

1	(i)	A Points lie close to straight line	B1 B1	2	Valid reason, eg “linear”. Not “strong correlation”				
	(ii)	C Non-linear relationship	B1 B1	2	eg curve or quadratic				
2	(i)	Median 8 Quartiles 6, 24	B1 B2	3	B1 for each Allow IQR = 24 - 6				
	(ii)	Extreme values/skew distort mean or 35 mentioned	B1	1	Accept just “data skewed”. Not “anomaly”				
	(iii)	Advantage: retains data values Disadv: harder to read (eg) median harder to compare distr’s visual comparison harder	B1 B1	2	Not “Can be shown on same diag”				
3	(i)	<table style="display: inline-table; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px;">2 3 4 1 6 5 7</td> <td style="padding: 2px;">6 5 4 7 2 3 1</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">1 2 3 4 5 6 7</td> <td style="padding: 2px;">7 6 5 4 3 2 1</td> </tr> </table> $\Sigma d^2 = 14$ $r_s = 1 - \frac{6\Sigma d^2}{7(7^2 - 1)}$ $r_s = \frac{3}{4}$	2 3 4 1 6 5 7	6 5 4 7 2 3 1	1 2 3 4 5 6 7	7 6 5 4 3 2 1	M1 M1 A1 M1 A1	5	Rank both sets consistently Find Σd^2 , dep ranks attempted. Allow arith errors $\Sigma d^2 = 14$ Use formula correctly, dep 2 nd M1 Answer $\frac{3}{4}$ or a.r.t. 0.750
	2 3 4 1 6 5 7	6 5 4 7 2 3 1							
1 2 3 4 5 6 7	7 6 5 4 3 2 1								
(ii)	Rankings generally agree dep $r_s > 0.5$	B1f	1	Must have “agree” or “similar” etc, Not ‘rankings well correlated’ If $r_s < 0.5$, “generally don’t agree”: B1					
4	(i)	$k = 1 - \left(\frac{1}{4} + \frac{1}{5} + \frac{2}{5} + \frac{1}{10}\right)$ $\frac{1}{20}$	M1 A1	2	Use $\Sigma p = 1$ or 0.05				
	(ii)	$E(X) = \Sigma xp(x)$ $= -1/10$ $\Sigma x^2p(x) = 2$ $\Sigma x^2p(x) - \mu^2$ $= 1.99$	M1 A1 M1 M1 A1	5	Use $\Sigma xp(x)$ with a value for k and correct signs -1/10 or -0.1 only Attempt $\Sigma x^2p(x)$ } or $\Sigma(x - \mu)^2p(x)$: M2 Subtract their μ^2 } Answer, 1.99 or 1 99/100				
5	(i)	(a) Geo(0.05) $(19/20)^5(1/20)$ $= 0.0387$	M1 M1 A1	3	Geo(0.05) or 0.95 stated or implied q^5p attempted Answer, a.r.t. 0.0387 ISW				
		(b) $(19/20)^{10}$ $= 0.599$	M1 M1 A1	3	q^{10} or $1 - p - pq \dots - pq^9$ [q^9 or q^{11} , or one wrong term: M1M0] Answer, a.r.t. 0.599 $1 - (19/20)^{10}$: M0M0A0				
	(ii)	Mean = $1/p$ $= 20$	M1 A1	2	20, cao				
6	(i)	B(5, 3/8) ${}^5C_2(3/8)^2(5/8)^3$ $= 5625/16384$ or 0.343	M1 M1 A1	3	B(5, 3/8) stated or ${}^3/8, {}^5/8$ seen and sum of powers = 5 Correct expression Answer, a.r.t. 0.343 ISW				
	(ii)	$\frac{1}{2} p_1 = \frac{3}{8}$ $p_1 = \frac{3}{4}$ AG	M1 A1	2	or ${}^3/8 / \frac{1}{2}$ or ${}^3/8 \times 2$ $\frac{3}{4}$ correctly obtained. Must see explicit step. Verification eg $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$ or ${}^3/8 / \frac{1}{2} = \frac{3}{4}$: M1A1				
	(iii)	$\frac{1}{2} p_2 = \frac{1}{3}$ $p_2 = \frac{2}{3}$	M1 A1	2	or $\frac{1}{3} / \frac{1}{2}$ or $\frac{1}{3} \times 2$ Answer 2/3 or a.r.t. 0.667				

7	(i)	Boxes are independent Probability same for each box	B1 B1	2	Both must be in context
	(ii)	(a) B(8, 0.1) 0.4305 (b) 1 – P(≤ 1) 0.1869	M1 A1 M1 A1	4	B(8, 0.1) stated or 0.1, 0.9 seen and sum of powers =8 0.43[05] correct 1 – 0.8131 or 1 – (0.9 ⁸ + 8x0.9 ⁷ x 0.1) correct Answer, a.r.t. 0.187
	(iii)	2 × 0.4305 × 0.1869 0.16092	M1 M1 A1	3	(a) x (b) } 2 x (a) × (b) } Answer, a.r.t. 0.161
8	(i)	$\frac{2 \times 7!}{8!}$ = 1/4	M1 M1 A1	3	7! and 8! used or ⁷ P ₇ and ⁸ P ₈ Correct formula, with “2 x” Answer, 1/4 or 0.25 only
	(ii)	1/4 or 4! × 4! or 3! × 3! or ^{3!} / _{4!} $\left(\frac{1}{4}\right)^2$ or $\frac{3! \times 3!}{4! \times 4!}$ = 1/16	M1 M1 A1	3	Correct expression or 0.0625
	(iii)	Attempt subdivide, allow one error. Correct subdivision into 3 or 13 cases Correct expression = $\frac{13}{16}$	M1 M1 M1 A1	4	By description or listing or implied by probs, eg 1 – (ii) – P(sep by 1) All 3 or all 13 cases clearly present or 0.8125 or a.r.t. 0.813 only
		Eg correct: $1 - 3 \times \frac{1}{16}$; 1 – (ii) – $2 \times \frac{3 \times 3!}{4 \times 4!}$ $\frac{3! \times 3! \times 13}{(4! \times 4!)}$; $(\frac{3}{4})^2 + 2 \times \frac{1}{4} \times \frac{2}{4}$			Eg incorrect: $1 - \frac{3! \times 3! \times 3}{8!}$: M1M1M0A0 $1 - \frac{1}{16} - \frac{3! \times 3!}{4! \times 4!}$: M1M0M0A0
9	(i)	$\frac{264 - \frac{90 \times 15}{5}}{1720 - \frac{90^2}{5}}$ or $\frac{264 - 5 \times 18 \times 3}{1720 - 5 \times 18^2}$ = –0.06 AG $y - \frac{15}{5} = -0.06(x - \frac{90}{5})$ $y = 4.08 - 0.06x$	M1 A1 M1 A1	4	Formula correctly used –0.06 correctly obtained or $a = \frac{15}{5} - (-0.06) \times \frac{90}{5}$ Complete equation correct
	(ii)	Substitute $x = 20.5$ ($y = 2.85$) Substitute $x = 19.5$ ($y = 2.91$) $2.91 - 2.85 = 0.06$	M1 M1 A1	3	Allow 20 ($y = 2.88$) or 20.49 Answer 0.06 or –0.06, c.w.d
	(iii)	–0.6, 0.5	B1 B1	2	–0.6 correct 0.5 correct
	(iv)	1.5 Calculated equation minimises this quantity	B1 B1	2	Not “Low value for Σe^2 means points near line”
	(v)	$\bar{e} = \Sigma e_i / 5$ = 0 $\Sigma e_i^2 / 5$ (– her \bar{e}) ² = 0.3	M1 A1 M1 A1	4	$\Sigma e_i / 5$ used Answer 0, c.w.d, cao $\Sigma e_i^2 / 5$ 0.3 only, must see – 0 ² or – 0 in variance. ie: No working: $\bar{e} = 0$: M1A1; Var = 0.3: M1A0