Version

Free-Standing Mathematics Qualification
June 2012

Mathematics Advanced Level 6990

(Specification 6990)

Using and Applying Statistics

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner 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 examiners 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 examiner understands and applies it in the same correct way. As preparation for standardisation each examiner 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, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal 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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Key to mark scheme abbreviations

M	mark is for method
m or 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
√or ft or F	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
–*x* EE	deduct *x* marks for each error
NMS	no method shown
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

Free-Standing Mathematics Qualification
Advanced Level – Using and Applying Statistics (6990/2)
Answers and Marking Scheme – June 2012

Q	Solution	Marks	Total	Comments
1(a)	East Midlands	B1	1	
(b)(i)	correct scale – goes in 2's vertical axis – % recycled countries identified – England, Wales, Scotland, Northern Ireland	B1 B1 B1	3	
(ii)	4 correct bars	B3	3	B2 for 2 or 3 correct bars
(c)	Wales	B1	1	
	Total		**8**	
2(a)(i)	compost	B1	1	
(ii)	London	B1	1	
(b)	$\frac{121.9}{402.6} \times 360$ $= 109^{\circ}$	M1 A1	2	
(c)	Plastics $\frac{12.5}{2.5} = 5$	B1 B1	2	
	Total		**6**	

Q	Solution	Marks	Total	Comments
3(a)	10 points plotted correctly to $\pm \frac{1}{2}$ square accuracy	B2		B1 for 8 or 9 correct
(b)(i)	$\bar{x} = 50$	B1		
(ii)	$\bar{y} = 50.9$	B1		
(iii)	$r = 0.924$	B1		Accept 0.923.....
(iv)	suggests the more goals scored the more points gained.	B1		their answer for *r*
(c)(i)	$y = 1.05x - 1.55$	B2		B1 values B1 equation
(ii)	as *x* increases so *y* increases for every goal scored, get increase of 1.05 points	B1 B1		in context
(iii)	line through their mean point (50, 50.9) line through another calculated value or (0,-1.55) correct line	B1ft B1ft B1		
(d)	38 – 39 points other factors affect points gained eg goals scored against; no. of draws, etc	B1ft E1		
	Total		**15**	
4(a)	cf values: 0, 2, 12, 27, 46, 66, 81, 95, 100 (or 99) points plotted at correct UCBs smooth curve through plots to $\pm\frac{1}{2}$ square accuracy.	B1 B1 B1		
(b)	husbands: 42.5 wives: 41 ± 0.5	B1 B1		allow 43
(c)	$Q_1 \approx 34.5$; $Q_2 \approx 48 \pm 0.5$ for both answers $48 - 34.5 = 13.5$	M1 A1ft		ft their graph
(d)	husbands slightly older than wives sensible comment using their value for IQR of wives and comparing to that of husbands	B1 B1ft		ft wife median value
	Total		9	

Q	Solution	Marks	Total	Comments
5(a)(i)	$\frac{(153034-141415)}{153034}\times 100$	M1		
	$=-7.59\%$	A1		decrease indicated
(ii)	1.0272 or 102.72	B1		
	$\frac{147735}{102.72}\times 100$	M1		
	$=143823$	A1		accept 144 000
(b)(i)	sensible scales	B1		
	accurate plots to $\pm\frac{1}{2}$ square accuracy	B2		B1 for 4 correct
(ii)	increase in divorces 2002 – 2003	B1		
	decrease in divorces 2004 – 2008	B1		
	Total		**10**	
6(a)	$(16+20+14.5)\times 1000=50500\text{g}$			
	$\frac{50500}{460}=109.782...$	M1		
	109 complete jars	A1		
(b)	$80\%\times 109=87.2$ jars	M1		ft answer from (a)
	$87.2\times £3.50=£305.20$	A1ft		87 jars $\rightarrow$ £304.50 or 88 jars $\rightarrow$ £308
(c)	$P(W>472): z=\frac{(472-460)}{15}$	M1		
		M1		attempt at standardising
	$z = 0.8$			
	$P(z>0.8)=1-P(z<0.8)$	M1		
	$= 0.21186$	A1		0.212 or better
(d)	For 90 %, $z = -1.28$	B1		accept $z = -1.29$
	$-1.28=\frac{(454-\mu)}{15}$	M1		
	$\mu=19.2+454$	m1		
	$\mu=473\text{g}$	A1		
	Total		**12**	
	TOTAL		**60**	