
GCSE STATISTICS 8382/2H

Higher Tier Paper 2

Mark scheme

June 2024

Version: 1.0 Final



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.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

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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 $a \leq \text{value} < b$
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	Mark	Comments
1	Decrease of 3%	B1	

Q	Answer	Mark	Comments
2	Quota	B1	

Q	Answer	Mark	Comments
3	More people died younger than 45 years than died older than 45 years	B1	

Q	Answer	Mark	Comments
4	–4, 6	B1	

Q	Answer	Mark	Comments	
5a	Cannot tell and acceptable reason	B1	eg 1020 could be using it / week 1 people may be using it too or may have downloaded and not used it or table doesn't show the number of people using it or could be downloaded to more than one device / had to re-download it	
	Additional Guidance			
	'Cannot tell' may be implied by their statement			
	'Yes' or 'No' indicated		B0	
	It's only downloads		B0	

Q	Answer	Mark	Comments
5b	$\frac{680 + 720 + 600 + 840}{4}$ or $\frac{2840}{4}$	M1	oe
	710	A1	accept if not in table but not contradicted
	Additional Guidance		
	Answer in table takes priority over answer in workings		
	Ignore numbers in shaded boxes		

Q	Answer	Mark	Comments
5c	Plots all five points correctly (2.5, 550), (3.5, 595), (4.5, 645), (5.5, 650), (6.5, their 710)	B2ft	ft their 710 B1ft three or four points plotted correctly or all correct heights plotted at a consistently incorrect point in the interval $\pm \frac{1}{2}$ small square tolerance
	Draws appropriate trend line	B1ft	mark intention of straight line
	Additional Guidance		
	Must have plotted five points and line must span at least their five points in order to score trend line mark		
	Ignore plots before first plot and after last plot		

Q	Answer	Mark	Comments
5d	Upward trend in the number of downloads	B1	oe comment, in context eg downloads are increasing (over time) as weeks go on, downloads increase
	Additional Guidance		
	Comment must reference downloads to be in context		
	Any quoted values must be correct		
	Ignore a non-contradictory reason with a correct reason		
	As weeks get higher so do number of downloads		B1
	Increasing		B0
	Comments should be about the whole graph and not just consecutive weeks eg Goes up except for week 6 – 7		B0
	Positive trend/correlation in the number of downloads		B0

Q	Answer	Mark	Comments
6a	Cross-hatching on field F	B1	
	Additional Guidance		
	Mark intention		

Q	Answer	Mark	Comments
6b	Reason for the statement	B1ft	eg fields B and G had most fertiliser and excellent crops or field A had least fertiliser and poor crops
	Reason against the statement	B1ft	eg field C had most fertiliser but poor crops or field D had good crops and the least fertiliser
	Additional Guidance		
	If field F has the incorrect shading in part a, follow through their reasons		
	Ignore irrelevant but non-contradictory statements		
	Must mention the amount of fertiliser and the crop yield		
	Do not allow a correct statement with an incorrect statement		
	Fields must be named but condone “both excellent” or “the two excellent” to refer to B and G		

Q	Answer	Mark	Comments
6c	Smaller areas or More specific labels	B1	oe eg increase the number of categories or give actual measurements of fertiliser used or actual amount of crops grown
	Additional Guidance		
	Ignore irrelevant but non-contradictory statements		
	Reference to “completing the key”		B0
	Comment referring to new choropleth maps / type of crop		B0

Q	Answer	Mark	Comments
6d	One possible variable	B1	eg weather/season or water or pests/diseases or shade/sun or soil conditions / type of fertiliser or drainage
	Additional Guidance		
	Ignore irrelevant but non-contradictory statements		
	Overcrowding leads to poorer quality		B1
	Public access (trampling crops)		B1

Q	Answer	Mark	Comments
7a	$\frac{1902}{3272}$ or [0.58, 0.5813]	B1	oe fraction, decimal or percentage
	Additional Guidance		
	Ignore attempt to convert after correct answer seen		

Q	Answer	Mark	Comments
7b	$\frac{1390}{3272}$ or [0.42, 0.425]	B2	oe fraction, decimal or percentage B1 numerator of 3272 – 1882 or 969 + 421 or 1390 oe or denominator of 3272 or $\frac{941}{1636}$ or [0.575, 0.58]
	Additional Guidance		
	[0.42, 0.425] must come from correct working		
	Ignore attempt to convert after correct answer seen		

Q	Answer	Mark	Comments
7c	numerator of 116 or denominator of 1370	M1	
	$\frac{116}{1370}$ or [0.08, 0.085]	A1	oe fraction, decimal or percentage
	Additional Guidance		
	Allow working in thousands		
	Ignore attempt to convert after correct answer seen		

Q	Answer	Mark	Comments
8a	$58 \div 342$ or 0.16(959) or 0.83	M1	oe
	17 or better	A1	

Q	Answer	Mark	Comments
8b	17%	B1ft	ft their answer to (a) allow rounding to the nearest whole number or nearest 10
	Acceptable assumption	B1	eg assumed the population behaves as this group have behaved the sample is representative (of all teenagers) the sample (of teenagers) was chosen randomly
	Additional Guidance		
	They may not be telling the truth		B0

Q	Answer	Mark	Comments
9	Acceptable factor	B1	eg temperature, weather, hours of sunshine etc
	Additional Guidance		
	Time of the year/season		B1
	Day of the week		B0

Q	Answer	Mark	Comments
10a	Two correct statements	B2	B1 one correct statement with no contradictory statement eg equal proportions/percentage of Food B sold each week increased proportion of Food A decreased proportion of Food C
	Additional Guidance		
	If values are stated, they must be comparisons and correct		
	Assume a comparison from Week 1 to Week 2 if not stated		
	Do not allow a comparison of types of food within the week		
	Food A increased by 10% from week 1 to week 2		B1
	Equal proportions/percentage of Food B sold each week		B1
	Equal amounts of Food B sold each week		B0
	There is more Food A sold in Week 2 than Week 1		B0

Q	Answer	Mark	Comments
10b	Comment to suggest that she has simply read off the higher value without taking into account the start value of B	B1	eg it should be 25% eg she forgot to take away 40
	Additional Guidance		
	Ignore further statements unless contradictory		
	If values from the graph are stated, they must be correct eg 65% - 40% (= 20%)		B1
	40% of this is for Food A		B1
	65% consists of Food A and Food B		B1

Q	Answer	Mark	Comments
11a	To ensure people using each mode of transport are asked or To ensure a mix of the correct proportion of children and adults	B1	oe eg to ensure a representative sample we want the sample in the same proportions as the sample frame people that come by car might travel further than people that walk
	Additional Guidance		
	Groups are different sizes		B1

Q	Answer	Mark	Comments
11b	$(108 + 90) \times \frac{50}{300}$ or $\frac{198}{300} \times 50$ or $\frac{50}{300} = \frac{33}{(108 + 90)}$	M1	oe $\frac{198}{33} = 6$ and $\frac{300}{6} = 50$ oe
	$(108 + 90) \times \frac{50}{300} = 33$ and Yes	A1	$\frac{198}{33} = 6$ and $\frac{300}{6} = 50$ oe and Yes
	Additional Guidance		
	$\frac{198}{300} = \frac{33}{50}$ and Yes		M1A0

Q	Answer	Mark	Comments
11c	$108 \times \frac{x}{300} = 9$ or $300 \times \frac{9}{108}$	M1	oe eg $x : 300 = 9 : 108$
	25	A1	SC1 answers 24 or 26 coming from T&I eg $\frac{108}{300} \times 24 = 8.64 \approx 9$
	Additional Guidance		
	36% = 9 people, $9 \div 36 \times 100 = 25$		M1A1

Q	Answer	Mark	Comments
12a	(5), 18, 60, 105, 120	B1	may be implied by plots
	Fully correct diagram for their cf (if increasing) • Appropriate vertical scale • Plotted at 2, 4, 6, 8, 10 • Correct heights (ft if cf attempted) • Points joined by line segments or smooth curve (ft if cf attempted) and vertical axis correctly labelled	B3ft	B2 any three bullets satisfied B1 bullet 1 or bullet 2 satisfied $\pm \frac{1}{2}$ small square tolerance mark intention of straight lines or smooth curve
	Additional Guidance		
	Ignore lines before first plot and after last plot		
	If no values written that are clearly cf attempt, up to B2 can be awarded for a strictly increasing graph, plotted at 2, 4, 6, 8, 10		
	Condone bar chart and cf drawn		
	Step polygon can only access the vertical scale mark		
	Bar chart only for diagram		B0

Q	Answer	Mark	Comments
12b	Alternative Method 1 – reading from their cf graph		
	Correct reading from their graph at 7 hours	M1	ft from increasing graph only
	$\frac{120 - \text{their reading}}{120}$	A1ft	oe fraction, decimal or percentage allow values rounded to nearest whole number or better ft only an increasing graph
	Alternative Method 2 – using the values from the table		
	$15 + \frac{45}{2}$ or 37.5 or $5 + 13 + 42 + \frac{45}{2}$ or 82.5	M1	accept 37 or 38 for 37.5 accept 82 or 83 for 82.5
	31.25 %	A1	oe accept equivalent answer using 37, 38, 82 or 83
	Additional Guidance		
	Ignore any line beyond the last plot as long as it is increasing		
	Cannot ft from a step polygon		
	Ignore attempt to convert after correct answer seen		
	Use of 37 gives an answer of 30.8(33...)% Use of 38 gives an answer of 31.6(666...)%		

Q	Answer	Mark	Comments
13	sight of $\frac{13}{40}$ or $\frac{27}{40}$ or $\frac{11}{40}$ or $\frac{16}{40}$	B1	oe
	One correct product of two relevant outcomes: $P(AC) = \frac{11}{40} \times \frac{13}{39} \left(= \frac{11}{120} \right)$ $P(BC) = \frac{16}{40} \times \frac{13}{39} \left(= \frac{2}{15} \right)$ $P(CC) = \frac{13}{40} \times \frac{12}{39} \left(= \frac{1}{10} \right)$ $P(CA) = \frac{13}{40} \times \frac{11}{39} \left(= \frac{11}{120} \right)$ $P(CB) = \frac{13}{40} \times \frac{16}{39} \left(= \frac{2}{15} \right)$ $P(AB) = \frac{11}{40} \times \frac{16}{39} \left(= \frac{22}{195} \right)$ $P(AA) = \frac{11}{40} \times \frac{10}{39} \left(= \frac{11}{156} \right)$ $P(BA) = \frac{16}{40} \times \frac{11}{39} \left(= \frac{22}{195} \right)$ $P(BB) = \frac{16}{40} \times \frac{15}{39} \left(= \frac{2}{13} \right)$ $P(CC') = \frac{13}{40} \times \frac{27}{39} \left(= \frac{9}{40} \right)$ $P(C'C) = \frac{27}{40} \times \frac{13}{39} \left(= \frac{9}{40} \right)$	M1	oe A = Aniseed B = Butterscotch C = Chewies A and B may be combined into not C (denoted by C') implied by sight of correct solution to a relevant product.
	$\frac{11}{20}$	A1	oe Decimal equivalent = 0.55
	Additional Guidance		
	Allow the method of finding $1 - P(\text{both not chewies})$		
	If individual probabilities are rounded decimals, final answer must be 0.55 to 2sf		
	For M1, if only decimals are used, they must be correct to a minimum of 3dp		

Q	Answer	Mark	Comments
14a	Because it is a sensitive topic.	B1	oe explanation eg because the school can't tell who answered the question and who just ticked yes.
	Additional Guidance		
	More likely to be honest		B1
	They may not be honest		B1
	It is anonymous		B1

Q	Answer	Mark	Comments
14b	34	B1	

Q	Answer	Mark	Comments
15a	Alternative method 1		
	30×26 or 780 or 90×74 or 6660	M1	oe eg $\frac{30 \times 26 + 40 \times x + 90 \times 74}{30 + 40 + 90} = 60$
	$60 \times (30 + 40 + 90)$ or 9600	M1	oe
	their $9600 - 30 \times 26 - 90 \times 74$ or 2160	M1dep	oe dep on M2
	their $2160 \div 40$	M1dep	oe dep on M3
	54	A1	
	Alternative method 2		
	$\frac{30}{160} \times 26$ (= 4.875) or $\frac{90}{160} \times 74$ (= 41.625)	M1	
	$\frac{30}{160} \times 26 + \frac{90}{160} \times 74$ (= 46.5)	M1dep	
	$60 - \left(\frac{30}{160} \times 26 \right) - \left(\frac{90}{160} \times 74 \right)$ or 13.5	M1dep	oe dep on M2
	their 13.5×4	M1dep	oe dep on M3
	54	A1	

Q	Answer	Mark	Comments
15b	Statement to say (Clara is wrong) the third module will have increased proportion	B1	oe
	Additional Guidance		
	(She is wrong,) the weighted mean will increase to 62		B1
	(She is wrong), weighted mean will increase		B0
	(She is wrong,) proportions will change		B0

Q	Answer	Mark	Comments
16a	Dorota is correct and $0.3 + 0.7 = 1$ or Dorota is incorrect and a statement to suggest that the next order includes both or not independent	B1	oe
	Additional Guidance		
	Eating in and take away may not be mutually exclusive		B1
	She is correct, 30% eat in so 70% take away		B0
	Dorota is correct as the events are independent from each other		B0

Q	Answer	Mark	Comments
16bi	$0.3^4 \times 0.7^{(1)}$ or 0.00567	M1	oe
	5×0.00567 (= 0.02835) or $5 \times 0.3^4 \times 0.7^{(1)}$ (= 0.02835)	A1	
	Additional Guidance		
	${}^5C_4 \times 0.3^4 \times 0.7^{(1)}$ (= 0.02835)		M1A1

Q	Answer	Mark	Comments
16bii	Alternative method 1		
	$(1 \times) 0.3^5 (\times 0.7^0)$ or 0.00243	M1	oe eg ${}^5C_5 \times 0.3^5 \times 0.7^0$
	1 – their 0.00243 – 0.02835	M1dep	oe their values must come from correct calculations
	0.96922	A1	accept 0.97 or 0.969(22) with no incorrect figures
	Alternative method 2		
	Two of $10 \times 0.3^3 \times 0.7^2$ or 0.1323 $10 \times 0.3^2 \times 0.7^3$ or 0.3087 $5 \times 0.3^{(1)} \times 0.7^4$ or 0.36015 $(1 \times) (0.3^0 \times) 0.7^5$ or 0.16807	M1	oe eg ${}^5C_3 \times 0.3^3 \times 0.7^2$ ${}^5C_2 \times 0.3^2 \times 0.7^3$ ${}^5C_1 \times 0.3^{(1)} \times 0.7^4$ $({}^5C_0 \times) (0.3^0 \times) 0.7^5$
	their 0.1323 + their 0.3087 + their 0.36015 + their 0.16807	M1dep	oe their values must come from correct calculations
	0.96922	A1	accept 0.97 or better with no incorrect figures

Q	Answer	Mark	Comments
16biii	Suitable comment	B1	eg she may not be correct, if for example someone brings in separate orders for a large workforce. she may not be correct if someone eats in it reduces the number of free tables for another person to eat at. time of day may affect type of order, eg more likely not to have free tables to eat in during lunch
	Additional Guidance		
	Accepts reasons linked to groups/families etc		
	May be valid as her sample is taken at random		B1
	It is valid as it is a binomial distribution		B0
	Time/weather must have a supporting statement		
	eg1 Because it is sunny so more people will eat out eg2 Because it is sunny eg3 Because it is raining so more people will eat in eg4 Because it is raining eg5 Because it is lunchtime so more people will be eating eg6 Because it is lunchtime		B1 B0 B1 B0 B1 B0

Q	Answer	Mark	Comments
17a	$\frac{17960}{10} - (40.4)^2$	M1	oe may be seen inside a square root
	12.8	A1	oe

Q	Answer	Mark	Comments
17b	One correct comment regarding the average times, in context	B1	eg on average, students took less time for biology students took longer for chemistry as the mean was larger
	One correct comment regarding the consistency/spread of the times, in context	B1ft	ft their standard deviation eg the times were more consistent in the biology test (as the standard deviation was lower) for chemistry, students had more varied times (as the standard deviation was higher)
	Additional Guidance		
	Do not allow incorrect values supporting statements		
	Ignore non-contradictory statements with correct statements		
	For the 1 st B1, comments must reference the mean/average eg students took less time for biology		B0
	Statements must be comparisons eg1 the average/mean time for chemistry was higher eg2 the average/mean time for chemistry was high		B1 B0

Q	Answer	Mark	Comments
18	Suitable comment	B1	eg in a normal distribution, mean is equal to median
	Additional Guidance		
	Any average should be equal to the other averages		B1
	If the mean is not equal to the median then the data is skewed		B1
	In a Normal Distribution the data is symmetrically distributed with no skew		B1

Q	Answer	Mark	Comments
19a	Points plotted at (1, 1.7), (4.7, 4.6), (0.7, 1) and (3.9, 3.1)	B2	B1 2 or 3 points correctly plotted $\pm \frac{1}{2}$ small square tolerance

Q	Answer	Mark	Comments
19b	positive	B1	
	Additional Guidance		
	Ignore reference to strong/weak		

Q	Answer	Mark	Comments
19ci	$\frac{3 + 3.5 + 2 + 2.8 + 1 + 4.7 + 0.7 + 3.9}{8}$ or 2.7 or $\frac{3.1 + 5 + 1.2 + 3.2 + 1.7 + 4.6 + 1 + 3.1}{8}$ or 2.86(25)	M1	
	(2.7, 2.86(25))	A1	accept (2.7, 2.9) may be written separately
	Their double mean point plotted	B1ft	$\pm \frac{1}{2}$ square
	Acceptable line of best fit through their double mean point	B1ft	mark intention of a straight line
	Additional Guidance		
	The line of best fit must reach their first and last plots		
	For the B marks, the double mean point must come from an attempt to calculate the mean(s)		
	For the double mean mark, condone 2 lines drawn from the axes touching at their double mean point		

Q	Answer	Mark	Comments
19cii	Correct reading from their graph	B1ft	ft a positive, straight line or intention of a straight line

Q	Answer	Mark	Comments
19ciii	Acceptable reason	B1	eg (6 is outside the given data set, so) extrapolation (may be unreliable as we don't know how the data may behave beyond the given data)
	Additional Guidance		
	The trend may not continue/may not follow the trend		B0
	It's further away from the mean point / original data		B0
	Goes beyond the last point		B0
	There isn't as much data around there		B0

Q	Answer	Mark	Comments
19d	Correct ranking for Sid 4, 3, 6, 5, 7, 1, 8, 2 or 5, 6, 3, 4, 2, 8, 1, 7 and Correct ranking for Bobbi 4.5, 1, 7, 3, 6, 2, 8, 4.5 or 4.5, 8, 2, 6, 3, 7, 1, 4.5	B2	B1 for one correct
	Correct method to find the sum of their differences squared or 17.5	M1	allow one error differences may be of the original scores
	Correct substitution into formula $1 - \frac{6 \times \text{their } 17.5}{8(8^2 - 1)}$	M1dep	dep on M1 and at least B1
	$\frac{19}{24}$ or 0.79	A1	oe with no incorrect workings
	Acceptable comment	B1ft	ft their value for SRCC in context eg Sid's hypothesis is supported because the value of SRCC is close to 1, so he and Bobbi have similar tastes in music.
	Additional Guidance		
	Do not follow through their SRCC being < -1 or > 1		
	Rankings must follow the same order for each person		
	0.79 with no working (calculator can do the work and to get this value they must have used the correct rankings)		B2M2A1
	(Strong) positive correlation and therefore they like similar music/his hypothesis is correct		B1
	Strong correlation and therefore they like similar music/his hypothesis is correct		B0

Q	Answer	Mark	Comments
19e	Acceptable reason	B1	eg data set is too small to base conclusions on
	Additional Guidance		
	May only be based on one genre of music		B1

Q	Answer	Mark	Comments
19f	No and the rankings will be the same or Yes because the tied values may be given different scores on a wider scale	B1	
	Additional Guidance		
	No and the difference in opinions would remain the same		B1
	Wider range of values		B0