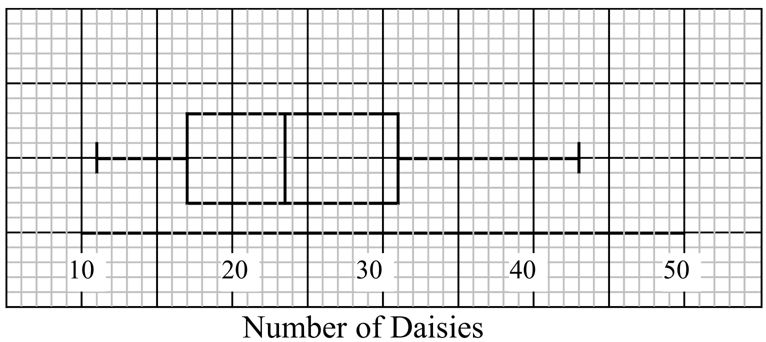
**Mock Paper Mark Scheme**

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

Subject **STATISTICS** Paper No. **Mock S1**

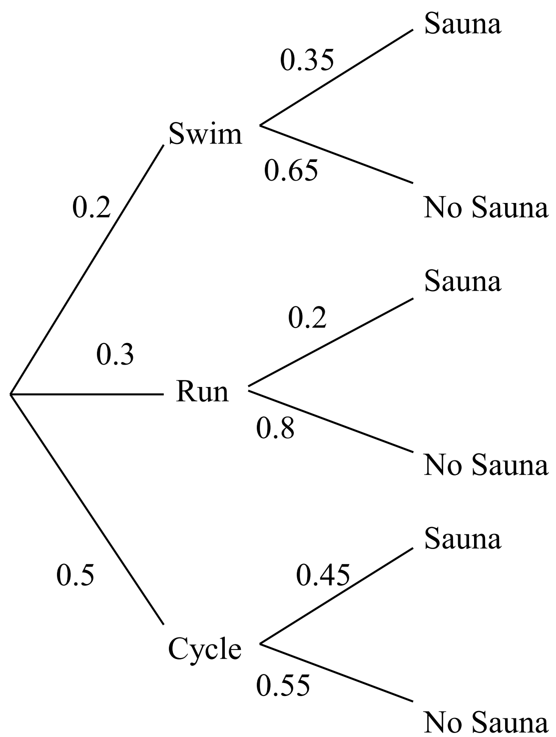
| Question number | Scheme | Marks |
|---|---|---|
| **1.** | Let $J$ represent the weight of a Jar $\therefore J \sim \text{N}(260.00, 5.45^2)$ | |
| | $\therefore \text{P}(J < 266) = \text{P}\left(Z < \dfrac{266 - 260}{5.45}\right)$ | M1 A1 |
| | $= \text{P}(Z < 1.10)$ | |
| | $= 0.8643$ | A1 |
| | (NB: calculator gives 0.86453: accept 0.864 – 0.865) | |
| | Let $C$ represent weight of coffee in a Jar $\therefore C \sim \text{N}(101.8, 0.72^2)$ | |
| | $\therefore \text{P}(C < 100) = \text{P}\left(Z < \dfrac{100 - 101.8}{0.72}\right)$ | M1 A1 |
| | $= \text{P}(Z < -2.50)$ | |
| | $= 0.0062$ | A1 |
| | $\therefore \text{P}(J < 266 \;\&\; C < 100) = 0.8643 \times 0.0062$ | M1 |
| | $= 0.0054$ | A1 (8) |

| Question number | Scheme | Marks |
| --- | --- | --- |
| **2.** (*a*) | Mode = 23 | B1 (1) |
| (*b*) | For $Q_1$ : $\frac{n}{4}$ = 10.5 $\Rightarrow$ 11th observation $\therefore Q_1 = 17$ | B1 |
| | For $Q_2$ : $\frac{n}{2}$ = 21 $\Rightarrow$ = $\frac{1}{2}$ (21st & 22nd) observations $\therefore Q_2 = \frac{23+24}{2}$ = 23.5 | M1 A1 |
| | For $Q_3$ : $\frac{3n}{4}$ = 31.5 $\Rightarrow$ 32nd observation $\therefore Q_3 = 31$ | B1 (4) |
| (*c*) |  Box plot<br>Scale & label<br>$Q_1$, $Q_2$, $Q_3$<br>11, 43 | M1<br>M1<br>A1<br>A1 (4) |
| (*d*) | From box plot or<br>$Q_2 - Q_1 = 23.5 - 17 = 6.5$<br>$Q_3 - Q_2 = 31 - 23.5 = 7.5$ (slight) positive skew | B1 (1) |
| (*e*) | Back-to-back stem and leaf diagram | B1 (1) **(11)** |

| Question number | Scheme | Marks |
| --- | --- | --- |
| **3.** (*a*) | $\bar{y} = \frac{-467}{200}$ (can be implied) | B1 |
| | $\therefore\ \bar{x} = 2.5\bar{y} + 755.0$ | M1 |
| | $= 2.5\left(\frac{-467}{200}\right) + 755.0$ | A1 |
| | $= 749.1625$ (accept awrt 749) | A1 |
| | $S_y = \sqrt{\frac{9179}{200} - \left(\frac{-467}{200}\right)^2}$ | M1 A1 |
| | $= 6.35946$ | A1 |
| | $\therefore\ S_x = 2.5 \times 6.35946$ | M1 |
| | $= 15.89865$ (accept awrt 15.9) | A1 (9) |
| (*b*) | Standard deviation < $\frac{2}{3}$ (interquartile range) | B1 |
| | Suggest using standard deviation since it shows less variation in the lifetimes | B1 (2) |
| | | **(11)** |

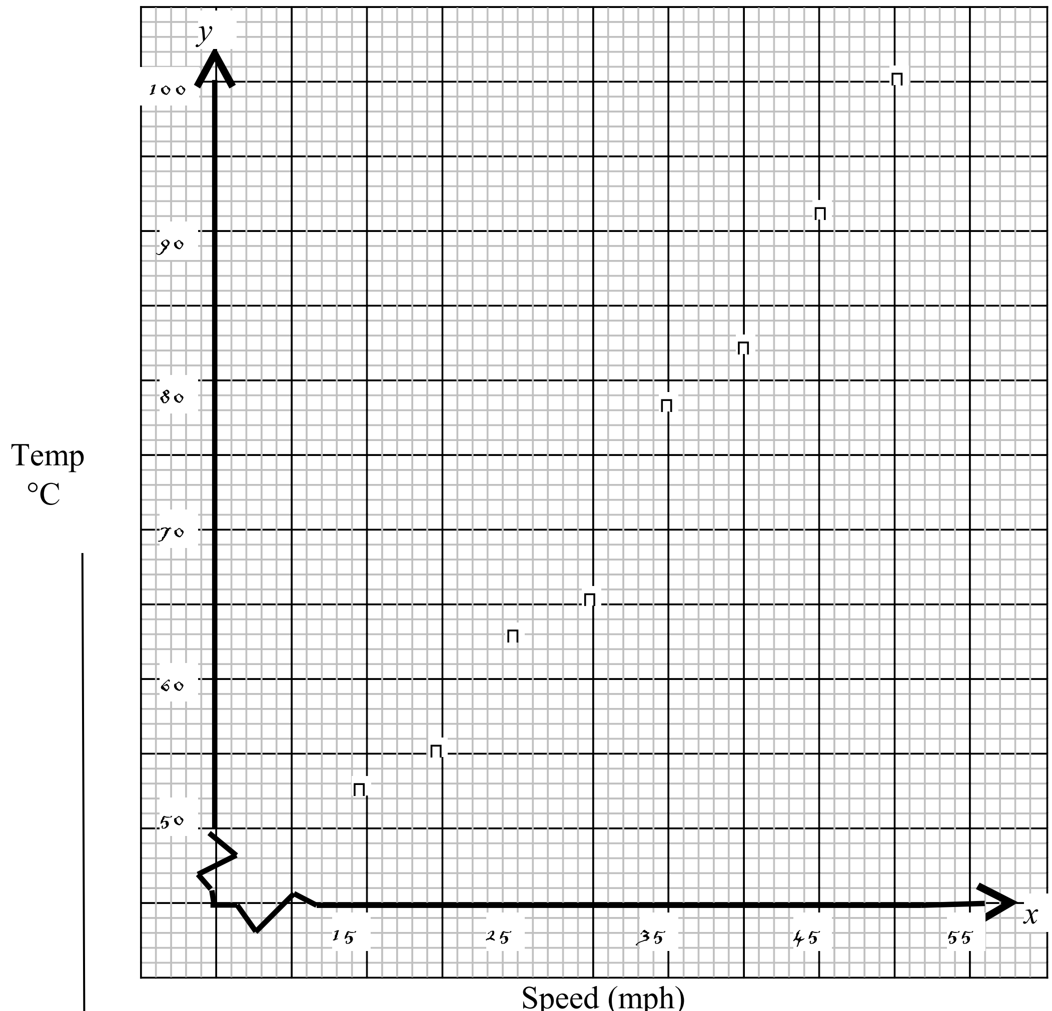
| Question number | Scheme | Marks |
|---|---|---|
| **4.** (*a*) | P(correct at third attempt) = $0.4 \times 0.4 \times 0.6$ | M1 |
| | $= 0.096$ | A1 (2) |
| (*b*) | $a$: 1, 2, 3, 4 ; $P(A = a)$: 0.6, 0.24, 0.096, 0.064 — $a = 1, 2, 3, 4$ | B1 |
| | All $P(A = a)$ correct | B1 (2) |
| (*c*) | P(correct number) = $1 - (0.4)^4$ | M1 |
| | $= 0.9744$ (accept awrt 0.974) | A1 (2) |
| (*d*) | $E(A) = \Sigma a\,P(A = a) = (1 \times 0.6) + \ldots + (4 \times 0.064)$ | M1 |
| | $= 1.624$ (accept awrt 1.62) | A1 |
| | $E(A^2) = \Sigma a^2\,P(A = a) = (1^2 \times 0.6) + \ldots + (4^2 \times 0.064)$ | M1 |
| | $= 3.448$ | A1 |
| | $\therefore \text{Var}(A) = 3.448 - (1.624)^2$ | M1 |
| | $= 0.810624$ (accept awrt 0.811) | A1 (6) |
| | $F(1 + E(A)) = P(A \le 1 + E(A))$ | |
| | $= P(A \le 2.624)$ | M1 |
| | $= 0.84$ | A1 (2) **(14)** |

<table>
<tr><th>Question number</th><th>Scheme</th><th>Marks</th></tr>
<tr><td>5. (a)</td><td>




Tree with correct number of branches<br>
0.2, 0.3, 0.5<br>
All correct</td><td>M1<br>A1<br>A1 (3)</td></tr>
<tr><td>(b)</td><td>P(used sauna) = $(0.2 \times 0.35) + (0.3 \times 0.2) + (0.5 \times 0.45)$<br>
$= 0.355$</td><td>M1 A1<br>A1 (3)</td></tr>
<tr><td>(c)</td><td>P(swim | sauna used) = $\frac{\text{P(swim \& sauna)}}{\text{P(sauna)}}$<br>
$= \frac{0.2 \times 0.35}{0.355}$<br>
$= 0.19718$ (accept awrt 0.197)</td><td><br>M1 A1<br>A1 (3)</td></tr>
<tr><td>(d)</td><td>P(swim | sauna not used) = $\frac{\text{P(sauna not used | swim) P(swim)}}{\text{P(sauna not used)}}$<br>
P(sauna not used | swim) = $1 - 0.35 = 0.65$<br>
P(sauna not used) $= 1 - 0.355 = 0.645$<br>
$\therefore$ P(swim | sauna not used) = $\frac{0.65 \times 0.2}{0.645}$<br>
$= 0.20155$ (accept awrt 0.202)</td><td>M1<br>B1<br>M1 A1 f.t.<br>M1<br>A1 (6) (15)</td></tr>
</table>


| Question | Scheme | Marks |
|---|---|---|

| number | | |
|---|---|---|
| **6.** (*a*) |  | Scales & labels B1<br>Points B2, 1, 0 (3) |
| (*b*) | Points lie reasonably close to a straight line | B1 (1) |
| (*c*) | $b = \frac{8 \times 20615 - 260 \times 589}{8 \times 9500 - (260)^2} = \frac{11780}{8400} = 1.40238\ldots$ (accept awrt 1.40) | M1 A1 |
| | $a = \frac{589}{8} - (1.40238\ldots)\left(\frac{260}{8}\right) = 28.0476175\ldots$ (accept awrt 28.0) | M1 A1 (4) |
| | $\therefore\ y = 28.0 + 1.40\,x$ | |
| (*d*) | $a \Rightarrow$ surrounding air temperature when tyre is stationary | B1 |
| | $b \Rightarrow$ for every extra mph, temperature rises by 1.40 °C | B1 (2) |

| | | |
|---|---|---|
| (*e*) | $y = 28.0 + 1.40 \times 50 = 98$ | B1 |
| | Regression line is only a line of best fit and does not necessarily pass through all points | B1 (2) |
| (*f*) | 12 mph – reasonable to use line; 12 is just below lowest *x*-value | B1; B1 |
| | 85 mph – not reasonable to use line; 85 is well outside range of values | B1; B1 (4) |
| | | **(16)** |