AQA

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme
January 2004

GCE

Mathematics & Statistics B

Unit MBS1

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Key to mark scheme

M	mark is for	method
m	mark is dependent on one or more M marks and is for	method
A	mark is dependent on M or m mark 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
AWFW		anything which falls within
AWRT		anything which rounds to
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		Perhaps implied
c		Candidate

Abbreviations used in marking

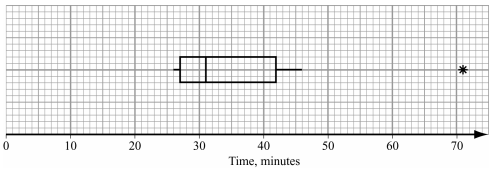
MC – *x*	deducted *x* marks for miscopy
MR – *x*	deducted *x* marks for misread
ISW	ignored subsequent working
BOD	gave benefit of doubt
WR	work replaced by candidate

Application of mark scheme

Correct answer without working	mark as in scheme
Incorrect answer without working	zero marks unless specified otherwise

Award method and accuracy marks as appropriate to an alternative solution using a correct method or partially correct method.

Question Number and part	Solution	Marks	Total	Comments
1(a)(i)	P (6 or fewer) = 0.3782	M1 A1		Correct use of Poisson tables or formula 0.378 (0.378 – 0.379)
(ii)	P (8) = 0.6620 – 0.5246 = 0.137	M1 A1	 4	P(8) = P(8 or fewer) – P(7 or fewer) **or** use of correct formula 0.137 (0.137 , 0.138)
(b)	$\sqrt{7.5} = 2.74$	M1 A1	 2	method **sc** B1 var = 7.5 2.74 (2.73 , 2.74)
	Total		**6**	
2 (a)	0.209	B3	3	0.209 – 0.21 allow M2A1 if method shown
(b)	Little evidence of linear association between Henri's and Michelle's estimates. Such slight evidence as there is suggests some agreement.	E1√ E1√	 2	Small/weak/no Some evidence of agreement Allow a mark for appropriate mention of 'linear' (not for 'positive')
	Total		**5**	
3 (a)(i)	Mean number of courses of treatment for all adult dental patients in England	E1		Definition implied
(ii)	Mean for participants	E1	2	In context
(b)(i)	All teachers	E1		Reason
(ii)	No, all from local schools	M1 A1	 3	No Reason
	Total		**5**	

Question Number and part	Solution	Marks	Total	Comments
4 (a)	26 26 27 27 28 28 30 31 33 35 39 42 44 46 71	M1		Attempt at ranking
	median 31	m1		8th observation
	lower quartile 27	m1		4th observation, allow 3.75th
	upper quartile 42	m1		12th observation, allow 11.25th or 12.25th or 12.5th
		A1	5	31 cao, 27 cao, 42 (39 ,43)
(b)	Outliers > 42 + 1.5 (42 – 27) = 64.5 and < 27 – 1.5(42 – 27) = 4.5	M1		method for one boundary – their quartiles – allow factors between 1 and 2
	71 only outlier	ml		method for identification of outliers (both ends)
		A1	3	64.5 (57 , 67) and correct identification of 71 as only outlier
4 (c)		M1		method generous (allow omit median)
		B1		Whiskers end at 26 and 46 and outlier correctly shown (approx correct)
		A1	3	Accurate plot by eye
(d)	All times in 2nd week greater that any times in 1st and 3rd weeks	E2,1	2	Clear statement scores both marks
	Total		**13**	
5(a)(i)	$z = \frac{172.5-168}{4.5} = 1.0$	M1		method of standardising – ignore sign
	P(<172.5) = 0.841	M1		A correct use of normal tables
		A1	3	0.841 (0.841 , 0.842)
(ii)	$z_1 = \frac{159-168}{4.5} = -2.0$	M1		method of standardising – consistent signs
	$z_2 = \frac{163.5-168}{4.5} = -1.0$	ml		Signs of z clearly correct
	Probability between 159 and 163.5 is	M1		Correct method – depends on M1 only
	0.97725 – 0.84134 = 0.136	A1	4	(0.1355 , 0.1365)
(b)	$z = \frac{172-168}{\frac{4.5}{\sqrt{11}}}$	B1		Use of $\frac{4.5}{\sqrt{11}}$
		M1		method for z
	= 2.948			
	P(mean >172) = 1 – 0.9984 = 0.0016	m1		Completely correct method
		A1	4	0.0016 (0.0015 , 0.0017)
(c)	Very unlikely 11 randomly selected female students would have a mean height as great as 172cm	E2,1	2	Clear explanation scores 2 marks
	Total		**13**	

Question Number and part	Solution	Marks	Total	Comments
6(a)(i)	Binomial $n = 8$ $p = 0.3$	B1 B1		Binomial 8, 0.3
	P (2 or fewer) = 0.552	B1		0.552 (0.551 , 0.5525)
(ii)	P(2) = 0.5518 – 0.2553 = 0.2965	M1 A1		P(2 or fewer) – P(1 or fewer) or use of correct formula 0.2965 (0.296 , 0.297)
(iii)	P(>3) = 1 – 0.8059 = 0.194	M1 A1	 7	P(>3) = 1 – P(3 or fewer) or use of correct formula 0.194 (0.193 , 0.195) **sc** B1 0.448 (0.448 , 0.449)
(b)	No, *n* not constant/probabilities not random/not independent/0,1 not possible outcomes	M1 A1	 2	No Reason
(c)	No, *p* not constant/ not independent	M1 A1	 2	No Reason
	Total		**11**	
7(a)	0.3	B1	1	0.3 cao
(b)	$0.6 \times 0.3 \times 0.75 = 0.135$	M1 m1 A1	 3	3 probabilities multiplied Correct method 0.135 cao
(c)(i)	$0.4 \times 0.3 + 0.12$	M1 A1		method – may be earned in (ii) 0.12 cao
(ii)	$0.75 \times 0.4 = 0.3$	A1	3	0.3 cao
(d)	$0.5 \times 0.12 + 0.5 \times 0.3 = 0.21$	M1 m1 A1	 3	Use of 0.5 Correct method 0.21 cao
	Total		**10**	

Question Number and part	Solution	Marks	Total	Comments
8(a)	(See graph on next page)	M1 B1 A1	3	method for scatter diagram Scales and labels Accurate plot (by eye) allow one small slip
(b)	$y = -2.70 + 0.268x$ $x = 20$ $y = 2.67$ $x = 200$ $y = 50.99$ + line	B2 B2 M1 A1	6	– 2.70 (–2.69 , – 2.7) **sc** B1 2.70 0.268 (0.268 , 0.269) Allow M1 A1 M1 A1 if method shown method for line Accurate line
(c)(i)	I $17 - (-2.6951) - 0.268437 \times 88$ $= -3.93$ J $47 - (-2.6951) - 0.268437 \times 195$ $= -2.65$	M1 m1 A1	3	method their line – ignore sign method needs all previous M marks- ignore sign –3.93 (–3.8 , – 4) and –2.65 (–2.5 , –2.7) allow read from graph, allow –3
(ii)	5.13	M1 A1	2	Method 5.13 (5.1 , 5.2)
(d)(i)	26.8	B1	1	26.8 (26.7 , 27)
(ii)	£22 about £5 below amount predicted by regression equation. Similar to mean residual. No reason to say Karen should have been supervised.	E1√ E1√	2	Below predicted amount No reason to say she should have been supervised, with references to residuals implied
	Total		**17**	
	TOTAL		**80**	

Graph for Q 8(a)