AQA Qualifications

GCSE

Statistics

43101H Unit 1: Statistics Written Paper (Higher) Mark scheme

43101H
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Version/Stage: Final v1

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.

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.
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.
E	Explain marks are awarded for a full and detailed explanation
ft	Follow through marks. Marks awarded 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 …	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 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.

Unit 1 Higher Tier

Q	Answer	Mark	Comments
1	Decide on a sample / sample frame / population / sample size / sampling method or decide on a data collection method or decide on what data is needed	B1	
	Any reference made to a conclusion or interpreting graphs/calculations or analysing/evaluating results or making a decision on the original hypothesis	B1	
	Additional Guidance		
	Who she is going to ask		1st B1
	Refer to finding data from years		1st B1
	Decide on a census		1st B1
	Conduct a pilot study		1st B1
	Sample the data		1st B1
	Gather a sample		1st B1
	Tests the hypothesis		1st B0
	Plan the investigation / decide on a strategy		1st B0
	Decide which graphs/calculations to use		1st B0
	Write a report on her findings		2nd B1
	Any reference to any of the other tasks		2nd B0

2(a)	0.93	B1	

Q	Answer	Mark	Comments
2(b)	Double mean point plotted at (5,8) or line of best fit drawn through the double mean point	M1	± ½ square tolerance
	Line of best fit drawn through (1.5, [2, 5]) and (9.5, [12, 16])	A1	Line of best fit must pass through both windows
2(c)	Correct value from their line	B1ft	± ½ square tolerance
	Additional Guidance		
	Condone poor money notation Their line must extend as far as 7 miles		
2(d)	Correct value from their line	B1ft	±½ square tolerance
	Additional Guidance		
	Their line must extend as far as £15		

Q	Answer	Mark	Comments
2(e)	Ticks 2(c) and refers to interpolation or ticks 2(c) and refers to the answer being within the range of the data	B1	oe
	Additional Guidance		
	Candidates must tick the 2(c) box to score in this part of the question or refer to it in the answer		
	Positive marking so ignore incorrect / irrelevant statement with the correct statement seen		
	Candidates can comment that 2(d) is extrapolation / outside the range of the data		
	Ticks 2(c), it's closer to the mean point / original data		B1
	Ticks 2(c), 15 goes beyond the last point		B1
	Ticks 2(c), because you can read it off the graph		B0
	Ticks 2(c), there isn't as much data around £15 (as there is for 7 miles)		B0
	Ticks 2(c), it isn't in the table		B0

Q	Answer	Mark	Comments
3(a)	Correct working for finding the median for either judge A or B or the mean for either judge A or B or the total for either judge A or B	M1	
	Median for judge A = 6.5 and Median for judge B = 7 or Mean for judge A = 6.25 and Mean for judge B = 6.75 or Total for judge A = 50 and Total for judge B = 54	A1	Accept 6.2 or 6.3 for 6.25 and 6.7 or 6.8 for 6.75 provided no wrong total is seen This mark can only be awarded for a correct pair of totals provided they are not subsequently used in an attempt to find means
	Correct decision based on a pair of medians, means or totals	A1ft	ft from their medians, means or totals SC2 for 5 and 5.4 and Judge B ticked SC1 for 5 and 5.4 and Judge A or no decision
	Additional Guidance		
	Acceptable method for finding medians: crossing off from each side of a correctly ordered list, or an arrow between the 4^{th} and 5^{th} numbers of a correctly ordered list or first 5 numbers in ascending or descending order. Acceptable method for finding mean: attempt to sum the correct 8 numbers and divide by 8 Candidates are not allowed to compare mode as Judge A has two modes		

Q	Answer	Mark	Comments
3(b)	The judges awarded different scores to the same dancer(s) or any reference to averages or totals being different or judges gave different rankings	B1	oe Answers must not be ambiguous
	Additional Guidance		
	eg Nina scored 5 with Judge A but 7 with Judge B		B1
	There was only one dancer that they gave the same scores to		B1
	Judges awarded different scores		B0

3(c)	Cruz	B1	

3(d)	Agree marking criteria (beforehand) or Give the judges some training or Have a practice run	B1	oe
	Additional Guidance		
	Watch video footage beforehand [implies training]		B1
	Watch video footage / a replay		B0
	Have only one judge / increase the number of judges		B0
	Make judges discuss each dance during or after		B0

Q	Answer	Mark	Comments
4(a)	Any suitable hypothesis relating to the number of (free / included) minutes for men and women	B1	oe must be comparative
	Additional Guidance		
	Women have more minutes than men		B1
	The number of minutes for women is higher		B1
	Women and men choose the same number of minutes		B1
	Women and men choose a different number of minutes		B1
	Any questions		B0
4(b)	She will only be asking customers from one mobile phone shop or She will only be asking people for a short period of time or She will only be asking people on one day	B1	Oe
	Additional Guidance		
	She may only be able to ask a few people		B0
	There could be more of one gender than the other		B0
	Biased		B0
	Results not representative		B0
	Not everyone will be buying a contract		B0

Q	Answer	Mark	Comments
4(c)(i)	Any reference to non-exhaustive / gaps eg no box for under 100 or no box for 400 – 500	B1	
	Any reference to overlaps eg 200 is covered by two boxes or 500+ overlaps with unlimited	B1	
	Additional Guidance		
	2 correct reasons for the same category scores B1 only Do not accept any reference to other to satisfy the non-exhaustive mark Any reference to the number of minutes changing each month No option for people without contracts		 B0 B0
4(c)(ii)	Due to the unlimited minutes (on some monthly contracts)	B1	
	Additional Guidance		
	Any reference to an open-ended response, or missing data, or no box to tick or more than one box to tick Because not all the data are numerical		B1 B1
	Because they do not know the exact number of minutes		B0

Q	Answer	Mark	Comments
4(d)	A suitable question with a time frame	B1	
	At least 3 boxes, all of which satisfy all 3 of the following conditions: exhaustive non-overlapping all boxes numerical	B2ft	ft their question, responses must be numerical B1 for at least 3 numerical boxes, 1 of which accepts a range, and exhaustive or B1 for at least 3 numerical boxes, 1 of which accepts a range, and non-overlapping
	Additional Guidance		
	Condone for the exhaustive condition boxes that are just in pounds, eg 1 – 5, 6 – 10 etc or 1, 2, 3, etc		
	Candidates do not need to include a box to cover 0		
	For B2 do not allow the use of other / more / less, however 30+, more than 30, less than 10 etc are acceptable		
	For either B1 do not allow 'other', 'more', 'less', for the range box For either B1 condone the use of other at either end, and more at the top end, and less at the bottom end, as an extra box to satisfy the exhaustive condition		

Q	Answer	Mark	Comments
4(e)	Any suitable extraneous variable but it must be clear that this will affect the cost of the contract rather than the cost of the monthly bill	B1	Oe
	Additional Guidance		
	Any reference to internet access or data allowance or 3G/4G / text messages / multimedia messages or the initial cost of the phone / upfront costs / make or model / length of contract / age of the phone, eg new, second hand, refurbished, etc or the service provider or the amount of cashback or the cost of insurance		B1 B1 B1 B1 B1
	How long you use your phone for How long you have used your phone for		B0 B0
5(a)	Secondary data	B1	
5(b)	East Midlands	B1	
5(c)	Terrace	B1	

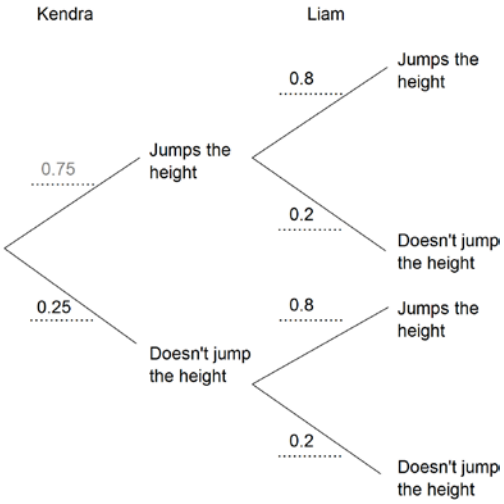
Q	Answer	Mark	Comments
5(d)	28.8 + 28.0 + 25.4	M1	Award for a sum of three values including at least 2 of 28.8, 28.0 and 25.4 Alt: 100 – 13.4 – 4.4 SC1 For the sum of the three 'House or bungalow' values for any region
	82.2	A1	Accept 82
	Additional Guidance		
	Sight of any of these values is sufficient for SC1… (England =) 81.6 (North East =) 84.5 (North West =) 88.5 (Yorkshire =) 87.6 (East Midlands =) 91.5 (West Midlands =) 87.4 (East =) 86.2 (London =) 51.9 (South West =) 84.8		
	If 82.2 is seen in the working but is followed by subsequent work, award M1 A0		

<table>
<tr><th>Q</th><th>Answer</th><th>Mark</th><th>Comments</th></tr>
<tr><td rowspan="4">5(e)</td><td>Any correct difference between the London and North West regions, e.g.
In the North West terrace houses are most common, but in London it is purpose-built flats
There are more semi-detached houses in the North West (than in London)
In London, the least common property type is detached houses but in the North West it is converted flats
The North West has more houses overall (than London)</td><td>B1</td><td>o.e</td></tr>
<tr><td>Any correct similarity between London and North West regions, e.g.
In both regions, terrace houses were the most common type of house
Both London and the North West have a higher proportion of terrace houses than England as a whole
Detached houses were less common than semi-detached houses in both regions</td><td>B1</td><td>o.e.</td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="3">Reference table…

<table>
<tr><th></th><th>Detached</th><th>Semi-detached</th><th>Terrace</th><th>Purpose-built flat</th><th>Converted flat</th><th>Number of properties</th></tr>
<tr><td>North West</td><td>18.0% (554 thousand)</td><td>35.0% (1077 thousand)</td><td>35.5% (1092 thousand)</td><td>9.8% (301 thousand)</td><td>1.7% (52 thousand)</td><td>3076 thousand</td></tr>
<tr><td>London</td><td>4.5% (146 thousand)</td><td>15.1% (490 thousand)</td><td>32.3% (1049 thousand)</td><td>38.7% (1257 thousand)</td><td>9.4% (305 thousand)</td><td>3248 thousand</td></tr>
</table>
</td></tr>
</table>

	Additional Guidance (continued)`	
5(e) (cont'd)	**Differences…**	
	London has (a lot) more flats (than the North West)	B1
	The two regions have very different proportions of detached houses	B1
	The two regions have different proportions of detached houses	B0
	Ignore any (correct or incorrect) numerical values stated, e.g. London has five times as many converted flats as the North West	B1
	Do not accept a comment that is based upon one of the regions only, e.g. London has a lot of flats	B0
	Do not accept a statement such as London has 4.5% detached houses but the North West has 18.0% detached houses	
	There are not many detached houses in London	B0
	Similarities…	
	Both London and the North West have a greater proportion of purpose-built flats than the East Midlands	B1
	Both have roughly the same number/ proportion of Terrace houses	B1
	Both have a high percentage of terrace houses	B1
	In both areas, more than half of properties are houses or bungalows	B1
	Both have lots of terrace houses [both have lots of all of the types of properties]	B0
	There are about the same number of houses and bungalows	B0
	The percentage of terraced houses is more than 30% [lacks details… does it refer to both regions or just one of them?]	B0
	The total number of houses [incomplete statement]	B0
	Do not accept a comment that is based upon one of the regions only, e.g. In London, terrace houses were the most common type of house/ bungalow	
	Do not allow a similarity based on the 'All properties' column.	
	Do not accept a trivial similarity, e.g. Both regions have all five types of property	

Q	Answer	Mark	Comments
5(f)	**Alternative method 1**		
	37.3% of 1152 (thousand) or 24.8% of 2345 (thousand)	M1	
	429(.696) (thousand) or 581(.56) (thousand)	A1	
	429(.696) (thousand) and 581(.56) (thousand)	A1	
	Alternative method 2		
	$\frac{37.3}{24.8}$ or 1.5(04…) or $\frac{24.8}{37.3}$ or 0.66(48…) or $\frac{1152}{2345}$ or 0.49(12…) or $\frac{2345}{1152}$ or 2.0(35…)	M1	
	1.5(04…) or 0.66(48…) and 0.49(12…) or 2.0(35…)	A1	
	Correct reasoning why there are less semi-detached properties in the North East than the South West	A1	e.g. The percentage of properties in the North East that are semi-detached is 1.5 times that in the South West but the South West has over twice as many properties
	Additional Guidance		
	In Alternative Method 1 For 429(.696), accept answers in the interval [429, 430]. For 581(.56), accept 580 or answers in the interval [581, 582]		
	In Alternative Method 2 The Method mark could be implied by a statement such as 'The South West has (over) twice the number of properties as the North East'.		

Q	Answer	Mark	Comments
6(a)	Completely correct tree diagram  	B2	oe B1 for 0.25 for Kendra or 0.8 with 0.2 on one pair of Liam's branches in either order

6(b)	0.75 × their 0.8	M1	oe 0 < their 0.8 < 1
	0.6	A1 ft	oe Follow through from (a) provided that 0 < their 0.8 < 1 Do not penalise subsequent change of form
	Additional Guidance		
	For M1 do not ignore further working following on from 0.75 × their 0.8		

Q	Answer	Mark	Comments
6(c)	**Alternative method 1**		
	their 0.25 × their 0.2 (= 0.05)	M1	Both probabilities should be in the interval (0, 1)
	1 – their 0.05	M1 dep	Dependent on previous M mark
	0.95	A1 ft	oe Follow through from their (a)
	Alternative method 2		
	0.75 × their 0.2 or 0.15 or their 0.25 × their 0.8 or 0.2	M1	Their probabilities should be in the interval (0, 1)
	their 0.15 + their 0.2 + their (b)	M1 dep	Dependent on previous M mark
	0.95	A1 ft	oe Follow through from their (a) and (b) provided that their answer is in the interval (0, 1)
	Additional Guidance		
	Beware of 0.95 coming from incorrect working (e.g. 0.75 + 0.2) Accept equivalent fractions or percentage		
7(a)	1.4 (million)	B1	Accept 1 400 000
7(b)	50%	B1	
7(c)	3.8 or 7.6 or 3.4 or 6.8 or 0.4 seen	M1	
	0.8 (million)	A1	Accept 800 000

Q	Answer	Mark	Comments
7(d)	Less men aged 20-39 in 1921	B1	oe, e.g. fewer men in their 20s (or 30s) in 1921 Accept reference to change in the shape of the population pyramid on the male side, e.g. the population pyramid in 1921 is not symmetrical.
	Additional Guidance		
	Less men in 1921	B0	
	Less men aged 20 – 49 / middle aged men in 1921	B0	
	The number of males has decreased	B0	
	Less men than women in 1921 [this was also true in 1911]	B0	
	The bars are shorter in 1921	B0	
	The pyramid for 1921 does not look like a pyramid [not quite enough]	B0	
	Less men aged 20 – 29 [it is not clear in which year there were less men]	B0	
	The difference between the number of men and women is greater in 1921	B1	
	The percentage of the population that is male in 1921 is smaller	B1	
	Less men aged up to 39 in 1921	B1	
	The groups 20-29 and/ or 30-39 were smaller in 1921	B1	
	Number of young men has decreased [the word 'decreased' suggests a comparison of the later time period to the earlier one]	B1	
	Ignore any numerical values given, e.g. There were 0.3 million less men aged 20 – 29 in 1921 [0.3 million is incorrect but the statement can be marked as implying there were less men]	B1	
	Assume any comparison is with the other year unless they state otherwise.		

8(a)	80 106 116 120	B1	

Q	Answer	Mark	Comments
8(b)	Points plotted at correct heights	B1ft	± ½ square
	Points plotted at upper class boundary	B1	Must be an increasing graph
	Points connected with curve or lines	B1ft	
	Additional Guidance		
	The graph does not need to be drawn down to the horizontal axis, ie the point (40, 0) does not need to be plotted Ignore line or curve before (their 50, 8) and after (their 100, 120)		
	If they have drawn bars accept the heights as their points, the maximum mark is B1 A cumulative frequency step polygon can score a maximum of B1 if the steps are at their correct heights		

Q	Answer	Mark	Comments
8(c)	**Alternative method 1**		
	Draws a line up from 75 to their graph and across to get a value for the cumulative frequency (± ½ square accuracy)	M1	This could be implied by a correct value for the cumulative frequency (± ½ square accuracy) or a correct mark on the vertical scale Graph must be a cumulative frequency graph
	90 seen and a correct decision or (their value)/120 expressed as a decimal/percentage and a correct decision	A1ft	oe ft their graph only
	Alternative method 2		
	Draws a line across at 90 (or at 0.75 × their 120) to their graph and down to the horizontal axis (± ½ square accuracy)	M1	This could be implied by a correct value for the fuel used (± ½ square accuracy) or by a correct mark on the horizontal axis Graph must be a cumulative frequency graph
	Correct working with 90 used and a correct decision	A1ft	

Q	Answer	Mark	Comments
8(c)	**Alternative method 3 – Linear Interpolation**		
	$\left(\frac{75-70}{10}\times 26\right)+50+22+8$ or $\frac{\text{their } 80+\text{their } 106}{2}$ or 93 seen or $\left(\frac{80-75}{10}\times 26\right)+10+4$ or 27 seen	M1	
	Target met and 93 and 90 seen or Target met and 93/120 expressed as a decimal/ percentage or Target met and 27 and 30 seen or Target met and 27/120 expressed as a decimal/ percentage and 0.25 or 25% or ¼	A1	
	Alternative Method 4		
	$\frac{(90-80)}{26}\times 10$ or 3.8...	M1	
	73.8, so target met	A1	
	Additional Guidance		
	Alternative method 1: For the A1 mark, follow through is from their graph only but not on 90 or 120. For the accuracy mark, any values given must be correct		
	Alternative method 2: For the A1 mark, follow through is from their graph but not on 90		
	If the candidate uses Alternative Method 1 or Alternative Method 2, they cannot score if their graph is a bar chart or a cumulative frequency step polygon		
	If both a bar chart and a cumulative frequency curve/ polygon are seen, the curve/polygon takes precedence.		

Q	Answer	Mark	Comments
8(d)	**Alternative method 1**		
	Reading across and down at either 12 or 0.1 × their 120 or at 108 or 0.9 × their 120	M1	Could be implied by horizontal and vertical line on graph. Graph must be increasing.
	Correct 10^{th} and 90^{th} percentiles from their cumulative frequency graph	A1ft	Follow through from their graph provided it is increasing but readings must be made at 12 and 108
	Correct answer from their graph	A1ft	
	Alternative method 2 – Linear interpolation		
	$\left(\frac{12-8}{22}\times 10\right)+50$ or 51.8(18…) or $\left(\frac{108-106}{10}\times 10\right)+80$	M1	Oe
	51.8(18…) and 82	A1	
	30.18(…) or 30.2	A1	Accept 30 if method seen
	Additional Guidance		
	Accept readings at 0.1 × 121 (= 12.1) and at 0.9 × 121 (= 108.9) for the A marks The M mark can be earned from a step polygon or a bar chart with increasing heights		
8(e)	Interpercentile range is less sensitive to extreme values in the data	B1	Accept any equivalent reason that implies that range could be affected by outliers. Accept range cannot be found because the data are grouped.
	Additional Guidance		
	It takes into account more of the data	B0	
	The range is only based on the highest and lowest values	B0	
	It shows how spread out the data are	B0	
	It is more accurate/ reliable [detail lacking]	B0	
	It is more accurate because it excludes outliers	B1	
	Interpercentile range is better if the data are skewed.	B1	

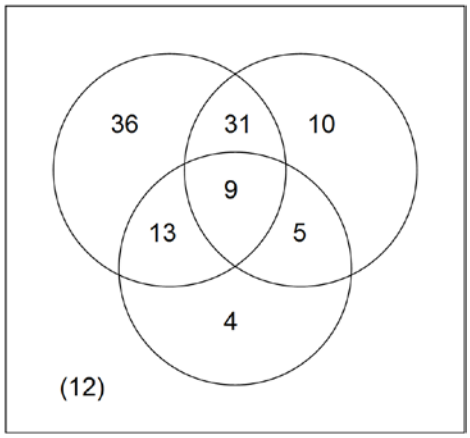
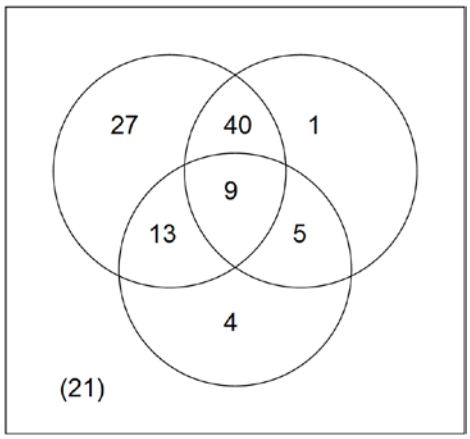
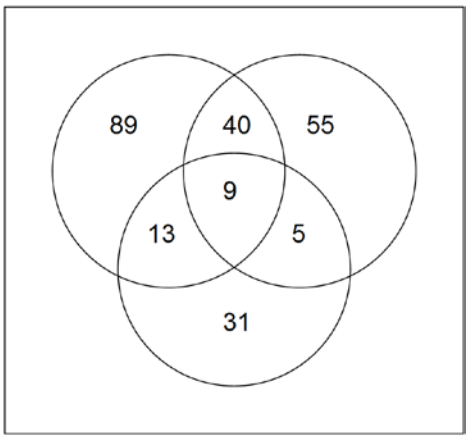
Q	Answer	Mark	Comments

8(f)	Weight of cargo could also affect the amount of fuel	B1	Cargo weight is an extraneous variable
	Additional Guidance		
	To make sure the experiment is accurate / not biased		B0
	To make a fair test [detail lacking]		B0
	To see if it affects the speed of the lorry		B0
	To act as a controlled variable		B1
	He needs to change only one variable at a time		B1
	To be sure that it is the speed that affects the fuel used		B1
	So that it does not influence the outcome of the experiment		B1
	The weight of the cargo could affect the speed the lorry can travel at [suggests that weight could influence the outcome of the experiment]		B1

8(g)	Fuel used	B1	
	Additional Guidance		
	Fuel/ amount of fuel		B0
	Fuel left at end		B1
	Do not accept a hypothesis or a description of the experiment.		

8(h)(i)	$9(9^2 – 1)$ or 9×80 or 720 seen	B1	Can be implied by correct final answer or 0.12 or 0.117 or better
	$1 - \frac{6 \times 14}{9(9^2 - 1)}$	M1	
	0.883	A1	Accept 0.88 or answers rounding to 0.883

Q	Answer	Mark	Comments
8(h)(ii)	The amount of fuel tends to decrease as the maximum speed decreases.	B1ft	oe e.g. positive correlation between fuel used and speed. Ignore any adjectives describing the strength of the correlation.
	Additional Guidance		
	The nature of the relationship can be deduced from the table. So an answer in context implying positive correlation can score here even if 8(h)(i) has no answer or an incorrect answer. An answer in context implying 'no correlation' or 'negative correlation' can score if it follows on from their answer to 8(h)(i) and their answer to 8(h)(i) is between -1 and 1 Answer must be in context, e.g When the lorries travel faster, they use more fuel. B1 but… (strong) positive correlation B0 There is positive correlation so the speed affects the amount of fuel used B1 Positive relationship/ agreement between speed and fuel used B1 Strong relationship between speed and fuel used B0 As the speed increases, the fuel used varies B0 The maximum speed affects the amount of fuel used B0		
	If the correlation coefficient in (i) is between –0.4 and +0.4, students may interpret this as 'no relationship between speed and fuel used' (oe). If the correlation coefficient in (i) is between –0.1 and 0, the interpretation (in context) should be 'no correlation' (oe).		

Q	Answer	Mark	Comments
9 (a)	All seven correct.  	B4	B3 4, 5 or 6 correct B2 2 or 3 correct B1 1 correct
	Additional Guidance		
	Note that a number is not required in the region outside of the 3 circles for full marks in part (a)		
	Common error 1  This scores B3 in (a)		**Common error 2**  This scores B2 in (a)

9 (b)	12	B1ft	ft from an entry in their diagram or as 120 – sum of their 7 entries
	Additional Guidance		
	Common error 1 An answer of 21 scores B1ft **Common error 2** A student could only score here if they have a number recorded outside the circles in part (a) and enter this as their answer to (b). It must be a positive number of 0		

Q	Answer	Mark	Comments
9 (c) (i)	$\frac{14}{120}$	B2 ft	oe The follow through is for the numerator only. For an award of B2ft, the final answer must lie in the interval (0, 1) B1ft for their 9 + their 5 provided that both numbers are greater than 0 and whole numbers.
	Additional Guidance		
	Equivalents include $\frac{7}{60}$, $0.11\dot{6}$ and equivalent percentages. For $0.11\dot{6}$, accept 0.12 or an answer to 3 or more significant figures (rounded or truncated).		
9 (c) (ii)	$\frac{98}{120}$	B2 ft	oe The follow through is for the numerator only. For B2 ft to be awarded, the answer must lie in the interval (0, 1) 27 + 40 + 13 + 9 + 4 + 5 B1ft or 89 + 5 + 4 B1ft or 31 + 36 + 31 B1ft or 89 + 31 – 22 B1ft or 120 – 10 – 12 B1ft
	Additional Guidance		
	89 + 31 = 120 B0 Equivalents include $\frac{49}{60}$, $0.81\dot{6}$ and equivalent percentages For $0.81\dot{6}$, accept 0.82 or an answer to 3 or more significant figures (rounded or truncated). **Common error 2** Sight of 89 + 40 + 13 + 9 + 5 + 31 or 187 scores B1 ft		

Q	Answer	Mark	Comments
9 (c) (iii)	$\frac{22}{89}$	B2ft	oe 22 or their 9 + their 13 B1ft or 89 as denominator B1ft
	Additional Guidance		
	Follow through numerator as their 13 + their 9 Follow through denominator as the sum of the four values in the Clothing circle Accept equivalent decimals: [0.247, 0.2472] or 0.25 or equivalent percentages **Common error 2** An answer of $\frac{22}{151}$ scores B2 ft		
10 (a)	Less time consuming	B1	Accept also • cheaper • simpler to conduct/ easier • less data to handle
	Additional Guidance		
	A census would give too much data (to process) B1 Uses less resources B1 Unbiased B0 More accurate/ reliable B0 A census only happens every 10 years B0 A sample can be done any time B0 You can get more specific data B0 If they used a census, some staff may have joined or left B0 A census includes everyone/ With a survey you ask a few people B0 [these are just definitions]		
10 (b)	A list of (all) staff at the company	B1	oe e.g. telephone directory of staff at the company, database/spreadsheet of staff, register of staff
	Additional Guidance		
	Any reference to types of sampling method (random, stratified, systematic) B0 Any reference to the number of people to be sampled B0 All staff [this is the population – the answer should refer to a list] B0		

Q	Answer	Mark	Comments
10(c)	236 + 249 + 383 + 492 +75 + 65 or 1500	M1	Allow one error or omission
	$\frac{383}{\text{their } 1500} \times 160$ or 40(.85…)	M1 dep	Dependent on previous M mark
	41	A1	SC2 for 40 seen on answer line with no wrong working
	Additional Guidance		
	1117 is total without 383 and scores first M1 485 + 875 + 140 scores M1 (sum of number of people with each job title) 694 + 806 scores M1 (sum of number of males and number of females)		
10(d)	People may not tell the truth/ may not want to answer	B1	Accept also answers that imply that it is a sensitive/personal question.
	Additional Guidance		
	The question will give biased results [more exemplification needed] B0 No time frame B0		
10(e)	104 – 0.5 × 160 or 24	M1	
	$\frac{\text{their } 24}{0.5 \times 160}$ or 0.3 or $\frac{\text{their } 24}{160}$ or 0.15	M1 dep	15% implies M2 if not from wrong working
	30 (%)	A1	

Q	Answer	Mark	Comments
11(a)	$\frac{457}{280}$ or 1.63… **or** $\frac{520}{457}$ or 1.13… or 1.14	M1	Oe
	$\frac{457}{280}$ × 100 or 163(.214…) **or** $\frac{520}{457}$ × 100 or 113(.785…) or 114	M1 dep	M1dep is for multiplying either of the correct ratios by 100
	163.2 **and** 113.8	A1	
11(b)(i)	$\sqrt[4]{(106.7 \times 116.7 \times \text{their } 163.2 \times \text{their } 113.8}$ or $\sqrt[4]{(1.067 \times 1.167 \times \text{their } 1.632 \times \text{their } 1.138}$	M1	Intention to multiply chain base index numbers and then take 4th root.
	[123.30, 123.32]	A1 ft	Accept 123 Follow through from their answers to (a)

Q	Answer	Mark	Comments
11(b)(ii)	(Average of) 23(.3)% increase in the number of apprenticeships per year	B2ft	Award B1ft for a partial interpretation that includes 23% increase Ft 23.3% from their (b)(i) provided that their (b)(i) is between 100 and 200 exclusive
	Additional Guidance		
	The percentage value must be given. The average annual percentage increase is 23% B2 Number of apprenticeships increases by 23.3% B1 On average (over the 4 years) the number of apprenticeships increases by 23.3% [does not state 23.3% per year] B1 23% increase B1 The number of apprentices increases per year B0		

Q	Answer	Mark	Comments
11(c)	Any correct comparisons of the distribution of ages, e.g. 1) Comparison of '25 and over' category, e.g. Higher proportion of 25 and over in 2012/2013 (than in 2007/2008) 2) Comparison of '18 or under' category, e.g. Smaller proportion of people aged under 19 in 2012/2013 3) Comparison of 19-24 category, e.g. A greater number of people aged 19-24 in 2012/2013 4) Comparison of modal age groups, e.g. The modal age group in 2007/2008 was '18 or under' but in 2012/2013 it was '25 and over'	B1	Accept equivalent statements, e.g. • A greater proportion of older people started apprenticeships in 2012/2013 • In 2007/2008 nearly 50% of apprentices were aged 18 or under, but in 2012/2013 it was less than 25%
	Additional Guidance		
	There were more people aged over 24 in apprenticeships in 2012/2013 B1 A higher proportion were 18 in 2007/08 than in 2012/13 B1 [reference here to 18 taken as reference to the '18 or under' age group] Increase in the number of 25 and over B1 [the word increase is implying a comparison of the later time period to the earlier one] In 2012/2013, there were less aged 18 or under and more aged 25 and over B1 [the mark here is for the second part of the statement - condone here the statement about the number of people aged under 18]		
	There were less people aged 18 or under (or aged 19-24) in 2012/2013 compared with 2007/2008 B0 There are more 25 and overs starting apprenticeships B0 [it is not clear in which year there were more] More people in 2012 [does not relate to distribution of ages] B0 Answers that do not involve a comparison score B0, e.g. In 2007/08, the modal age group was 18 or under B0		

Q	Answer	Mark	Comments
11(d)	$\pi \times 3.7^2$ or [42.9866, 43.014] **or** $\pi \times 2.5^2$ or [19.6, 19.64] **or** 3.7^2 **and** 2.5^2	M1	
	$\frac{3.7^2}{2.5^2}$ or 1.48^2 or $\frac{[42.9866, 43.014]}{[19.6, 19.64]}$ or [2.19, 2.2] or $\frac{2.5^2}{3.7^2}$ or $0.67(5\ldots)^2$ or $\frac{[19.6, 19.64]}{[42.9866, 43.014]}$ or [0.45, 0.46]	M1	
	[492, 493] (thousand)	A1	Accept 493 000 etc Accept 490 or 490 000

12 (a)	(Mean =) 15 (metres)	B1	
	95% of values lie within 2 (or 1.96) standard deviations of the mean	M1	Could be implied by $\frac{22-8}{2\times 2}$ or $\frac{22-15}{2}$
	[3.5, 3.6] (metres)	A1ft	Follow through from their mean height
	Additional Guidance		
	The M1 mark is for linking 95% to 2 SD. Any reference to 2SD or 2σ is also M1 provided it is not also accompanied by sight of 1SD or 3SD.		

12 (b)(i)	The histogram is skew/ not symmetrical	B1	Ignore reference to direction of skew. Accept e.g. "not a bell-shape curve".
	Additional Guidance		
	There is an outlier		B0
	There are more young trees than old trees		B0
	It has a positive distribution		B0
	The class widths are not all equal		B0
	The data are bunched up on the left		B1

Q	Answer	Mark	Comments
12 (b)(ii)	**Alternative method 1**		
	(800 – 600) × 0.02 or 4 or (600 – 400) × 0.08 or 16 or (400 – 340) × 0.2 or 12	M1	
	(800 – 600) × 0.02 or 4 and (600 – 400) × 0.08 or 16 and (400 – 340) × 0.2 or 12	M1	
	32	A1	
	Alternative method 2		
	(340 – 300) × 0.2 or 8 or (300 – 200) × 0.26 or 26 or (200 – 140) × 0.5 or 30 or (140 – 100) × 0.65 or 26 or (100 – 0) × 0.38 or 38	M1	
	(340 – 300) × 0.2 or 8 and (300 – 200) × 0.26 or 26 and (200 – 140) × 0.5 or 30 and (140 – 100) × 0.65 or 26 and (100 – 0) × 0.38 or 38	M1	Could be implied by sight of 128
	32	A1	

Q	Answer	Mark	Comments
12 (b)(ii) (cont.)	**Alternative method 3**		
	400 (small squares) or 80 (small squares) or 2.5 (small squares = 1 oak tree) or (1 small square) = 0.4 (oak trees)	M1	
	80 **and** 400 or 2.5 or 0.4	M1	
	32	A1	
12 (c)	The relationship is non-linear	B1	oe, e.g. • A curve of best fit is needed • Points are not increasing at a constant rate • The points are levelling off
	Additional Guidance		
	A line would not be accurate		B0
	A line would not fit the data [more information is needed about why it would not fit the data]		B0
	Some points would lie too far from a line		B0
	The data are curved		B1
	The girth stops increasing after a certain age		B1
	In this question, allow a comment such as 'girth and age are not proportional'.		