Question	Answer	Marks
1	$\sum x - 50n = 144$	**B1**
	$50n + 144 = 944$	**M1**
	$n = 16$	**A1**
		3

Question	Answer	Marks
2(a)	$\frac{56}{500}$ or $\frac{14}{125}$ or 0.112	**B1**
		1
2(b)	$\mathrm{P}(\mathrm{D}\mid\mathrm{S}) = \frac{\mathrm{P}(\mathrm{D}\cap\mathrm{S})}{\mathrm{P}(\mathrm{S})} = \frac{120}{280}$	**M1**
	$\frac{120}{280}$ or $\frac{3}{7}$	**A1**
		2

Question	Answer	Marks
2(c)	$P(\text{hockey}) = \frac{220}{500} = 0.44$ $P(\text{Amos or Benn}) = \frac{242}{500} = 0.484$ $P(\text{hockey} \cap \text{A or B}) = \frac{104}{500} = 0.208$ $P(H) \times P(A \cup B) = P(H \cap (A \cup B))$ if independent	**M1**
	$\frac{220}{500} \times \frac{242}{500} = \frac{1331}{6250}$ so not independent	**A1**
		2

Question	*Answer*	Marks
3(a)	Median = 0.238	**B1**
	UQ = 0.245, LQ = 0.231, So IQR = 0.245 – 0.231	**M1**
	0.014	**A1**
		3

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td rowspan="5">3(b)</td><td>
<table>
<tr><td></td><td></td><td>LQ</td><td>M</td><td>UQ</td><td></td></tr>
<tr><td>A</td><td>0.220</td><td>0.231
FT</td><td>0.238
FT</td><td>0.245
FT</td><td>0.254</td></tr>
<tr><td>B</td><td>0.211</td><td>0.224</td><td>0.232</td><td>0.243</td><td>0.256</td></tr>
</table>
</td><td></td></tr>
<tr><td>Medians and quartiles correctly plotted for A or B</td><td>B1</td></tr>
<tr><td>End points correct for A or B</td><td>B1</td></tr>
<tr><td>Completely correct, including scale</td><td>B1</td></tr>
<tr><td></td><td>3</td></tr>
<tr><td rowspan="3">3(c)</td><td>Lengths of rods produced by machine A are longer.
(B1 for comparison of central tendency)</td><td>B1</td></tr>
<tr><td>Lengths of rods produced by machine A are less spread out
(B1 for comparison of spread)</td><td>B1</td></tr>
<tr><td></td><td>2</td></tr>
</table>

Question	Answer	Marks
4(a)	$\mathrm{P}(X < 25) = \mathrm{P}\left(z < \frac{25-40}{12}\right) = \mathrm{P}(z < -1.25)\mathrm{P}(X < 25) = \mathrm{P}(z <)$	**M1**
	$1 - 0.8944$	**M1**
	0.106	**A1**
		3
4(b)	0.8944 divided by 3 (**M1** for 1 - *their* **(a)** divided by 3)	**M1**
	0.298 **AG**	**A1**
		2
4(c)	0.2981 gives $z = 0.53$	**B1**
	$\frac{h-40}{12} = 0.53$	**M1**
	$h = 46.4$	**A1**
		3

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td rowspan="3">5(a)</td><td>

	1	1	2	2	3
1	1	1	2	2	3
2	2	2	2	2	3
3	3	3	3	3	3

</td><td>M1</td></tr>
<tr><td>$\frac{7}{15}$ AG</td><td>A1</td></tr>
<tr><td></td><td>2</td></tr>
<tr><td rowspan="4">5(b)</td><td>

x	1	2	3
Probability	$\frac{2}{15}$	$\frac{6}{15}$	$\frac{7}{15}$

</td><td>B1</td></tr>
<tr><td>P(1) or P(2) correct</td><td>B1</td></tr>
<tr><td>3^{rd} probability correct, FT sum to 1</td><td>B1</td></tr>
<tr><td></td><td>3</td></tr>
</table>

Question	Answer	Marks
5(c)	$\mathrm{E}(X) = \dfrac{2+12+21}{15} = \dfrac{35}{15} = \dfrac{7}{3}$	**B1**
	$\mathrm{Var}(X) = \dfrac{1^2 \times 2 + 2^2 \times 6 + 3^2 \times 7}{15} - \left(\dfrac{7}{3}\right)^2$	**M1**
	$\dfrac{22}{45}(0.489)$	**A1**
		3

Question	*Answer*	Marks
6(a)	$\dfrac{8!}{3!}$	**M1**
	6720	**A1**
		2

Question	Answer	Marks
6(b)	Total number $= \frac{10!}{2!3!}$ (302400) (A)	**B1**
	With Es together $= \frac{9!}{3!}$ (60480) (B)	**B1**
	Es not together = *their* (A) – *their* (B)	**M1**
	241920	**A1**
	Alternative method for question 6(b)	
	_^_^_^_^_^_^_^_^_ $\frac{8!}{3!} \times \frac{9 \times 8}{2}$	
	$8! \times k$ in numerator, k integer ≥ 1, denominator ≥ 1	**B1**
	$3! \times m$ in denominator, m integer ≥ 1	**B1**
	Their $\frac{8!}{3!}$ Multiplied by ${}^9C_2$ (OE) only (no additional terms)	**M1**
	241920	**A1**
		4

Question	Answer	Marks
6(c)	Scenarios: E M M M $^5C_0 = 1$ E M M _ $^5C_1 = 5$ E M _ _ $^5C_2 = 10$	**M1**
	Summing the number of ways for 2 or 3 correct scenarios	**M1**
	Total = 16	**A1**
		3

Question	Answer	Marks
7(a)	1 – P(10, 11, 12) $= 1 - [{}^{12}C_{10}\, 0.72^{10} 0.28^2 + {}^{12}C_{11}\, 0.72^{11} 0.28^1 + 0.72^{12}]$	**M1**
	$1 - (0.19372 + 0.09057 + 0.01941)$	**A1**
	0.696	**A1**
		3
7(b)	$0.28^3 \times 0.72 = 0.0158$	**B1**
		1

Question	Answer	Marks
7(c)	Mean = $100 \times 0.72 = 72$ Var $= 100 \times 0.72 \times 0.28 = 20.16$	**M1**
	P(less than 64) $= \text{P}\left(z < \frac{63.5 - 72}{\sqrt{20.16}}\right)$ (**M1** for substituting *their μ and σ* into ±standardisation formula with a numerical value for '*63.5*')	**M1**
	Using either 63.5 or 64.5 within a ±standardisation formula	**M1**
	Appropriate area Φ, from standardisation formula P(z<…) in final solution $= \text{P}(z < -1.893)$	**M1**
	0.0292	**A1**
		5