Rewarding Learning

General Certificate of Secondary Education
2019

Statistics

Unit 1

Higher Tier

[GST12]

THURSDAY 13 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.

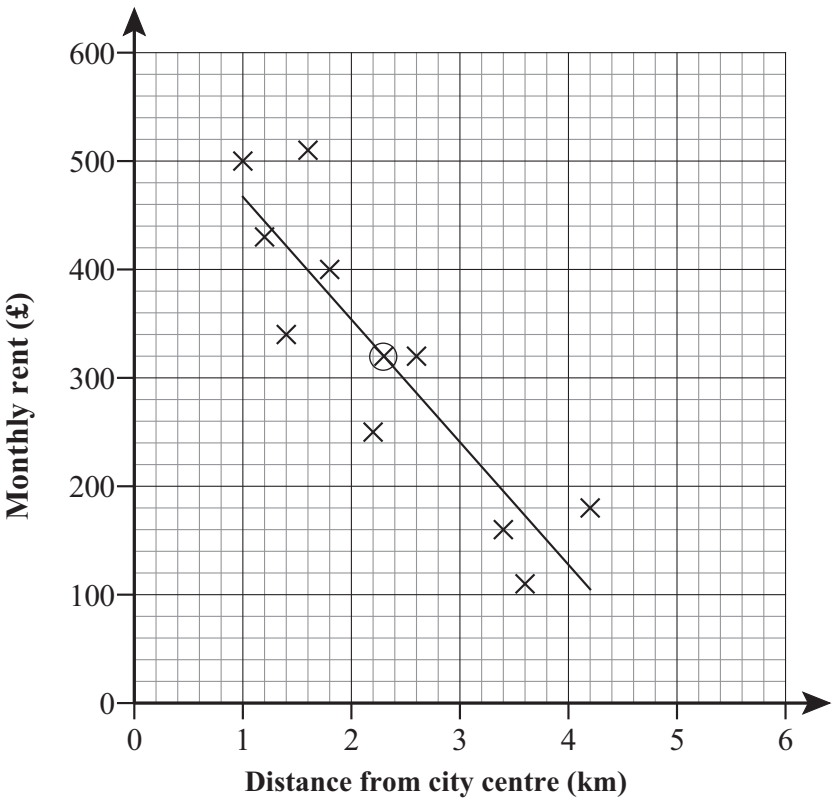
Some common examples of this occur in the following cases:

(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;

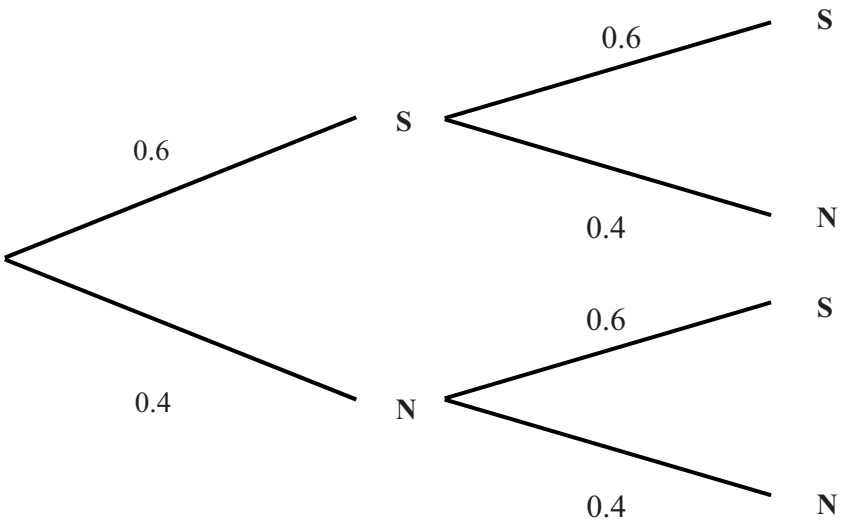
(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

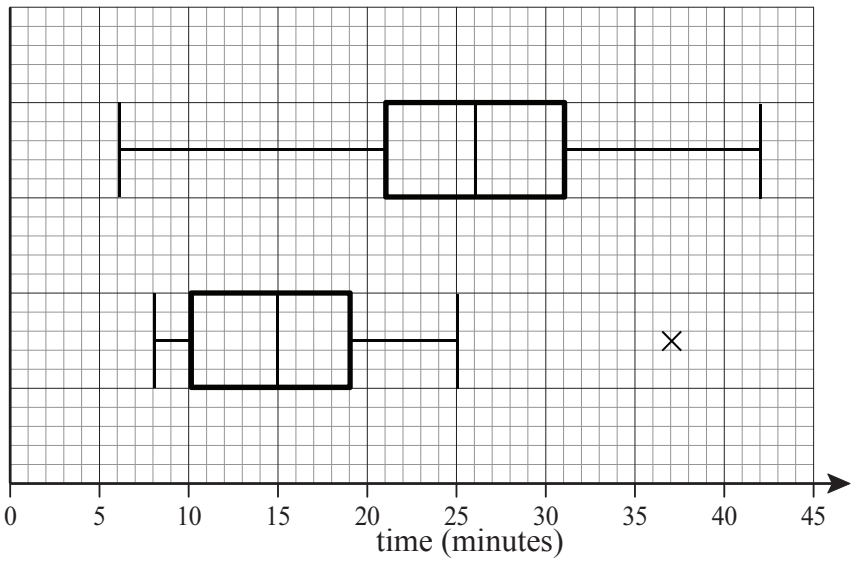
When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examiner)

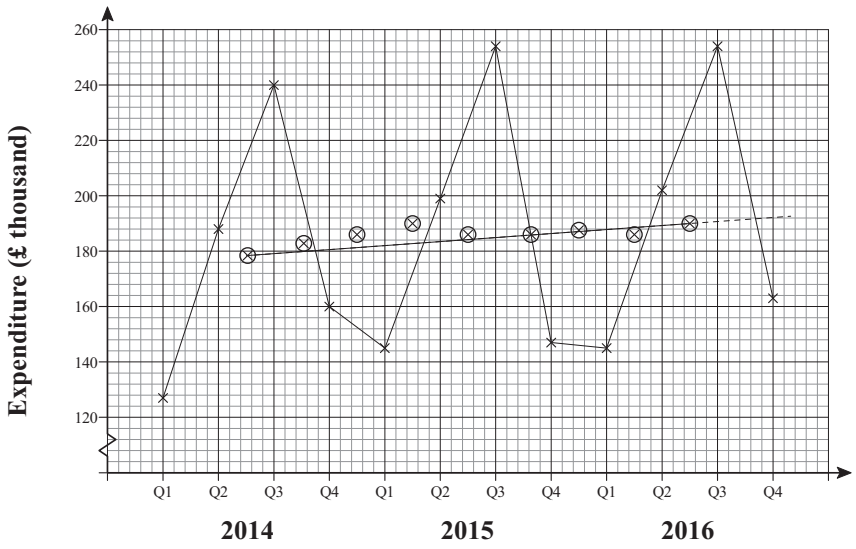
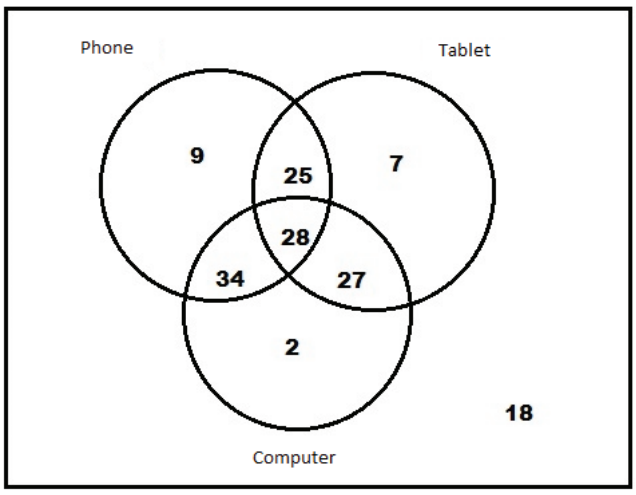
				AVAILABLE MARKS
1	**(a)**	Any two appropriate advantages, e.g. less time consuming for the researcher, costs less, etc.	A2	
	(b)	It is a leading question.	A1	
	(c)	It would allow the researcher to collect preliminary data and would highlight any potential problems with the survey before full implementation.	A2	
	(d)	Some of those included in the sample may not be residents of the town.	A1	6
2	**(a)**	London and Yorkshire and the Humber	A1	
	(b)	No	A1	
	(c)	The average starting salary for graduates in London is £29,500 and 50% of graduates earn this amount or less	A2	
	(d)	**(i)** Identified area, e.g. South West	A1	
		(ii) Reason, e.g. lowest unemployment rate.	A1	6

				AVAILABLE MARKS
3	**(a)**	Mean $= \frac{1.0 + 1.2 + 1.4 + 1.6 + 1.8 + 2.2 + 2.6 + 3.4 + 3.6 + 4.2}{10}$	MA1	
		$= 2.3$ km	A1	
	(b)		MA2	
	(c) **(i)**	Negative correlation	A1	
	(ii)	Apartments further away from the city centre have cheaper rent.	A1	
	(d) **(i)**	Yes	A1	
	(ii)	The given distance falls within the range of values for which the line of best fit was drawn.	A1	8

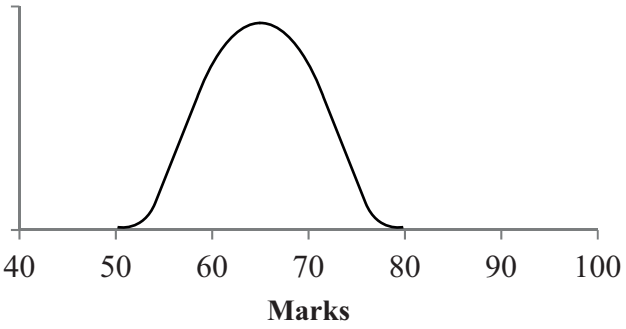
			AVAILABLE MARKS
4	**(a)** Obtain a list of all pupils in the school. Start at a random place on the list. Select every $\frac{1400}{50} = 28^{th}$ name.	A3	
	(b) Opportunity sampling	A1	
	(c) **(i)** $8 \leqslant t < 11$	MA1 A1	
	(ii) $11 \leqslant t < 14$	A1	
	(d) Helen's results follow a more uniform distribution than Peter's. The modal class for the results in Helen's sample was greater than the modal class for the results in Peter's sample.	A2	
	(e) **(i)** Peter	A1	
	(ii) The results from Peter's sample are more likely to be representative of the whole school.	A1	11

5	**(a)** 0.6	A1	AVAILABLE MARKS
	(b) 	MA3	
	(c) **(i)** P(SS) = 0.6 × 0.6	MA1	
	= 0.36	A1	
	(ii) P(SN or NS) = 0.6 × 0.4 + 0.4 × 0.6	M1 MA1	
	= 0.48	A1	
	(d) Expected frequency = 200 × 0.6 = 120	MA1	
	(e) This is very close to the expected frequency so the spinner is unlikely to be biased.	A2	12

			AVAILABLE MARKS
6	**(a)** 26 minutes	A1	
	(b) IQR = 31 – 21	MA1	
	= 10 minutes	A1	
	(c) Upper limit for outlier = UQ + 1.5IQR	M1	
	= 19 + 1.5(19 – 10)		
	= 32.5	A1	
	37 > 32.5 so 37 is an outlier	A1	
	(d) 	A3	
	(e) Teachers surveyed have a larger median travel time so take, on average, longer to travel to school. The travel times of those students surveyed have a smaller range so their travel times are more consistent/not as varied.	A4	
	(f) **(i)** The median will increase by 5 minutes.	A1	
	(ii) The range will stay the same.	A1	15

			AVAILABLE MARKS
7	**(a)** People are more likely to go cycling in the summer.	A1	
	(b) **(i)** The four points reflect the four quarters in the year.	A1	
	(ii) $\frac{147 + 145 + 202 + 254}{4} = 187$	MA1	
	$\frac{145 + 202 + 254 + 163}{4} = 191$	MA1	
	(c) 	MA2	
	(d) $\frac{202 + 254 + 163 + x}{4} = 192$	M1 MA1	
	$x =$ £149 thousand	A1	9
8	**(a)** 	MA4	
	(b) $18 + 7 = 25$	MA1	
	(c) $\mathrm{P}(T \cap \bar{P} \cap \bar{C}) = \frac{7}{150}$	MA1	
	(d) $\mathrm{P}(C \mid T) = \frac{28 + 27}{25 + 28 + 27 + 7}$	MA1	
	$= \frac{55}{87}$	A1	8

			AVAILABLE MARKS
9	**(a)** $P(\bar{A} \cap \bar{A}) = 0.4 \times 0.4$ (where A is the event that Michael arrives on time)	MA1	
	$= 0.16$	A1	
	(b) **(i)** Binomial distribution	A1	
	(ii) $n = 5$	A1	
	$p = 0.6$	A1	
	(c) $P(T = 2) = 10p^2q^3$	M1	
	$= 10(0.6)^2(0.4)^3$	MA1	
	$= 0.2304$	A1	
	(d) $P(T \geqslant 4) = P(T = 4) + P(T = 5)$	A1	
	$= 5(0.6)^4(0.4) + (0.6)^5$	MA1	
	$= 0.337$	A1	11

		AVAILABLE MARKS
10 **(a)** 	A2	
(b) $z = \frac{x-\mu}{\sigma}$		
$= \frac{71-65}{5}$	MA1	
$= 1.2$	A1	
(c) **(i)** Digital Technology	A1	
(ii) Her standardised score was higher in Digital Technology than in Home Economics.	A1	
(d) **(i)** $\bar{x} = \frac{\sum x}{n}$		
$= \frac{2124}{30}$	MA1	
$= 70.8$	A1	
(ii) $\sigma = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$	M1	
$= \sqrt{\frac{151887}{30} - \left(\frac{2124}{30}\right)^2}$	MA1	
$= 7.09$	A1	
(e) $z = \frac{x-\mu}{\sigma}$		
$-0.92 = \frac{x-70.8}{7.09}$	M1 MA1	
$= 64.277....$	A1	
$= 64$		14
	Total	**100**