GCSE
STATISTICS
8382/2F

Foundation Tier Paper 2

Mark scheme

June 2022

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226G8382/2F/MS

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 Examiner.

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.

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Glossary for Mark Schemes

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

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

M	Method marks are awarded for a correct method which could lead to a correct answer.
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.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
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.
[a, b)	Accept values $a \leq$ value $< b$
3.14…	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
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 student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

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

Questions which do not ask students to show working

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

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student 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.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the student intended it to be a decimal point.

Q	Answer	Marks	Comments
1	lower quartile	B1	

Q	Answer	Marks	Comments
2	C	B1	

Q	Answer	Marks	Comments
3	$\frac{3}{5}$	B1	

Q	Answer	Marks	Comments
4	stem-and-leaf diagram	B1	

Q	Answer	Marks	Comments
5(a)	293	B1	
	Additional Guidance		
	Condone 293 000 000		B1

Q	Answer	Marks	Comments
5(b)	Sight of any correct subtraction	M1	eg 544 – 397 or 517 – 338 or 513 – 293 or 475 – 215 or 459 – 165 or 383 – 123 or the reverse of any of these
	2017 with no incorrect working seen	A1	accept with no working
	Additional Guidance		
	Please check table for workings		
	Answers to any correct subtraction, with or without a – sign ie (–)147 or (–)179 or (–)220 or (–)260 or (–)294 or (–)260		M1

Q	Answer	Marks	Comments
5(c)	Plots the remaining four points	B1	±½ small square tolerance
	Joins their plots with dotted lines	B1ft	
	Additional Guidance		
	$\pm \frac{1}{2}$ square tolerance on plots and joins		

Q	Answer	Marks	Comments
5(d)	Two valid comments	B2	B1 for one valid comment (but no contradictory comment)
	Additional Guidance		
	Ignore irrelevant comments but please check any numerical values quoted, as they need to be correct		
	Do not accept comments which refer to 'physical'		
	Accept both comments in one sentence		
	Value of streaming increased year upon year and Value of downloads decreased year upon year		B2
	Streaming keeps going up but downloads keep going down		B2
	Streaming is getting more popular and downloads are getting less popular		B2
	Streaming made more sales over the years		B1
	Streaming has positive trend / is increasing because it's positive (correlation)		B1
	It's positive (correlation)		B0

Q	Answer	Marks	Comments
6(a)	3 correct plots with no incorrect plots	B1	±½ small square tolerance
	Additional Guidance		
	Ignore additional points plotted outside [26, 28]		

Q	Answer	Marks	Comments
6(b)	$\frac{50+54+...+66}{9}$ or $\frac{522}{9}$	M1	oe allow one error or omission
	58	A1	
	Additional Guidance		
	Condone poor notation if recovered eg 50 + 54 + 52 + 57 + 57 + 56 + 65 + 65 + 66 ÷ 9 = 58 eg 50 + 54 + 52 + 57 + 57 + 56 + 65 + 65 + 66 ÷ 9 = 463.33	 M1A1 M0A0

Q	Answer	Marks	Comments
6(c)	Double mean plotted at (23, their 58)	M1	±½ small square tolerance may be implied by lobf going through this point
	Acceptable line of best fit through correct or their plotted double mean, positive gradient for x values from 18.5 to 27.5	A1ft	ft their double mean point and their plotted points
	Additional Guidance		
	Mark intention of a straight line		

Q	Answer	Marks	Comments
6(d)	Correct value for mass = 25 on their line of best fit	B1ft	must be from a positive line of best fit ±½ small square tolerance

Q	Answer	Marks	Comments
6(e)	No and suitable comment linking this dog's mass/weight to the data	B2ft	B1ft correct reading from their lobf or No
	Additional Guidance		
	Do not accept comments that refer to mean height/weight		
	No, smallest height on table is 50 cm and that's for 18.5 kg / that dog weighs less		B2
	No, it should be near/over 50 cm		B2
	No, other dogs around that mass are (taller) around 50 cm		B2
	No, measurements are too far out from this data		B1
	It doesn't go below 50 ("it" refers to the dog and it is below 50)		B0
	The breed doesn't go below 50		B0
	Yes, the dog could just be very skinny		B0

Q	Answer	Marks	Comments
7(a)	Whatsapp	B1	

Q	Answer	Marks	Comments
7(b)(i)	$0.8 \times 68\,(000\,000)$ or $\frac{55}{68}\,(\times 100)$	M1	oe please check graph for workings
	54.4 (million) or 54 400 000 or 80.8(8) or 80.9	A1	 accept 81
	(nearly 55 million) so Simran is correct or (nearly 80%) so Simran is correct	B1ft	accept 54.4 and "it's nearer to 54, so incorrect" ft if M1A0 awarded
	Additional Guidance		
	Ignore reference (correct or incorrect) to the second part of the statement.		
	B1 is only available to those who have been awarded M1		
	If a build up method is used, marks cannot be awarded if working is not shown eg 10% = 5, 80% = 40 so Simran is wrong eg 55 ÷ 10 = 5, 10% = 5, 80% = 40 so Simran is wrong		 M0A0B0 M1A0B1
	Simran is correct may be implied eg 54.4 is almost 55		 M1A1B1

Q	Answer	Marks	Comments
7(b)(ii)	There is no evidence that this means daily use (so Simran is wrong)	B1	
	Additional Guidance		
	Doesn't say what days/times	B1	
	Don't know how often/frequently this was used	B1	
	No evidence to support this	B1	
	No way to tell/prove	B1	
	Doesn't say if it's every day / several times a day	B1	
	People may be at school/work/holiday so can't be on it every day	B0	
	We don't know if they're on it all day	B0	

Q	Answer	Marks	Comments
8(a)	16 outside the two circles but in the box	B1	
	$\frac{100-16}{4}$ or 21 or 63	M1	
	63 in T and 21 in M	A1	

Q	Answer	Marks	Comments
8(b)	$\frac{\text{their } 21}{100}$	B1ft	oe fraction, decimal or percentage
	Additional Guidance		
	$0 <$ their $21 < 100$		
	Ignore further work after a correct answer seen		
	Do not accept a ratio		

Q	Answer	Marks	Comments
9(a)	3 + 11 + … + 34 + 42 or 168	M1	allow one error or omission
	$\frac{42}{168}$ or $\frac{1}{4}$	A1	oe fraction, decimal or percentage
	Additional Guidance		
	Ignore further work after a correct answer seen		
	Do not accept a ratio		

Q	Answer	Marks	Comments
9(b)	Any three of these errors • omission of 10 (20, 30) from key/scale/range • error in shading for centre top square • shading should follow order of values, eg darkest for highest • value of 42 is seen but scale finishes at 39	B3	oe B2 any two of the errors B1 any one error check diagram
	Additional Guidance		
	Top middle is wrong colour (or other identification of that box)		B1
	No colour for 42 / 42 cannot be (dealt with) on diagram		B1
	11 cannot be two different colours		B1
	0-9 light shading, 31-39 dark shading		B1
	Key has missing numbers / skipped numbers / gaps		B1
	Colours should be lightest to darkest		B1
	He has not got a higher number box		B0
	42 in bottom right		B0
	Missing numbers / numbers aren't correct (too vague)		B0
	11 is wrong colour / second box is wrong colour		B0
	Top middle		B0
	Squares shaded wrong way round / incorrectly		B0
	Key upside down		B0

Q	Answer	Marks	Comments
10(a)	Conservative	B1	accept any indication

Q	Answer	Marks	Comments
10(b)	100 (°)	B1	$\pm 2°$ may be implied by correct answer
	$\frac{\text{their } 100}{360} \times 54\,000$	M1	oe $0 <$ their angle < 360
	15 000	A1ft	ft their 100°
	Additional Guidance		
	For the M1A1ft, the wrong sector may be used		
	For the A1ft on a different angle, if the full, correct value is seen, ignore any subsequent rounding		
	100 (°) seen and eg $\frac{25}{360} \times 54\,000 = 3750$ (100 (°) abandoned)		B0M1A1ft
	90 (°) or right angle symbol on chart and $54\,000 \div 4 = 13\,500$		B0M1A1ft
	$54\,000 \div 4 = 13\,500$ (there are 4 parties)		B0M0A0

Q	Answer	Marks	Comments
11(a)	Attempts to add, cumulatively	M1	allow one error
	(8), 31, 71, 90, (100)	A1	
	Additional Guidance		
	Accept these values seen anywhere, not necessarily in the table - check graph for implied values if table is blank		

Q	Answer	Marks	Comments
11(b)	Fully correct diagram • plotted at 5, 10, 15, 20, 25 • correct heights (ft if cumulative frequency attempted) • points joined by line segments or a smooth curve (ft if cumulative frequency attempted)	B3ft	B2 any two bullets satisfied B1 bullet 1 or bullet 2 satisfied ±½ small square tolerance mark intention of straight lines or smooth curve
	Additional Guidance		
	Ignore lines before first plot and after final plot		
	If no values in (a), up to B2 can be awarded for a strictly increasing graph, plotted at 5, 10, 15, 20, 25		
	Condone bar chart and cf drawn		

Q	Answer	Marks	Comments
11(c)	Fully correct diagram • median = 9 • LQ = 6 • UQ = 14 • structure correct with a box and whiskers to 1 and 27	B4	±½ small square tolerance B3 3 bullets satisfied B2 2 bullets satisfied B1 1 bullet satisfied
	Additional Guidance		
	If the median, LQ and UQ values have been identified somewhere other than on the boxplot, they can still score unless contradicted by their boxplot – check cf graph		
	If no boxplot is drawn, but on the cf graph they have only the three sets of lines to "read off" at LQ, Med, UQ and the correct value against each correct line, you can award these marks even if they are not identified		
	Do not accept a LQ value of 6.75, this comes from 27 ÷ 4		

Q	Answer	Marks	Comments
12(a)	Comment to suggest that correlation does not necessarily imply causation	B1	
	Additional Guidance		
	Correlation is not always causation		B1
	Weather affects sales but sales do not affect the weather		B1
	The amount of rain cannot be controlled, so the sale of umbrellas has no effect		B1
	There will not be greater rainfall if you sell more umbrellas		B1
	If she sells all her umbrellas it doesn't mean it's going to rain any more		B1
	Rainfall doesn't depend on Caro selling umbrellas		B1
	Rain causes more umbrellas to be sold, not the other way around		B1
	Selling/buying umbrellas does not make it rain / change the weather		B1
	You cannot predict the weather by the sale of umbrellas		B0
	Cara has no control over the weather		B0
	The greater the rainfall, the greater the number of umbrellas sold		B0
	Rain is not controlled by umbrellas		B0

Q	Answer	Marks	Comments
12(b)	No and suitable comment to suggest that extrapolation may lead to inaccuracy	B1	
	Additional Guidance		
	"No" could be mentioned in their explanation, rather than being ticked		
	No, not reliable after 13 (mm) (Condone 14)		B1
	No, it doesn't go up to 20 (mm)		B1
	No, it's outside the data collected		B1
	Yes ticked with/without explanation		B0
	No, it only goes to 12.5 (incorrect statement)		B0

Q	Answer	Marks	Comments
13	384	B1	

Q	Answer	Marks	Comments
14(a)	The leaves have not been ordered	B1	oe
	The stem value of 5 has been missed out	B1	oe
	Additional Guidance		
	Missed out the 5 row / 5|		B1
	Missed out (1 and) 5 on the left		B1
	Should have done (0, 1,) 2, 3, 4, 5, 6		B1
	Missed out the 50s (row)		B1
	Only one row is in order		B1
	Not in order (of size) (stem is in order of size)		B0
	It goes from 40 to 60		B0
	Missed out 1		B0
	Missed out 5 / 50		B0
	Should be a 5 between the 4 and 6 (which 4 and 6?)		B0
	It doesn't record in the fifth week		B0
	Only goes up to 6, there may be more		B0

Q	Answer	Marks	Comments
14(b)	Orders the data to at least half-way from either end	M1	oe allow one error or omission 22, 24, 26, 27, 29, 31, 34, 34,… or 64, 60, 47, 43, 42, 41, 34, 34
	34	A1	with no errors seen
	Additional Guidance		
	34 with no working		M1A1
	Data ordering may be seen as a new stem and leaf diagram		
	Do not award final mark if $\frac{34+34}{2}(=34)$ seen, as this comes from incorrect placement of the median		

Q	Answer	Marks	Comments
15(a)	2005	B1	oe

Q	Answer	Marks	Comments
15(b)	2299	B1	check table
	$\frac{\text{their } 2299}{53012456} \times 1000$	M1	oe
	0.0433 or 0.0434 or better or 0.0000433(67…) × 1000	A1ft	0.043367… ft B0M1 answers to 4dp
	Additional Guidance		
	0.043367 with no working		B1M1A1
	Correct values used but answer 0.0435		B1M1A0
	$\frac{2372}{53012456} \times 1000$, 0.0447…		B0M1A1ft
	$\frac{2372}{53012456} \times 1000$, 0.045…		B0M1A0

<table>
<tr><th>Q</th><th>Answer</th><th>Marks</th><th>Comments</th></tr>
<tr><td rowspan="6">16(a)</td><td>Buddy as their median is greatest at 20 and no incorrect median seen</td><td>B2</td><td>B1 any correct median

<u>Medians</u>
Troy 15
Buddy 20
Bruno 17
Murphy 18
Bumble 12</td></tr>
<tr><td>Bruno as their mean/total is greatest at 20 / 100 and no incorrect mean/total seen</td><td>B2</td><td>B1 any correct mean/total

<u>Means</u> <u>Totals</u>
Troy 15.6 or 16 78
Buddy 17.8 or 18 89
Bruno 20 100
Murphy 17 85
Bumble 11 55</td></tr>
<tr><td>Murphy as their mode is greatest at 24 and no incorrect mode seen</td><td>B2</td><td>B1 any correct mode

<u>Modes</u>
Troy 13
Buddy no mode
Bruno 12
Murphy 24
Bumble 12</td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2">Each average/total needs to be linked to the correct dog eg
Mode, Troy = 13 or Median, Murphy = 18 or Mean, Bruno = 20</td><td></td></tr>
<tr><td colspan="2">All five dogs do not need all three averages stating/calculating to score full marks</td><td></td></tr>
<tr><td colspan="2">Total may be shown but not labelled as a total
eg (27 + 22 + 14 + 20 + 12 =) 89 for Buddy</td><td>B1</td></tr>
</table>

Q	Answer	Marks	Comments
16(b)	No idea of conditions for experiment or Small sample of experiments or Only one aspect of training tested	B1	oe
	Additional Guidance		
	Location can change result		B1
	Not much data to work with		B1
	Dogs can get distracted		B1
	Small sample of dogs		B0
	Dogs can change how long they sit for / behaviour		B0
	Inaccurate		B0

Q	Answer	Marks	Comments
17(a)	Most/more people are against HS2 (than in favour of it)	B1	oe hypothesis (not question)
	Additional Guidance		
	Most people will have negative opinions about HS2		B1
	People are against HS2		B1
	More older people are against HS2 than younger people		B1
	HS2 will be disliked (by locals)		B1
	The reason people oppose HS2 is because it affects the countryside		B1
	Many people are unhappy with HS2's plans		B1
	HS2 will affect the countryside		B0
	HS2 will affect housing		B0
	HS2 doesn't affect the environment		B0
	HS2 will affect house prices		B0
	I/Tom believe(s) most people are against HS2		B0
	HS2 will ruin the countryside. Most people will use HS2		B0
	The sacrifice of the countryside is worth less than HS2		B0

Q	Answer	Marks	Comments
17(b)	Any two from • Comment about omission of over 70s • Comment about 21 – 50 group's width / uneven group widths • Reference to no unit (years) given • Reference to 'prefer not to say' type responses	B2	oe both responses may be seen in one comment B1 any one correct response
	Additional Guidance		
	Condone irrelevant/incorrect responses with correct response(s) as long as not contradictory		
	21 – 50 is too large and it doesn't say years (all in one comment)	B2	
	It's too personal/sensitive	B1	
	Some may not want to give their age	B1	
	Doesn't state all possible ages	B1	
	21 – 50 is a big age group/gap	B1	
	There are big age gaps	B0	
	Not enough option boxes	B0	
	It's not relevant	B0	
	People could lie	B0	

Q	Answer	Marks	Comments
17(c)	No time frame is given or No option of 'prefer not to say' type response	B1	oe do not accept same reason in parts (b) and (c) do not accept reference to no option boxes
	Additional Guidance		
	Condone irrelevant/incorrect responses with correct response(s) as long as not contradictory		
	People may not earn anything		B1
	Some may not want to share		B1
	People may be paid in Euros		B0
	Some will lie		B0
	Doesn't say before or after tax		B0

Q	Answer	Marks	Comments
17(d)	**Alternative method 1**		
	Number the stations (0)1 to 29	B1	oe
	Obtain five (two-digit) random numbers from the internet or other source to obtain the stations, disregarding repeats	B1	oe eg obtain five different/unique numbers using random number generator
	Alternative method 2		
	Put all 29 station names in a hat	B1	oe
	Draw out five at random without replacement	B1	oe eg draw out five different/unique names
	Additional Guidance		
	Accept random name generator if just using names eg Type all 29 names into random name generator and obtain five names without repeats		B2
	Number the stations		B0
	Pick five using random number generator		B0
	Put 29 stations/names in a hat		B1
	Put all the names in a hat		B1
	Put names in a hat		B0

Q	Answer	Marks	Comments
17(e)(i)	Convenience	B1	accept Opportunity or Judgement
	Additional Guidance		
	Accept poor spellings		
	Opportunity and systematic on answer line		B0

Q	Answer	Marks	Comments
17(e)(ii)	Will be asking rail travellers or quick/convenient/easy/cheap/efficient	B1	oe do not accept "convenient" here if "convenience" given in e(i)

Q	Answer	Marks	Comments
17(e)(iii)	Will not be asking (m)any non-rail travellers	B1	oe comment that suggest widening the sample frame
	Additional Guidance		
	May not be / is not representative		B1
	More likely to support HS2		B1
	Only on Saturday afternoon		B1
	Need to go on different days / at different time		B1
	Might all be from same train/group		B1
	Biased as the arrival time could be a variable		B1
	Biased		B0
	Might all be male/female		B0
	Not asked the whole population		B0

Q	Answer	Marks	Comments
17(e)(iv)	Many people are affected in other places (without stations)	B1	oe
	Additional Guidance		
	So it's (more) representative of the population		B1
	To get more opinions		B1
	To broaden the data		B1
	To compare data (of those who have a station with those that don't)		B1
	Those that won't have a station will/may have a different opinion		B1
	(Those) people will/may have different opinions		B1
	They'd have an unbiased opinion		B0
	Need everyone's opinion		B0
	To avoid bias		B0

Q	Answer	Marks	Comments
17(f)(i)	Dual bar chart	B1	accept multiple bar chart

Q	Answer	Marks	Comments
17(f)(ii)	[124, 129] and [64, 69] or [124, 129] – 60 or [64, 69] + 60	M1	accept in hours (without units stated) please check the graph for workings
	Yes ticked, and correct subtraction of their values in range or Yes ticked and [124, 129] – 60, with correct answer, compared to [64, 69] or Yes ticked and [64, 69] + 60, with correct answer, compared to [124, 129]	A1	
	Additional Guidance		
	127 and 65 seen. Yes, 62 minutes is about an hour (subtraction implied)	M1A1	
	127 and 65 seen. Yes, it is about an hour (answer to subtraction not seen)	M1A0	
	127 – 65 = 62 (no decision)	M1A0	
	It is 59 minutes which is about an hour so Li Na is correct (no evidence)	M0A0	

Q	Answer	Marks	Comments
17(g)	**Alternative Method 1**		
	44	B1	may be seen as part of a calculation
	$\frac{\text{their } 44}{128} \times 100$ or 34.375	M1	oe their 44 must be <128
	34.4	A1ft	ft their 44 to 1dp
	Alternative Method 2		
	44	B1	
	$\left(1-\frac{84}{128}\right)\times 100$ or 34.375 or $100-\frac{84}{128}\times 100$ or 65.625 and 34.375	M1	oe
	34.4	A1	
	Additional Guidance		
	Accept 34 or 34.3 or 34.37 or 34.38 in place of 34.375 Accept 65.6 or 65.62 or 65.63 in place of 65.625		
	44 seen then answer 34		B1M1A0
	34.375 only (nothing else seen)		B0M1A0
	$\frac{44}{208}\times 100$		B1M0A0