Question	Answer	Marks	Guidance
1(i)	$4 \times 5.5 + 3x + 90 = 8 \times 29$	**M1**	An expression to work out total cost of individual items = 8 × mean, x may be implied.
	$112 + 3x = 232$ $x = 40$	**A1**	Correct complete unsimplified expression / calculation
	(Cost = $)40	**A1**	Units not required
	Total:	**3**	
1(ii)	sd = 0 so all cost the same	**M1**	Must see comment interpreting sd = 0, OE
	shirts cost 4 × $26 = $104 **AG**	**A1**	See 4 × $26, $130 – $26 OE. Must have a final value of $104 stated
	Total:	**2**	
2(i)	med = 3.2	**B1**	Accept 3.2 ± 0.05
	UQ = 3.65 ⩽ uq ⩽ 3.7 LQ = 2.55⩽ lq ⩽ 2.6	**M1**	UQ – LQ, UQ greater than *their* 'median', LQ less than *their* 'median'
	IQR = 1.05 ⩽ iqr ⩽ 1.15	**A1**	Correct answer from both LQ and UQ in given ranges
	Total:	**3**	
2(ii)	134 – 24 = 110	**B1**	Accept $108 \leqslant n \leqslant 112$, n an integer
	Total:	**1**	

Question	Answer	Marks	Guidance
2(iii)	200 – 12 = 188 less than length l	**M1**	188 seen, can be implied by answer in range, mark on graph.
	$l = 4.5$ cm	**A1**	Correct answer accept $4.4 \leqslant l \leqslant 4.5$
	Total:	**2**	
3(i)	$k(-2)^2$ is the same as $k(2)^2 = 4k$	**B1**	need to see $-2^2\,k$, 2^2k and $4k$, algebraically correct expressions OE
	Total:	**1**	
3(ii)	x | –2 | –1 | 2 | 4 Prob | $4k$ | k | $4k$ | $16k$	**B1**	–2, -1, 2, 4 only seen in a table, together with at least one attempted probability involving k
	$4k + k + 4k + 16k = 1$	**M1**	Summing 4 probs equating to 1. Must all be positive (table not required)
	$k = 1/25$ (0.04)	**A1**	CWO
	Total:	**3**	
3(iii)	$E(X) = -8k + -k + 8k + 64k = 63k$	**M1**	using Σpx unsimplified. FT their k substituted before this stage, no inappropriate dividing
	$= 63/25$ (2.52)	**A1**	
	Total:	**2**	

Question	Answer	Marks	Guidance
4	P(score is 6) = P(3, 3)	**M1**	Realising that score 6 is only P(3, 3)
	$= r^2 = 1/36$ $r = 1/6$	**A1**	Correct ans [SR **B2** $r = 1/6$ without workings]
	P(2, 3) + P(3, 2) = 1/9 $qr + rq = 1/9$	**M1**	Eqn involving qr (OE) equated to 1/9 (r may be replaced by *their* 'r value')
	$q/6 + q/6 = 1/9$	**M1**	Correct equation with *their* 'r value' substituted
	$q = 1/3$	**A1**	Correct answer seen, does **not** imply previous M's
	$p = 1 - 1/6 - 1/3 = 1/2$	**B1 FT**	FT their p + their r + their q =1 , $0 < p < 1$
	Total:	**6**	
5(i)	$(z =)\dfrac{4.2 - 3.9}{\sigma}$	**M1**	Standardising, not square root of σ, not σ^2
	$z = 0.916$ or 0.915	**B1**	Accept $0.915 \leqslant \pm z \leqslant 0.916$ seen
	$\sigma = 0.328$	**A1**	Correct final answer (allow 20/61 or 75/229)
	Total:	**3**	

Question	Answer	Marks	Guidance
5(ii)	$z = 4.4 – 3.9$/their 0.328 or $z = 3.4 – 3.9$/their 0.328 $= 1.5267$ $= –1.5267$	**M1**	Standardising attempt with 3.4 or 4.4 only, allow square root of σ, or σ^2
	$\Phi = 0.9364$	**A1**	$0.936 \leqslant \Phi \leqslant 0.937$ or $0.063 \leqslant \Phi \leqslant 0.064$ seen
	Prob $= 2\Phi – 1 = 2(0.9364) – 1$	**M1**	Correct area 2Φ – 1OE i.e. $\Phi = – (1 – \Phi)$, linked to final solution
	$= 0.873$	**A1**	Correct final answer from $0.9363 \leqslant \Phi \leqslant 0.9365$
	Total:	**4**	
5(iii)	dividing (0.5) by a larger number gives a smaller z-value or more spread out as sd larger or use of diagrams	***B1**	No calculations or calculated values present e.g. ($\sigma =$)0.656 seen Reference to spread or z value required
	Prob is less than that in (ii)	**DB1**	Dependent upon first B1
	Total:	**2**	
6(i)	*EITHER*: Route 1 *A*********A* in 9! / 2!2!5! = 756 ways	**(*M1**	*Considering AA and BB options* with values
	*B*********B* in 9! / 4!5! = 126 ways	**A1**	Any one option correct
	756 + 126	**DM1**	*Summing their AA and BB outcomes* only
	Total = 882 ways	**A1)**	

Question	Answer	Marks	Guidance
	OR1: Route 2 *A**********A* in ${}^{9}C_{5} \times {}^{4}C_{2} = 756$ ways	**(M1**	*Considering AA and BB options* with values
	*B**********B* in ${}^{9}C_{4} \times {}^{5}C_{5} = 126$ ways	**A1**	Any one option correct
	756 + 126	**DM1**	*Summing their AA and BB outcomes* only
	Total = 882	**A1)**	
	Total:	**4**	

Question	Answer	Marks	Guidance
6(ii)	*EITHER:* (The subtraction method) *A*s together, no restrictions 8! / 2!5! = 168	**(*M1**	*Considering all As together* – 8! seen alone or as numerator – condone × 4! for thinking A's not identical
	*A*s together and *B*s together 7! / 5! = 42	**M1**	*Considering all As together and all Bs together* – 7! seen alone or numerator
		M1	*Removing repeated Bs or Cs* – Dividing by 5! either expression or 2! 1st expression only – OE
	Total 168 – 42	**DM1**	Subt their 42 from their 168 (dependent upon **first M** being awarded)
	= 126	**A1)**	
	OR1: *A*s together, no restrictions $^{8}C_{5}$ x $^{3}C_{1}$ = 168	**(*M1**	$^{8}C_{5}$ seen alone or multiplied
		M1	$^{7}C_{5}$ seen alone or multiplied
	*A*s together and *B*s together $^{7}C_{5}$ x $^{2}C_{1}$ = 42	**M1**	First expression x $^{3}C_{1}$ or second expression x $^{2}C_{1}$
	Total 168 – 42	**DM1**	Subt their 42 from their 168 (dependent upon **first M** being awarded)
	= 126	**A1)**	
	OR2: (The intersperse method)	**(M1**	*Considering all "As together" with Cs* – Mult by 6!
	(*AAAA)CCCCC* then intersperse *B* and another *B*	**M1**	*Removing repeated Cs* – Dividing by 5!– [Mult by 6 implies M2]
		***M1**	*Considering positions for Bs* – Mult by 7P2 oe –

Question	Answer	Marks	Guidance
	$\frac{6!}{5!}\times 7\times 6\div 2$	**DM1**	Dividing by 2! Oe – removing repeated *B*s (dependent upon **3rd M** being awarded)
	= 126	**A1)**	
	Total:	**5**	
7(i)	P(H) = P(BH) + P(SH) = 0.6×0.05 + 0.4×0.75	**M1**	Summing two 2-factor probs using 0.6 with 0.05 or 0.95, and 0.4 with 0.75 or 0.25
	= 0.330 or $\frac{33}{100}$	**A1**	Correct final answer accept 0.33
	Total:	**2**	
7(ii)	$\mathrm{P}\left(S\middle\vert H\right) = \frac{P(S\cap H)}{P(H)} = \frac{0.4\times 0.75}{0.33} = \frac{0.3}{0.33}$	**M1 FT**	Their $\frac{P(S\cap H)}{P(H)}$ unsimplified, FT from (i)
	$= \frac{10}{11}$ or 0.909	**A1**	
	Total:	**2**	
7(iii)	Var (B) = 45×0.6×0.4 Var (S)= 45×0.4×0.6	**B1**	One variance stated unsimplified
	Variances same	**B1**	Second variance stated unsimplified **and** at least one variance clearly identified, **and** both evaluated *or* showing equal *or* conclusion made SR **B1** – Standard Deviation calculated Fulfil all the criteria for the variance method but calculated to Standard Deviation
	Total:	**2**	

Question	Answer	Marks	Guidance
7(iv)	$1 - P(0, 1)$ $= 1 - [(0.6)^{10} + {}^{10}C_1(0.4)(0.6)^9] = 1 - 0.0464$ OR $P(2,3,4,5,6,7,8,9,10)$ $= {}^{10}C_2(0.4)^2(0.6)^8 + \ldots + {}^{10}C_9(0.4)^9(0.6) + (0.4)^{10}$	**M1** **M1**	Bin term ${}^{10}C_x p^x(1-p)^{10-x}$ $0 < p < 1$ Correct unsimplified answer
	$= 0.954$	**A1**	
	Total:	**3**	