LEVEL 2

WJEC Level 2 Additional Mathematics

Approved by Qualifications Wales

Sample Assessment Materials

Unit 4: Statistics

Teaching from 2026
For award from 2027

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

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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

Surname	Centre number	Candidate number
First name(s)		0

Level 2

5322U4

Additional Mathematics – Unit 4 Statistics

50 minutes

SAMPLE ASSESSMENT MATERIALS

Additional materials

The use of a calculator will be required for this examination.

Instructions to candidates

Use black ink or black ball-point pen. Do **not** use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces provided at the top of this page.

Answer **all** the questions in the spaces provided.

Write your answers in the spaces provided in this booklet. If you need more space, use the additional page(s) at the back of this booklet, taking care to number the question(s) correctly.

For examiner's use only		
Question	**Maximum mark**	**Mark awarded**
1.	**4**	
2.	**8**	
3.	**4**	
4.	**6**	
5.	**9**	
6.	**9**	
Total	**40**	

Information for candidates

The number of marks is given in brackets at the end of each question or part-question.

In question **5(a)**, the assessment will take into account the quality of your mathematical organisation, communication and accuracy in writing.

Formula List – Unit 4 Statistics

Probability

Generalised addition formula:

$$\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$$

Variance (Data)

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

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

Discrete Distributions

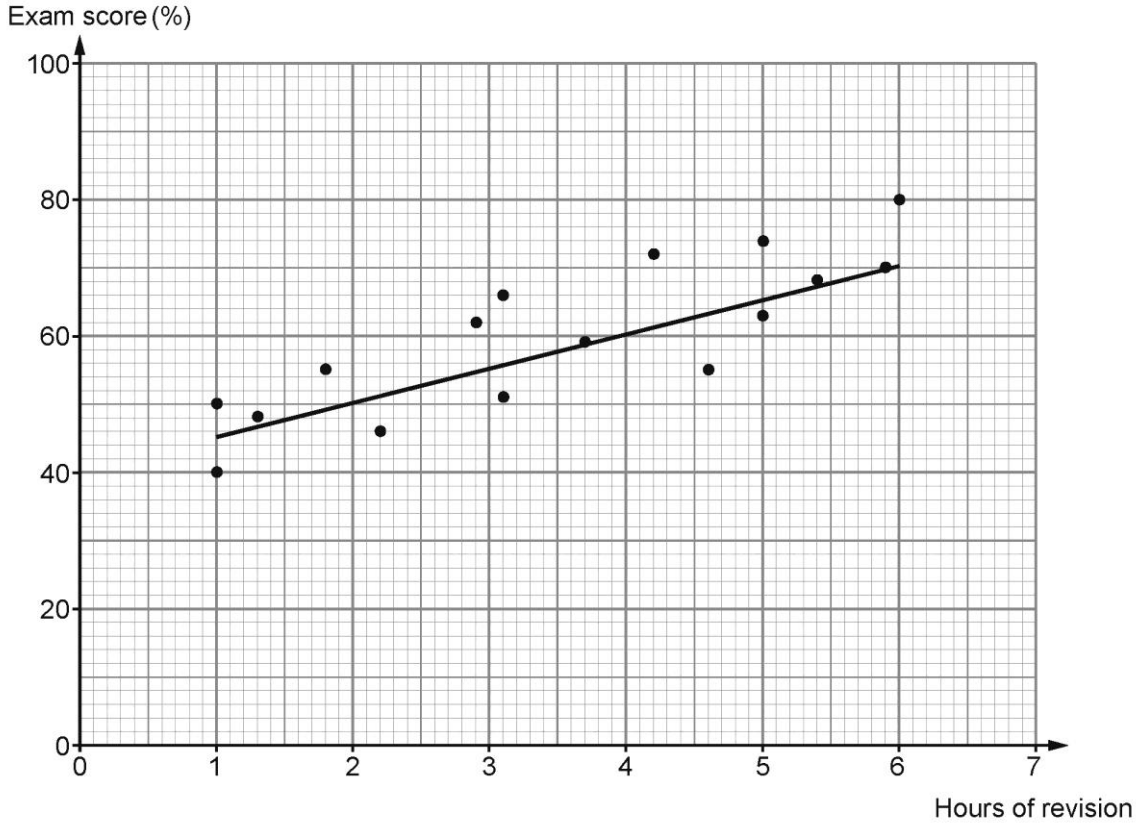
Expectation (Mean): $\mathrm{E}(X) = \mu = \sum x\mathrm{P}(X = x)$

Variance: $\mathrm{Var}(X) = \sigma^2 = \sum x^2\mathrm{P}(X = x) - \mu^2$

Answer **all** questions.

Examiner only

1. A researcher is investigating the relationship between the number of hours spent revising for an exam and the scores obtained in the exam for a group of students. The scatter diagram below shows the results.



The equation of the regression line is given by

$$y = 5.5x + 40.5,$$

where x is the number of hours spent revising and y is the exam score obtained.

(a) (i) Describe the correlation shown in the scatter diagram. [1]

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(ii) Explain why correlation may not imply causation in this context. [1]

Examiner only

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(b) Use the equation of the regression line to estimate the exam score of a student who revised for 4 hours. [1]

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(c) A student revised for 10 hours. Explain why using the regression line to predict their score might be unreliable. [1]

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Examiner only

2. The events A and B are such that

$$P(A) = 0.2, \qquad P(B) = 0.4, \qquad P(A \cup B) = 0.52.$$

(a) Calculate $P(A \cap B)$. [2]

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(b) Determine whether or not A and B are independent. [2]

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Examiner only

(c) The event C is such that $P(C) = 0.25$.
The events A and C are mutually exclusive, and the events B and C are independent.

Draw a Venn diagram to illustrate the events A, B and C. Include the probability for each distinct region on your diagram. [4]

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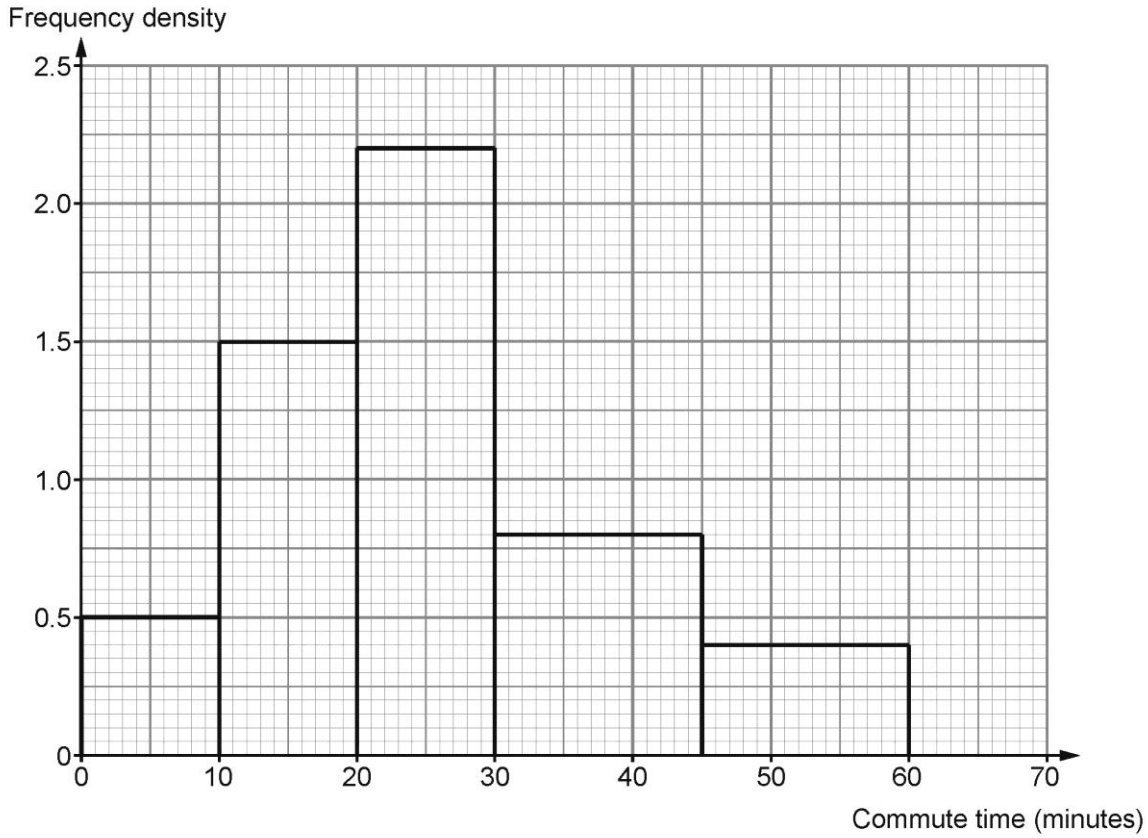
Examiner only

3. A study was conducted in Aberystwyth to analyse the time that residents spend commuting to work each morning. The data for 60 residents are summarised in the histogram below.



(a) The local councillor claims that most residents spend under 20 minutes commuting to work each morning. Use the histogram data to assess the validity of this claim. [2]

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(b) (i) Describe the skewness of the data. [1]

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(ii) Explain what it suggests about commuting habits in Aberystwyth. [1]

Examiner only

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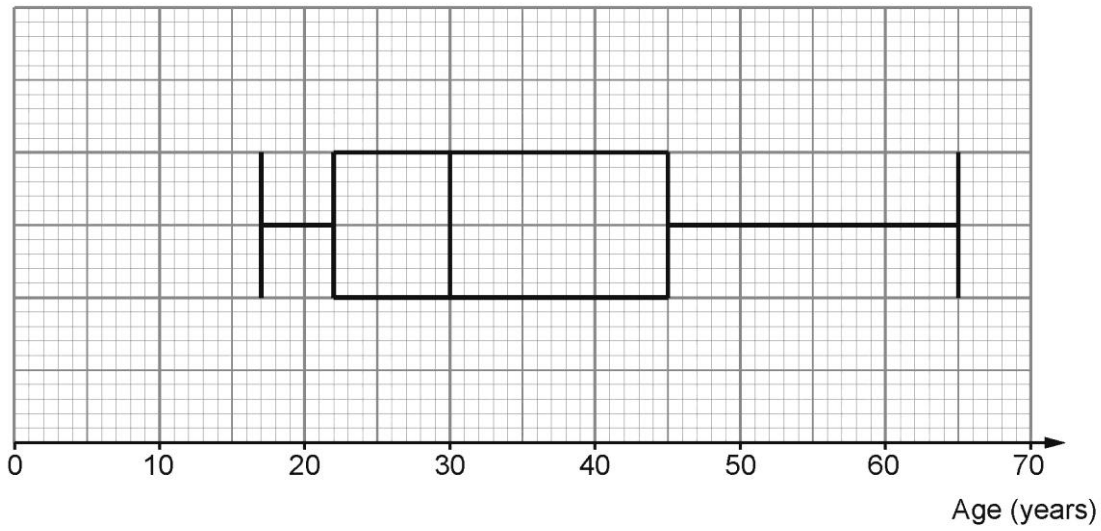
Examiner only

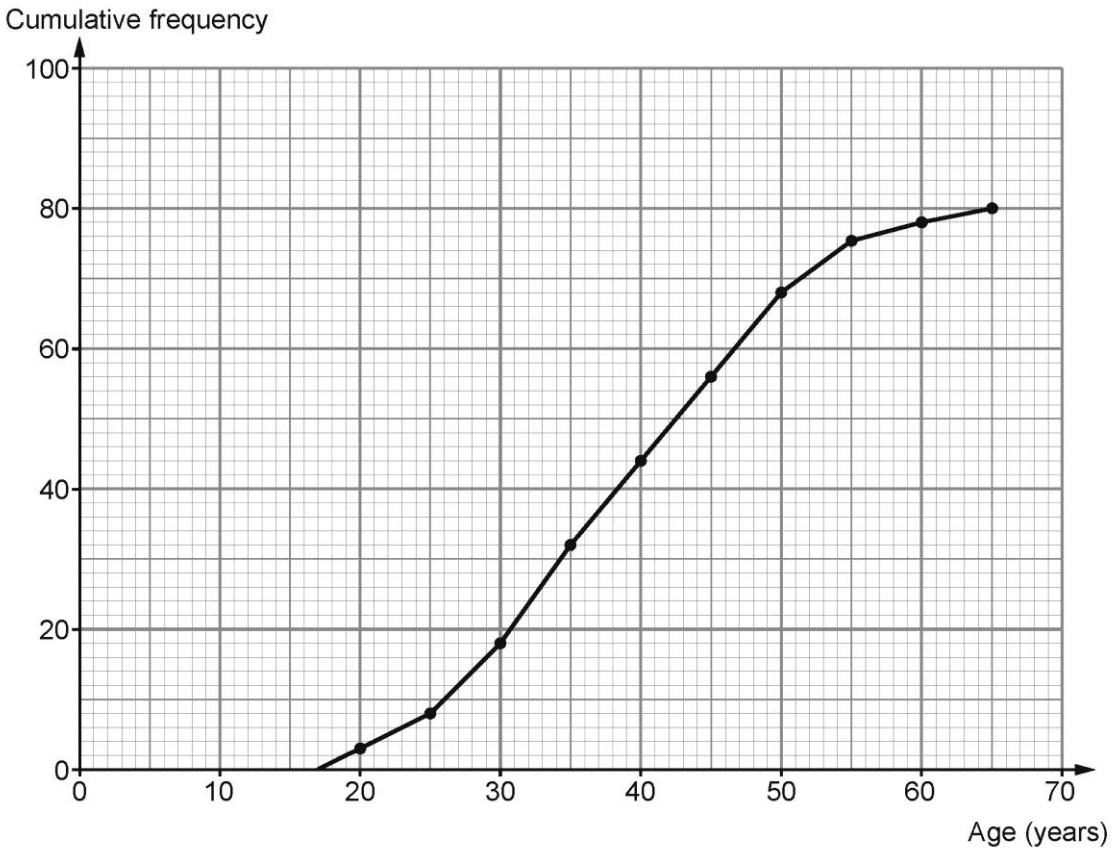
4. A sports analyst is studying the ages of participants in two popular Welsh running events: the Cardiff Half Marathon and the Snowdonia Trail Race.

The data for the Cardiff Half Marathon are represented using a box-and-whisker diagram, while the data for the Snowdonia Trail Race are presented as a cumulative frequency diagram.

Cardiff Half Marathon



Snowdonia Trail Race



(a) Compare the two distributions. What does this suggest about the age of participants in each race? [4]

Examiner only

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(b) Describe the skewness of the distribution of the ages of participants in the **Cardiff Half Marathon**. Justify your answer. [2]

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Examiner only

5. A restaurant chain monitors the number of visitors per day, to the nearest 10, at two of its locations, Aberystwyth and Bangor, over a 20-day period. The data are summarised in the frequency tables below.

Aberystwyth								
Number of visitors (x)	50	60	70	80	90	100	110	120
Frequency (f)	2	3	4	5	3	2	1	0

Bangor								
Number of visitors (x)	50	60	70	80	90	100	110	120
Frequency (f)	4	5	5	3	2	1	0	0

(a) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Calculate the mean and standard deviation for the number of visitors per day to **Aberystwyth**.

You must show all your workings. [5 + 2 OCW]

Examiner only

(b) The mean number of visitors per day for Bangor is 68.5, and the standard deviation is 14.2.
Compare the number of visitors for the two locations, using appropriate statistical measures. [2]

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6. A factory produces small electronic components. The number of defective components found in a daily quality check can be modelled by the discrete random variable X. The probability distribution of X is given below.

Number of defective components (x)	0	1	2	3	4
$P(X = x)$	0.35	0.3	0.2	0.1	0.05

(a) Show that the probability distribution is valid. [1]

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(b) Find the probability that at least 2 defective components are found on a random chosen day. [2]

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(c) Calculate the expected number of defective components found per day.
You must show all your workings. [2]

Examiner only

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(d) Calculate the variance of X.
You must show all your workings. [4]

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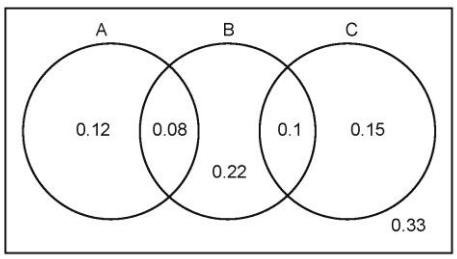
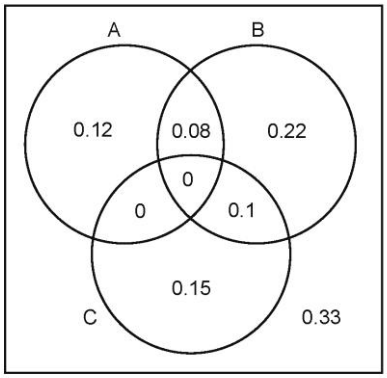
END OF QUESTIONS

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.
	…… ……

MARK SCHEME

Level 2 Additional Mathematics Unit 4: Statistics SAMs		Mark	Comments
1(a) (i)	**Positive** correlation	B1	
1(a) (ii)	Valid comment about other factors that affect exam score, e.g. • Natural ability • Quality of revision • Exam difficulty • Stress	E1	
1(b)	$y = 5.5 \times 4 + 40.5$ $= 62.5 \ (\%)$	B1	
1(c)	Valid comment about 10 being outside the data range, e.g. • Unreliable prediction due to extrapolation. • 10 hours is outside the data range	E1	
2 (a)	$\mathrm{P}(A \cap B) = 0.2 + 0.4 - 0.52$ $= 0.08$	M1 A1	Do not accept use of $P(A \cap B) = P(A)P(B)$
2 (b)	$P(A) \times P(B) = 0.4 \times 0.2$ $= 0.08 = P(A \cap B)$ Therefore, A and B are independent	M1 A1	
2 (c)		B4	B1 showing $P(A \cap C) = 0$ B1 for both 0.1 and 0.08. FT their 0.08 B1 any two of 0.12, 0.15, 0.22 and 0.33 B1 for all of 0.12, 0.15, 0.22 and 0.33, with a fully valid Venn diagram.
2(c)	*Alternative method*	B4	B1 showing $P(A \cap C) = 0$ B1 for both 0.1 and 0.08. FT their 0.08

			B1 any two of 0.12, 0.15, 0.22 and 0.33 B1 for all of 0.12, 0.15, 0.22 and 0.33, with a fully valid Venn diagram.
3(a)	Proportion of commuters under 20 minutes $= 33.\dot{3}\%$ or 20 commuters < half of 60. Valid comment e.g. Only one third of commuters travel less than 20 minutes, so the claim is incorrect.	B1 E1	
3(b) (i)	**Positive** skew	B1	
3(b) (ii)	Valid comment, e.g. Most commuters have shorter travel times. Fewer commuters have longer travel times.	E1	
4(a)	Correctly identifying **both** medians, CHM= 30 STR = 38 Correctly identifying **both** IQR, CHM = 23 STR = 16 **One** valid comment comparing the medians, e.g. On average STR attracts older participants. **One** valid comment comparing the IQRs, e.g. CHM has a wider spread of ages	B1 B1 E1 E1	CHM = Cardiff Half Marathon STR = Snowdonia Trail Race Do not accept, The median is higher for STR. The median is lower for CHM. Do not accept, The IQR is lower for STR. The IQR is higher for CHM.

4(b)	Cardiff Half Marathon has a **positive skew.** Valid comment, e.g. The median (30) is closer to Q1 (22) than Q3 (45). The data are more closely grouped for the lower ages, but more spread out for the higher ages.	B1 E1	
5(a)	$\sum fx = 50 \times 2 + 60 \times 3 + 70 \times 4 + 80 \times 5 + 90 \times 3 + 100 \times 2 + 110 \times 1 (+120 \times 0)$ $= 1540$ Mean = $\frac{1540}{20} = 77$ $\sum fx^2 = 50^2 \times 2 + 60^2 \times 3 + 70^2 \times 4 + 80^2 \times 5 + 90^2 \times 3 + 100^2 \times 2 + 110^2 \times 1 (+120^2 \times 0)$ $= 123800$ $\text{Var}(X) = \frac{123800}{20} - 77^2$ $= 261$ SD = $\sqrt{261} = 16.2\ (16.15549442)$	M1 A1 M1 M1 A1	Or equivalent method to calculate the variance FT their '77'
	Organisation and communication Writing	OC1 W1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means For W1, candidates will be expected to: • show all their working

			• use correct mathematical form in their working • use appropriate terminology, units, etc.
5(b)	**One** valid comment comparing the means, e.g. On average Aberystwyth has more daily visitors than Bangor **One** valid comment comparing the standard deviations, e.g. The number of visitors at Bangor are more consistent from day to day compared to Aberystwyth	B1 B1	Do not accept, The mean is higher for Aberystwyth. The mean is lower for Bangor. Do not accept, The standard deviation is higher for Aberystwyth. The standard deviation is lower for Bangor.
6(a)	$0.35 + 0.3 + 0.2 + 0.1 + 0.05 = 1$ Since the total probability is 1, the distribution is valid.	 B1	
6(b)	$\mathrm{P}(X \geq 2) = \mathrm{P}(X = 2) + \mathrm{P}(X = 3) + \mathrm{P}(X = 4)$ $= 0.2 + 0.1 + 0.05$ $= 0.35$	 M1 A1	
6(c)	$\mathrm{E}(X) = \sum x\mathrm{P}(X = x)$ $= 0 \times 0.35 + 1 \times 0.3 + 2 \times 0.2 + 3 \times 0.1 + 4 \times 0.05$ $= 1.2$	 M1 A1	
6(d)	$\mathrm{E}(X^2) = \sum x^2\mathrm{P}(X = x)$ $= 0^2 \times 0.35 + 1^2 \times 0.3 + 2^2 \times 0.2 + 3^2 \times 0.1 + 4^2 \times 0.05$ $= 2.8$ $\mathrm{Var}(X) = 2.8 - (1.2)^2$ $= 1.36$	 M1 A1 M1 A1	 FT their ‘2.8’ and their ‘1.2’ CAO

How to read the mark scheme

- ‘M' marks are awarded for any correct method applied to appropriate working, even though a numerical error may be involved. Once earned they cannot be lost.
- ‘m’ marks are dependent method marks. They are only given if the relevant previous ‘M’ mark has been earned.
- ‘A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- ‘S’ marks are awarded for strategy
- ‘E’ marks are awarded for explanation
- ‘U’ marks are awarded for units
- ‘P’ marks are awarded for plotting points
- ‘C’ marks are awarded for drawing curves
- ‘OC’ marks are awarded for ‘organising and communicating’, a strand of OCW (organising, communicating and writing accurately)
- ‘W’ marks are awarded for ‘writing accurately’, a strand of OCW (organising, communicating and writing accurately)
- ‘SC’ marks are awards for special cases
- CAO: correct answer only
- ISW: ignore subsequent working
- FT: follow through

Mapping grid

Question	Marks	Assessment objective			OCW
		AO1	AO2	AO3	
1(a) i)	1	1			
1(a) ii)	1			1	
1(b)	1	1			
1(c)	1			1	
2(a)	2	2			
2(b)	2	2			
2(c)	4		4		
3(a)	2			2	
3(b) i)	1	1			
3(b) ii)	1			1	
4(a)	4			4	
4(b)	2		2		
5(a)	7	7			*
5(b)	2		2		
6(a)	1	1			
6(b)	2	2			
6(c)	2	2			
6(d)	4	4			
Total	**40**	**23**	**8**	**9**	