



General Certificate of Secondary Education

Statistics 3311

Higher Tier

Mark Scheme

2007 examination - June series

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 meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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The following abbreviations are used on the mark scheme:

- M** Method marks awarded for a correct method.
- A** Accuracy marks awarded when following on from a correct method. It is not necessary always to see the method. This can be implied.
- B** Marks awarded independent of method.
- M dep** A method mark which is dependent on a previous method mark being awarded.
- 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.
- oe** Or equivalent.
- eeoo** Each error or omission.

Higher Tier

Q	Answer	Mark	Comments
1(a)	All 20 squares correct	B3	B2 18 or 19 correct B1 10 or more correct
1(b)	D marked in any cell Reason matches position	B1	Anything sensible
2(a)(i)	Choices are given	B1	oe Imply some choice
2(a)(ii)	Groups can be given as choices so people are not revealing their age	B1	oe Easier to analyse Allow general implication of age eg, 'better response rate'
2(b)	Collect them himself	B1	Pre-paid envelope / telephone / internet / rewards / incentives / more closed questions / shorter questions / interviews / fewer questions
2(c)	Test it on a small sample	B1	Idea of pilot Do not accept 'be more careful' / 'should have checked it'
2(d)	No time frame given in question	B1	It is two questions not one Why ask about pub – he is thinking of a restaurant
	No response boxes	B1	Might be difficult to recall or average out 'It varies'
3(a)(i)	0.25 seen on a branch	B1	oe
	2 correct branches	B1	
	3 rd correct branch	B1	
3(a)(ii)	The phone that one call goes to does not affect which phone the second will go to	B1	oe If words 'not dependent' used must be qualified in a sentence
3(b)	0.75×0.75	M1	ft Their tree
	0.56(25)	A1	oe

Q	Answer	Mark	Comments
4(a)	Allocates a single number to Emergency	B1	
	Allocates a single number to Non-urgent	B1	
	Allocates the remaining 4 numbers to Urgent	B1	‘Others’, ‘rest of’ (alternatives to ‘remaining’)
4(b)	All correct	B2ft	ft An allocation using 1 - 6 only alternatively accept, if no allocation, 1 number with an E, 1 number with an N and the remaining numbers with U’s B1ft One or two errors (B1 only available for a shown allocation)
5(a)	Shortening of vertical scale	B1	oe eg, increase exaggerated / should have used a break mark
	Labelling of horizontal scale not consistent	B1	oe
5(b)	The proportion of drivers over 79 in fatal crashes could be large The number of drivers over 79 may be small	B2	oe Mark positively (ignore incorrect or irrelevant statements) B1 Don’t know how many there are over 79 B1 Shows numbers not proportions B1 They might have lots of other non-fatal crashes B1 Only one year’s data
5(c)	Area of large phone more than six times area of small phone	B1	oe Not accept not to scale or not in proportion Must see reference to area or 6 times or reference to 36

Q	Answer	Mark	Comments
6(a)	18	B1	
6(b)	Two people	B1	
6(c)	Rounding effects	B1	oe
6(d)	All dividing lines within tolerance	B3	–1 eeo Tolerances (working up) 25 - 30 60 - 65 75 - 80 90 - 95 Count no shading as 1 error Ignore bar width
6(e)	Similarity - the % of 2 (or 3 or 4)	B1	Allow ft or correct answers
	Difference - the % of 1 (or 5+)	B1	Ignore incorrect or irrelevant answers
7(a)	All correct	B2	–1 each error
7(b)	General increase over time	B1	
	Peaks in Quarter 3 / troughs in Q1	B1	
7(c)	112.5 115	M1	Figures need not be in table/any one of the figures M1
	117.5 119.5	A3	–1 each error
7(d)(i)	Plot	B1	ft From their heights/accept 8 or 9 correct
	Position	B1	Increasing order or clearly specified
7(d)(ii)	Trend line	B1	Must be on or within 2002 Q1 (95,110) and 2004 Q4 (115,130)
7(e)	Data - Trend	M1	Dep on 7d(ii)
	14 11 15	A1	
	Mean 13.3	A1	Accept - 13.3 dep on first A1
7(f)	Read off trend	M1	Dep on d(ii)
	$124.5 - 13.3 = 111.2$	M1 A1	M1 Reading off their trend line and attempt add/subtract their 7(e)

Q	Answer	Mark	Comments
8(a)	Rankings	B1	Either ranking correct
		B1	Other ranking correct and consistent
	$\sum d^2 = 28.5$	M1	For d^2
		M1	For $\sum d^2$
	Formula and coefficient = 0.661	M1 A1	cao Accept 0.66 or better
8(b)	Some agreement	B1	ft From (a)/in context/not positive correlation
8(c)	-0.98 0.75	B1 B1	

9(a)	Both peak in 1999	B1	Dip in 2000 oe
	Freight traffic decreased sharply in 1997	B1	
9(b)(i)	Median	B1	
	Quartiles and box	B1	
	Whiskers	B1	
9(b)(ii)	Symmetrical	B1	Not allow normal
	Positive skew	B1	
9(b)(iii)	IQR = 45	M1	Seen
	1.5×45	M1	or $1.5 \times$ their IQR or 67.5 seen
	= 262.5	A1	or 262 - 263 or 127.5 - 262.5 or 262.5 seen anywhere

Q	Answer	Mark	Comments																								
10(a)	$\sum fx = 450$	M1																									
	Mean = 3	A1																									
	Sum of squares of differences = 376	M1	or $\sum fx^2 = 1726$																								
	Formula: variance = 2.507	A1	2 sig fig accuracy for n – 1 2.5235																								
	St. devn. = 1.58	A1	ft 2 sig fig accuracy for n – 1 1.585																								
10(b)(i)	$(21 - 16.5)/2.8 = 1.61$	M1 A1	Accept 1.6																								
10(b)(ii)	$(x - 14)/4.5 = 2.4$	M1																									
	$x = 24.8$	M1 A1	M1dep Accept 25 with working																								
10(b)(iii)	$16.5 \pm (3) (2.8)$	M1 A1	M1 For idea of confidence interval																								
	8.1 – 24.9	A1																									
11(a)(i)	<table border="1"> <tr> <td>15</td><td>01</td><td>20</td><td>16</td><td>22</td><td>30</td><td>19</td><td>08</td> </tr> <tr> <td>M</td><td>M</td><td>M</td><td>M</td><td>M</td><td>M</td><td>M</td><td>M</td> </tr> <tr> <td>4</td><td>4</td><td>4</td><td>3</td><td>3</td><td>2</td><td>2</td><td>2</td> </tr> </table>	15	01	20	16	22	30	19	08	M	M	M	M	M	M	M	M	4	4	4	3	3	2	2	2	B3 B2 B1	For all correct For 6 or 7 correct At least 5 correct Condone errors on gender / passes
	15	01	20	16	22	30	19	08																			
	M	M	M	M	M	M	M	M																			
4	4	4	3	3	2	2	2																				
11(a)(ii)	$24/8 = 3$	B1ft																									
11(b)(i)	Males 4 Females 2	M1 A1	Their '20'/30 maybe by implication cao																								
	<table border="1"> <tr> <td>04</td><td>29</td><td>13</td><td>14</td><td>23</td><td>24</td> </tr> <tr> <td>M</td><td>M</td><td>F</td><td>M</td><td>F</td><td>M</td> </tr> <tr> <td>8</td><td>6</td><td>5</td><td>5</td><td>7</td><td>2</td> </tr> </table>	04	29	13	14	23	24	M	M	F	M	F	M	8	6	5	5	7	2	B2	B2 for 6 correct B1 for 5 correct						
	04	29	13	14	23	24																					
M	M	F	M	F	M																						
8	6	5	5	7	2																						
11(b)(ii)	$33/6 = 5.5$	B1	ft																								
11(c)	Represents M and F in proportion	B1	Right number or proportion of M/F or better estimator																								
11(d)	Strongly disagree, disagree Undecided, agree, strongly agree	B2	or reversed If numbers used must be defined																								

Q	Answer	Mark	Comments
12(a)(i)	$\sum WI = 175390.6$ $\sum WI / \sum W = 175390.6/903$	M3	M1 for an attempt at $W \times I$ M1 for their $\sum WI$ for either 12 or 14 items M1 for their $\sum WI / 903$ dep
	Index = 194.2	A1	oe Method giving answer of 194.3
12(a)(ii)	Both categories had high / large index values	B2	or Higher than the RPI
		B1	Reference to only one category
12(b)(i)	$546/500 \times 100$	M2	M1 For expression; $M1 \times 100$
	109.2 122.7 95.5 97.7	A2	-1 each error
12(b)(ii)	Increase 9.2% or 22.7%	B1	Years can be implied: must have % no ft
	Decrease 4.5% or 2.3%	B1	
13(a)	Scaling	M1	If see either 1.6 or 0.4 minimum of 2 marks
	Heights 1.6 and 0.4	A1	For correct heights
		A1	For correct bars
13(b)	30 36 20	B2	B1 For two correct B2 For all 3 correct
13(c)	$5 \leq t \leq 10$	B1	
13(d)	$20/130 \times 8/129$	M1 A1	Allow ft Either numerator wrong 0/4
	$\times 2$ or add	M1	M2 For replacement only
	$= 32/1677$ or 0.01908	A1	0.019 or better
13(e)	5/13	B1ft	Their frequency/Their total
	$5/13 \times 5/13 \times 5/13 \times 5/13$	M1	Their values but must be probabilities
	625/28561 or 0.0219	A1	0.022 or better 3 marks for correct use of sampling without replacement 0.0203