LEVEL 2

WJEC Level 2 Additional Mathematics

Approved by Qualifications Wales

Guidance for Teaching: Unit 3

Teaching from 2026
For award from 2027

This Qualifications Wales regulated qualification is not available to centres in England.

Made for Wales.
Ready for the world.

WJEC would like to thank the students and teachers of Fitzalan High School, Cardiff and Llanwern High School, Newport for their participation in the creation of these covers.

Contents

Introduction

The 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
- Online Examination Review.

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 3 Summary of Assessment

Unit 3: Geometry and Trigonometry **Written examination: 50 minutes** **33⅓% of qualification** **40 marks**
The paper will comprise a number of short and longer, both structured and unstructured, questions. A calculator will be allowed in this paper.

Overview of Unit 3

Geometry and Trigonometry
(33⅓% of the qualification)

The purpose of this unit is to develop and strengthen the knowledge, skills and understanding of topics relating to geometry and trigonometry and be able to apply them in different contexts.

A calculator will be allowed in this examination.

In this unit, learners will develop knowledge, skills and understanding in:	
3.1	Coordinate geometry in the (x, y) plane
3.2	Trigonometry

Unit 3 Assessment objectives and weightings

AO1	Recall and use their knowledge of the prescribed content.	18⅓%
AO2	Select and apply mathematical methods.	6⅔%
AO3	Interpret and analyse problems and use mathematical reasoning to solve them.	8⅓%

Unit 3 Teacher Guidance

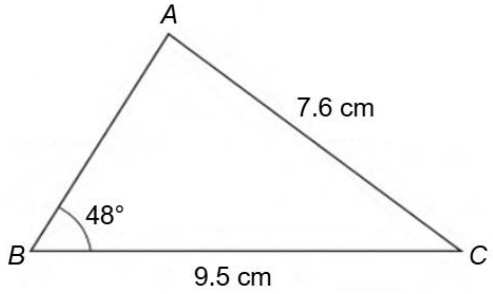
3.1 Coordinate geometry in the (x, y) plane		
Content Amplification		**Teacher Guidance**
3.1.1 Properties of a straight line	Learners should understand: • the conditions for two line segments to be parallel or perpendicular. Learners should be able to: • find the equation of a straight line • find the midpoint of a line segment • identify 2-D geometrical shapes from the properties of the line segments forming the shape.	To include: • The knowledge that parallel lines have the same gradient. • The product of the gradients of two perpendicular lines is equal to -1. • Knowledge of the properties of 2-D shapes including triangles and quadrilaterals. • Finding the coordinates of a point identified by given geometrical information, including an unknown vertex of a parallelogram. **Example Question** Find the equation of the straight line perpendicular to *AB* that passes through the midpoint of *AB*. The equation of a line may be expressed in the forms: • $y = mx + c$ • $y - y_1 = m(x - x_1)$ • $ax + by + c = 0$

3.1.2 Application of Pythagoras' theorem	Learners should be able to apply Pythagoras' theorem to: • find the length of a line segment • form the equation of the circle using $(x-a)^2+(y-b)^2=r^2$, where (a,b) is the centre of the circle and r is the radius of the circle. Learners should be able to use the positions of the centres of two circles to: • determine whether two circles touch internally or externally • find the shortest distance between two circles.	To include: • Finding the length of a line joining two given points. • Finding the centre of a circle as the midpoint of the diameter. Values of r may be required in surd form. Access to a calculator will enable learners to simplify any such surds. Learners may be expected to recognise the equation of a circle in the form $x^2+y^2+ax+by+c=0$. **Example Questions** • Circle C_1 has centre $(-1,3)$ and radius 5. Circle C_2 has centre $(11,8)$ and radius 6. Find the shortest distance between the circles C_1 and C_2. • Circle C has centre $(-3,5)$ and radius $4\sqrt{3}$. The point P has coordinates $(-6,2)$. Determine whether P lies inside C, on C or outside C.

3.2 Trigonometry		
3.2.1 Trigonometric graphs	Learners should understand: • The sine, cosine and tangent functions • The symmetries and periodicity of the trigonometric graphs $y = \sin\theta$, $y = \cos\theta$ and $y = \tan\theta$	To include the use of graphs to understand: • $\cos\theta = \cos(360 - \theta)$ and $\cos(-\theta) = \cos\theta$ • $\sin\theta = \sin(180 - \theta)$ and $\sin(-\theta) = -\sin\theta$ • $\tan\theta = \tan(180 + \theta)$ and $\tan(-\theta) = -\tan\theta$
3.2.2 Trigonometric identities	Learners should be able to use the identities: • $\tan\theta \equiv \frac{\sin\theta}{\cos\theta}$ • $\sin^2\theta + \cos^2\theta \equiv 1$	These identities may be used to solve trigonometric equations and prove other identities.

3.2.3 Solving simple trigonometric equations	Learners should be able to:
	• solve simple trigonometric equations in a given interval, including the solution to equations such as:
	  • $\sin\theta = \frac{\sqrt{3}}{2}$
	  • $2\cos\theta = -0.8$
	  • $4\tan\theta\cos\theta + 1 = 0$
	  • $2\cos^2\theta + \sin\theta = 2$
		Learners need to solve simple trigonometric equations in a given interval.
		Example Questions
		Solve $\sin\theta = \frac{\sqrt{3}}{2}$, for $0° \leq \theta \leq 360°$
		Solve $2\cos\theta = -0.8$, for $-180° \leq \theta \leq 180°$

3.2.4 Use of the sine rule, the cosine rule, and the formula for the area of a triangle in the form $\frac{1}{2}ab\sin C$	Learners should be able to: • apply the sine rule, the cosine rule, and the formula for the area of a triangle in the form $\frac{1}{2}ab\sin C$ to solve problems in 2D • consider the ambiguous case of sine.	To include the use of the sine rule in the ambiguous case. Sine rule: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$ Area of a triangle: $\frac{1}{2}ab\sin C$ **Example Question**

		The diagram below shows a sketch of the triangle ABC with $AC = 7.6\,cm$, $BC = 9.5cm$ and $A\hat{B}C = 48°$. Show that there are two possible values for $B\hat{A}C$. 

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.	It is important for learners to be encouraged to take increasing responsibility for their own learning and the evaluation of their own mathematical development. Learners can engage with different pedagogies in the classroom. For example: • to encourage independent learning a flipped learning exercise can be used to introduce a topic • to develop collaboration, open-ended questions can be given to learners, or learners could write their own problem which is then assessed by their peers. Working independently and collaboratively supports the development of the five mathematical proficiencies. For example, to develop strategic competence, learners could independently explore ways to derive the centre of a circle from an equation in the form $x^2 + y^2 + ax + by + c = 0$. Learners could then compare strategies, check each other's work and refine techniques.
Gain experience and appreciation of the role mathematics plays in other subjects and areas of the curriculum.	There are opportunities in Unit 3 to use scale maps to calculate real distances using trigonometry. For example: • solve navigation problems using bearings and triangulation • calculate the relief of land using measured distances and angles of elevation or depression. Computer-aided design (CAD) software could be used to create accurate scale models. The application of trigonometry could be extended to resolve forces or calculate the angle of elevation in projectile motion.
Gain awareness and appreciation of some of the different careers and work-related areas that draw upon mathematics.	There may be opportunities to show how mathematics explored in Unit 3 can be used in civil engineering and architecture, landscaping, 3D modelling in game development, or aviation.

Access rich tasks that invoke curiosity, build resilience and require Learners to be resourceful.	Open ended questions encourage curiosity, non-routine problems build resilience, and real-life contexts encourage learners to be resourceful. **Example of a non-routine problem:** The area of a triangle is 60cm^2. One of its angles is 30°. One of its sides is 12cm and another is 15cm. Find all the possible triangles that satisfy these conditions.
Undertake practical work that allows Learners to apply their mathematical skills inside and outside of the classroom setting.	Dynamic graphing software can be used to explore trigonometric identities. For example: • Clinometers can be used to measure angles of elevation to calculate the height of buildings. • An orienteering activity could be used to explore the accuracy of calculations made from a map.
Encounter familiar, unfamiliar and complex problems.	It is important for learners to encounter problems at different levels of challenge to support the development of the five mathematical proficiencies and to ensure that learners build and apply deep understanding, not just memorise procedures. Familiar problems could include: • Find the centre and radius of a circle with equation $(x-4)^2+(y+1)^2=50$. Problems like this develop fluency through familiarity and routine. Unfamiliar problems could include: • A circle has centre $(2,-1)$ and passes through the point $(9,-6)$. Find the equation of the circle. Problems like this deepen conceptual understanding. Here, learners must grasp how radius and distance relate and apply logical reasoning to decide a method to use. Complex problems could include: • The circle C has centre A and radius r. The points $P(3,-8)$ and $Q(5,6)$ are at either end of a diameter of C. Point $P(9,-6)$ lies on C. Find angle $P\hat{Q}R$. Problems like this require learners to plan a multi-step strategy and refine it as needed.

Opportunities for embedding elements of the Curriculum for Wales

<table>
<tr><th colspan="4">Curriculum for Wales Strands</th></tr>
<tr><th colspan="4">Cross-cutting Themes</th></tr>
<tr><td rowspan="3">Careers and Work-Related Experiences</td><td colspan="3">There are many opportunities to include Career and Work-Related Experiences (CWRE) in Level 2 Additional Mathematics. These opportunities are important to learners because it enables them to develop logical thinking, problem-solving and decision-making skills which are invaluable in the workplace.

Below are some examples of how CWRE can be embedded into teaching and learning:</td></tr>
<tr><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>3.2.3</td><td>Solving simple trigonometric equations</td><td>Learners can explore the application of trigonometric equations to electrical engineering.

For example, alternating current circuits use sine and cosine waveforms. Solving trigonometric equations can determine voltage and current which is essential in the safe design of circuits.</td></tr>
<tr><td>3.2.4</td><td>Use of the sine rule, the cosine rule, and the formula for the area of a triangle in the form $\frac{1}{2}ab\sin C$.</td><td>Learners could have the opportunity to explore the application of trigonometry in different contexts.

For example, planning a new breakwater structure involves knowing the angle that waves will hit so it can be made strong in the correct direction.</td></tr>
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<table>
<tr><th colspan="4">Cross-curricular Skills – Literacy</th></tr>
<tr><td></td><td colspan="3">There are many opportunities to include Literacy in Level 2 Additional Mathematics. These opportunities are important to learners because the accurate use of mathematical language enables learners to describe processes and explain and justify their conceptual understanding.

Below are some examples of how literacy can be embedded into teaching and learning:</td></tr>
<tr><td rowspan="2">Listening</td><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>3.1.1</td><td>Properties of a straight line</td><td>Learners must listen carefully to instructions to differentiate between the terms used to describe a geometrical shape and interpret their meaning.

For example, the terms ‘opposite side’, ‘angle in a semi-circle’, ‘adjacent’, ‘alternate segment’ help describe a shape of the position of an angle.</td></tr>
<tr><td rowspan="2">Reading</td><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>3.1.2</td><td>Application of Pythagoras’ theorem</td><td>Learners must be able to interpret text that describes a situation.

For example, interpreting the equation of the circle using $(x-a)^2+(y-b)^2=r^2$, where (a,b) is the centre of the circle and r is the radius of the circle.</td></tr>
<tr><td></td><td>3.2.2</td><td>Trigonometric identities</td><td>Knowing that $\sin^2\theta$ represents $(\sin\theta)^2$</td></tr>
</table>

Speaking	***Specification Reference***	***Amplification***	***Example***
	3.1.1 Properties of a straight line	Learners should be able to: • identify 2-D geometrical shapes from the properties of the line segments forming the shape.	Verbally describing shapes using mathematical terms supports the development of the mathematical vocabulary required in unit 3.
	3.2.2 Trigonometric identities	Learners should be able to use the identities: $\tan\theta \equiv \frac{\sin\theta}{\cos\theta}$ $\sin^2\theta + \cos^2\theta \equiv 1$	Verbalising $\sin^2\theta$ as 'the square of sine' helps develop the conceptual understanding of the notation. This can also be applied to $\tan^{-1}\theta$ where the 'inverse of tan' should be used and not 'tan to the minus 1'.
Writing	***Specification Reference***	***Amplification***	***Example***
	3.1.1 Properties of a straight line	Learners should be able to: • find the equation of a straight line	Using good mathematical form is essential for learners to describe what they are doing in multi-step solutions. For example, clearly labelling each part of a calculation leading to the formation of an equation of a straight line.

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<tr><th colspan="4">Cross-curricular Skills – Numeracy</th></tr>
<tr><td></td><td colspan="3">There are many opportunities to include Numeracy in Level 2 Additional Mathematics. These opportunities are important to learners because strong numeracy skills are essential for learners to foster enjoyment in studying the units. The units offer opportunity to develop Conceptual understanding, Communication using symbols, Fluency, Logical reasoning and Strategic competence.

Below are some examples of how Numeracy can be embedded into teaching and learning:</td></tr>
<tr><td rowspan="3">Developing Mathematical Proficiency</td><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>3.1.1
Properties of a straight line</td><td>Learners should understand:
• the conditions for two line segments to be parallel or perpendicular.

Learners should be able to:
• find the equation of a straight line
• find the midpoint of a line segment
• identify 2-D geometrical shapes from the properties of the line segments forming the shape.</td><td>Mathematical concepts can be built on and deepened. Learners have the opportunity to make connections between skills developed in algebraic contexts in the GCSE course and their application in unit 3.</td></tr>
<tr><td>3.1.2
Application of Pythagoras’ theorem</td><td>Learners should be able to apply Pythagoras’ theorem to:
• find the length of a line segment
• form the equation of the circle using</td><td>Learners have the opportunity to draw on their understanding of Pythagoras’ Theorem explored in the GCSE course and can apply it in a new context.</td></tr>
</table>

		$(x-a)^2+(y-b)^2=r^2$, where (a,b) is the centre of the circle and r is the radius of the circle. Learners should be able to use the positions of the centres of two circles to: • determine whether two circles touch internally or externally • find the shortest distance between two circles.	
Understanding the number system helps us to represent and compare relationships between numbers and quantities	***Specification Reference*** 3.2.3 Solving simple trigonometric equations	***Amplification*** Learners should be able to: • solve simple trigonometric equations in a given interval, including the solution to equations such as: • $\sin\theta=\frac{\sqrt{3}}{2}$ • $2\cos\theta=-0.8$ • $4\tan\theta\cos\theta+1=0$ $2\cos^2\theta+\sin\theta=2$	***Example*** Learners need to be able to recognise and define limitations on accuracy of measurements that may be caused by rounding to early when working towards a solution.

	Specification Reference	***Amplification***	***Example***
Learning about geometry helps us understand shape, space and position and learning about measurement helps us quantify in the real world	3.1.1 Properties of a straight line	Learners should understand: • the conditions for two line segments to be parallel or perpendicular. Learners should be able to: • find the equation of a straight line • find the midpoint of a line segment • identify 2-D geometrical shapes from the properties of the line segments forming the shape.	Learners are not required to draw and measure angles in unit 3 but the need to extend their understanding of position and angles to the (x, y) plane.

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 the use of dynamic graphing software is an essential part of exploring mathematics. **Below are some examples of how Digital Competence can be embedded into teaching and learning:**		
Data and Computational Thinking	***Specification Reference***	***Amplification***	***Example***
	3.1.1	Properties of a straight line	Learners could use programming code to construct 2-D geometrical shapes. This requires applying logical reasoning to determine the input, outputs and processes needed to form a shape.
	3.2.1	Trigonometric graphs	Learners could use dynamic graphing software to investigate the properties of trigonometric graphs. This requires logical reasoning to determine the input, outputs and processes of a program.

<table>
<tr><th colspan="4">Integral Skills</th></tr>
<tr><td rowspan="3">Creativity and Innovation</td><td colspan="3">There are many opportunities to include Creativity and Innovation in Level 2 Additional Mathematics. These opportunities are important to learners because problem-solving often requires learners to work towards a solution by exploring different starting points. This requires the application of creative and innovative thinking, encouraging learners to make their own mathematical discoveries and connections.

Below are some examples of how Creativity and Innovation can be embedded into teaching and learning:</td></tr>
<tr><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>3.2.1</td><td>Trigonometric graphs</td><td>Learners could use dynamic graphing software to create wave art by overlaying sine, cosine and tangent curves in creative arrangements. This allows learners to innovatively explore changes in amplitude and vertical shift.</td></tr>
<tr><td>Critical Thinking and Problem Solving</td><td colspan="3">There are many opportunities to include Critical Thinking and Problem Solving in Level 2 Additional Mathematics. These opportunities are important to learners because these skills are central to learning in mathematics and problem-solving strategies acquired, extend into other curriculum areas, every-day life and the workplace. Problem Solving in mathematics begins with analysing the problem, asking questions, and evaluating information. Learners then explore possible approaches, form arguments and justify their conclusions.

Below are some examples of how Critical Thinking and Problem Solving can be embedded into teaching and learning:</td></tr>
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<table>
<tr><td rowspan="2"></td><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>3.1.1</td><td>Properties of a straight line</td><td>Learners need to consider the conditions that make lines parallel or perpendicular to each other.

For example, rather than drawing the shape, learners could use the position of its vertices, gradients and lengths to determine the type of shape.</td></tr>
<tr><td></td><td>3.1.2</td><td>Application of Pythagoras’ theorem</td><td>Learners need to use critical thinking to link Pythagoras’ Theorem to the equation of a circle in the form $(x-a)^2+(y-b)^2=r^2$, that is, to explore the question ‘Why does the equation represent a circle?’</td></tr>
<tr><td rowspan="4">Planning and Organisation</td><td colspan="3">There are many opportunities to include Planning and Organisation in Level 2 Additional Mathematics. These opportunities are important to learners because they need to be able to break down tasks, sequence steps, manage time and check accuracy. These are all skills that transfer to examinations and real-life problem solving. Developing confidence in decision making aspires learners to set goals and challenges for themselves.

Below are some examples of how Planning and Organisation can be embedded into teaching and learning:</td></tr>
<tr><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>3.1.1</td><td>Properties of a straight line</td><td>Finding the equation of a straight line may involve a sequence of tasks that require planning and organisation.

For example, a gradient may need to be determined, a point on the line identified, the equation formed and then rearranged to $y=mx+c$.</td></tr>
</table>

<table>
<tr><td></td><td>3.2.4</td><td>Use of the sine rule, the cosine rule, and the formula for the area of a triangle in the form $\frac{1}{2}ab\sin C$.</td><td>Learners may need to decide a logical order to calculate an unknown length of a triangle.

For example:
Sketch the triangle ➡ Mark on known information ➡
Select formula ➡ Substitute values ➡ Solve ➡
Check the reasonableness of the answer.</td></tr>
<tr><td rowspan="4">Personal Effectiveness</td><td colspan="3">There are many opportunities to include Personal Effectiveness in Level 2 Additional Mathematics. These opportunities are important to learners because learners inevitably encounter challenges during their studies. Overcoming these challenges fosters resourcefulness and resilience.

Below are some examples of how Personal Effectiveness can be embedded into teaching and learning:</td></tr>
<tr><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>3.1.1</td><td>Properties of a straight line</td><td>Learners could practice different methods of finding the equation of a straight line.

For example, from a point and gradient and from two points. Developing multiple methods allows learners to select the most effective method for a given situation.</td></tr>
<tr><td>3.2.1</td><td>Trigonometric graphs</td><td>Learners can develop self-correction by comparing their sketches of graphs with a given range to a graphing tool and correct mistakes without teacher input.</td></tr>
</table>

Glossary for Unit 3

Term	Definition
Amplitude	The height of a trigonometric graph from its centre line to the highest point (or lowest point).
Periodicity	The interval over which a graph repeats along the x axis. For example, the graphs of $\sin\theta$ and $\cos\theta$ have a period of $360°$. Tangent has a period of $180°$.
The ambiguous case of sine	Can occur when using the sine rule to calculate an unknown angle from two sides and a non-included angle. The given information can result in two different possible values of an angle.