GCSE
Mathematics

Unit 1 43601H
Mark scheme

43601H
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Version 1.1

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from aqa.org.uk

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

M	Method marks are awarded for a correct method which could lead to a correct answer.
M dep	A method mark dependent on a previous method mark being awarded.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
Q	Marks awarded for Quality of Written Communication.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[*a, b*]	Accept values between *a* and *b* inclusive.
3.14 …	Allow answers which begin 3.14 eg 3.14. 3.142, 3.149
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a candidate has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the candidate. In cases where there is no doubt that the answer has come from incorrect working then the candidate should be penalised.

Questions which ask candidates to show working

Instructions on marking will be given but usually marks are not awarded to candidates who show no working.

Questions which do not ask candidates to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Candidates often copy values from a question incorrectly. If the examiner thinks that the candidate has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Q	Answer	Mark	Comments
1(a)	All four points plotted correctly (275, 125), (150, 190), (125, 225), (180, 175)	B2	B1 for two or three correct plots

Q	Answer	Mark	Comments
1(b)	Appropriate line of best fit	B1	A straight line at least 4 squares wide which goes through, or would go through, the two gates (125, 175 - 225) and (275, 75 - 125)

Q	Answer	Mark	Comments
1(c)	Correct reading from their graph	B1ft	ft their negative, straight line of best fit If B0 awarded in (b), accept answer in range [145, 150]

1(c)	**Additional Guidance**
	Allow ± ½ square tolerance but condone rounding up to the next 5 or down to the previous 5

Q	Answer	Mark	Comments
2(a)	Survey — Colours Experiment — People Observation — Vehicles Data logging — Reaction times	B2	B1 Any one or two correctly linked

2(b)	Primary selected **and** Secondary **not** selected	B1	
	Discrete selected **and** Continuous **not** selected	B1	

	Additional Guidance	
2(b)	1, 3	B2
	1, 4	B1
	1, 3, 4	B1
	1, 2, 3	B1
	2, 3	B1

3	All four correct combinations **and** scores (in any order)		**B3**	B2 for any 2 or 3 correct combinations (condone missing or incorrect scores) B1 for any 1 correct combination (condone missing or incorrect score) Rows may be in any order

W	D	L	Score
4	0	0	8
3	1	0	7
3	0	1	6
2	2	0	6
2	1	1	5
1	3	0	5

3	**Additional Guidance**
	Accept blank as zero
	Must have correct scores for B3
	Beware 2, 1, 0 = 5 (doesn't add up to 4 games)

4(a)	**Alternative method 1**		
	3×5 or 15 (children) or 20 (children)	M1	eg 3 : 15
	15 and 20 and No	A1	oe No, they had 5 extra children
	Alternative method 2		
	$20 \div 5$ or 20 (children) or 4 (adults)	M1	eg 4 : 20
	4 and No	A1	oe No, they needed 1 more adult

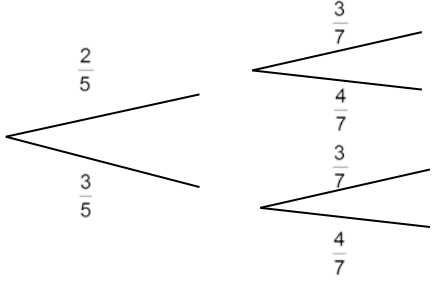|		
4(a)	**Additional Guidance**	
	Allow misreads for the other sports on Saturday or walking on Sunday or walking on Saturday and Sunday:	
	$27 \div 5$ or 5.4 (adults) M1A0	
	$18 \div 5$ or 3.6 (adults) M1A0	
	$30 \div 5$ or 6 (adults) M1A0	
	$50 \div 5$ or 10 (adults) M1A0	

4(b)	$\frac{1}{3}$ or $\frac{9}{27}$ or $\frac{8}{24}$	B1	oe **fraction**

4(c)	12 ÷ 3 or 30 ÷ 5 or 16 ÷ 2	M1	4 adults (archery) or 6 adults (walking) or 8 adults (sailing) NB 4, 6, 3 implies M0
	12 ÷ 3 and 30 ÷ 5 and 16 ÷ 2	M1	4 adults (archery) and 6 adults (walking) and 8 adults (sailing) Condone misread of **one** bar height if number of adults rounded up
	18	A1	Must be from 12, 30 and 16

4(c)	**Additional Guidance**
	Condone all M marks for misread of Saturday for any bar: Archery : 27 ÷ 3 = 9 M1 Walking : 20 ÷ 5 = 4 Sailing : 18 ÷ 2 = 9 (Total = 22) M1A0
	Condone all M marks for misread of both days for any bar: Archery : 39 ÷ 3 = 13 M1 Walking : 50 ÷ 5 = 10 Sailing : 34 ÷ 2 = 17 (Total = 40) M1A0
	NB 1 + 3 = 4 is M0
	NB 1 + 5 = 6 is M0
	12 ÷ 3 + 30 ÷ 5 + **15** ÷ 2 = 4 + 6 + 8 = 18 is M1M1A0 (the 8 is from wrong working but one misread of a bar height is allowed)

5	**Alternative method 1**		
	1200 – 970 or 230	M1	
	$\dfrac{\text{their } 230}{1200} \times 100$ or 19.1(6...)	M1dep	
	19.2	A1	SC2 for an answer of 80.8 SC1 Any answer with at least 2 dp seen and correctly rounded to 1 dp
	Alternative method 2		
	$\dfrac{970}{1200} \times 100$ or 80.83...	M1	
	100 – their 80.83... or 19.1(6...)	M1dep	
	19.2	A1	SC2 for an answer of 80.8 SC1 Any answer with at least 2 dp seen and correctly rounded to 1 dp

6	11 chosen with no other number less than 11 chosen	B1	
	4×10 or 40	M1	
	23	A1	SC1 for 2 numbers with a total of 34

7(a)		B2	B1 at least one pair of branches correct

7(b)	$\dfrac{2}{5} \times \dfrac{3}{7}$	M1	oe May be seen on tree diagram
	$\dfrac{6}{35}$	A1	oe 0.17(...)

7(b)	**Additional Guidance**

	Condone further work involving adding extra probabilities for the M mark, eg
	
	P(black, orange) + P(orange, black) = $\dfrac{2}{5} \times \dfrac{3}{7}$ + $\dfrac{3}{7} \times \dfrac{2}{5}$
	
	    or
	
	P(black, orange) + P(white, orange) = $\dfrac{2}{5} \times \dfrac{3}{7}$ + $\dfrac{3}{5} \times \dfrac{3}{7}$
	
	                                                                                        M1A0

8	680 or 120	B1	
	their 680 $\times$ 19.6(0) or 13 328 **and** (800 – their 680) $\times$ 23 or 2760	M1	their 680 must be in the range [560, 710] Allow reversed values as a misread
	16 088	A1ft	ft their 680 if in the range [640, 690] SC2 17 992

8	**Additional Guidance**
	The SC2 is for swapping the prices
	Allow [640, 690] for M1A1ft as this interval contains all the likely scale misreads for reading off around 17 - 18 years age
	If the student misreads the graph for 680, the following pairs are likely combinations for M1A1ft:
	640, 160 → £16 224
	650, 150 → £16 190
	660, 140 → £16 156
	690, 110 → £16 054
	Allow [560, 710] for M1as this is [15, 20] years
	The following pairs score M1 max:
	580, 220 → (£16 428)
	620, 180 → (£16 292)
	700, 100 → (£16 020)

9(a)	min = 9 **and** max = 30 on box plot	B1	
	median = 21	B1	
	LQ = 15 **and** UQ = 27	B1	Condone 15.5 **and** 26
	Correct structure – box with LQ, median, UQ and whiskers to min and max	Q1	Strand (ii) Logical organised working Must have scored at least B1

9(a)	**Additional Guidance**
	Mark the box plot first (allow normal tolerance of ± ½ square on diagram)
	Only consider working if measures are not obvious from box plot
	If extra (or no) vertical line(s) for median, assume box ends are LQ and UQ Q0

9(b)	Yes Ben's median (24) is bigger than Amy's median (21) or Yes and 24 and 21	B1ft	ft their box plot values from (a) oe

9(c)	their 27 – their 15 or 12 or 25 – 20 or 5	M1	Condone '20 to 25' or '15 to 27' for M1
	Yes and Ben's IQR is 5 and Amy's IQR is 12	A1ft	ft their box plot values from (a) Accept Yes and his IQR is smaller for M1A1 SC1ft No and their ranges are both the same (21)

10	$\dfrac{21}{100} \times 1.262 \times 10^{11}$ or 26 502 000 000 or 2.6502×10^{10} or $\dfrac{34}{100} \times 6.7 \times 10^{7}$ or 22 780 000 or 2.278×10^{7} or $(1.262 \times 10^{11}) \div (6.7 \times 10^{7})$ or 1883.(...)	M1	oe Digits 26 502 or 2278 or 1883 imply M1
	their 26 502 000 000 ÷ their 22 780 000 or their 1883.(...) $\times \dfrac{21}{100} \div \dfrac{34}{100}$	M1dep	oe Digits 1163 imply M2
	1163.38(...) or 1163 or 1163.4 or 1163.39 or $1.163(...) \times 10^{3}$	A1	

11(a)	Each group in the sample is in the same proportion (as the population)	Q1	oe Must refer to the idea of proportion Strand (i) Vocabulary

	Additional Guidance		
	Use of word proportion(al), ratio, relative is usually worth a mark		
	The word 'fair' without reference to idea of proportionate is not enough		
11(a)	...distributed equally between sections	B0	
	...splitting the data fairly	B0	
	...grouped sample. Strata means group	B0	
	...in the same ratio as the whole group	B1	
	...relative in size to the group	B1	
	...choosing fair proportions	B1	
		B1	
	...the same percentage of each group		B1

	$\dfrac{35}{35+220+45} \times 60$	M1	oe $35 \div 5$
	7	A1	May be implied by $\dfrac{7}{60}$
11(b)	$\dfrac{\text{their } 7}{60}$ and $\dfrac{\text{their } 7-1}{59}$	M1	Condone $\dfrac{\text{their } 7}{60} \times \dfrac{\text{their } 7-1}{60}$ or $\dfrac{\text{their } 7}{60} \times \dfrac{\text{their } 7}{59}$ or $\dfrac{35}{300} \times \dfrac{34}{299}$
	$\dfrac{42}{3540}$ or $\dfrac{7}{590}$ or 0.0118(...) or 0.0119 or 0.012	A1ft	oe ft their $\dfrac{\text{their } 7}{60} \times \dfrac{\text{their } 7-1}{59}$ SC2 $\dfrac{119}{8970}$ or 0.013... oe

12(a)	**Alternative method 1**		
	(175 – 170) × 2 or 10 (firefighters) or (185 – 175) × 3.8 or (190 – 185) × 6 or (200 – 190) × 1.2 or 12	M1	
	38 or 30	A1	
	175 ≤ height < 185 and 38 seen	A1	Working needed SC1 for 175 ≤ height < 185 without relevant working Condone 175 – 185 or 185 – 175
	Alternative method 2		
	170 to 175 = 2 or = 50 or 190 to 200 = 2.4 or = 60	M1	Counts squares
	7.6 or 6 or 190 (firefighters) or 150	A1	Must be from counting squares
	175 ≤ height < 185 and 190 seen or 175 ≤ height < 185 and 7.6 seen	A1	Working needed SC1 for 175 ≤ height < 185 without relevant working Condone 175 – 185 or 185 – 175

12(a)	**Additional Guidance**
	Ignore a slip in calculating the end bar(s) if middle correct

12(b)	**Alternative method 1**		
	Midpoints seen or implied 172.5, 180, 187.5, 195	B1	Condone one error
	their Σfx $10 \times 172.5 + 38 \times 180 + 30 \times 187.5 + 12 \times 195$ or 1725 + 6840 + 5625 + 2340 or 16 530	M1	Condone one error ft their midpoints
	their $\Sigma fx \div 90$	M1 dep	their 16 530 ÷ 90
	184 or 183.7 or 183.66... or 183.67	A1	Anything less accurate than 2dp requires correct working seen NB Using heights gives 183.69 and scores B1 only
	Alternative method 2		
	Midpoints seen or implied 172.5, 180, 187.5, 195	B1	Condone one error
	their Σfx $2 \times 172.5 + 7.6 \times 180 + 6 \times 187.5 + 2.4 \times 195$ or 345 + 1368 + 1125 + 468 or 3306	M1	Condone one error ft their midpoints
	their $\Sigma fx \div 18$	M1 dep	their 3306 ÷ 18
	184 or 183.7 or 183.66... or 183.67	A1	Anything less accurate than 2dp requires correct working seen NB Using heights gives 183.69 and scores B1 only

12(b)	**Additional Guidance**
	A repeated consistent error is only one error

12(c)	One correct bound seen 170.35 or 170.45 or 195.55 or 195.65	M1	195.6 – 170.4 + 0.1
	25.3	A1	