SPECIMEN MATERIAL

Level 3 Certificate
MATHEMATICAL STUDIES
1350/2A

Paper 2A – Statistical techniques

Mark scheme

Specimen

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

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Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

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

Glossary for Mark Schemes

Examinations are marked in such a way as to award positive achievement wherever possible. Thus, for 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	mark is for method
dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
ft	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
OE	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

Q	Answer	Mark	Comments
1	the numbers in column D can be automatically calculated by using a sum formula to add those in columns B and C or cell D3 should be 23 or cell D3 has not been added up correctly or cell B3 or Cell C3 may have the wrong value as they don't add up to 33	B1	
	comments on sampling. eg sample size too small or he has not asked the whole class	B3	B1 each correct statement
	no time period is given so an average per day cannot be calculated		
	comments on lack of average, eg.no averages mentioned: texts per person per day or similar is expected or totals cells needed/cell with formula to calculate average		
	collection of texts received is irrelevant		

Q	Answer	Mark	Comments
Alt 1 **2**	3 × 66 000 = 198 000 (not 188 000)	B1	This is the amount the bank will lend him.
	Pete should divide by 0.9 (instead of multiplying by 0.9)	B1	This is to find the maximum house price he can afford. There is no purpose to the multiplication done.
	(£) 220 000	B1	This is the maximum price he can afford for a house.
Alt 2 **2**	188 000 ÷ 3 ≠ 66 000	B1	
	$\frac{188000}{90}\times 100$ or $\frac{198000}{90}\times 100$	B1	
	(£) 220 000	B1	This is the maximum price he can afford for a house.
3(a)	says that the complaint was justified and gives any two of the following reasons • column headings needed • the last column should be stated to be percentages • the last but one column should be stated to be votes received • all candidates should be listed • the total electorate should be stated • the percentage turnout is omitted	E2	or equivalent E1 says that the complaint was justified and gives one correct reason (ignore any incorrect reasons given) or gives two correct reasons but does not say that the complaint was justified

Q	Answer	Mark	Comments
3 (b)	calculates 2010 electorate: 51 228 ÷ 0.714 or [71 740, 71750]	M1	oe
	uses their 2010 figure to make a sensible estimate of the 2014 figure and makes a valid conclusion based on 50% of their electorate	A1	eg assumes the electorate remains stable and compares half of their electorate assumes an increase in electorate and compares half of their increased electorate SC1 says that as we are not told the number of registered voters in 2014 we cannot say if half did not vote
	says that UKIP did make the biggest numerical gain and gives evidence or says that UKIP did make the biggest percentage gain and gives evidence	E1	relevant figures are: Conservative – 10 159 Labour – 4596 Liberal – 9242 UKIP + 8074 condone 'UKIP' were the only ones of the four parties from 2010 to increase their vote there is no need for a comment about the parties who did not take part in 2010, but accept any correct comment eg the other parties cannot have increased their vote beyond the 1891 of the independent candidate relevant figures are: Conservative – 8.9(%) Labour – 4.6(%) Liberal – 17.4(%) UKIP + 22.1(%) condone 'UKIP' were the only ones of the four parties from 2010 to increase their vote there is no need for a comment about the parties who did not take part in 2010, but accept any correct comment eg the other parties cannot have increased their vote beyond the 4.9% of the independent candidate

Q	Answer	Mark	Comments
3(c)	Jenrick (Conservative)		
	Conservatives did gain a majority, however more people voted against them (47.65) than for them (45%)	E2	full well communicated comment putting both sides E1 for partial explanation eg Jenrick was correct as Conservatives gained more votes than any other party or Jenrick is wrong as more people voted against the government (46.7%) than for the government (45%) or the government is a coalition so including the Liberal Democrat percentage gives the government an even bigger majority (47.6%)
	Helmer (UKIP)		
	any comparison of 3.8 and 25.9	M1	no credit for result in general election approx factor of 5 as not a justification
	$\frac{25.9}{3.8} \approx 6$ so he is right or 25.9 ÷ 3.8 is approx 7 so he is wrong or 6 × 3.8 = 22.8 so it's more than a factor of 6	A1	can conclude they agree or disagree with Helmer with correct reasoning
	any comparison of $7\,403$ and $16\,152$	M1	
	$\frac{7403}{16152} \approx \frac{1}{2}$ or 16152 ÷ 2 = 8076 and yes / they more than halved the majority	A1	
	Payne (Labour)		
	various sensible numerical arguments are possible, for example • reference to the $45.0\ \%$ being less than half • only a quarter of the	E1	

	electorate voted **against** the Conservative candidate		
	clearly communicated answers with links to each candidate's statement and numerical justifications	B1	

4	$\bar{x} = \frac{1078}{10} = 107.8$	B1	seen
	90% value gives $z = 1.64$	B1	
	$107.8 \pm 1.64\frac{4.69}{\sqrt{10}}$	M2	if one error award M1, if all correct award M2.
	$= 107.8 \pm 2.43$	M1	
	$= (105.4, 110.2)$	A1	
	115 lies above the 90% confidence interval so claim is correct	E1	comparison 115 and interval and conclusion

Q	Answer	Mark	Comments
Alt 1 **5**	pmcc used for comparison	B1	decides strategy
	Will/Kylie -0.74 Will/Ricky -0.68 Kylie/Ricky +0.87	B2	B1 for one correct value
	the views of Kylie and Ricky show good agreement	E1	oe
	Will tends to have opposite views to the others	E1	oe
	eg given that the agreement is usually between Kylie and Ricky the exclusion of Will does not have that much effect or although there is not agreement it is good to have an alternative opinion so keep all 3	B1	ft their values with appropriate conclusion
Alt 2 **5**	scatter graphs used for comparison	B1	decides strategy
	3 graphs drawn –can be sketches but must clearly show correlation	B2	B1 for one correct value
	the views of Kylie and Ricky show good agreement/ positive correlation	E1	oe
	Will tends to have opposite views to the others or graphs between Will and each other judge show negative correlation	E1	oe
	eg given that the agreement is usually between Kylie and Ricky the exclusion of Will does not have that much effect or although there is not agreement it is good to have an alternative opinion so keep all 3	B1ft	ft their graphs with appropriate conclusion

Alt 3 **5**	ranking used for comparison	B1	decides strategy
	ranks all 3 sets correctly Will C,H,I,B,A,F,E,D,G Kylie D,E,G,I,B,A,H,C,F Ricky D,E,B,I,A,G,F,H,C	B2	B1 for one correct ranking can use table and give numbers to each competitor to rank
	the views of Kylie and Ricky show good agreement/ Kylie and Ricky both chose the same people for 1st (and 2nd place)	E1	oe
	Will tends to have opposite views to the others/ Will put C first but the other two had C at/near the bottom	E1	oe
	eg given that the agreement is usually between Kylie and Ricky the exclusion of Will does not have that much effect or although there is not agreement it is good to have an alternative opinion so keep all 3	B1ft	ft their ranking with appropriate conclusion

Q	Answer	Mark	Comments
6(a)	65.2	B1	allow 65.1
	11.9 or 12.5	B2	allow B1 for variance
	in general they have lower heart rate than the general population. their heart rates have a similar spread to those of the general population.	B1 B1	
6(b)	2 sds above the mean is 95. the highest heart rate amongst the players is less than this (90).	B1 B1	
6(c)	2.5 % are expected to qualify	B1	
	35 000 ÷ 100 × their 2.5	M1	
	875	A1	
	their 875 × (£)23.95	M1	
	[£20 950, 21 000]	A1ft	ft their number of qualifying patients Correct amount for 875 patients is £20 956.25
	explains that the actual figure is likely to be lower as not all of the qualifying patients will have the test	E1	eg some people won't hear about the screening some people won't want to have the screening

Q	Answer	Mark	Comments
7(a)	$w = 1.47l + 3.14$ (coefficients to 3sf)	B1 B1	from 1.4687129 from 3.13882765
	$\overline{l} = 21.75 =$ 21.8 cm (to 3sf) and $\overline{w} = 35.08\dot{3} = 35.1$ cm (to 3sf)	B1	
	line through their mean point (21.8, 35.1)	B1ft	within one square
	intercept 3.14	B1ft	within one square
7(b)	substitutes 90 for length their 1.47 × 90 or 132.3	M1	
	135.44 and 150	A1ft	ft their equation of the regression line converts both measures to same form
	decision with appropriate reason	E1	eg yes, because the value is only 15 cm out and the figures given were approximate no, because there is a 10% difference from the actual values any decision with an indication that extrapolating outside the range of given data is not reliable
Alt 1 **8(a)**	plots points as a scatter diagram	B1	
	positive	B1	ignore any line of best fit drawn ignore further descriptions such as ‘strong’
	as one increases, so does the other	E1	
Alt 2 **8(a)**	pmcc = 0.91(05)	B1	
	positive	B1	ignore further descriptions such as ‘strong’
	as one increases, so does the other	E1	

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8(b)</td>
<td>works out absolute differences
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DP</td><td>-0.1
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