LEVEL 2

WJEC Level 2 Additional Mathematics

Approved by Qualifications Wales

Guidance for Teaching: Unit 4

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 3
    Aims of the Guidance for Teaching 3
    Additional ways that WJEC can offer support: 3
Qualification Structure 4
Unit 4 Summary of Assessment 5
Overview of Unit 4 5
Unit 4 Assessment objectives and weightings 5
Unit 4 Teacher Guidance 6
Learning Experiences 13
Opportunities for embedding elements of the Curriculum for Wales 14
Glossary for Unit 4 22

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
- 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 4 Summary of Assessment

Unit 4: Statistics **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 4

Statistics
(33⅓% of the qualification)

The purpose of this unit is to develop and strengthen the understanding of topics and concepts relating to statistics and probability and be able to use the associated mathematical language and terminology effectively.

A calculator will be allowed in this examination.

In this unit, learners will develop knowledge, skills and understanding in:	
4.1	Probability
4.2	Data representation and interpretation
4.3	Statistical Distributions

Unit 4 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 4 Teacher Guidance

4.1 Probability		
Content Amplification		**Teacher Guidance**
4.1.1 Mutually exclusive and independent events	Learners should be able to: • understand and use the addition law for mutually exclusive events, A and B, that is, $\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B)$ • understand and use the multiplication law for independent events, A and B, that is, • $\mathrm{P}(A \cap B) = \mathrm{P}(A) \times \mathrm{P}(B)$.	Learners should understand the difference between events that cannot occur together (mutually exclusive events) and those whose outcomes do not affect each other (independent events). This builds on GCSE probability and introduces formal use of the addition law for mutually exclusive events and the multiplication law for independent events. Learners should be able to justify independence using numerical reasoning e.g. comparing $P(A \cap B)$ with $P(A) \times P(B)$. **Example Question:** In a school, the probability that a student studies French is 0.3, and the probability that a student studies Spanish is 0.5. The probability that a student studies either French or Spanish is 0.65. (a) Calculate the probability that a student studies both French and Spanish. (b) Determine whether studying French and Spanish are independent events. Justify your answer.

4.1.2 Venn diagrams	Learners should be able to: • use Venn diagrams to calculate probabilities • use set notation and associated language, including the use of the generalised addition law, that is, • $\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$.	Learners are introduced to set notation for the first time, extending their GCSE experience of Venn diagrams. They should be able to interpret and complete diagrams using union ($A \cup B$), intersection ($A \cap B$) and complement (A') notation. Learners could use familiar contexts such as survey data (e.g. music or sport preferences) to populate diagrams. Emphasise the generalised additional law and how overlapping sets affect probability. **Example Question** Continued from previous section: (c) A third language, German, is studied by 20% of students. French and German are mutually exclusive, while Spanish and German are independent. Draw a Venn diagram to represent the events French (F), Spanish (S), and German (G), including the probability for each distinct region.

4.2 Data representation and interpretation

4.2.1 Measures of central tendency and variation

Learners should be able to:

- interpret measures of central tendency
- calculate standard deviation, including from listed data, frequency tables and grouped frequency tables
- interpret measures of variation, including range, interquartile range, variance and standard deviation
- compare data distributions using one measure of central tendency and/or one measure of variation.

The measures of central tendency that learners need to interpret are the mean, media and mode

Learners are to build on their knowledge of range and interquartile range (measures of variation). At this level, they extend to interpreting and calculating variance and standard deviation from listed data, frequency tables and grouped frequency tables.

To include the use of the following formulas (both to be given in formula list):

$$Var(X) = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2$$

$$Var(X) = \frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2$$

Example Question

The table shows the number of books read by a group of students in year 10 in a month.

Books read (x)	0	1	2	3	4	5
Frequency (f)	2	5	8	10	3	2

(a) Calculate the mean and standard deviation.

(b) Another group of students in year 11 were asked how many books the read in a month. The mean and standard deviation of the students in year 11 were 2.5 and 1.8 respectively. Compare the number of books read in a month by year 10 and 11 students, using appropriate statistical measures.

4.2.2 Statistical diagrams	Learners should be able to: • interpret diagrams for single variable data sets, including box and whisker diagrams, cumulative frequency diagrams and histograms • use diagrams to compare sets of data • understand skewness to describe the distribution of data, including use of the terms symmetrical, positive skew and negative skew • identify and interpret possible outliers in statistical diagrams, such as box and whisker diagrams.	Learners are expected to interpret diagrams such as, box and whisker diagrams, cumulative frequency diagrams and histograms. Learners are **not** expected to construct these diagrams. Learners are expected to be able to extract key features such as the median and quartiles, skewness and possible outliers. Learners are expected to use diagrams to compare distributions and discuss shape and spread.
4.2.3 Scatter diagrams	Learners should be able to: • interpret scatter diagrams for bivariate data, including understanding of correlation and that correlation does not imply causation • understand and interpret regression lines for bivariate data • use the equation of a regression line to make predictions, including interpolation and consideration of the dangers of extrapolation. Learners are not expected to calculate the coefficients of regression lines.	Learners should understand correlation and be able to use the terms 'positive', 'negative', 'zero', 'strong' and 'weak' to describe correlation. Learners may be asked to use the equation of a regression line to make predictions. Regression line will be given, learners will not draw a line of best fit or calculate the equation of a line of best fit. Learners should understand that correlation does not imply causation. Learners could be given opportunities to explore relationships using real-world contexts and to discuss reliability of making predictions, especially when extrapolating. **Example Question** A researcher investigates the relationship between hours of sleep (x) and concentration scores (y). The regression line is given by: $y = -2x + 80$ (a) Use the regression line to estimate the score for someone who slept 6 hours.

		(b) Explain why using the regression line to predict the score for someone who slept 12 hours may be unreliable. (c) Interpret the gradient of the regression line in context.

4.3 Statistical Distributions		
4.3.1 Discrete probability distributions	Learners should be able to: • calculate probabilities from a simple discrete probability distribution • interpret a probability function for a discrete random variable • calculate the mean and variance of a discrete random variable • interpret the mean and variance of a discrete random variable.	Learners are introduced to discrete random variables and probability distributions, extending their GCSE understanding of simple probability. Learners should be able to interpret a simple discrete probability distribution, calculate probabilities from it and verify that the distribution is valid (total probability is 1). Learners may be expected to calculate the mean (expectation) and the variance of a simple discrete random variable using the following formulas (both to be given in formula list): Expected (Mean): $E(X) = \mu = \sum xP(X = x)$ Variance: $Var(X) = \sigma^2 = \sum x^2\, P(X = x)\ - \mu^2$ Use everyday contexts such as the number of defective items in a batch or the number of goals scored in a match to help learners understand how distributions model real-world scenarios. **Example Question** The number of calls received by a helpdesk in an hour is modelled by the discrete random variable X.

X	**0**	**1**	**2**	**3**	**4**
P$(X = x)$	0.1	0.2	0.4	0.2	0.1

(a) Show that this is a valid probability distribution.

		(b) Find the probability that more than 2 calls are received. (c) Calculate the expectation (mean) of X. (d) Calculate the variance of X. (e) Interpret the mean and variance in context.

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.	Learners can work independently to analyse statistical data sets and interpret diagrams. They can collaborate in pairs or small groups to compare findings, discuss interpretations and justify conclusions. Group tasks could include evaluating the reliability of data sources or comparing different data representations.
Gain experience and appreciation of the role mathematics plays in other subjects and areas of the curriculum.	Learners can be encouraged to explore how statistical methods are used in subjects such as geography (e.g. population data), science (e.g. experimental results) and PE (e.g. performance analysis). Teachers can use cross-curricular data sets to highlight the relevance of statistical thinking across disciplines.
Gain awareness and appreciation of some of the different careers and work-related areas that draw upon mathematics.	Teachers can introduce careers that use statistics, such as analyst, sports scientist, market researcher, or epidemiologist. Learners could investigate how professionals use statistical tools to make decisions and reflect on how these skills are transferable to the workplace.
Access rich tasks that invoke curiosity, build resilience and require Learners to be resourceful.	Learners can be given open-ended tasks such as: “Which city has the most consistent weather?” or “Is there a link between screen time and sleep?”. These tasks require learners to source and interpret data, make assumptions and justify their conclusions using statistical reasoning.
Undertake practical work that allows Learners to apply their mathematical skills inside and outside of the classroom setting.	Learners can collect data from their own environment (e.g. class survey, sports performance, local traffic counts) and use statistical techniques to analyse and present their findings. This supports the development of real-world data handling and interpretation skills.
Encounter familiar, unfamiliar and complex problems.	Learners are exposed to a range of problems, such as familiar problems (e.g. involving interpreting box and whisker diagrams), unfamiliar problems (e.g. interpreting skewness or reasoning about probability in context), or complex problems (e.g. combine multiple techniques, such as comparing two data sets using both central tendency and variation).

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">Local, National & International Contexts</td><td colspan="3">There are many opportunities to include Local, National and International Contexts in Level 2 Additional Mathematics. These opportunities are important to learners because it helps them understand how mathematics is used to interpret and compare data from their own communities, across Wales and around the world. Below is an example of how Local, National & International Contexts can be embedded into teaching and learning:</td></tr>
<tr><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>4.2.1</td><td>Measure of central tendency and variation</td><td>Learners could use real data sets from Welsh government reports, UK census data or international sporting events.

Learners could analyse population data of Wales and other countries to compare measures of central tendency and variation.</td></tr>
<tr><td rowspan="3">Sustainability</td><td colspan="3">There are many opportunities to include Sustainability in Level 2 Additional Mathematics. These opportunities are important to learners because they encourage them to use statistical reasoning to explore the impact of human actions on the environment.

Below is an example of how Sustainability can be embedded into teaching and learning:</td></tr>
<tr><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>4.2.3</td><td>Scatter diagrams</td><td>Learners could explore how statistical analysis can inform sustainable decision-making, such as using scatter diagrams to investigate the relationship between energy consumption and carbon emissions.</td></tr>
</table>

<table>
<tr><td rowspan="3">Diversity</td><td colspan="3">There are many opportunities to include Diversity in Level 2 Additional Mathematics. These opportunities are important to Learners because they allow them to explore how data can reflect or challenge inequalities in society.

Below is an example of how Diversity can be embedded into teaching and learning:</td></tr>
<tr><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>4.2.2</td><td>Statistical diagrams</td><td>Learners could use statistical diagrams to explore representation and inclusion. Learners could interpret cumulative frequency diagrams and boxplots, comparing income distribution across different regions or demographic groups.</td></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 shows how statistical skills are used in a wide range of careers and industries.

Below is an example 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>4.3.1</td><td>Discrete probability distributions</td><td>Teachers should highlight how statistical skills are used in various professions and give learners the opportunity to see how these skills are transferable.

For example, learners could interpret probability distributions used in quality control within manufacturing industries and professions.</td></tr>
</table>

Cross-curricular Skills – Literacy			
	There are many opportunities to include Literacy in Level 2 Additional Mathematics. These opportunities are important to learners because they support development of clear and precise communication. Learners must be able to interpret written information, explain their reasoning and present statistical findings using appropriate vocabulary and structure. **Below are some examples of how Literacy can be embedded into teaching and learning:**		
	Specification Reference	***Amplification***	***Example***
Listening	4.2.3	Scatter diagrams	Learners could listen to peers/teacher explain the meaning of correlation and regression and respond with questions or clarification. For example, learners to listen to discussions about why correlation does not imply causation and contribute with their own examples.
	Specification Reference	***Amplification***	***Example***
Reading	4.2.2	Statistical diagrams	Learners could read and interpret written descriptions of data seta and statistical diagrams. For example, learners could read a contextual problem involving a histogram and extract key information to answer questions.

Speaking	***Specification Reference*** 4.1.1	***Amplification*** Mutually exclusive and independent events	***Example*** Learners could explain verbally their reasoning when determining whether events are independent or mutually exclusive. Learners could present their solutions to probability problems to the class, justifying their use of the multiplication law. Encourage learners to use mathematical terminology.
Writing	***Specification Reference*** 4.2.1	***Amplification*** Measure of central tendency and variation	***Example*** Learners could write structured responses explaining statistical comparisons and interpretations. For example, learners could write a conclusion comparing two data sets using mean and standard deviation.

Cross-curricular Skills – Numeracy			
	There are many opportunities to include Numeracy in Level 2 Additional Mathematics. These opportunities are important to learners because they strengthen mathematical fluency and reasoning in real-world contexts. Below are some examples of how Numeracy can be embedded into teaching and learning:		
Developing Mathematical Proficiency	***Specification Reference*** 4.2.1	***Amplification*** Measure of central tendency and variation	***Example*** Learners could apply statistical techniques to summarise and compare data sets. Learners could calculate and interpret standard deviation and variance from grouped data.
Understanding the number system helps us to represent and compare relationships between numbers and quantities	***Specification Reference*** 4.2.3	***Amplification*** Scatter diagrams	***Example*** Learners could interpret numerical relationships between variables and use regression lines to make predictions. For example, learners could use a regression line to estimate values and discuss the reliability of extrapolation.
Learning that statistics represent data, and that probability models chance, help us make informed inferences and decisions	***Specification Reference*** 4.3.1	***Amplification*** Discrete Probability Distributions	***Example*** Learners could use probability models to evaluate outcomes and assess risks. Probability distributions could be used to model outcomes in quality control or decision-making scenarios.

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 help them use technology to process data, apply statistical techniques and explore probability models. **Below are some examples of how Digital Competence can be embedded into teaching and learning:**		
Producing	***Specification Reference*** 4.2.2	***Amplification*** Statistical diagrams	***Example*** Learners could use digital tools to create visual representation of data and enhance clarity in communication. For example, learners could use spreadsheet software to generate boxplots and cumulative frequency graphs from raw data. Learners can the interpret these statistical diagrams and make comparisons.
Data and Computational Thinking	***Specification Reference*** 4.3.2	***Amplification*** Discrete probability distributions	***Example*** Learners could use digital tools to calculate probabilities, expected values and variance, and to simulate random events. For example, learners could use CODAP or GeoGebra Probability Calculator to simulate random variables and explore how distributions behave over repeated trials.

<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 they encourage them to explore data in imaginative ways, ask meaningful questions and design their own investigations.

Below is an example 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>4.2.1</td><td>Measures of central tendency and variation</td><td>Learners should be encouraged to explore data creatively and propose new questions.

For example, learners could design their own survey and decide how to analyse and present their results.</td></tr>
<tr><td rowspan="3">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 it helps them evaluate data critically, question assumptions and justify their conclusions

Below is an example of how Critical Thinking and Problem Solving can be embedded into teaching and learning:</td></tr>
<tr><td>Specification Reference</td><td>Amplification</td><td>Example</td></tr>
<tr><td>4.1.1</td><td>Mutually exclusive and independent events.</td><td>Learners should develop the ability to evaluate data and reasoning.

For example, learners could evaluate whether two events are independent using contextual and numerical reasoning.</td></tr>
</table>

Planning and Organisation	**There are many opportunities to include Planning and Organisation in Level 2 Additional Mathematics. These opportunities are important to learners because they support the development of structural thinking and methodical working.** **Below is an example of how Planning and Organisation can be embedded into teaching and learning:**		
	Specification Reference	***Amplification***	***Example***
	4.2.1	Measure of central tendency and variation	Teachers should support learners in structuring their approach to statistical tasks. Independently, learners could then plan how to collect, organise and analyse data for a classroom investigation.
Personal Effectiveness	**There are many opportunities to include Personal Effectiveness in Level 2 Additional Mathematics. These opportunities are important to learners because they build confidence in using mathematics to make sense of the world.** **Below is an example of how Personal Effectiveness can be embedded into teaching and learning:**		
	Specification Reference	***Amplification***	***Example***
	4.2.3	Scatter diagrams	Learners should be encouraged to reflect on their learning and apply it confidently. For example, learners could present their findings from a data investigation to the class, using scatter diagrams.

Glossary for Unit 4

Term	Definition
Box and Whisker Diagram	A diagram that shows the minimum, lower quartile, median, upper quartile, and maximum of a data set.
Conditional Probability	The probability of an event occurring given that another event has already occurred.
Correlation	A measure of the strength and direction of a relationship between two variables.
Cumulative Frequency Diagram	A graph that shows the running total of frequencies, used to estimate medians and quartiles.
Discrete Random Variable	A variable that can take only specific, separate values, each with an associated probability.
Expected Value (Mean)	The average value of a random variable, calculated by multiplying each value by its probability and summing the results.
Histogram	A type of bar chart used to represent grouped continuous data, where the area of each bar is proportional to the frequency.
Independent Events	Events where the outcome of one does not affect the outcome of the other. For example, rolling a die and flipping a coin.
Interquartile Range (IQR)	The difference between the upper and lower quartiles; it measures the spread of the middle 50% of the data.
Mutually Exclusive Events	Events that cannot happen at the same time. If one occurs, the other cannot. For example, getting heads or tails on a single coin toss.
Probability Distribution	A table or function that shows the probabilities of all possible values of a discrete random variable.
Regression Line	A straight line that best fits the data in a scatter diagram, used to make predictions.
Scatter Diagram	A graph used to show the relationship between two variables.
Set Notation	Symbols used to describe relationships between sets, such as $\cup$ (union), $\cap$ (intersection), and A' (complement of A).
Skewness	A description of the asymmetry of a data distribution. Positive skew means a longer tail on the right; negative skew means a longer tail on the left.
Standard Deviation	A measure of how spread out the values in a data set are from the mean.
Variance	The average of the squared differences from the mean; a measure of spread.
Venn Diagram	A diagram that uses overlapping circles to show relationships between sets and to calculate probabilities.