Note: "3 sfs" means an answer which is equal to, or rounds to, the given answer. If such an answer is seen and then later rounded, apply ISW. Penalize over-rounding only once in paper, except qu 8(ii).

1i	$1-(^3/_{10}+{}^1/_5+{}^2/_5)$ $^1/_{10}$	M1 A1 2	or $(^3/_{10}+{}^1/_5+{}^2/_5)+p=1$
ii	$^3/_{10}+2\times{}^1/_5+3\times{}^2/_5$ $^{19}/_{10}$ oe	M1 A1 2	$\div$ 4or6 $\Rightarrow$ M0A0
Total		**4**	
2i	$\Sigma x=20; \Sigma y=11; \Sigma x^2=96; \Sigma y^2=31; \Sigma xy=52$) $S_{xx}=16$ or 3.2 $S_{yy}=6.8$ or 1.36 $S_{xy}=8$ or 1.6 $r=\frac{8}{\sqrt{(16\times6.8)}}$ or $\frac{1.6}{\sqrt{(3.2\times1.36)}}$ $=0.767$ (3 sfs)	B1 B1 B1 M1 A1 5	dep $-1\le r\le 1$ ft their S's (S_{xx} & S_{yy} +ve) for M1 only
ii	Small sample oe	B1f 1	
Total		**6**	
3i	120	B1 1	not just 5!
iia	$3\times4!$ or 72 ($\div5!$) $^3/_5$ oe	M1 A1 2	oe, eg $^{72}/_{120}$
b	Starts 1 or 21 (both) $^1/_5+{}^1/_5\times{}^1/_4$ $={}^1/_4$ oe	M1 M1 A1 3	12,13,14,15, ($\ge$2 of these incl 21, or allow 1 extra) can be implied by wking or $5\times3!$ or $4!+3!$ ($\div5!$) complement: full equiv steps for Ms
Total		**6**	
4ia	**W & Y** *oe*	B1 1	
b	**X** *oe*	B1 1	
ii	Geo probs always decrease or Geo has no upper limit to x or $x\neq0$	B1 1	Geo not fixed no. of values diags have fixed no of trials not Geo has +ve skew
iii	**W** Bin probs cannot fall then rise or bimodal	B1 B1dep 2	indep allow Bin probs rise then fall
Total		**5**	
5i	$\frac{2685-\frac{140\times106.8}{8}}{3500-\frac{140^2}{8}}$ or $\frac{2685-8\times17.5\times13.35}{3500-8\times17.5^2}$ $={}^{136}/_{175}$ or 0.777 (3 sfs) $y-{}^{106.8}/_8=0.777(x-{}^{140}/_8)$ $y=0.78x-0.25$ or better or $y={}^{136}/_{175}x-{}^1/_4$	M1 A1 M1 A1 4	Correct sub in any correct formula for b (incl. $(x-\bar{x})$ etc) or $a={}^{106.8}/_8-0.777\times{}^{140}/_8$ ft b for M1 $\ge$ 2 sfs sufficient for coeffs
ii	$0.78\times12-0.25$ $=9.1$ (2 sfs)	M1 A1f 2	M1: ft their equn A1: dep const term in equn
iiia b	Reliable Unreliable because extrapolating oe	B1 B1 2	Just "reliable" for both: B1
Total		**8**	

6i	Geo($^2/_3$) stated $({}^1/_3)^3\times{}^2/_3$ $={}^2/_{81}$ or 0.0247 (3 sfs)	M1 M1 A1 3	or implied by $({}^1/_3)^n\times{}^2/_3$

ii	$(1/3)^3$ $1 - (1/3)^3$ $26/27$ or 0.963 (3 sfs)	M1 M1 A1 3	or $2/3+1/3x^2/3+(1/3)^2x^2/3$: M2 one term omitted or extra or wrong: M1 $1 - (1/3)^4$ or $1- (2/3+1/3x^2/3+(1/3)^2x^2/3)$:M1
iii	1 / 2/3 = 3/2 oe	M1 A1 2	
Total		**8**	
7i	$2/9$ or $7/9$ oe seen $3/9$ or $6/9$ oe seen $1/8$ or $7/8$ oe seen Correct structure All correct	B1 B1 B1 B1 B1 5	 ie 8 correct branches only, ignore probs & values including probs and values, but headings not req'd
ii	$3/10 \times 7/9 + 7/10 \times 3/9 + 7/10 \times 6/9$ $14/15$ or 0.933 oe	M2 A1 3	or $3/10x7/9 + 7/10$ or $1 - 3/10 \times 2/9$ M1: one correct prod or any prod + $7/10$ or $3/10 \times 2/9$
iii	$3/10 \times 2/9 \times 7/8 + 7/10 \times 6/9$ $21/40$ or 0.525 oe	M2 A1 3	M1: one correct prod cao
	No ft from diag except: with replacement: (i) structure: B1 (ii) $91/100$: B2 (iii) 0.553: B2		
Total		**11**	
8i	Med = 2 LQ = 1 or UQ = 4 IQR = 3	B1 M1 A1 3	cao or if treat as cont data: read cf curve or interp at 25 & 75 cao
ii	Assume last value = 7 (or eg 7.5 or 8 or 8.5) Σxf attempted $\geq$ 5 terms 2.6 or 3 sf ans that rounds to 2.6 Σx^2f or $\Sigma(x-m)^2f$ $\geq$ 5 terms $/(\Sigma x^2f/100 - m^2)$ or $/(\Sigma(x-m)^2f)/100$ fully correct but ft m 1.6 or 1.7 or 3 sf ans that rounds to 1.6 or 1.7	B1 M1 A1 M1 M1 A1 6	stated, & not contradicted in wking eg 7-9 or 7,8, 9 Not just in wking allow "midpts" in Σxf or Σx^2f dep M3 penalize > 3 sfs only once
iii	Median less affected by extremes or outliers etc (NOT anomalies)	B1 1	or median is an integer or mean not int. or not affected by open-ended interval general comment acceptable
iv	Small change in var'n leads to lge change in IQR UQ for W only just 4, hence IQR exaggerated orig data shows variations are similar	 B1 1	 for Old Moat LQ only just 1 & UQ only just 3 oe specific comment essential
v	OM % (or y) decr (as x incr) oe Old Moat	B1 B1 2	ranks reversed in OM or not rev in W NIS
Total		**13**	

9i	${}^{11}C_5 \times (1/4)^6 \times (3/4)^5$ 0.0268 (3 sfs)	M1 A1 2	or $462 \times (1/4)^6 \times (3/4)^5$
ii	$q^{11} = 0.05$ or $(1-p)^{11} = 0.05$ $\sqrt[11]{0.05}$ $q = 0.762$ or 0.7616 . . . $p = 0.238$ (3 sfs)	M1 M1 A1 A1f 4	(any letter except p)$^{11} = 0.05$ oe oe or invlog$(\frac{\log 0.05}{11})$ ft dep M2
iii	$11 \times p \times (1-p) = 1.76$ oe $11p - 11p^2 = 1.76$ or $p - p^2 = 0.16$ $11p^2 - 11p + 1.76 = 0$ or $p^2 - p + 0.16 = 0$ $(25p^2 - 25p + 4 = 0)$ $(5p-1)(5p-4) = 0$ or $p = \frac{11 - \sqrt{(11^2 - 4 \times 11 \times 1.76)}}{2 \times 11}$ $p = 0.2$ or 0.8	M1 A1 A1 M1 A1 5	not $11pq = 1.76$ any correct equn after mult out or equiv with = 0 or correct fact'n or subst'n for their quad equ'n eg $p = \frac{1 \pm \sqrt{(1-4 \times 0.16)}}{2}$
Total		**11**	

Total 72 marks