

EDEXCEL

GENERAL CERTIFICATE OF EDUCATION

Advanced Subsidiary/Advanced Level

Statistics S1

MARKING SCHEME

January 2005

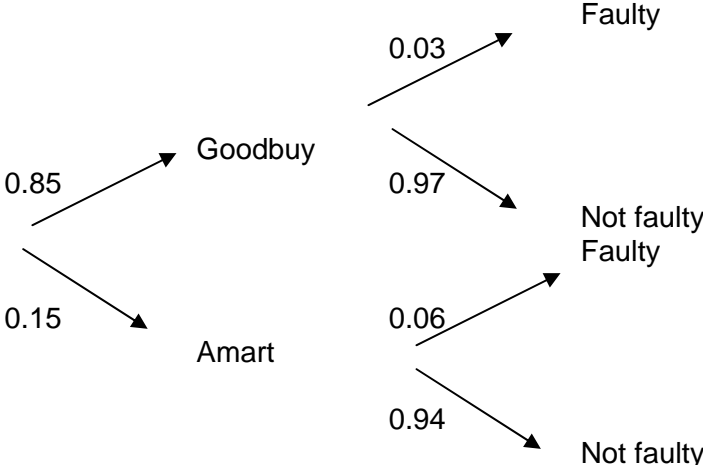
Principal Examiner:

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Marking should be completed by 16 February 2005.

General Instructions

1. The total number of marks for the paper is 75.
2. Method (M) marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.
3. Accuracy (A) marks can only be awarded if the relevant method (M) marks have been earned.
4. (B) marks are independent of method marks.
5. Method marks should not be subdivided.
6. For misreading which does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, in that part of the question affected. Indicate this action by 'MR' in the body of the script (but see also note 10).
7. If a candidate makes more than one attempt at any question:
 - (a) If all but one attempt is crossed out, mark the attempt which is NOT crossed out.
 - (b) If either all attempts are crossed out or none are crossed out, mark all the attempts and score the highest single attempt.
8. Marks for each question, or part of a question, must appear in the right-hand margin and, in addition, total marks for each question, even where zero, must be ringed and appear in the right-hand margin and on the grid on the front of the answer book. It is important that a check is made to ensure that the totals in the right-hand margin of the ringed marks and of the unringed marks are equal. The total mark for the paper must be put on the top right-hand corner of the front cover of the answer book.
9. For methods of solution not in the mark scheme, allocate the available M and A marks in as closely equivalent a way as possible, and indicate this by the letters 'OS' (outside scheme) put alongside in the body of the script.
10. All A marks are 'correct answer only' (c.a.o.) unless shown, for example, as A1 f.t. to indicate that previous wrong working is to be followed through. In the body of the script the symbol \checkmark should be used for correct f.t. and \surd for incorrect f.t. After a misread, however, the subsequent A marks affected are treated as A f.t., but manifestly absurd answers should never be awarded A marks.
11. Ignore wrong working or incorrect statements following a correct answer.

Question Number	Scheme	Marks
1 (a)	 <p>Tree 0.85, 0.15 0.03, 0.97, 0.06, 0.94</p>	<p>M1 A1 A1</p> <p>(3)</p>
(b)	<p> $P(\text{Not faulty}) = (0.85 \times 0.97) + (0.15 \times 0.94)$ $= 0.9655$ </p> <p>their values, all correct awrt 0.966</p>	<p>M1, A1 A1</p> <p>(3) (Total 6 marks)</p>

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Question Number	Scheme	Marks
2 (a)	$Q_1 = 33, Q_2 = 41, Q_3 = 52$	B1B1B1
(b)		(3)
(c)	<p>Median of Northcliffe is greater than median of Seaview. Upper quartiles are the same IQR of Northcliffe is less than IQR of Seaview Northcliffe positive skew, Seaview negative skew</p>	any 3 acceptable comments B1B1B1
(d)	<p>On 75% of the nights that month both had no more than 52 caravans on site.</p>	B1 B1
		(2) (Total 14 marks)

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Question Number	Scheme	Marks																										
3(a)	<div><p>S1 Jan 2005 Question 3(a)</p><table><tr><th>Height (x)</th><th>Weight (y)</th></tr><tr><td>147</td><td>44</td></tr><tr><td>148</td><td>39</td></tr><tr><td>152</td><td>52</td></tr><tr><td>155</td><td>49</td></tr><tr><td>156</td><td>56</td></tr><tr><td>162</td><td>65</td></tr><tr><td>164</td><td>59</td></tr><tr><td>165</td><td>72</td></tr><tr><td>172</td><td>77</td></tr><tr><td>175</td><td>70</td></tr><tr><td>182</td><td>80</td></tr><tr><td>184</td><td>77</td></tr></table></div>	Height (x)	Weight (y)	147	44	148	39	152	52	155	49	156	56	162	65	164	59	165	72	172	77	175	70	182	80	184	77	<p>Scales and labels B1 10 or 11 points correct, all correct B1,B1</p> <p>(3)</p>
Height (x)	Weight (y)																											
147	44																											
148	39																											
152	52																											
155	49																											
156	56																											
162	65																											
164	59																											
165	72																											
172	77																											
175	70																											
182	80																											
184	77																											

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Question Number	Scheme	Marks
(b)	Positive; as x increases, y increases	B1;B1
(c)	$S_{xy} = 122783 - \frac{1962 \times 740}{12} = 1793$	use of formula, cao M1A1
(d)	$b = \frac{S_{xy}}{S_{xx}} = \frac{1793}{1745} = 1.027507...$	division, 1.028 M1A1
(e)	$\bar{y} = \frac{740}{12} = 61\frac{2}{3}$ $s = \sqrt{\frac{47746}{12} - \left(\frac{740}{12}\right)^2} = 13.26859...$	$61\frac{2}{3}$ or 61.6 or 61.7 B1 use of formula including root, 13.3 M1A1
(f)	35.7, 87.7	B1B1
(g)	All values between 35.7 and 87.7 so could be normal.	Reason required B1
		(Total 15 marks)

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Question Number	Scheme	Marks
4 (a)	$k + 2k + 3k + 4k + 5k = 1$ $15k = 1$ $** k = \frac{1}{15} **$	$\sum P(X = x) = 1$ M1 cso A1
(b)	$P(X < 4) = P(1) + P(2) + P(3) = \frac{1}{15} + \frac{2}{15} + \frac{3}{15}$ $= \frac{2}{5}$	sum of 3 probabilities M1 $\frac{6}{15}$ or $\frac{2}{5}$ A1
(c)	$E(X) = 1 \times \frac{1}{15} + 2 \times \frac{2}{15} + 3 \times \frac{3}{15} + 4 \times \frac{4}{15} + 5 \times \frac{5}{15}$ $= \frac{11}{3}$	use of $\sum xP(X = x)$ M1 $\frac{55}{15}$ or $\frac{11}{3}$ or $3\frac{2}{3}$ or $3.\dot{6}$ or 3.67 A1
(d)	$E(3X - 4) = 3E(X) - 4 = 11 - 4$ $= 7$	3xtheirs-4 M1 A1
	(OR) $E(3X - 4) = -1 \times \frac{1}{15} + 2 \times \frac{2}{15} + 5 \times \frac{3}{15} + 8 \times \frac{4}{15} + 11 \times \frac{5}{15}$ $= 7$	$\sum (3x - 4)kx$ M1 cao A1)
		(2) (Total 8 marks)

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Question Number	Scheme	Marks
5 (a)		<p>6 B1 subtract M1 4,5,7 A1 subtract A1 16,19,25 A1 918 B1</p> <p style="text-align: right;">(6)</p>
(b)	$P(\text{No defects}) = \frac{918}{1000} = 0.918$	<p style="text-align: right;">B1</p> <p style="text-align: right;">(1)</p>
(c)	$P(\text{No more than 1}) = \frac{918+16+19+25}{1000} \quad \text{OR} \quad 1 - \frac{5+6+4+7}{1000}$ $= 0.978$	<p style="text-align: right;">M1</p> <p style="text-align: right;">0.978 A1</p> <p style="text-align: right;">(2)</p>
(d)	$P(B \text{Only 1 defect}) = \frac{P(B \text{ and 1 defect})}{P(1 \text{ defect})} = \frac{\frac{19}{1000}}{\frac{16+19+25}{1000}}$ $= \frac{19}{60}$	<p style="text-align: right;">conditional prob M1</p> <p style="text-align: right;">$\frac{19}{60}$ or 0.316 or 0.317 A1</p> <p style="text-align: right;">(2)</p>
(e)	$P(\text{Both had type B}) = \frac{37}{1000} \times \frac{36}{999}$ $= \frac{37}{27750} \text{ or } 0.0013 \text{ or } 0.00133$	<p style="text-align: right;">theirs from B x M1</p> <p style="text-align: right;">cao A1</p> <p style="text-align: right;">(2)</p> <p style="text-align: right;">(Total 13 marks)</p>

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Question Number	Scheme	Marks
6(a)	(Discrete) Uniform	B1 (1)
(b)	e.g. Tossing a fair dice / coin	B1 (1)
(c)	Useful in theory – allows problems to be modelled not necessarily true in practice	B1 B1 (2)
(d)	Carry out an experiment to establish probabilities	B1 B1 (2) (Total 6 marks)

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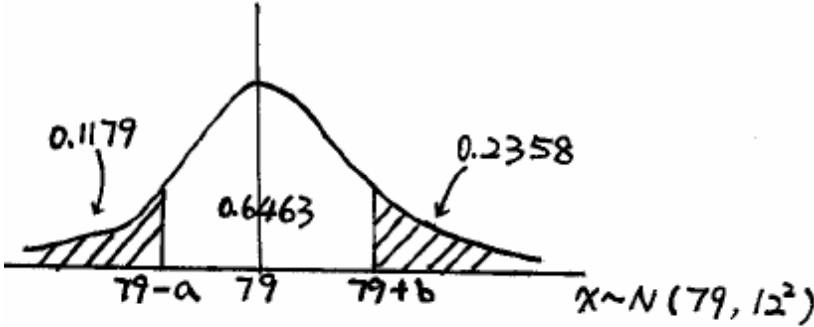
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Question Number	Scheme	Marks
7 (a)	$P(X < 70) = P\left(Z < \frac{70-79}{12}\right)$ $= P(Z < -0.75) = 0.2266$	standardise 79, 12 or 79, 144 M1 -0.75, 0.2266 A1A1 (3)
(b)	$P(64 < X < 96) = P\left(\frac{64-79}{12} < Z < \frac{96-79}{12}\right)$ $= P(-1.25 < Z < 1.42) = 0.8166$	standardise both, 79 & 12 only M1 -1.25 & 1.42, 0.8166 A1,A1 (3)
(c)	 <p style="text-align: center;">$X \sim N(79, 12^2)$</p>	Shaded area is $= \frac{1}{3}(1 - 0.6463)$ M1A1 $= 0.1179$ A1 (3)
(d)	$P(X \leq 79+b) = 0.7642$ $\Rightarrow \frac{b}{12} = 0.72$ $b = 8.64$	0.7642 B1 standardise LHS = probability, all correct M1A1 A1 (4)
(Total 13 marks)		

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