

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.

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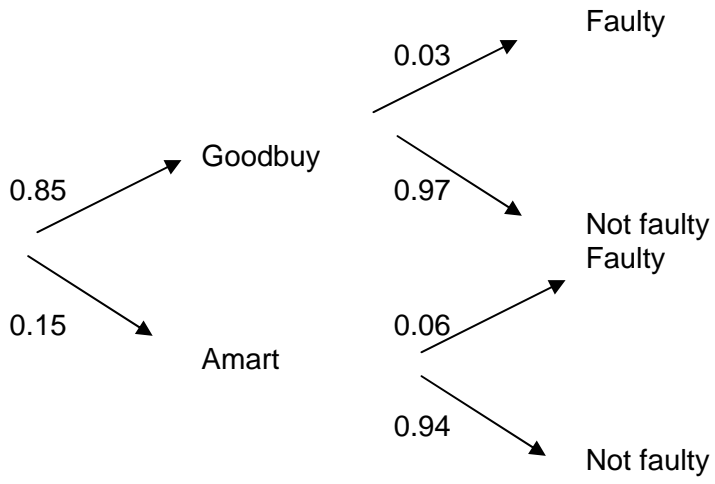
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General Certificate of Education

Subject: **Statistics**

Paper: **S1**

Question Number	Scheme	Marks
1 (a)	 <pre> graph LR     Root(( )) -- 0.85 --&gt; Goodbuy     Root -- 0.15 --&gt; Amart     Goodbuy -- 0.03 --&gt; Faulty1[Faulty]     Goodbuy -- 0.97 --&gt; NotFaulty1[Not faulty]     Amart -- 0.06 --&gt; Faulty2[Faulty]     Amart -- 0.94 --&gt; NotFaulty2[Not faulty]     </pre>	<p>Tree  0.85,0.15  0.03,0.97,0.06,0.94</p> <p><b>M1</b>  <b>A1</b>  <b>A1</b></p> <p><b>(3)</b></p>
(b)	<p>P(Not faulty) <math>= (0.85 \times 0.97) + (0.15 \times 0.94)</math>  <math>= 0.9655</math></p>	<p>their values, all correct  awrt 0.966</p> <p><b>M1,A1</b>  <b>A1</b></p> <p><b>(3)</b>  <b>(Total 6 marks)</b></p>

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Question Number	Scheme	Marks
2 (a)	$Q_1 = 33, Q_2 = 41, Q_3 = 52$	<b>B1B1B1</b>
(b)		<b>(3)</b>
(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 <b>B1B1B1</b>
(d)	<p>On 75% of the nights that month                      both had no more than 52 caravans on site.</p>	<b>B1</b> <b>B1</b>
		<b>(2)</b> <b>(Total 14 marks)</b>

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Question Number	Scheme	Marks																										
3(a)	<p style="text-align: center;"><b>S1 Jan 2005 Question 3(a)</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Data points from the scatter plot</caption> <thead> <tr> <th>Height (x)</th> <th>Weight (y)</th> </tr> </thead> <tbody> <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> </tbody> </table>	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 style="text-align: right;">Scales and labels <b>B1</b>                      10 or 11 points correct, all correct <b>B1,B1</b></p> <p style="text-align: right;"><b>(3)</b></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	<b>B1;B1</b>
(c)	$S_{xy} = 122783 - \frac{1962 \times 740}{12} = 1793$	use of formula, cao <b>M1A1</b>
(d)	$b = \frac{S_{xy}}{S_{xx}} = \frac{1793}{1745} = 1.027507\dots$	division, 1.028 <b>M1A1</b>
(e)	$\bar{y} = \frac{740}{12} = 61\frac{2}{3}$ $s = \sqrt{\frac{47746}{12} - \left(\frac{740}{12}\right)^2} = 13.26859\dots$	$61\frac{2}{3}$ or $61.\dot{6}$ or 61.7 <b>B1</b> use of formula including root, 13.3 <b>M1A1</b>
(f)	35.7, 87.7	<b>B1B1</b>
(g)	All values between 35.7 and 87.7 so could be normal.	Reason required <b>B1</b>
		<b>(Total 15 marks)</b>

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Question Number	Scheme	Marks
4 (a)	$k + 2k + 3k + 4k + 5k = 1$ $15k = 1$ $** k = \frac{1}{15} **$	$\sum P(X = x) = 1$ <b>M1</b>  cso <b>A1</b>  <b>(2)</b>
(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 <b>M1</b>  $\frac{6}{15}$ or $\frac{2}{5}$ <b>A1</b>  <b>(2)</b>
(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 $\sum xP(X = x)$ <b>M1</b>  $\frac{55}{15}$ or $\frac{11}{3}$ or $3\frac{2}{3}$ or 3.6 or 3.67 <b>A1</b>  <b>(2)</b>
(d)	$E(3X - 4) = 3E(X) - 4 = 11 - 4$ $= 7$ <p><b>(OR)</b></p> $E(3X - 4) = -1 \times \frac{1}{15} + 2 \times \frac{2}{15} + 5 \times \frac{3}{15} + 8 \times \frac{4}{15} + 11 \times \frac{5}{15}$ $= 7$	3xtheirs-4 <b>M1</b>  <b>A1</b>  $\sum (3x - 4)kx$ <b>M1</b>  cao <b>A1)</b>  <b>(2)</b>
<b>(Total 8 marks)</b>		

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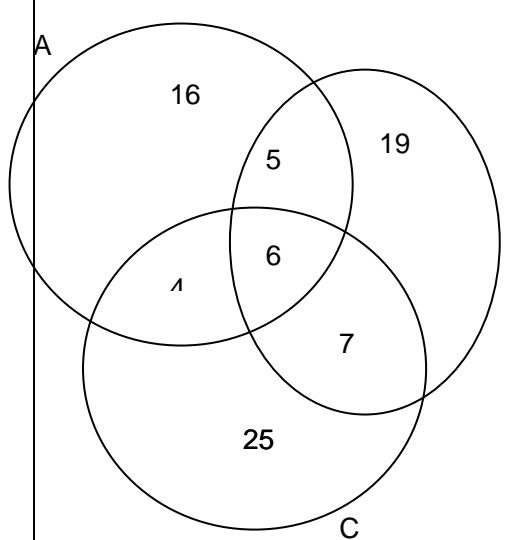
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Question Number	Scheme	Marks
5 (a)		<p>6      <b>B1</b>  subtract      <b>M1</b>  4,5,7      <b>A1</b>  subtract      <b>A1</b>  16,19,25      <b>A1</b>  918      <b>B1</b></p> <p style="text-align: right;"><b>(6)</b></p>
(b)	$P(\text{No defects}) = \frac{918}{1000} = 0.918$	<p style="text-align: right;"><b>B1</b></p> <p style="text-align: right;"><b>(1)</b></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;"><b>M1</b></p> <p style="text-align: right;">0.978      <b>A1</b></p> <p style="text-align: right;"><b>(2)</b></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      <b>M1</b></p> <p style="text-align: right;"><math>\frac{19}{60}</math> or 0.316 or 0.317      <b>A1</b></p> <p style="text-align: right;"><b>(2)</b></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      <b>M1</b></p> <p style="text-align: right;">cao      <b>A1</b></p> <p style="text-align: right;"><b>(2)</b></p> <p style="text-align: right;"><b>(Total 13 marks)</b></p>



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

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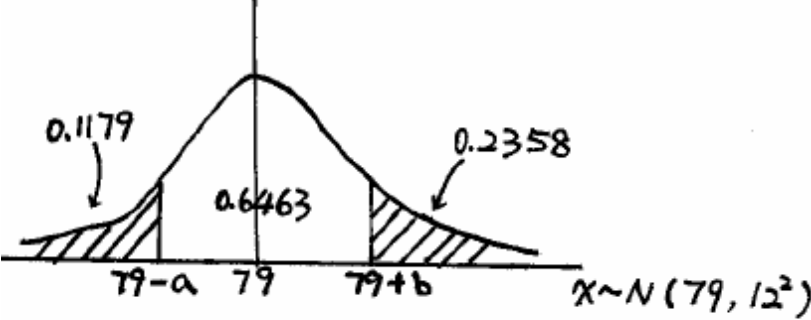
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7 (a)	$P(X < 70) = P\left(Z < \frac{70-79}{12}\right)$ $= P(Z < -0.75) = 0.2266$	standardise 79, 12 or 79, 144 <b>M1</b> -0.75, 0.2266 <b>A1A1</b> <b>(3)</b>
(b)	$P(64 < X < 96) = P\left(\frac{64-79}{12} < Z < \frac{96-79}{12}\right)$ $= P(-1.25 <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

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