

## Mock Paper Mark Scheme

### Advanced Subsidiary/Advanced GCE General Certificate of Education

Subject **STATISTICS**Paper No. **Mock S3**

Question number	Scheme	Marks
1. (a)	$\bar{X} \sim N\left(100, \frac{14^2}{10}\right)$	<p style="text-align: right;">Normal</p> <p style="text-align: right;">B1</p> <p style="text-align: right;"><math>100, \frac{14^2}{10}</math></p> <p style="text-align: right;">B1</p> <p style="text-align: right;">(2)</p>
(b)	$P( \bar{X} - 100  > 5) = P(\bar{X} > 105) + P(\bar{X} < 95)$ $= 2P(\bar{X} > 105)$ $= 2P\left(Z > \frac{105 - 100}{\sqrt{\frac{14^2}{10}}}\right)$ $= 2P(Z > 1.13)$ $= 0.2584$	<p style="text-align: right;">M1</p> <p style="text-align: right;">A1</p> <p style="text-align: right;">A1</p> <p style="text-align: right;">(3)</p> <p style="text-align: right;"><b>(5 marks)</b></p>
2.	<p><math>H_0</math>: No association between type and cover</p> <p><math>H_1</math>: Association between type and cover</p> <p><math>\alpha = 0.05</math>; <math>\nu = 2</math>;</p> <p>Critical value = 5.991</p> $\sum \frac{(O - E)^2}{E} = 11.09$ <p>Since 11.09 is in the critical region, there is evidence of association between type of book and type of cover</p>	<p style="text-align: right;">(both)</p> <p style="text-align: right;">B1</p> <p style="text-align: right;">M1 A1</p> <p style="text-align: right;">B1</p> <p style="text-align: right;">M1 A1</p> <p style="text-align: right;">(6)</p> <p style="text-align: right;"><b>(6 marks)</b></p>

Question number	Scheme	Marks
<p>3. (a)</p>	<p><math>H_0: \mu_{sp} = \mu_{st}; H_1: \mu_{sp} &gt; \mu_{st};</math>  <math>\alpha = 0.05</math>; critical region: <math>z &gt; 1.6449</math></p> <p>standard error = <math>\sqrt{\frac{22^2}{100} + \frac{31^2}{80}} = 4.1051 \dots</math></p> $z = \frac{75 - 64}{4.1051\dots} = 2.68$ <p>Since 2.68 is in the critical region there is evidence to reject <math>H_0</math> and conclude that the special diet is more effective in reducing blood cholesterol.</p>	<p>B1 B1 B1 M1 A1 M1 A1 M1 A1<sup>✓</sup> (9)</p>
<p>(b)</p>	<p>Drop in blood cholesterol levels are normally distributed, or Central Limit Theorem can be applied, or standard deviations of the populations are 22 and 31</p>	<p>Any two B1 B1 (2) <b>(11 marks)</b></p>
<p>4. (a)</p>	<p><math>H_0</math>: Poisson distribution is a suitable model  <math>H_1</math>: Poisson distribution is not a suitable model</p> <p>From these data <math>\lambda = \frac{52}{80} = 0.65</math></p> <p>Expected frequencies 41.76, 27.15, <math>\underbrace{8.82, 2.27}_{11.09}</math></p> <p><math>\alpha = 0.05, \nu = 3 - 1 - 1 = 1</math>; critical value = 3.841</p> $\sum \frac{(O - E)^2}{E} = 1.312$ <p>Since 1.312 is not the critical region there is insufficient evidence to reject <math>H_0</math> and we can conclude that the Poisson model is a suitable one.</p>	<p>both B1 M1 A1 M1 A2/1/0 Amalgamation M1 B1<sup>✓</sup>; B1<sup>✓</sup> M1 A1 M1 A1<sup>✓</sup> (13) <b>(13 marks)</b></p>



Question number	Scheme	Marks																						
7. (a)	$H_0: \rho = 0, H_1: \rho > 0$ $\alpha = 0.01$ , critical value = 0.7887 Since 0.774 is not in the critical region there is insufficient evidence of positive correlation.	B1 B1 B1 M1 A1 (5)																						
(b)	e.g. <table style="margin-left: 40px; border-collapse: collapse;"> <tr> <td style="padding-right: 10px;"><math>R_T</math></td> <td style="padding-right: 10px;">3</td> <td style="padding-right: 10px;">4</td> <td style="padding-right: 10px;">8</td> <td style="padding-right: 10px;">2</td> <td style="padding-right: 10px;">1</td> <td style="padding-right: 10px;">5</td> <td style="padding-right: 10px;">7</td> <td style="padding-right: 10px;">6</td> <td style="padding-right: 20px;"></td> <td style="padding-right: 10px;">Ranks</td> </tr> <tr> <td><math>R_A</math></td> <td>2</td> <td>5</td> <td>7</td> <td>3</td> <td>1</td> <td>4</td> <td>6</td> <td>8</td> <td></td> <td>All correct</td> </tr> </table> $\sum d^2 = 10$ $r_s = 1 - \frac{6 \times 10}{8 \times 63} = 0.881$	$R_T$	3	4	8	2	1	5	7	6		Ranks	$R_A$	2	5	7	3	1	4	6	8		All correct	M1 A1 M1 A1 M1 A1 (6)
$R_T$	3	4	8	2	1	5	7	6		Ranks														
$R_A$	2	5	7	3	1	4	6	8		All correct														
(c)	$H_0: \rho = 0, H_1: \rho > 0$ $\alpha = 0.01$ ; critical value: 0.8333 Since 0.881 is in the critical region there is evidence of positive correlation.	both B1 B1 A1 $\checkmark$ (3)																						
(d)	Because it makes no distributional assumptions about the data or order is more important than the mark  Product moment correlation assumes bivariate normality and it is very unlikely that these scores will be distributed this way.	B1  B1 (2)  <b>(16 marks)</b>																						

