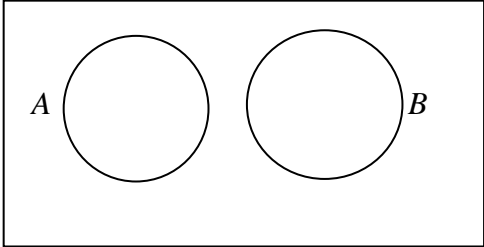
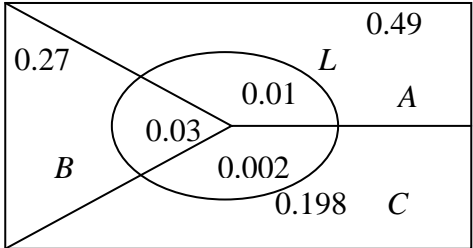
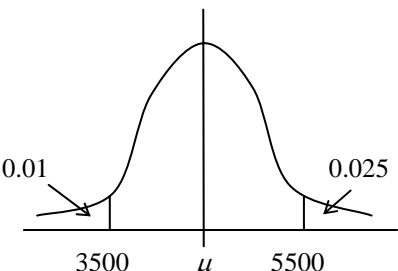


Question Number	Scheme	Marks
1.	$P(\text{Not } 6) = 1 - \frac{1}{6} = \frac{5}{6}$ $P(6 \text{ on third throw}) = \frac{5}{6} \times \frac{5}{6} \times \frac{1}{6} = 0.116$ $= \frac{25}{216} = 0.1157\dots \text{ (accept 0.116)}$	B1 (1) M1 A1ft A1 (3) (4 marks)
2.	Observe real world problem Devise a statistical model and collect data Compare observed against expected outcomes and test the model Refine model if necessary	B1 B1 B1 B1 (4) (4 marks)
3.	<p>(a) $P(B A)$ = Probability of B, given A has occurred</p> <p>(b) </p> <p>$P(\text{Amber is late}) = 0.5 \times 0.02 = 0.01$</p> <p></p> <p>(e) $P(\text{Late}) = 0.03 + 0.01 + 0.002 = 0.042$</p>	B1, B1 (2) A & B B1 no overlap B1 (2) M1 A1 cao (2) complete diagram M1 0.49; 0.01 B1 0.198; 0.002 B1 0.27; 0.03 B1 (4) intersections, three of them added M1 A1 cao (2) (12 marks)

ft = follow-through mark; cao = correct answer only

Question Number	Scheme	Marks																		
<p>4. (a)</p> <p>(b)</p> <p>(c)</p>	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">x</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> <td style="padding: 5px;">5</td> <td style="padding: 5px;">6</td> <td style="padding: 5px;">7</td> <td style="padding: 5px;">8</td> </tr> <tr> <td style="padding: 5px;">$P(X=x)$</td> <td style="padding: 5px;">0.1</td> <td style="padding: 5px;">0.1</td> <td style="padding: 5px;">0.05</td> <td style="padding: 5px;">0.15</td> <td style="padding: 5px;">0.1</td> <td style="padding: 5px;">0.1</td> <td style="padding: 5px;">0.15</td> <td style="padding: 5px;">0.25</td> </tr> </table> <p>$E(X) = (1 \times 0.1) + (2 \times 0.1) + \dots + (8 \times 0.25)$ $= 5.2$</p> <p>$E(X^2) = (1^2 \times 0.1) + (2^2 \times 0.1) + \dots + (8^2 \times 0.25)$ $= 32.8$</p> <p>$\text{Var}(X) = E(X^2) - \{E(X)\}^2$ $= 32.8 - (5.2)^2 = 5.76$ (*)</p> <p>$E(Y) = 2E(X) + 3 = 13.4$</p> <p>$\text{Var}(Y) = 2^2 \text{Var}(X)$ $= 4 \times 5.76 = 23.04$</p>	x	1	2	3	4	5	6	7	8	$P(X=x)$	0.1	0.1	0.05	0.15	0.1	0.1	0.15	0.25	<p>M1 A2 (-1 eeo) (3)</p> <p>M1 A1 M1 A1 M1 A1 cso (6)</p> <p>B1 M1 A1 (3)</p> <p>(12 marks)</p>
x	1	2	3	4	5	6	7	8												
$P(X=x)$	0.1	0.1	0.05	0.15	0.1	0.1	0.15	0.25												
<p>5. (a)</p> <p>(b)</p> <p>(c)</p>	<p>Bell shaped curve; symmetrical about the mean; 95% of data lies within 2sd of mean; asymptotic etc (any 2).</p>  <p>$P(X < 3500) = 0.01 \Rightarrow \mu - 3500 = 2.3263\sigma$</p> <p>$P(X < 5500) = 0.025 \Rightarrow 5500 - \mu = 1.96\sigma$</p> <p>solving for μ and σ</p> <p>$\sigma = 466.6028\dots$ accept 466.6/467</p> <p>$\mu = 4585.4583\dots$ accept 4585.5/4590</p> <p>$P(X < 4000) = P\left(Z < \frac{4000 - 4585.4583\dots}{466.6028\dots}\right)$ $= P(Z < -1.25)$ $= 0.1056$</p>	<p>B1; B1 (2)</p> <p>M1 A1 A1 M1 A1 A1 (6)</p> <p>M1 A1ft A1 A1 (4)</p> <p>(12 marks)</p>																		

(*) indicates final answer is given on question paper; ft = follow-through mark

Question Number	Scheme	Marks
6.	(a) Frequency densities – 5, 0, 10, 4, 110, 75, 1.7 Graph: scales and labels, shape, correct frequency densities	B1 B1, M1, A1 (4)
	(b) $\Sigma fy = 2888.5$ Mean weight = $14 + \frac{2888.5}{50 \times 10}$ $= 19.777$ accept 19.78/19.8	B1 M1 A1
	$S_y = \sqrt{\frac{171503.75}{50} - \left(\frac{2888.5}{50}\right)^2}$ $= 9.62819\dots$ awrt 9.63	M1 A1
	Standard deviation of weight = $\frac{9.62819}{10} = 0.96219\dots$ accept 0.963/0.96 (NB: Using $n - 1$ gives 0.9725...)	A1ft (6)
	(c) $Q_2 = 20.0 + \frac{(25 - 12)}{22} \times 0.2$ $= 20.118\dots$ accept 20.1/20.12	M1 A1 (2)
	(d) Median – data skewed Mean – lower value; fewer complaints	B1 B1 (2)
		(14 marks)

awrt = anything which rounds to

Question Number	Scheme	Marks
7.	(a) $\Sigma t = 169; \Sigma c = 357$	
	$S_{cc} = 14245 - \frac{357^2}{10} = 1500.1$	M1 A1
	$S_{tt} = 168.9, S_{ct} = 492.7$	A1, A1
	$r = \frac{492.7}{\sqrt{1500.1 \times 168.9}}$	M1 A1
	$= 0.97883\dots$	accept 0.979 A1 (7)
	(b) Since r close to 1, value supports use of regression line	B1 B1 (2)
	(c) $b = \frac{S_{ct}}{S_{tt}} = \frac{492.7}{168.9} = 2.91711\dots$	B1
	$a = \bar{c} - b\bar{t} = \frac{357}{10} - \frac{492.7}{168.9} \times \frac{169}{10} = -13.59917\dots$	B1
	$c = -13.6 + 2.92t$	B1 (3)
	(d) 3 extra ice-creams are sold for every 1 °C increase in temperature	B1 (1)
(e) $c = -13.6 + 2.92 \times 16 = 33.12$	M1 A1	
i.e. 33 ice-creams	A1 (3)	
(f) Temperature likely to be outside range of validity	B1 (1)	
	(17 marks)	