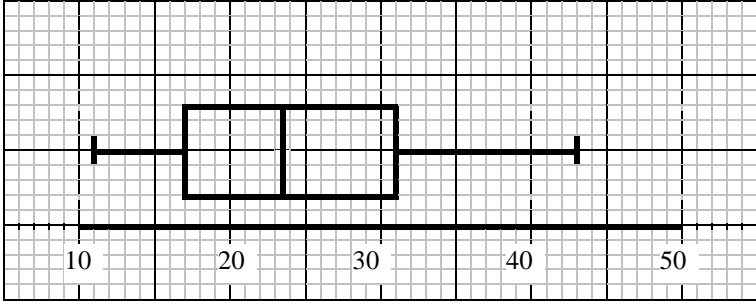


Mock Paper Mark Scheme

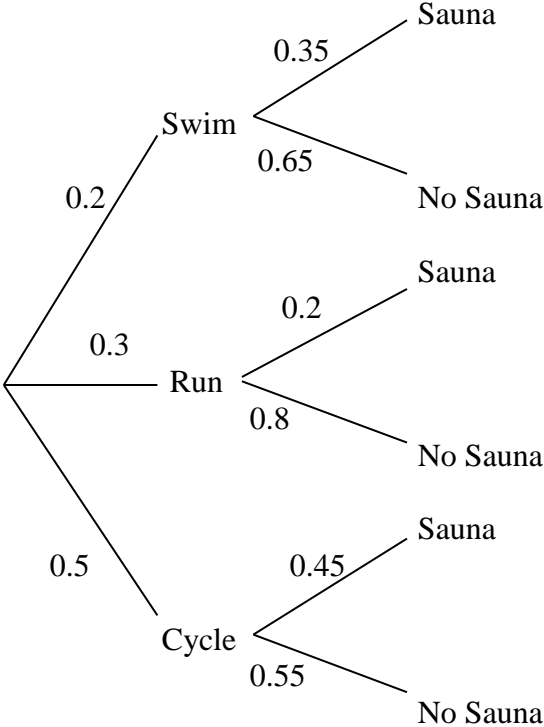
Advanced Subsidiary/Advanced GCE General Certificate of Education

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

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

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

Question number	Scheme	Marks										
4. (a)	$P(\text{correct at third attempt}) = 0.4 \times 0.4 \times 0.6$ $= 0.096$	M1 A1 (2)										
(b)	<table style="display: inline-table; border-collapse: collapse; margin-right: 20px;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">a</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">4</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">$P(A = a)$</td> <td style="padding: 5px;">0.6</td> <td style="padding: 5px;">0.24</td> <td style="padding: 5px;">0.096</td> <td style="padding: 5px;">0.064</td> </tr> </table> $a = 1, 2, 3, 4$ All $P(A = a)$ correct	a	1	2	3	4	$P(A = a)$	0.6	0.24	0.096	0.064	B1 B1 (2)
a	1	2	3	4								
$P(A = a)$	0.6	0.24	0.096	0.064								
(c)	$P(\text{correct number}) = 1 - (0.4)^4$ $= 0.9744 \quad (\text{accept awrt } 0.974)$	M1 A1 (2)										
(d)	$E(A) = \sum a P(A = a) = (1 \times 0.6) + \dots + (4 \times 0.064)$ $= 1.624 \quad (\text{accept awrt } 1.62)$ $E(A^2) = \sum a^2 P(A = a) = (1^2 \times 0.6) + \dots + (4^2 \times 0.064)$ $= 3.448$ $\therefore \text{Var}(A) = 3.448 - (1.624)^2$ $= 0.810624 \quad (\text{accept awrt } 0.811)$ $F(1 + E(A)) = P(A \leq 1 + E(A))$ $= P(A \leq 2.624)$ $= 0.84$	M1 A1 M1 A1 M1 A1 (6) M1 A1 (2) (14)										

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

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

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