

LEVEL 2

WJEC Level 2 Additional Mathematics

Approved by Qualifications Wales

Guidance for Teaching: Unit 1

Teaching from 2026

For award from 2027



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Introduction

WJEC Level 2 Additional Mathematics has been approved by Qualifications Wales and is available to all centres in Wales. It will be awarded for the first time in Summer 2027, using grades Pass, Merit or Distinction.

Aims of the Guidance for Teaching

The principal aim of the Guidance for Teaching is to support teachers in the delivery of WJEC Level 2 Additional Mathematics and to offer guidance on the requirements of the qualification and the assessment process. The Guidance for Teaching is **not intended as a comprehensive reference**, but as support for teachers to develop stimulating and exciting courses, tailored to the needs and skills of their learners. The guide offers possible classroom activities and links to useful resources (including our own, freely available digital materials and some from external sources) to provide ideas for immersive and engaging lessons.

Additional ways that WJEC can offer support:

- sample assessment materials and mark schemes
- professional learning events
- examiners' reports on each unit
- direct access to the subject officer
- free online resources
- Exam Results Analysis
- Assessment Feedback package.

Qualification Structure

WJEC Level 2 Additional Mathematics consists of six units (two mandatory, four optional). The qualification is unitised and does not contain tiering. There is no hierarchy to the order the units should be taught.

	Unit title	Type of Assessment	Weighting
Mandatory Units			
Unit 1	Algebra	Written examination	33⅓%
Unit 2	Calculus	Written examination	33⅓%
Optional Units			
Unit 3	Geometry and Trigonometry	Written examination	33⅓%
Unit 4	Statistics	Written examination	33⅓%
Unit 5	Mechanics	Written examination	33⅓%
Unit 6	Discrete and Decision Mathematics	Written examination	33⅓%

To be awarded the qualification, learners must complete **three** units:

- **two** mandatory units
- **one** optional unit.

Learners who complete fewer than three units will receive unit certification for the successful completion of each unit.

Unit 1 Summary of Assessment

Unit 1: Algebra Written examination: 50 minutes 33⅓% of qualification	40 marks
<p>The paper will comprise a number of short and longer, both structured and unstructured, questions.</p> <p>A calculator will not be allowed in this paper.</p>	

Overview of Unit 1

Algebra

(33⅓% of the qualification)

The purpose of this unit is to:

- formulate and reinforce key mathematical techniques
- strengthen manipulative algebraic skills.

A calculator will **not** be allowed in this examination.

In this unit, learners will develop knowledge, skills and understanding in:	
1.1	Algebraic manipulation
1.2	Quadratic functions
1.3	Sequences and series

Unit 1 Assessment objectives and weightings

AO1	Recall and use their knowledge of the prescribed content.	23⅓%
AO2	Select and apply mathematical methods.	6⅔%
AO3	Interpret and analyse problems and use mathematical reasoning to solve them.	3⅓%

Unit 1 Teacher Guidance

1.1 Algebraic Manipulation		
	Content Amplification	Teacher Guidance
1.1.1 Surds	<p>Learners should be able to:</p> <ul style="list-style-type: none"> simplify numerical expressions involving surds, including rationalising the denominator of expressions. Numerators will be restricted to constants. 	<p>To include simplification of:</p> <ul style="list-style-type: none"> expressing surds in their simplest form performing operations with surds, including addition, subtraction, multiplication, and division. rationalising denominators where the denominator is a single surd or an expression containing a surd. <p>Example Questions:</p> <ul style="list-style-type: none"> rationalise the denominator in the following expression $\frac{1}{3-\sqrt{2}}$ simplify $(\sqrt{3} + 2)^2 - (\sqrt{3} - 2)^2$, leaving your answer in surd form.
1.1.2 Laws of indices	<p>Learners should be able to:</p> <ul style="list-style-type: none"> use the laws of indices to simplify numerical and algebraic expressions written in index form with positive, negative and fractional indices. <p>For example:</p> <ul style="list-style-type: none"> Write expressions such as $\sqrt{\frac{x^{\frac{5}{2}} \times x^{\frac{7}{2}}}{x^2}}$ and $\frac{5x^{\frac{1}{2}} + 6x^{\frac{5}{2}}}{2x^{\frac{1}{2}}}$ as a single power of x. Solve $8^x = \frac{2^{56}}{4^{10}}$ 	<p>Learners should be able to solve equations where the variable appears in the index, including those which require rewriting a term in index form in terms of a common base such as 2.</p>

<p>1.1.3 Proofs</p>	<p>Learners should be able to construct formal mathematical proofs:</p> <ul style="list-style-type: none"> using the correct notation, including use of the symbol \equiv, and a clear structure involving a series of logical steps to reach conclusions including using algebraic identities. 	<p>Learners should be able to construct a formal mathematic proof for algebraic identities, such as:</p> <ul style="list-style-type: none"> Prove that $(x + \sqrt{y})(x - \sqrt{y}) \equiv x^2 - y$ Prove that $\frac{2x-1}{x-1} - \frac{x+2}{x+1} \equiv \frac{x^2+1}{x^2-1}$
<p>1.2 Quadratic Functions</p>		
<p>1.2.1 Solving quadratic equations</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> solve quadratic equations by factorising or completing the square solve quadratic equations with higher powers such as: $x^4 - 2x^2 + 1 = (x^2 - 1)^2 = 0$ use completing the square as a method to find maximum or minimum values of quadratic functions. <p>When completing the square, the coefficient of x^2 will not be greater than 1.</p>	<p>Learners should be aware that some quadratic equations cannot be solved by factorisation, but can be solved by completing the square. They should recognise when completing the square is the most appropriate method, particularly when asked to express roots in exact form, which may include surds.</p> <p>Example Questions:</p> <ul style="list-style-type: none"> Find the exact solutions of the equation $x^2 = 10x + 5$ By completing the square, show that the solutions to the equation $x^2 - 2bx + c = 0$ are given by $x = b \pm \sqrt{b^2 - c}$ <p>Learners should also be able to solve equations involving higher powers reducible to quadratic form. For example, by making a suitable substitution such as $y = x^2$.</p>

<p>1.2.2 Applications of quadratic functions</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> form and manipulate quadratic expressions from a given context form, manipulate and solve quadratic equations that arise from a given context. 	<p>Learners should be able to recognise contexts which give rise to a quadratic expression, such as in geometrical problems. More advanced problems may involve calculating shaded areas between shapes, requiring multiple algebraic steps to construct the appropriate quadratic expression.</p>						
<p>1.2.3 Quadratic simultaneous equations</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> solve two simultaneous equations in two unknowns algebraically, including one linear equation and one quadratic equation. 	<p>Questions may be set in context. For example, involving the coordinates of points of intersection between a straight line and a curve, or within a geometrical problem. Learners should be able to interpret their solutions in the context, recognising and rejecting any values that are not valid in the given situation.</p>						
<p>1.2.4 The discriminant</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> find and interpret the discriminant of quadratic equations understand the conditions for two distinct real roots, one repeated real root and no real roots. 	<p>Learners will be expected to understand and use the following conditions:</p> <table style="width: 100%; border: none;"> <tr> <td style="padding-right: 20px;">$b^2 - 4ac > 0$</td> <td>Two real and distinct roots</td> </tr> <tr> <td>$b^2 - 4ac = 0$</td> <td>One repeated real root</td> </tr> <tr> <td>$b^2 - 4ac < 0$</td> <td>No real roots.</td> </tr> </table>	$b^2 - 4ac > 0$	Two real and distinct roots	$b^2 - 4ac = 0$	One repeated real root	$b^2 - 4ac < 0$	No real roots.
$b^2 - 4ac > 0$	Two real and distinct roots							
$b^2 - 4ac = 0$	One repeated real root							
$b^2 - 4ac < 0$	No real roots.							
<p>1.2.5 Quadratic graphs</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> sketch graphs of quadratic functions, clearly showing any points of intersection with the coordinate axes. 	<p>When sketching quadratic graphs, learners should be able to clearly link their sketches to the discriminant, interpreting the nature of the roots through the graph's points of intersections with the x-axis. Sketches should demonstrate whether the quadratic has two distinct real roots, one repeated real root, or no real roots, based on the shape and position of the curve.</p>						

1.3 Sequences and Series

1.3.1

Arithmetic sequences and series

Learners should be able to:

- find the n th term of arithmetic sequences using:
 $u_n = a + (n - 1)d$
- find the sum to n terms of arithmetic series using:
 $S_n = \frac{1}{2}n[2a + (n - 1)d]$ or $S_n = \frac{1}{2}n[a + l]$
- work with arithmetic series and sequences in a variety of ways – for example, to find the first term and the common difference using an algebraic method.

Learners should be confident in applying the formulae for the n th term and the sum of an arithmetic sequence.

They should be able to solve problems involving arithmetic sequences and series in a variety of contexts. This includes:

- finding the sum of a given number of terms. For example, find the sum of the first 25 terms of the sequence: 9, 17, 25, 33...
- Using algebraic methods to find unknown. For example, given the third term of an arithmetic sequence is 13 and the sixth term is 22, find the first term and the common difference.

1.3.2

Geometric sequences and series

Learners should be able to:

- find the n th term of geometric sequences using:
 $u_n = ar^{n-1}$
- find the sum to n terms of geometric series using:
 $S_n = \frac{a(1 - r^n)}{1 - r}$
- work with geometric series and sequences in a variety of ways – for example, to find the first term and the common ratio using an algebraic method.

Learners are not expected to find the sum to infinity of a convergent geometric series.

Learners should be able to apply the formulae for the n th term and the sum of a geometric sequence.

They should be confident in solving problems involving geometric sequences and series, including:

- finding the sum of a given number of terms. For example, find the sum of the first 10 terms of the geometric sequence: 3, 6, 12, 24...
- Using algebraic methods to find unknowns. For example, given the second term of a geometric sequence is 8 and the fifth term is 64, find the first term and the common ratio.

Learning Experiences

Learners should be encouraged to consider the following learning experiences and skills to further develop their understanding, appreciation and awareness of the subject content. Information in the table below provides opportunities for teachers to integrate the learning experiences into delivery.

Learning Experience	Exemplification of Learning Experience
Work both independently and collaboratively	<p>Learners could be given opportunities to work individually to solve algebraic problems and then collaborate in pairs or small groups to compare methods, discuss strategies, and present solutions to the class.</p> <p>For example:</p> <ul style="list-style-type: none"> learners may simplify surds individually (see 1.1.1), then work together to compare approaches and justify their choices group tasks could include proving identities (1.1.3) or solving quadratic equations (1.2.1), with learners encouraged to explain why a particular method was chosen and evaluate its effectiveness.
Gain experience and appreciation of the role mathematics plays in other subjects and areas of the curriculum	<p>Learners could be given opportunities to explore how mathematical concepts from Unit 1 are applied across the curriculum.</p> <p>For example:</p> <ul style="list-style-type: none"> sequences and series (1.3.1 and 1.3.2) are used in financial mathematics to calculate compound interest, savings growth, and loan repayments in physics, learners apply algebraic manipulation (1.1) to rearrange formulae and solve equations related to motion and energy.
Gain awareness and appreciation of some of the different careers and work-related areas that draw upon mathematics	<p>Learners can explore how mathematical skills developed in Unit 1 are essential in a range of careers.</p> <p>For example:</p> <ul style="list-style-type: none"> in finance, quadratic functions (1.2) and geometric sequences (1.3.2) are used to model investment growth, calculate compound interest, and assess risk.
Access rich tasks that invoke curiosity, build resilience and require learners to be resourceful	<p>Learners can engage with tasks set in a real-life context.</p> <p>For example:</p> <ul style="list-style-type: none"> using completing the square (1.2.1) to find the minimum point of a quadratic function in real-world contexts such as, calculating the minimum advertising spend needed to achieve a target.

Undertake practical work that allows learners to apply their mathematical skills inside and outside of the classroom setting	Learners could collect data from a physical experiment. For example: <ul style="list-style-type: none">the height of a ball over time, and use of algebra to model the data. Use tools like GeoGebra to visualise quadratic graphs and link them to the discriminant (1.2.4).
Encounter familiar, unfamiliar and complex problems	Learners solve a range of problems, from textbook exercises to more challenging problems requiring multi-step reasoning. For example: <ul style="list-style-type: none">solving quadratic equations using completing the square (1.2.1) or interpreting the discriminant graphically (1.2.4).

Opportunities for embedding elements of the Curriculum for Wales

Curriculum for Wales Strands			
Cross-cutting Themes			
Careers and Work-Related Experiences	<p>There are many opportunities to include Career and Work-Related Experiences (CWRE) in Level 2 Additional Mathematics. These opportunities are important to Learners because they help them understand the importance of how mathematical skills are applied in real-world professions. Learners develop their mathematical skills and problem-solving abilities to better prepare them for a future in STEM related careers.</p> <p>Below are some examples of how CWRE can be embedded into teaching and learning:</p>		
	<i>Specification Reference</i>	<i>Amplification</i>	<i>Example</i>
	1.2.2	Applications of quadratic functions	<p>Learners can form, manipulate and solve quadratic equations that arise from a given context.</p> <p>Learners could calculate the maximum floor area of a building space using quadratic functions which could relate to a task performed by an architect.</p>

Cross-curricular Skills – Literacy

There are many opportunities to include Literacy in Level 2 Additional Mathematics. These opportunities are important to Learners because they must be able to write and present their work using a clear structure that demonstrates mathematical reasoning. Literacy skills are further developed when learners are required to outline their mathematical thinking, justify methods, and explain concepts. Learners should be able to interpret and respond to problems set in context, make informed decisions based on results, and present structured solutions clearly and effectively.

Below are some examples of how Literacy can be embedded into teaching and learning:

	<i>Specification Reference</i>	<i>Amplification</i>	<i>Example</i>
Listening	1.2.4	The discriminant	Learners could listen to peers explain how the discriminant relates to the shape and position of a quadratic graph.
	1.2.5	Quadratic graphs	In a group activity, learners could take turns sketching a quadratic graph based on a given equation. Each learner explains how the discriminant affects the number of points of intersection of the graph with the x -axis. The next learner listens and builds on the explanation by adjusting the graph or equation to reflect a different discriminant value.

Reading	<p>Specification Reference</p> <p>1.3</p>	<p>Amplification</p> <p>Sequences and series</p>	<p>Example</p> <p>Learners read problems in a real-life context and extract key information before solving.</p> <p>Learners could read a real-life scenario involving a geometric sequence, such as the growth of an investment over time. They identify all relevant information from the text, such as the initial value and interest rate. Using this information, the learner can calculate the value of the investment after a specified time period.</p>
Speaking	<p>Specification Reference</p> <p>1.2.1</p>	<p>Amplification</p> <p>Solving quadratic equations</p>	<p>Example</p> <p>Learners could describe and justify the method used to solve a quadratic equation, comparing factorisation and completing the square.</p> <p>Learners could explain to their peers why completing the square was the most efficient method for solving a given quadratic equation and why factorisation was not possible.</p>

Writing	<p>Specification Reference</p> <p>1.1.3</p>	<p>Amplification</p> <p>Proofs</p>	<p>Example</p> <p>Learners could write formal mathematical proofs using correct notation and logical structure.</p> <p>Learners could write a step-by-step proof of an identity, clearly showing each progressive step and conclusion.</p>
<p>Cross-curricular Skills – Numeracy</p>			
<p>There are many opportunities to include Numeracy in Level 2 Additional Mathematics. These opportunities are important to Learners because they help develop fluency in mathematical techniques, confidence in applying different methods to solve problems, and the ability to interpret and analyse numerical relationships. Learners should apply these skills in real-world contexts such as financial modelling.</p> <p>Below are some examples of how Numeracy can be embedded into teaching and learning:</p>			
Developing Mathematical Proficiency	<p>Specification Reference</p> <p>1.2</p>	<p>Amplification</p> <p>Quadratic functions</p>	<p>Example</p> <p>Learners can select the appropriate methods such as factorisation and completing the square to solve quadratic equations.</p> <p>Learners recognise when to apply specific methods to solve quadratic equations, such as choosing to complete the square when factorisation is not possible. They also interpret the resulting form to find exact roots, including those expressed in surd form, when required.</p>

<p>Understanding the number system helps us to represent and compare relationships between numbers and quantities</p>	<p>Specification Reference</p> <p>1.3</p>	<p>Amplification</p> <p>Sequences and series</p>	<p>Example</p> <p>Learners explore how arithmetic and geometric sequences model numerical relationships and change over time, including increasing and decreasing sequences.</p> <p>Learners could compare different savings plans using arithmetic and geometric sequences to determine which offers better returns over time. Learners can also look at depreciation for the value of assets such as cars and smartphones.</p>
<p>Learning about geometry helps us understand shape, space and position and learning about measurement helps us quantify in the real world</p>	<p>Specification Reference</p> <p>1.2.2</p>	<p>Amplification</p> <p>Applications of quadratic functions</p>	<p>Example</p> <p>Learners can form, manipulate and solve quadratic equations that arise from a given context.</p> <p>Learners could form and solve quadratic equations to calculate the area of shaded regions or identify and reject values calculated for dimensions of a shape.</p>

Cross-curricular Skills – Digital Competence

There are many opportunities to include Digital Competence in Level 2 Additional Mathematics. These opportunities are important to Learners because they allow learners to use technology and digital tools to explore mathematical concepts and visualise problems.

Below are some examples of how Digital Competence can be embedded into teaching and learning:

	<i>Specification Reference</i>	<i>Amplification</i>	<i>Example</i>
Data and Computational Thinking	1.2	Quadratic functions	<p>Learners can use digital tools such as GeoGebra or Desmos to sketch graphs of quadratic functions.</p> <p>Learners can use digital tools to explore how changing coefficients of a quadratic function will affect the shape and position of the graph, the maximum or minimum point of the graph and the nature of the roots.</p>

Integral Skills			
Creativity and Innovation	<p>There are many opportunities to include Creativity and Innovation in Level 2 Additional Mathematics. These opportunities are important to Learners because they encourage learners to approach and solve mathematical problems in a variety of ways promoting problem-solving skills. Learners should develop confidence in applying mathematics to problems in an unfamiliar context.</p> <p>Below are some examples of how Creativity and Innovation can be embedded into teaching and learning:</p>		
	<i>Specification Reference</i>	<i>Amplification</i>	<i>Example</i>
	1.2.3	Quadratic simultaneous equations	<p>Learners can form and solve two simultaneous equations in two unknowns algebraically.</p> <p>Learners could calculate the dimensions of overlapping shapes to determine the shaded area formed by the intersection of two graphs, one linear and one quadratic.</p>

<p>Critical Thinking and Problem Solving</p>	<p>There are many opportunities to include Critical Thinking and Problem Solving in Level 2 Additional Mathematics. These opportunities are important to Learners because they develop the ability to investigate the use of different strategies to solve problems and apply critical thinking skills to solve problems.</p> <p>Below are some examples of how Critical Thinking and Problem Solving can be embedded into teaching and learning:</p>		
	<p><i>Specification Reference</i></p> <p>1.2.1</p>	<p><i>Amplification</i></p> <p>Solving quadratic equations</p>	<p><i>Example</i></p> <p>Learners should be able to solve quadratic equations by factorising or completing the square.</p> <p>Learners can compare methods to solve a quadratic equation and determine the most appropriate method, justifying which method they have used.</p>
<p>Personal Effectiveness</p>	<p>There are many opportunities to include Personal Effectiveness in Level 2 Additional Mathematics. These opportunities are important to Learners because they develop resilience, confidence and independence when solving more complex problems. Learners should take opportunities to learn from mistakes and find strategies to improve their problem-solving skills.</p> <p>Below are some examples of how Personal Effectiveness can be embedded into teaching and learning:</p>		
	<p><i>Specification Reference</i></p> <p>1.1.3</p>	<p><i>Amplification</i></p> <p>Proofs</p>	<p><i>Example</i></p> <p>Learners should be able to construct formal mathematical proofs using the correct notation and a clear structure involving a series of logical steps to reach conclusions.</p> <p>Learners could write a proof for an identity and then work backwards from the final answer to verify all the previous steps to identify and correct any errors or omissions in the method.</p>

Glossary for Unit 1

Term	Definition
Arithmetic sequence	A sequence of numbers in which the difference between consecutive terms is constant
Completing the square	A method used to solve quadratic equations
Geometric sequence	A sequence of numbers in which the ratio of consecutive terms is constant
Maximum value of a quadratic function	The highest point on the graph of a quadratic function, often found by completing the square for the quadratic function
Minimum value of a quadratic function	The lowest point on the graph of a quadratic function, often found by completing the square for the quadratic function
Rationalising the denominator	The process of eliminating surds from the denominator of a fraction
The discriminant	The expression $b^2 - 4ac$, obtained from a quadratic equation in the form $ax^2 + bx + c = 0$, used to determine the nature of the roots