unless told to round.

Simplifying 2.1.3

- Collect like terms; keep variable parts identical.
- Multiply & divide algebraic terms using index laws.
- Distinguish $x + x$ from $x \cdot x$.

Index laws on letters 2.1.7

- $x^m \cdot x^n = x^{m+n}$, $\dfrac{x^m}{x^n} = x^{m-n}$.
- $(x^m)^n = x^{mn}$ and $x^0 = 1$.
- Negative indices: $x^{-n} = \dfrac{1}{x^n}$.

Crib sheet »

Algebraic vocab, substitution & simplifying in one page

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

Terms vs expressions vs equations

A *term* is a single piece like $3x$ or $-5y^2$.

An *expression* is terms joined by $+$ or $-$ (no equals sign).

An *equation* has $=$; a *formula* expresses one variable in terms of others; an *identity* ($\equiv$) is true for every value.

Substituting values

Replace each letter with its value, then evaluate using BIDMAS.

If $a = 3$, $b = -2$: $2a - 3b = 2(3) - 3(-2) = 6 + 6 = 12$.

Wrap negatives in brackets before squaring: $b^2 = (-2)^2 = 4$, not -4.

Like terms

Terms are *like* only if they have the same letters with the same powers.

$3x$ and $5x$ are like; $3x$ and $3x^2$ are not.

Add coefficients, keep the letter part: $3x + 5x = 8x$, $7ab - 2ab = 5ab$.

Powers stay attached

$x \cdot x = x^2$, $x^2 \cdot x^3 = x^5$ (add the indices when multiplying).

$\frac{x^5}{x^2} = x^3$ (subtract when dividing).

You can't simplify $x^2 + x^3$ — not like terms.

Coefficients & signs

The coefficient is the number in front; an invisible 1 sits in front of a bare letter.

$x = 1x$, $-y = -1y$.

Watch signs when subtracting whole brackets: $-(3x - 4) = -3x + 4$.

Multiplying terms together

Multiply numbers, then letters: $3x \times 4y = 12xy$.

$2a \times 5a = 10a^2$.

$(-3x)(2x) = -6x^2$ — sign times sign first.

Dividing terms

Cancel numerical factors, then letters.

$\frac{12x^3}{4x} = 3x^2$, $\frac{20a^2b}{5ab} = 4a$.

Anything to the power 0 is 1, so $\frac{a}{a} = a^0 = 1$.

Common traps

- $3x + 4y$ does *not* simplify — different letters.
- $-x^2 \neq (-x)^2$: the first is $-(x^2)$, the second is x^2.
- Don't drop the letter when adding: $3x + 5x \neq 8$.

Examiner only

(c) Evaluate $16^{-\frac{3}{2}}$. [2]

16. Simplify the following expression.

$$\frac{4x^2 - 7x - 2}{4x - 8}$$ [4]

Examiner only

15. *(a)* Simplify $\sqrt{45}$.
Circle your answer. [1]

$3\sqrt{5}$ $3\sqrt{15}$ $5\sqrt{3}$ $9\sqrt{5}$ 22·5

(b) Evaluate $\left(2\sqrt{7}-\sqrt{3}\right)^2$.
Simplify your answer. [2]

Examiner only

13. *(a)* Show that [3]

$$6x(8x + 1) - 3(4x + 1)(4x - 1) \equiv 6x + 3.$$

(b) **Hence**, write down the value of x for which $6x(8x + 1) - 3(4x + 1)(4x - 1) = 0.$ [1]

Examiner only

(b) The area can be estimated again, using ordinates at every half unit, namely $x = 0$, $x = 0{\cdot}5$, $x = 1$, $x = 1{\cdot}5$, $x = 2$, $x = 2{\cdot}5$, $x = 3$, $x = 3{\cdot}5$ and $x = 4$.

Without calculating the new area, tick one of the following boxes.

The new area will be **equal to** the estimated area found in part *(a)*. ☐

The new area will be **greater than** the estimated area found in part *(a)*. ☐

The new area will be **less than** the estimated area found in part *(a)*. ☐

You must give a reason for your answer. [1]

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17. Simplify the following expression. [4]

$$\frac{2x^2 - 13x + 20}{2x - 8}$$

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Examiner only

1. *(a)* Write an expression for the nth term of the following sequence. [2]

2 7 12 17 .....

.....

.....

nth term = ...

(b) The first four diagrams in a sequence are shown below.

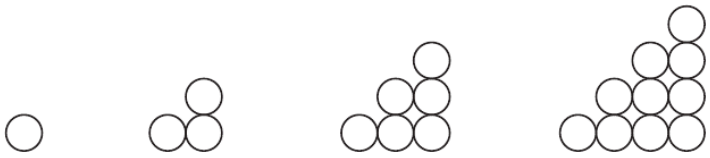

Diagram 1 Diagram 2 Diagram 3 Diagram 4

Complete the following subtraction. [1]

Number of circles in Diagram 17	–	Number of circles in Diagram 16	=	

(c) The first three diagrams in another sequence are shown below.

Diagram 1 Diagram 2 Diagram 3

Give an expression, in terms of n, for the number of dots (●) in Diagram n.
You must simplify your expression. [2]

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Examiner only

14. *(a)* Express $0\dot{8}\dot{1}\dot{2}$ as a fraction. [2]

(b) Simplify $\sqrt{72}$.
Circle your answer. [1]

$2\sqrt{6}$ $6\sqrt{2}$ $6\sqrt{12}$ 36 $36\sqrt{2}$

(c) Expand and simplify $\left(7-2\sqrt{5}\right)\left(3+\sqrt{5}\right)$. [2]

Examiner only

18. A circle has radius r cm, where r is an integer.
The side of a square is of length x cm.

If the circle and square have the same area, explain why x cannot be an integer.

You should consider algebraic expressions in your answer. [2]

Examiner only

13. Simplify the following expression. [4]

$$\frac{6x^2 - 9x}{4x^2 - 9}$$

Examiner only

14. Find the value of $x^{-\frac{2}{3}}$.

Simplify your answer. [2]

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Examiner only

3. Express 1575 as a product of its prime factors in index form. [3]

4. Simplify the following expressions.

(a) $2p^3q \times 3p^4q^7$ [2]

(b) $7a(a+5) - 2(3a^2 + 6a - 7)$ [4]

Examiner only

16. (a) Circle the correct answer for each of the following statements.

(i) $64^{\frac{2}{3}}$ is equal to [1]

$\frac{128}{3}$ 96 $\frac{194}{3}$ 16 512

(ii) $10000^{-\frac{1}{2}}$ is equal to [1]

$-\frac{1}{100}$ $\frac{1}{100}$ -5000 -100 $\frac{1}{5000}$

(b) Express $0{\cdot}07\dot{1}\dot{4}$ as a fraction. [2]

Examiner only

(c) Simplify $\sqrt{11\frac{1}{4}}$.

Give your answer in the form $\frac{a\sqrt{5}}{b}$, where a and b are integers. [2]

(d) Give an example of an irrational number that lies between 6 and 7. [1]

My example of an irrational number is .....

Examiner only

17. If n is an integer, prove that $(2n-1)^2+7$ is always a multiple of 4.
You must use an algebraic method. [3]

18. Make t the subject of the following formula. [4]

$$\sqrt[3]{ct^3-9}=t$$

Examiner only

13. Prove that $(8n+1)^2-3$ is always an even number, for all integers n.
You must use an algebraic method. [3]

14. Evaluate $\left(\frac{4}{3}\right)^{-1}+16^{-\frac{3}{4}}$. [3]

Examiner only

15. Simplify the following expression. [4]

$$\left(5+\sqrt{3}\right)\left(1-\sqrt{3}\right)-\left(\sqrt{3}\right)^5$$

16. Simplify $\dfrac{16c^2-d^2}{8c^2+2cd}$. [4]