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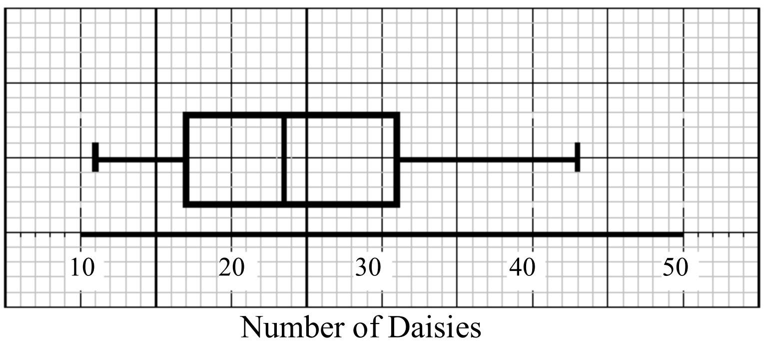
Mock Paper Mark Scheme

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 $\therefore$ $J \sim \text{N}(260.00, 5.45^2)$	
	$\therefore \text{P}(J < 266) = \text{P}\left(Z < \frac{266-260}{5.45}\right)$	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 $\therefore$ $C \sim \text{N}(101.8, 0.72^2)$	
	$\therefore \text{P}(C < 100) = \text{P}\left(Z < \frac{100-101.8}{0.72}\right)$	M1 A1
	$= \text{P}(Z < -2.50)$	
	$= 0.0062$	A1
	$\therefore \text{P}(J < 266 \text{ \& } C < 100) = 0.8643 \times 0.0062$	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 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*)

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

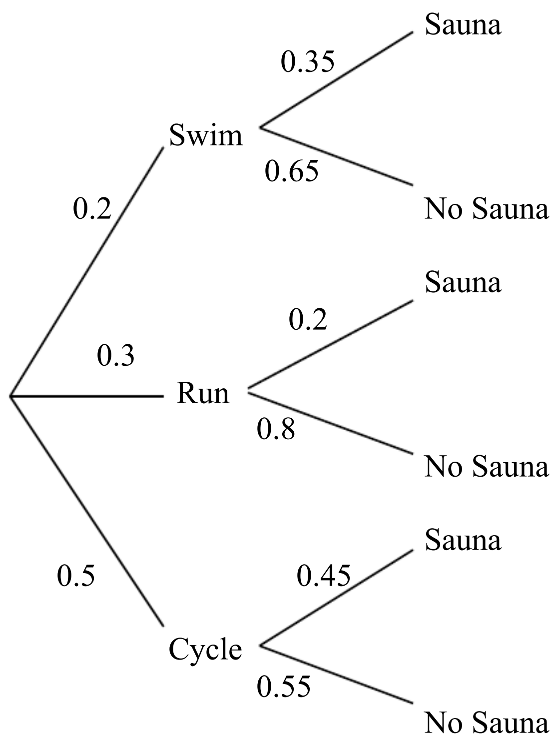
$\therefore \text{Var}(A) = 3.448 - (1.624)^2$ — M1

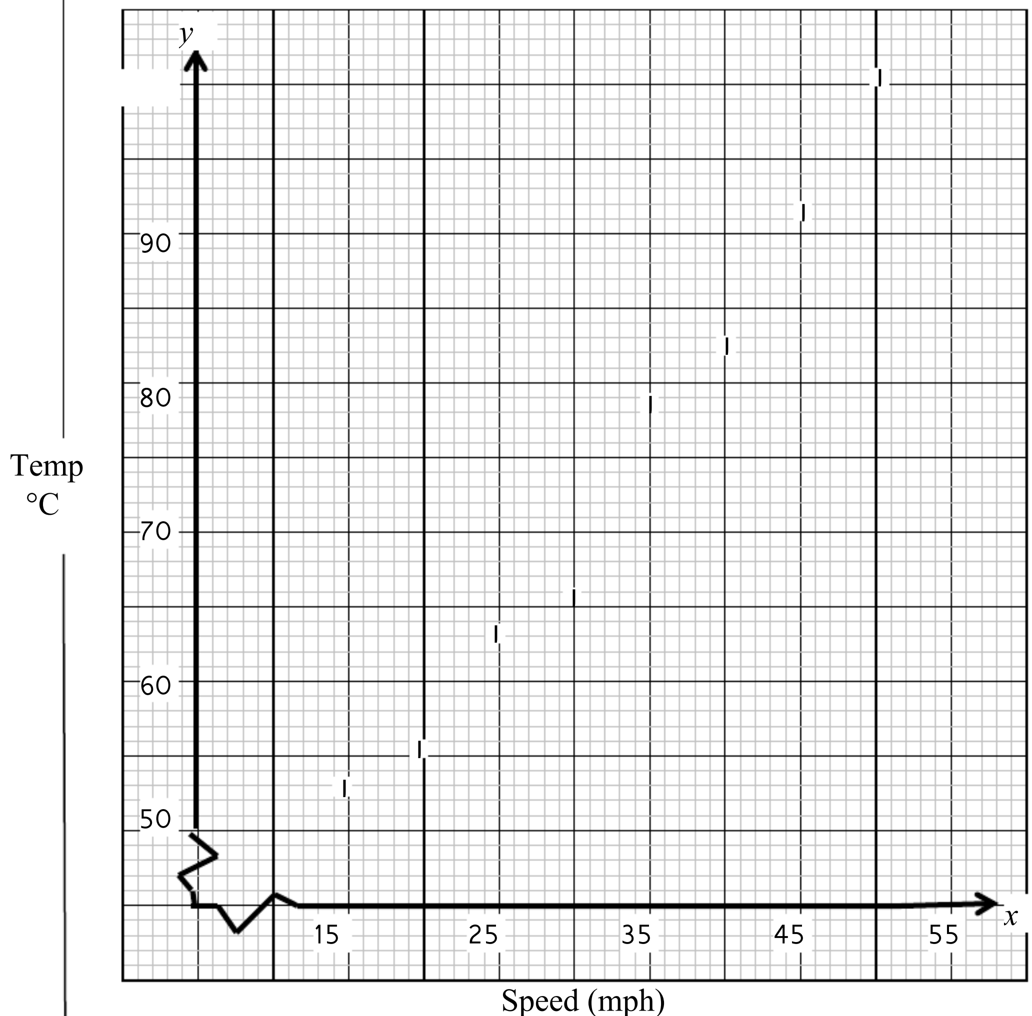
$= 0.810624$ (accept awrt 0.811) — A1 (6)

$F(1 + E(A)) = P(A \le 1 + E(A))$

$= P(A \le 2.624)$ — M1

$= 0.84$ — A1 (2) **(14)**

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) $= \dfrac{\text{P(sauna not used} \mid \text{swim) P(swim)}}{\text{P(sauna not used)}}$	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 $b \Rightarrow$ for every extra mph, temperature rises by 1.40 °C	B1 B1 (2)

(*e*)	$y = 28.0 + 1.40 \times 50 = 98$	B1
	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)