

**Mark Scheme 4732
January 2007**

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	$1 - (\sqrt[3]{10} + \sqrt[1]{5} + \sqrt[2]{5})$ $\sqrt[1]{10}$	M1 A1 2	or $(\sqrt[3]{10} + \sqrt[1]{5} + \sqrt[2]{5}) + p = 1$
ii	$\sqrt[3]{10} + 2 \times \sqrt[1]{5} + 3 \times \sqrt[2]{5}$ $\sqrt[19]{10}$ oe	M1 A1 2	$\div 4 \text{ or } 6 \Rightarrow \text{M0A0}$
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 $r = \frac{8}{\sqrt{(16 \times 6.8)}} \text{ or } \frac{1.6}{\sqrt{(3.2 \times 1.36)}}$ $= 0.767$ (3 sfs)	B1 B1 B1 M1 A1 5	dep $-1 \leq r \leq 1$ 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!
iiia	$3 \times 4!$ or 72 ($\div 5!$) $\sqrt[3]{5}$ oe	M1 A1 2	oe, eg $\sqrt[72]{120}$
b	Starts 1 or 21 (both) $\sqrt[1]{5} + \sqrt[1]{5} \times \sqrt[1]{4}$ $= \sqrt[1]{4}$ oe	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 $x \neq 0$	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	$\frac{2685 - \frac{140 \times 106.8}{8}}{3500 - \frac{140^2}{8}}$ or $\frac{2685 - 8 \times 17.5 \times 13.35}{2500 - 9 \times 17 \times 5^2}$ $= \sqrt[136]{175}$ or 0.777 (3 sfs) $y - \frac{106.8}{8} = 0.777(x - \frac{140}{8})$ $y = 0.78x - 0.25$ or better or $y = \sqrt[136]{175}x - \frac{1}{4}$	M1 A1 M1 A1 4	Correct sub in any correct formula for b (incl. $(x - \bar{x})$ etc) or $a = \frac{106.8}{8} - 0.777 \times \frac{140}{8}$ 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	Reliable	B1	Just "reliable" for both: B1
b	Unreliable because extrapolating oe	B1 2	
Total		8	
6i	Geo($\sqrt[2]{3}$) stated $(\sqrt[1]{3})^3 \times \sqrt[2]{3}$ $= \sqrt[2]{81}$ or 0.0247 (3 sfs)	M1 M1 A1 3	or implied by $(\sqrt[1]{3})^n \times \sqrt[2]{3}$

ii	$(\frac{1}{3})^3$ $1 - (\frac{1}{3})^3$ $\frac{26}{27}$ or 0.963 (3 sfs)	M1 M1 A1 3	or $\frac{2}{3} + \frac{1}{3}x^{\frac{2}{3}} + (\frac{1}{3})^2x^{\frac{2}{3}}$: M2 one term omitted or extra or wrong: M1 $1 - (\frac{1}{3})^4$ or $1 - (\frac{2}{3} + \frac{1}{3}x^{\frac{2}{3}} + (\frac{1}{3})^2x^{\frac{2}{3}})$: M1
iii	$1 / 2/3$ $= 3/2$ oe	M1 A1 2	
Total		8	
7i	$\frac{2}{9}$ or $\frac{7}{9}$ oe seen $\frac{3}{9}$ or $\frac{6}{9}$ oe seen $\frac{1}{8}$ or $\frac{7}{8}$ 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	$\frac{3}{10}x^{\frac{7}{9}} + \frac{7}{10}x^{\frac{3}{9}} + \frac{7}{10}x^{\frac{6}{9}}$ $\frac{14}{15}$ or 0.933 oe	M2 A1 3	or $\frac{3}{10}x^{\frac{7}{9}} + \frac{7}{10}$ or $1 - \frac{3}{10}x^{\frac{2}{9}}$ M1: one correct prod or any prod + $\frac{7}{10}$ or $\frac{3}{10}x^{\frac{2}{9}}$
iii	$\frac{3}{10}x^{\frac{2}{9}}x^{\frac{7}{8}} + \frac{7}{10}x^{\frac{6}{9}}$ $\frac{21}{40}$ or 0.525 oe	M2 A1 3	M1: one correct prod cao
	No ft from diag except: with replacement:	(i) structure: B1 (ii) $\frac{91}{100}$: 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) xf attempted ≥ 5 terms 2.6 or 3 sf ans that rounds to 2.6 x^2f or $(x-m)^2f \geq 5$ terms $\sqrt{(x^2f/100 - m^2)}$ or $\sqrt{(x-m)^2f/100}$ 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 xf or x^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 $0.7616 \dots$ $p = 0.238$ (3 sfs)	M1 M1 A1 A1f 4	(any letter except p) $^{11} = 0.05$ oe oe or $\text{invlog}(\frac{\log 0.05}{11})$ 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 $p = \frac{11 - \sqrt{(11^2 - 4 \times 11 \times 1.76)}}{2 \times 11}$	M1 A1 A1 M1	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	$p = 0.2$ or 0.8	A1 5	
Total 72 marks		11	