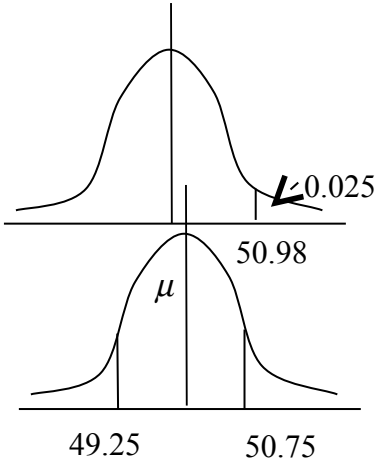


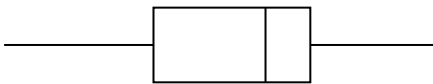
**EDEXCEL STATISTICS S1 (6683) - NOVEMBER 2002**  
**PROVISIONAL MARK SCHEME**

| Question Number | Scheme                                                                                                                                                                                                                                                                                                                     | Marks                                                                                                   |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 1.              | <p>(a) Statistical models allow problems to be solved without the need to construct a full-scale physical model, saving time/expense. They allow parameters to be changed and refinements to be made quickly.</p> <p>(b) (i) Normal; (ii) Discrete uniform</p>                                                             | <p>B2, 1, 0 (2)</p> <p>B1, B1 (2)</p> <p><b>(4 marks)</b></p>                                           |
| 2.              | <p>(a) 60A, 40S, 2M</p> $P(\text{all only arts}) = \frac{60}{125} \times \frac{59}{124} \times \frac{58}{123} = \frac{3422}{31775} = 0.10769\ldots$ <p>(b) <math>P(\text{exactly one only science}) = 3 \times \frac{40}{125} \times \frac{85}{124} \times \frac{84}{123}</math></p> $= \frac{2856}{6355} = 0.44940\ldots$ | <p>B1</p> <p>M1 A1 A1 (4)</p> <p>B1</p> <p>M1 A1 (3)</p> <p><b>(7 marks)</b></p>                        |
| 3.              | <p>(a) <math>P(A \cap B) = P(A)P(B) = 0.25 \times 0.30 = 0.075</math></p> <p>(b) <math>P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.25 + 0.30 - 0.075 = 0.475</math></p> <p>(c) <math>P(A B') = \frac{P(A \cap B')}{P(B')} = \frac{P(A) - P(A \cap B)}{1 - P(B)}</math></p> $= \frac{0.25 - 0.075}{1 - 0.3}$ $= 0.25$       | <p>M1 A1 (2)</p> <p>M1</p> <p>A1 (2)</p> <p>M1</p> <p>M1 A1ft</p> <p>A1 (4)</p> <p><b>(8 marks)</b></p> |

EDEXCEL STATISTICS S1 (6683) - Nov 2002  
PROVISIONAL MARK SCHEME

| Question Number | Scheme                                                                                                                                                                                                                                                         | Marks                                                      |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| 4. (a)          |  $P(L > 50.98) = 0.025$ $P\left(Z > \frac{50.98 - \mu}{0.5}\right) = 0.025$ $\therefore \frac{50.98 - \mu}{0.5} = 1.96$ $\therefore \mu = 50 \quad (*)$ $L \sim N(50, 0.5^2)$ | <p>B1</p> <p>M1 A1</p> <p>M1 A1 (5)</p>                    |
| (b)             | $P(49.25 < L < 50.75) = P\left(\frac{49.25 - 50}{0.5} < Z < \frac{50.75 - 50}{0.5}\right)$ $= P(-1.5 < Z < 1.5) \quad -1.5 \text{ \& } +1.5$ $= 2\Phi(1.5) - 1$ $= 0.8664$                                                                                     | <p>M1</p> <p>A1</p> <p>M1</p> <p>A1 (4)</p>                |
| (c)             | $P(\text{Both}) = (1 - 0.8664)^2$ $= 0.01784\dots$                                                                                                                                                                                                             | <p>M1</p> <p>A1 (2)</p> <p>(11 marks)</p>                  |
| 5. (a)          | $S_{ss} = 108.07875; S_{st} = 129.1675$ $q = \frac{S_{st}}{S_{ss}} = \frac{129.1675}{108.07875} = 1.1951239\dots$ $p = \frac{65.0}{8} - (1.1951239\dots) \times \frac{48.5}{8} = 0.879561\dots$ $\therefore t = 0.879561\dots + 1.1951239\dots S$              | <p>B1; B1</p> <p>M1, A1</p> <p>M1, A1</p> <p>A1 ft (7)</p> |
| (b)             | $y - 20 = 0.879561\dots + 1.1951239\dots(x - 6)$ $\therefore y = 13.709 + 1.195x$                                                                                                                                                                              | <p>M1, A1 ft</p> <p>A1 (3)</p>                             |
| (c)             | <p>0.943; the pmcc is an index (no units) and is not affected by linear transformations of either/both variables</p>                                                                                                                                           | <p>B1; B1 (2)</p> <p>(12 marks)</p>                        |

EDEXCEL STATISTICS S1 (6683) - NOVEMBER 2002  
PROVISIONAL MARK SCHEME

| Question Number | Scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Marks                                                                                                                                                                                                                 |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.              | <p>(a) <math>\alpha + \beta = 0.5</math><br/> <math>-2\alpha + 2\beta = -0.2</math><br/> <math>\therefore \alpha = 0.3, \beta = 0.2</math></p> <p>(b) <math>F(0.8) = 0.6</math></p> <p>(c) <math>E(X^2) = (4 \times 0.3) + \dots + (4 \times 0.2), = 2.4</math><br/> <math>\therefore \text{Var}(X) = 2.4 - (-0.2)^2, = 2.36</math></p> <p>(d) <math>E(3X - 2) = 3E(X) - 2, = -2.6</math></p> <p>(e) <math>\text{Var}(2X + 6) = 4 \text{Var}(X), = 9.44</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>B1<br/> M1<br/> M1 A1; A1 <b>(6)</b><br/> B1 ft <b>(1)</b><br/> M1, A1<br/> M1, A1 <b>(4)</b><br/> M1, A1 ft <b>(2)</b><br/> M1, A1 ft <b>(2)</b><br/> <b>(15 marks)</b></p>                                       |
| 7.              | <p>(a) Mode = 78</p> <p>(b) <math>Q_1 = 56; Q_2 = 70; Q_3 = 78</math></p> <p>(c) <math>(Q_3 - Q_1) = 22</math><br/> <math>Q_1 - 1.0(Q_3 - Q_1) = 34 \Rightarrow 31 \text{ \&amp; } 31 \text{ are outliers}</math><br/> <math>Q_3 + 1.0(Q_3 - Q_1) = 100 \Rightarrow \text{no outliers}</math></p> <p>(d) <i>(accurate sketch on graph paper required)</i></p> <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;"> <p>boxplot</p> <p>scales and labels</p> <p><math>Q_1, Q_2, Q_3</math></p> <p>31, 32, 34 (39), 92</p> </div> </div> <p>(e) <math>\mu = \frac{3363}{50} = 67.26</math><br/> <math>\sigma^2 = \frac{238305}{50} - (67.26)^2 = 242.1924</math><br/> <math>\therefore \sigma = \sqrt{242.1924} = 15.56253\dots</math></p> <p>(f) <math>(Q_3 - Q_2) &lt; (Q_2 - Q_1)</math>, i.e. <math>8 &lt; 14 \Rightarrow \text{negative skew}</math><br/> Mean &lt; Median &lt; Mode, i.e. <math>67.26 &lt; 70 &lt; 78 \Rightarrow \text{negative skew}</math></p> | <p>B1 <b>(1)</b><br/> B1; B1; B1 <b>(3)</b><br/> M1 A1<br/> A1 <b>(3)</b><br/> M1<br/> B1<br/> A1<br/> A1 <b>(4)</b><br/> B1<br/> M1<br/> A1 <b>(3)</b><br/> M1, A1<br/> M1, A1 <b>(4)</b><br/> <b>(18 marks)</b></p> |