Rewarding Learning

General Certificate of Secondary Education
2019

Statistics

Unit 2

Higher Tier

[GST22]

THURSDAY 20 JUNE, MORNING

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.

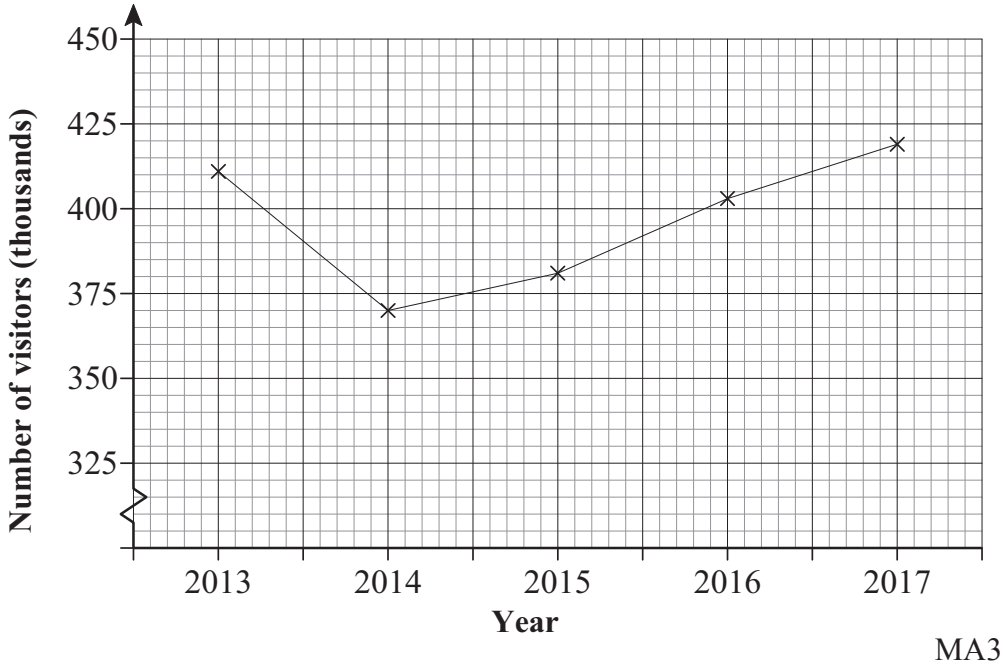
Some common examples of this occur in the following cases:

(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)

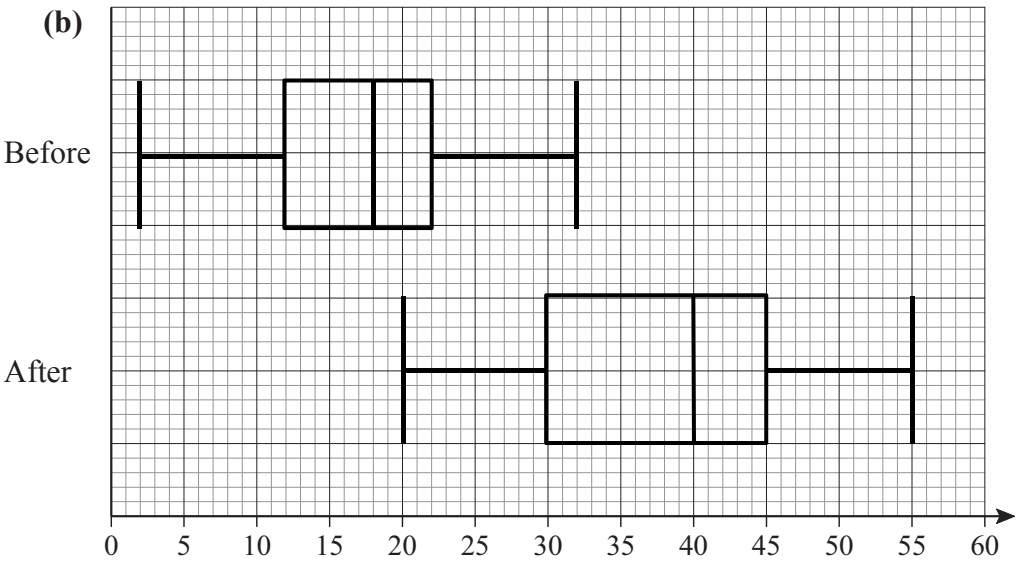
				AVAILABLE MARKS
1	**(a)**	A method of data collection which involves the entire population.	A1	
	(b)	Advantage: results are accurate	A1	
		Disadvantage: some items in the population may be difficult to access.	A1	
	(c)	The attraction may not be listed on the Discover Northern Ireland website.	A1	
	(d)	**(i)** People who are not visitors could be counted.	A1	
		(ii) All members of a large group may not be counted.	A1	6
2	**(a)**	784 thousand	A1	
	(b)	1627 thousand (1.627 million)	A1	
	(c)	Line graph	A1	
	(d)	**(i)** Kilbroney Park	A1	
		(ii) Significant increase in visitor numbers in 2017 following relatively stable numbers between 2013–2016	A1	
	(e)	Additional information shown in the diagram such as proportions, percentage change, etc.	A1 A1	
	(f)	**(i)** No	A1	
		(ii) Two independent reasons, e.g. Some visitors may not have been from Northern Ireland. Some people may have visited more than once.	A2	10

			AVAILABLE MARKS
3	**(a)**	 MA3	
	(b) **(i)**	2014 A1	
	(ii)	It is the lowest point on the line graph. A1	
	(c)	Decrease in visitor numbers beween 2013 and 2014 followed by a steady increase between 2014 and 2017. A2	
	(d)		

Year	**2013**	**2014**	**2015**	**2016**	**2017**
No. of visitors (thousands)	411	370	381	403	419
Index number	100	90.0	92.7	98.1	101.9

A1 for 100
A2 for all other values with P1 each 2 errors. A3 10

4	**(a)**	Hypothesis stated clearly A1	
		Appropriate data identified for both years A2	
		Reference to NISRA website A1	
		Potential problem identified, e.g. data may not be available for both years A1	
		How problem should be overcome, e.g. removal of attraction from sample A1	
	(b)	Appropriate diagram, e.g. multiple bar chart A1	
		Clear reason for diagram A1	
		Appropriate calculation e.g. percentage change A1	
		Clear reason for calculation A1	10

				AVAILABLE MARKS
5	**(a)**	**(i)** 18 orders	A1	
		(ii) 22 – 12	M1	
		= 10 orders	A1	
	(b)		A2	
	(c)	Median has increased from 18 to 40 orders so there are more orders on average.	A2	
		However, larger IQR (10 to 15) so less consistency in the number of orders.	A2	9
6	**(a)**	Secondary data	A1	
	(b)	Appropriate hypothesis, e.g. 'the lower the admission price, the more visitors'.	A1	
	(c)	The value of r cannot be less than –1	A1	
	(d)	–0.164	A2	
	(e)	The value is close to 0 so there is unlikely to be a correlation between admission price and visitor numbers.	A2	7

7 **(a)** Any advantages, e.g. no need for a different row for each possible result. A1
Any disadvantage, e.g. loss of accuracy A1

AVAILABLE MARKS

(b)

Mass, m (kg)	Frequency	m	fm
$0 \leqslant m < 5$	1	2.5	2.5
$5 \leqslant m < 10$	14	7.5	105
$10 \leqslant m < 15$	37	12.5	462.5
$15 \leqslant m < 20$	54	17.5	945
$20 \leqslant m < 25$	17	22.5	382.5
$25 \leqslant m < 35$	2	30	60
	125		1957.5

MA2

Mean = 1957.5 ÷ 125 M1
= 15.66 kg A1

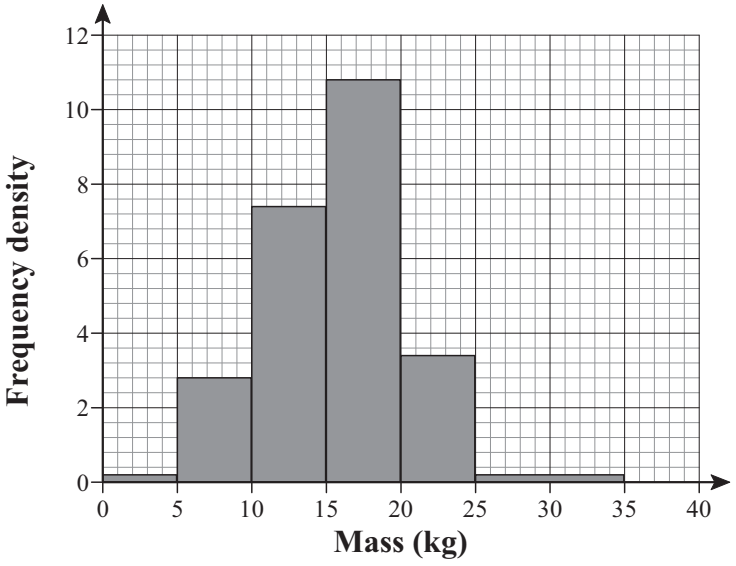
(c) 15.66 – 4.79 = 10.87 A1
15.66 + 4.79 = 20.45 A1

(d) She assumed the distribution of masses of suitcases was Normal. A1

(e)

Mass, m (kg)	Frequency	Frequency Density
$0 \leqslant m < 5$	1	0.2
$5 \leqslant m < 10$	14	2.8
$10 \leqslant m < 15$	37	7.4
$15 \leqslant m < 20$	54	10.8
$20 \leqslant m < 25$	17	3.4
$25 \leqslant m < 35$	2	0.2

MA2



MA2

(f) Distribution is approximately symmetrical so Carla's assunmption is justified. A2

15

			AVAILABLE MARKS
8	**(a)** Quantitative and bivariate.	A2	
	(b) 10.6 °C	A1	
	(c) The points lie close to a straight line	A1	
	(d) For every 1 °C increase in temperature, an estimated 24.9 more people visit the park.	A2	
	(e) $y = -25.5 + 24.9(16)$ $= 372.9$ $= 373$	MA1 A1	
	(f) –25.5	A1	
	(g) Two suitable reasons, e.g. $x = 0$ is outside the range of values for which the line was drawn Model unlikely to be applicable to a winter day	A2	11
9	**(a)** There was a 13.4% increase in admission price between 2013 and 2014	A2	
	(b) 1.064×3.89 = £4.14	MA1 A1	
	(c) $\frac{3.89}{2.88} \times 100$ $= 135.1$	MA1 A1	
	(d) They are based on the previous period of time rather than a fixed one in the past	A1	
	(e)		

	Bronze	**Silver**	**Gold**
Index number	103.126...	101.667...	107.696...

MA3

Weighted Index Number $= \frac{(103.126... \times 50) + (101.667... \times 35) + (107.696... \times 15)}{50 + 35 + 15}$ M1

$= 103.3$ A1

	(f) The geometric mean assumes equal contributions whereas the weighted mean takes relative proportions into account.	A1	13

				AVAILABLE MARKS
10	**(a)**	The radius of the 2017 chart is longer	A1	
	(b)	Angle = 75°	MA1	
		No. of Adults = $\frac{1575}{75} \times (360 - 75)$	M1	
		= 5985	A1	
	(c)	$r = 5$ cm and $R = 6.4$ cm		
		$f = 7560$	MA1	
		Proportional: $\frac{F}{6.4^2} = \frac{7560}{5^2}$	M1	
		$F = 12\,386$	A1	
		No. of adults = $\frac{288}{360} \times 12\,386$	M1	
		= 9909	A1	9
			Total	**100**