



Rewarding Learning

**General Certificate of Secondary Education
2024**

Statistics

Unit 2

Higher Tier

[GST22]

MONDAY 17 JUNE, AFTERNOON

MARK SCHEME

General Marking Instructions

Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The marks awarded for each question are shown in the right hand column and they are prefixed by the letters **M**, **A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers.

MA indicates marks for combined method and accurate working.

The solution to a question gains marks for correct method and marks for an accurate working based on this method. Where the method is not correct no marks can be given.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking

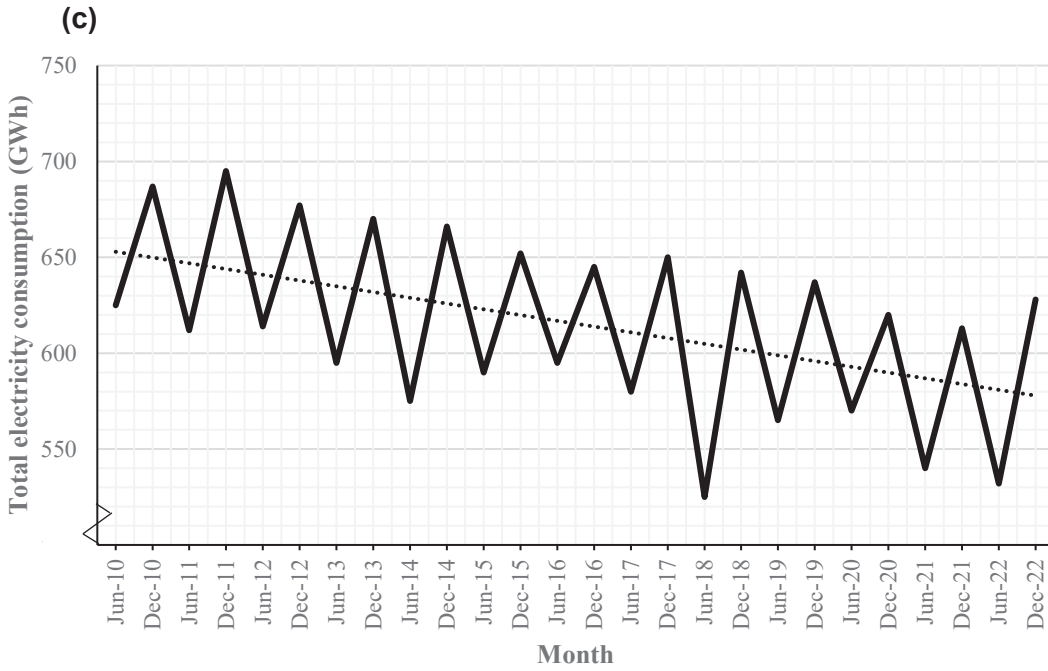
It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

- (a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;
- (b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examiner).

			AVAILABLE MARKS																																																																	
1	(a) Compound percentage bar chart	A1	5																																																																	
	(b) Republic of Ireland	A1																																																																		
	(c) Cannot tell The chart shows percentages so it is not possible to say whether the actual amounts represented by them are the same.	A2																																																																		
2	1500 is missing from the horizontal scale.	A1	3																																																																	
	Only 10 bars are present and the graph should show 11 (Lisburn and Castlereagh is missing).	A1																																																																		
	The grid needs to be longer as the values for Mid Ulster and Newry, and Down cannot be read.	A1																																																																		
3	(a)	3 4 means 34 visits	11																																																																	
		<table style="border-collapse: collapse; margin: auto;"> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">3</td><td style="padding: 2px 5px;">4</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">7</td><td></td><td></td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">4</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">8</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">5</td><td style="padding: 2px 5px;">4</td><td style="padding: 2px 5px;">5</td><td style="padding: 2px 5px;">5</td><td style="padding: 2px 5px;">5</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">8</td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">6</td><td style="padding: 2px 5px;">5</td><td style="padding: 2px 5px;">9</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">8</td><td style="padding: 2px 5px;">5</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">10</td><td style="padding: 2px 5px;">5</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>		3	4	6	7					4	2	8						5	4	5	5	5	6	8		6	5	9						7								8	5							9								10	5							MA2 A1
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	10	5																																																																		
(b) In Jack's class, 25% of the students visited the library 42 times or fewer last term.	A2																																																																			
(c) $IQR = Q_3 - Q_1$ $= 65 - 42$ $= 23$	MA1 A1																																																																			
(d) Lower outlier $< Q_1 - 1.5 \times IQR = 42 - 1.5 \times 23 = 7.5$ No lower outliers Upper outlier $> Q_3 + 1.5 \times IQR = 65 + 1.5 \times 23 = 99.5$ $105 > 99.5$ so 105 is an outlier.	MA1 A1 MA1 A1																																																																			
4	(a) A time series is a set of measurements of a variable which have been taken at intervals of time	A2																																																																		
	(b) June 2018	A1																																																																		



A1

(d) The trend line shows that there was a general decrease in the company's total electricity consumption between June 2010 and December 2022. A1

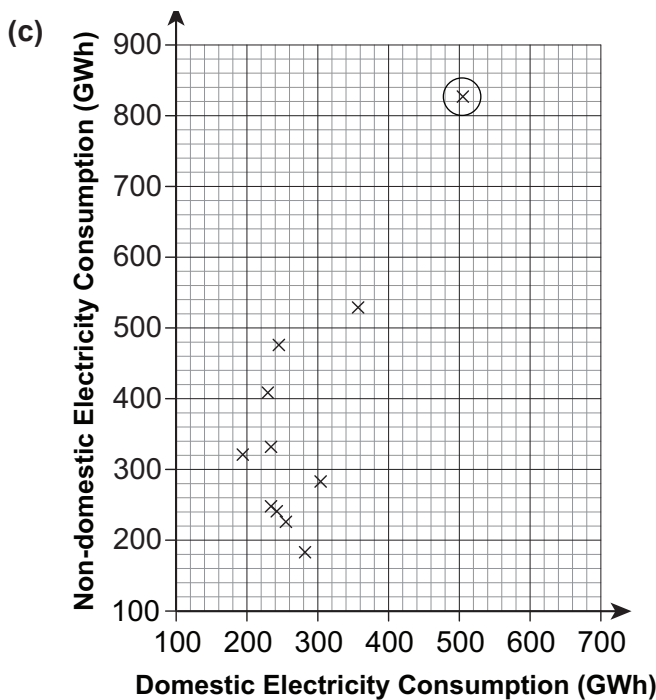
(e) He must assume that the trend will continue into 2023. A1

6

5 (a) (i) $\text{Mean} = \frac{4088 - 16}{11}$ MA1
 $= 370.18 \dots$
 $= 370 \text{ GWh}$ A1

(ii) Derry City and Strabane A1

(b) The value of the product moment correlation coefficient is fairly close to 1 so it suggests that there is a positive correlation between the domestic and non-domestic consumption for each of the council areas. A2



MA1 A1

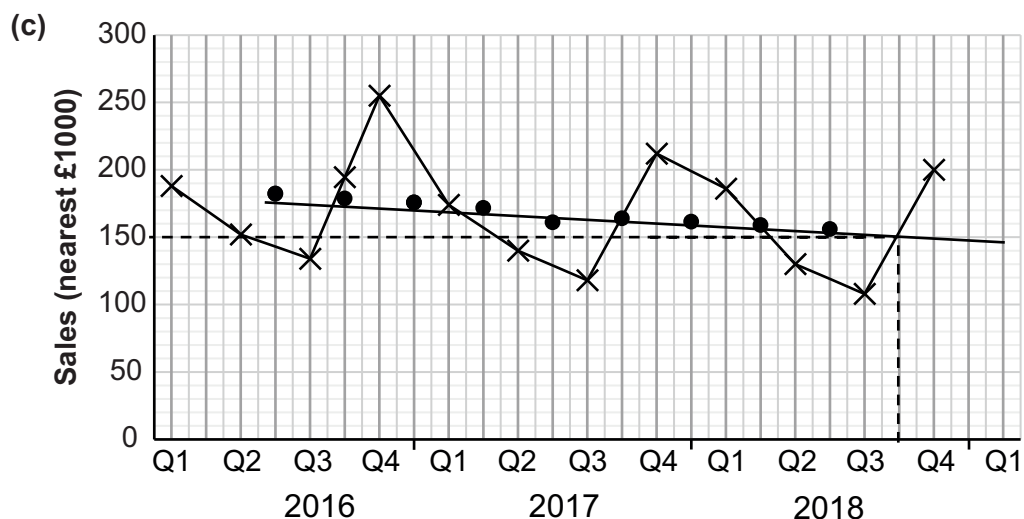
		AVAILABLE MARKS	
(d)	(i) See diagram Belfast	A1 A1	
	(ii) Belfast has the largest population and more businesses than any of the other council areas.	A2	
(e)	0.305	MA2	
(f)	The value of the product moment correlation coefficient for the remaining 10 council areas is close to 0 which suggests that there is no correlation between the total domestic and non-domestic electricity consumption for the council areas.	A2	
6	(a) A simple index number for a year shows the percentage total annual energy consumption compared to the base year 2009.	A2	
	(b) There has been a 1.94% decrease in total annual energy consumption since 2013	A3	
	(c) (i) $\frac{8095}{8049} \times 100 = 100.57$	MA1 A1	
	(ii) $\frac{8181}{8095} \times 100 = 101.06$	MA1 A1	
	(iii) $8049 \times \frac{104.76}{100} = 8432$	MA1 A1	
	(d) Annual energy consumption decreased over the period 2010 to 2014. Factors may include: weather conditions, energy efficiency improvements, extension of gas network, new boilers, more efficient appliances, increases in electricity prices, household composition.	A2	
	7	(a) $\frac{360 - 82}{360} \times 3178 = 2454$	MA1 A1
		(b) $\frac{912}{77} \times 283 = 3352$	MA1A1
		(c) $\frac{n}{r^2} = \frac{N}{R^2}$ $\frac{3178}{4^2} = \frac{4264}{R^2}$ $R^2 = \frac{16}{3178} \times 4264$ $R = 4.6 \text{ cm}$	M1MA1 A1
		(d) $RR = \frac{\text{risk of defective Crystalclear}}{\text{risk of defective Omniglaze}}$ $= \frac{0.005}{0.00125}$ $= 4$	MA2 MA1
			15
		13	

(e) Crystalclear windscreens are 4 times more likely to be defective than Omniglaze windscreens. A2

8 (a) Quarter 4 A1

(b) $\frac{212 + 186 + 130 + 108}{4} = 159$ MA1

$\frac{186 + 130 + 108 + 200}{4} = 156$ MA1



MA2

(d) There has been a general decrease in sales over the period. A1

(e) $\frac{130 + 108 + 200 + x}{4} = 153$ (candidate's own reading) M1 MA1

$x = 174$ A1

9

9 (a) Multivariate, discrete A2

(b) The scatter diagrams have been drawn using different scales which makes comparisons between them difficult. A2

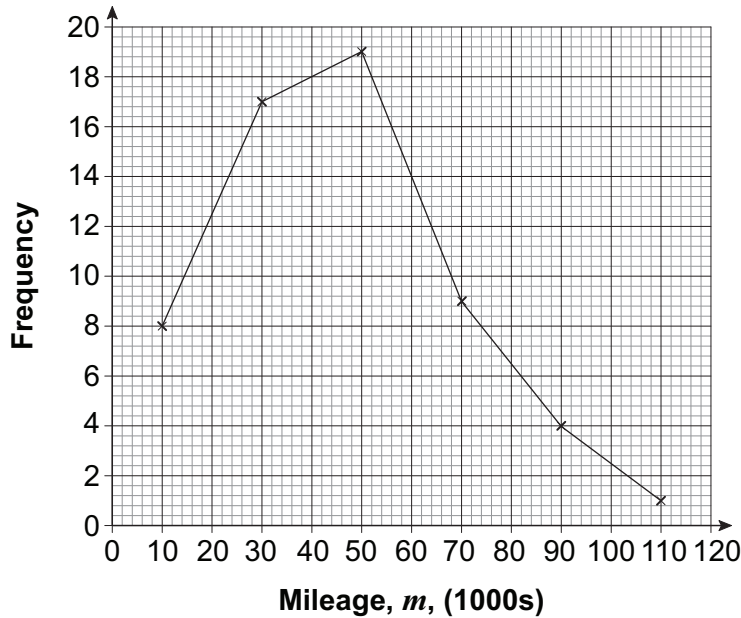
(c) There is a positive correlation between the Mathematics scores and the scores in the other two subjects.
The correlation is stronger between Science and Mathematics. A2

(d) (i) She should use the equation for the line of best fit for the Science and Mathematics diagram since the correlation is stronger for this one. A2

(ii) $y = -7.783 + 1.002x$
 $= -7.783 + 1.002 \times 78$ MA1
 $= 70.373$
 $= 70$ A1

10

10 (a)



MA2
A2

(b) The frequency polygon shows some positive skewness so a normal distribution model may not be appropriate.

A2

(c)

Mileage, m , (1000 miles)	Frequency f	fm	Cumulative frequency
$0 \leq m < 20$	8	80	8
$20 \leq m < 40$	17	510	25
$40 \leq m < 60$	19	950	44
$60 \leq m < 80$	9	630	53
$80 \leq m < 100$	4	360	57
$100 \leq m < 120$	1	110	58
	58	2640	

MA4

$$\text{Mean} = \frac{\sum fm}{\sum f} = \frac{2640}{58} = 45.5$$

$$= 45\,500 \text{ miles}$$

MA1

A1

$$\text{Median} = b + \left(\frac{\frac{n}{2} - CF}{f} \right) c$$

$$= 40 + \left(\frac{\frac{58}{2} - 25}{19} \right) \times 20$$

$$= 44.2$$

$$= 44\,200 \text{ miles}$$

MA1

A1

Rory should use the median to support the advertising statement since the median mileage is less than 45 000 miles.

A2

Total

AVAILABLE
MARKS

16

100