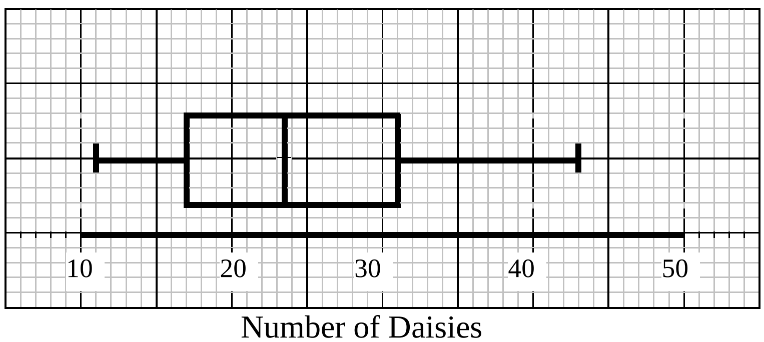
Mock Paper Mark Scheme

Advanced Subsidiary/Advanced GCE
General Certificate of Education

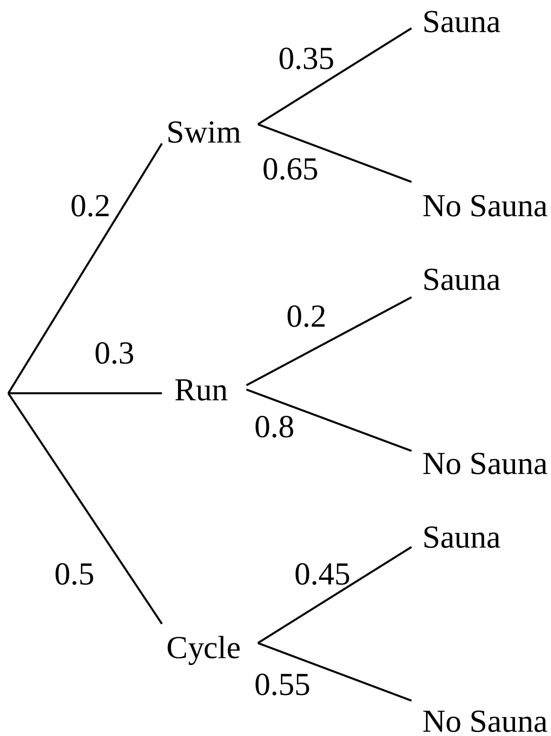
Subject **STATISTICS** Paper No. **Mock S1**

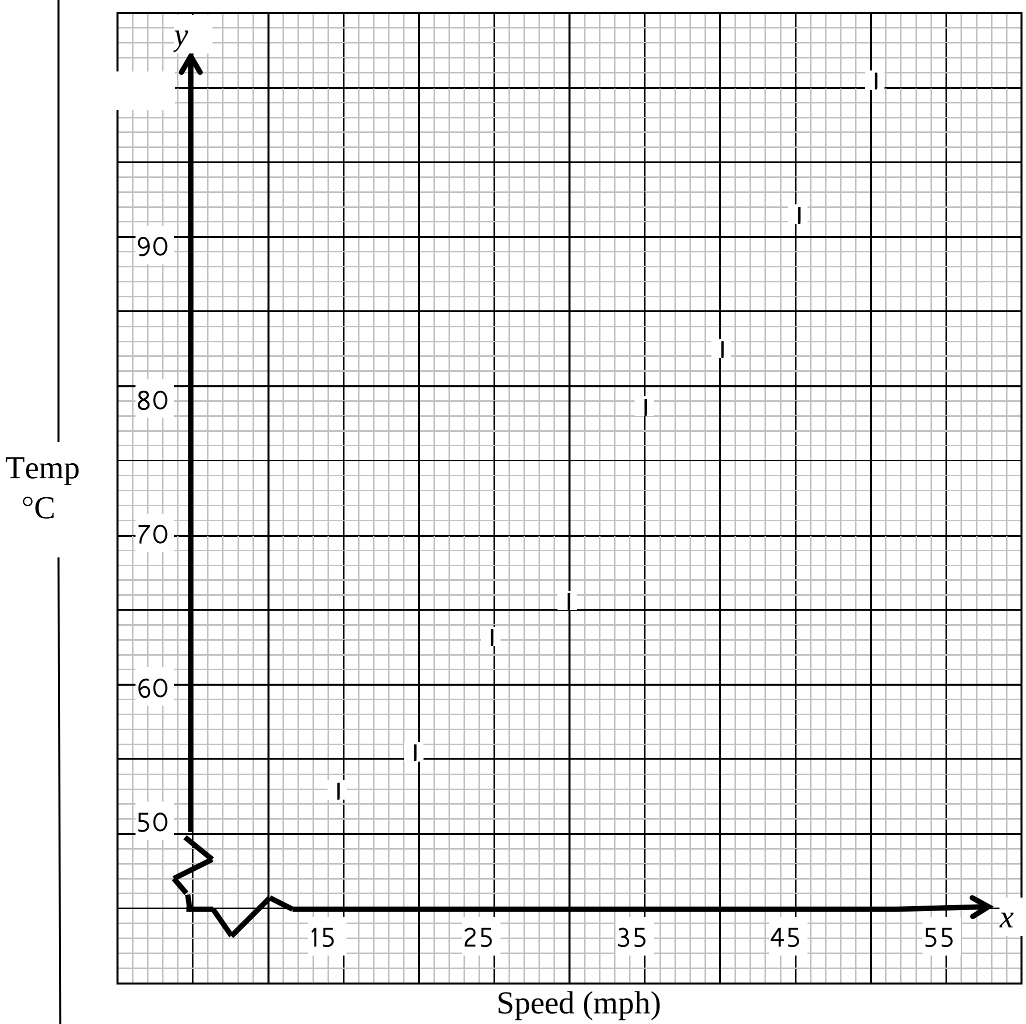
Question number	Scheme	Marks
1.	Let J represent the weight of a Jar $\therefore$ $J \sim \text{N}(260.00, 5.45^2)$	
	$\therefore$ P($J < 266$) = $\text{P}\left(Z < \frac{266 - 260}{5.45}\right)$	M1 A1
	= P(Z < 1.10)	
	= 0.8643	A1
	(NB: calculator gives 0.86453: accept 0.864 – 0.865)	
	Let C represent weight of coffee in a Jar $\therefore$ $C \sim \text{N}(101.8, 0.72^2)$	
	$\therefore$ P(C < 100) = $\text{P}\left(Z < \frac{100 - 101.8}{0.72}\right)$	M1 A1
	= P(Z < –2.50)	
	= 0.0062	A1
	$\therefore$ P(J < 266 & C < 100) = 0.8643 × 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 Scale & label Q_1, Q_2, Q_3 11, 43	M1 M1 A1 A1 (4)
(*d*)	From box plot or $Q_2 - Q_1 = 23.5 - 17 = 6.5$ $Q_3 - Q_2 = 31 - 23.5 = 7.5$ (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*)	<table><tr><td>a</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>$P(A = a)$</td><td>0.6</td><td>0.24</td><td>0.096</td><td>0.064</td></tr></table> $a = 1, 2, 3, 4$ All $P(A = a)$ correct	B1 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
	$\therefore$ Var$(A) = 3.448 - (1.624)^2$	M1
	$= 0.810624$ (accept awrt 0.811)	A1 (6)
	$F(1 + E(A)) = P(A \leq 1 + E(A))$	
	$= P(A \leq 2.624)$	M1
	$= 0.84$	A1 (2) **(14)**

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

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*)	$b = \dfrac{8 \times 20615 - 260 \times 589}{8 \times 9500 - (260)^2} = \dfrac{11780}{8400} = 1.40238\ldots$ (accept awrt 1.40)	M1 A1
	$a = \dfrac{589}{8} - (1.40238\ldots)\left(\dfrac{260}{8}\right) = 28.0476175\ldots$ (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)