Mark Scheme 4732
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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	$\div 4$ or $6 \Rightarrow$ M0A0
Total			**4**	
2i	$x = 20$; $y = 11$; $x^2 = 96$; $y^2 = 31$; $xy = 52$) $S_{xx} = 16$ or 3.2 $S_{yy} = 6.8$ or 1.36 $S_{xy} = 8$ or 1.6 $r = \dfrac{8}{\sqrt{(16 \times 6.8)}}$ or $\dfrac{1.6}{\sqrt{(3.2 \times 1.36)}}$ $= 0.767$ (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	$3 \times 4!$ or 72 ($\div 5!$) $^3/_5$ 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, (≥ 2 of these incl 21, or allow 1 extra) can be implied by wking or $5 \times 3!$ or $4! + 3!$ ($\div 5!$) 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 $x \ne 0$	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	$\dfrac{2685 - \frac{140 \times 106.8}{8}}{3500 - \frac{140^2}{8}}$ or $\dfrac{2685 - 8 \times 17.5 \times 13.35}{3500 - 8 \times 17.5^2}$ $= ^{136}/_{175}$ 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 ≥ 2 sfs sufficient for coeffs
ii	$0.78 \times 12 - 0.25$ $= 9.1$ (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	$(^1/_3)^3$	M1		or $^2/_3 + ^1/_3 x ^2/_3 + (^1/_3)^2 x ^2/_3$: M2
	$1 - (^1/_3)^3$	M1		one term omitted or extra or wrong: M1
				$1 - (^1/_3)^4$ or $1 - (^2/_3 + ^1/_3 x ^2/_3 + (^1/_3)^2 x ^2/_3)$:M1
	$^{26}/_{27}$ or 0.963 (3 sfs)	A1	3	
iii	1 / 2/3	M1		
	= 3/2 oe	A1	2	
Total		**8**		
7i	$^2/_9$ or $^7/_9$ oe seen	B1		
	$^3/_9$ or $^6/_9$ oe seen	B1		
	$^1/_8$ or $^7/_8$ oe seen	B1		
	Correct structure	B1		ie 8 correct branches only,
				ignore probs & values
	All correct	B1	5	including probs and values,
				but headings not req'd
ii	$^3/_{10} x ^7/_9 + ^7/_{10} x ^3/_9 + ^7/_{10} x ^6/_9$	M2		or $^3/_{10} x ^7/_9 + ^7/_{10}$ or $1 - ^3/_{10} x ^2/_9$
				M1: one correct prod or any prod $+ ^7/_{10}$
	$^{14}/_{15}$ or 0.933 oe	A1	3	or $^3/_{10} x ^2/_9$
iii	$^3/_{10} x ^2/_9 x ^7/_8 + ^7/_{10} x ^6/_9$	M2		M1: one correct prod
	$^{21}/_{40}$ or 0.525 oe	A1	3	cao
	No ft from diag except: with replacement: (i) structure: B1 (ii) $^{91}/_{100}$: B2 (iii) 0.553: B2				
Total		**11**		
8i	Med = 2	B1		cao
	LQ = 1 or UQ = 4	M1		or if treat as cont data:
				read cf curve or interp at 25 & 75
	IQR = 3	A1	3	cao
ii	Assume last value = 7 (or eg 7.5 or 8 or 8.5)	B1		stated, & not contradicted in wking
				eg 7-9 or 7,8, 9 Not just in wking
	xf attempted ≥ 5 terms	M1		allow "midpts" in xf or x^2f
	2.6 or 3 sf ans that rounds to 2.6	A1		
	x^2f or $x-m)^2f$ ≥ 5 terms	M1		
	$\sqrt{(x^2f /100 - m^2)}$ or			
	$\sqrt{(x-m)^2f)}/100$ fully correct but ft m	M1		
	1.6 or 1.7 or 3 sf ans that rounds to 1.6 or 1.7	A1		dep M3
			6	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			for Old Moat LQ only just 1 & UQ only just 3
	orig data shows variations are similar	B1	1	oe specific comment essential
v	OM % (or y) decr (as x incr) oe	B1		ranks reversed in OM or not rev in W
	Old Moat	B1	2	NIS
Total		**13**		

9i	$^{11}C_5$ x $(^1/_4)^6$ x $(^3/_4)^5$ 0.0268 (3 sfs)	M1 A1 2	or 462 x $(^1/_4)^6$ x $(^3/_4)^5$
ii	$q^{11} = 0.05$ or $(1 – p)^{11} = 0.05$ $^{11}\sqrt{0.05}$ $q = 0.762$ or $0.7616\ldots$ $p = 0.238$ (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 x p x $(1 – p) = 1.76$ 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 $p = \underline{11 - \sqrt{(11^2 – 4 \times 11 \times 1.76)}}$
	                 2 x 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 $p = \underline{1\pm\sqrt{(1-4 \times 0.16)}}$
			                  2

Total		**11**	
	Total 72 marks		