Question	Answer	Marks	Guidance
1	$p + q = 0.45$	**M1**	Equation involving $\Sigma P(x) = 1$
	$0.15+ 2p + 1.2 + 6q = 3.05$	**M1**	Equation using $E(X) = 3.05$
	$q = 0.2$	**M1**	Solving simultaneous equations to one variable
	$p = 0.25$	**A1**	Both answers correct
		4	

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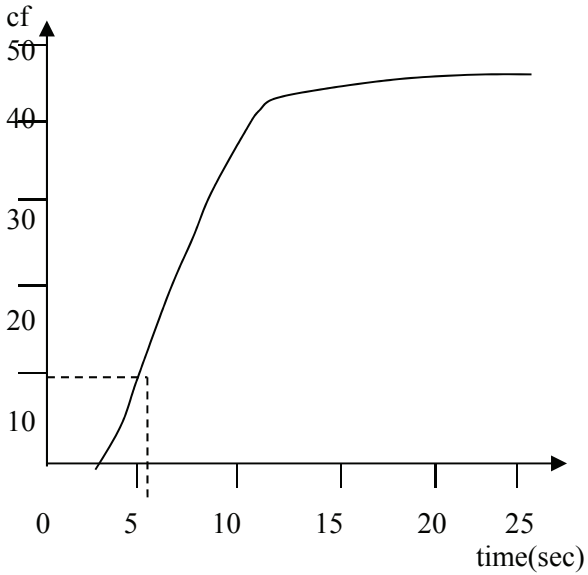
Question	Answer	Marks	Guidance
2(i)	Points (5.5,10), (8.5,25), (11.5,42), (16.5,46), (25.5,48)  	**B1**	Correct cfs values seen listed, in or by table or on graph, 0 not required
		B1	Axes labelled "cumulative frequency" (or cf) and "time [or t etc.] (in) seconds (or sec etc.)". Linear scales – cf 0–48, time 2.5 – 25.5 (ignore <2.5 on time.) At least 3 values stated on each axis, but (0,0) can be implied without stating.
		B1	All points plotted accurately, (5, 10) etc. scores **B0**. Curve or line segments drawn starting at (5.5,10) and passing within '1 scale unit' vertically and horizontally of plotted points
		3	

Question	Answer	Marks	Guidance
2(ii)	48 – 35 = 13 t = 6.5 sec	**M1**	Subt 35 (checked ±1 mm on graph) from 48 or 50,
		A1	6 ⩽ Ans ⩽ 7
		2	

Question	Answer	Marks	Guidance
3(i)	$p = 0.207$	**B1**	
		1	
3(ii)	Var = 30 × 0.207 × 0.793 = 4.92	**B1**	
		1	
3(iii)	P(⩾ 2) = 1 – P(0, 1)	**M1**	
	$= 1 - (0.793)15 - \binom{15}{1}(0.207)(0.793)14$	**M1**	1 – P(0, 1) seen n =15 p = any prob
	= 0.848	**A1**	
		3	

Question	Answer	Marks	Guidance
4(i)	$\frac{(48.7\times12+38.1\times7)}{19}$	**M1**	Accept unsimplified (may be separate calculations)
	$= 44.8$	**A1**	
		2	
4(ii)	$7.65^2 = \frac{\Sigma x^2}{12} - 48.7^2 \quad \Sigma x^2 = 29162.55$	**M1**	Substitution in one correct variance formula
	$4.2^2 = \frac{\Sigma y^2}{7} - 38.1^2 \qquad \Sigma y^2 = 10284.75$	**A1**	One Σx^2 or Σy^2 correct (can be rounded to 4sf))
	Combined var $= \frac{(29162.55+10284..75)}{19} - 44.79^2$ $= \frac{39447.3}{19} - 44.79^2$	**M1**	Using their Σx^2 and Σy^2 and their **4(i)** in the variance formula
	Combined $\sigma = 8.37$ or 8.36	**A1**	
		4	

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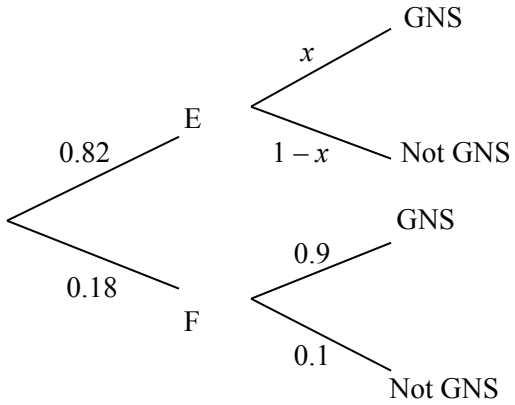
Question	Answer	Marks	Guidance
5(i)		**B1**	Must see at least 4 probs correct including one with an x in, correct shape
		B1	Shape, clear labels/annotation and all probs correct
		2	
5(ii)	$0.82x + 0.18 \times 0.9 = 0.285$	**M1**	Eqn with x in , two 2-factors on one side
	$x = 0.15$	**A1**	
		2	
5(iii)	$P(E \mid notGNS) = \dfrac{\mathrm{P}(\mathrm{E} \cap \mathrm{notGNS})}{\mathrm{P}(\mathrm{notGNS})}$	**M1**	Attempt at P(E∩not GNS) seen as num or denom of fraction
		M1	Attempt at P(not GNS) seen anywhere
	$= \dfrac{0.82 \times 0.85}{1 - 0.285} = 0.975$	**A1**	Correct answer
		3	

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Question	Answer	Marks	Guidance
6(a)(i)	${}^{40}P_5$	**M1**	${}^{40}P_x$ or ${}^{y}P_5$ oe seen, can be mult by $k \geqslant 1$
	= 78 960 960	**A1**	
		2	
6(a)(ii)	not front row e.g. WEJ** in 3× 3! = 18 ways	**B1**	3! seen mult by $k \geqslant 1$
	7 rows in 7 × 18= 126 ways	**B1**	mult by 7
	front row: e.g. *MA** in 4 × 2 = 8 ways	**M1**	attempt at front row arrangements and multiplying by the 7 other rows arrangements, need not be correct
	Total 126×8 = 1008	**A1**	
		4	
6(b)	*EITHER:* e.g. *R** in ${}^{8}C_3$ ways = 56 ways *L** in ${}^{8}C_3$ = 56 ways	**(M1**	Considering either R or L only in team
	**** in ${}^{8}C_4$ = 70 ways	**M1***	Considering neither in team
		DM1	summing 3 scenarios
	Total 182 ways	**A1)**	
	OR1: No restrictions ${}^{10}C_4$ = 210 ways	**(M1**	${}^{10}C_4$ – , Considering no restrictions with subtraction
	RL = ${}^{8}C_2$ = 28	**M1***	Considering both in team
	210 – 28	**DM1**	subt
	= 182 ways	**A1)**	

Question	Answer	Marks	Guidance
6(b)	*OR2:* R out in ${}^{9}C_{4} = 126$ ways L out in ${}^{9}C_{4} = 126$ ways	**(M1**	Considering either R out or L out
	Both out in ${}^{8}C_{4} = 70$	**M1***	Considering both out
		DM1	Summing 2 scenarios and subtracting 1 scenario
	126 + 126 – 70 = 182 ways.	**A1)**	
		4	

Question	Answer	Marks	Guidance
7(i)	$P(< 570) = P\left(z < \frac{570-500}{91.5}\right) = P(z < 0.7650)$ $= 0.7779$	**M1**	Standardising for either 570 or 390, no cc, no sq, no √
	$P(< 390) = P\left(z < \frac{390-500}{91.5}\right) = P(z < -1.202)$	**A1**	One correct z value
	$= 1 - 0.8853 = 0.1147$	**A1**	One correct Φ, final solution
	Large:0.222 (0.2221) Small: 0.115 (0.1147)	**A1**	Correct small and large
	Medium: 0.663 (0.6632)	**A1FT**	Correct Medium rounding to 0.66 or ft 1 – (their small + their large)
		5	

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Question	Answer	Marks	Guidance
7(ii)	$1.645 = \left(\frac{x - 500}{91.5}\right)$	**B1**	± 1.645 seen (critical value)
		M1	Standardising accept cc, sq, sq rt
	$x = 651$	**A1**	$650 \leqslant \text{Ans} \leqslant 651$
		3	
7(iii)	P($x > 610$) = 0.1147 (symmetry)	**M1**	Attempt to find upper end prob $x > 610$ or $\Phi(x)$, ft their P(< 390) from **(i)**
	$0.3 + 0.1147 = 0.4147 \Rightarrow \Phi(x) = 0.5853$	**M1**	Adding 0.3 to *their* P($x > 610$) or subt 0.5 from $\Phi(x)$ or 0.8853 – 0.3
	$z = 0.215$ or 0.216	**M1**	Finding $z = \Phi^{-1}(0.5853)$
	$0.215 = \frac{k - 500}{91.5}$	**M1**	Standardising and solving, accept cc, sq, sq rt
	$k = 520$	**A1**	
		5	