

Mark Scheme 4732

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1(i)	$\frac{2}{3} + \text{prod of 2 P's}$ or $1 - \text{prod of 2 P's}$ $\frac{2}{3} + \frac{1}{3} \times \frac{3}{4}$ or $1 - \frac{1}{3} \times \frac{1}{4}$ $= \frac{11}{12}$ or 0.917 (3 sfs)	M1 M1 A1 3	$\text{or } \frac{1}{3} \times \frac{3}{4}$ or $\frac{1}{3} \times \frac{1}{4}$
(ii)	$\frac{1}{3} \times p$ $\frac{2}{3} + \frac{1}{3} \times p = \frac{5}{6}$ oe $p = \frac{1}{2}$	M1 M1 A1 3	$\text{or } \frac{1}{3}(1 - p)$ $\text{or } \frac{1}{3}(1 - p) = 1 - \frac{5}{6}$ SW: $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$ M2A0, unless clear this is a check
Total		6	
2(i)	124.5, 4.8	B1B1 2	for 4.8 allow "same"
(ii)	mean smaller or generally smaller or means similar or hts similar oe More widely spread or varied oe	B1f B1f 2	Assume 2 nd referred to unless clear 1 st or less consistent or gter dispersion or further from mean, gter variance Not "range" greater Allow opposite if ft (i)
(iii)	$(\text{"124.5"} + 2 \times 123)/3$ $= 123.5$	M1 A1 2	$\text{or } (50 \times \text{"124.5"} + 100 \times 123)/150$ cao
Total		6	
3(i)	$\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3}$ or $\frac{2}{5} \times \frac{3}{4} \times \frac{1}{3}$ $\times 2$ or + $\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} + \frac{2}{5} \times \frac{3}{4} \times \frac{1}{3}$ $= \frac{1}{5}$ AG	M1 M1 M1 A1 4	$\text{or } \frac{1}{10}$ <u>from tree</u> add 2 equal products of 3 probs all correct Must see correct working NB incorrect methods eg $\frac{3}{5} \times \frac{2}{4} \times \frac{2}{3}$
(ii)	Σxp $= 4$ $\Sigma x^2 p (= 17)$ $- \mu^2$ $= 1$	M1 A1 M1 M1 A1 5	≥ 3 terms added. Allow arith errors. ≥ 3 terms added. Allow arith errors Indep if +ve result $\Sigma(x - \mu)^2 p$ M2; 3 terms: M1 dep +ve result Σxp & $\Sigma x^2 p$, if \div eg 4: M0A0 ($-\mu^2$ poss M1)
Total		9	

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4(i)(a)	Total area = 60 sqs Recog that total area reps 300 $8 \times 300/60$ = 40	M1 M1 M1 A1	4	Attempt total area, eg 15000 or 15 cm ² eg 1 squ = 5 or 15000 ÷ (300 or 50) or 2000/50 cao
(b)	Splitting classes $1.2 \times 4 \times 5$ or $0.8 \times 6 \times 5$ oe 48	M1 M1 A1	3	or $0.3 \times 16 \times 5$ or $0.4 \times 12 \times 5$ or 24 NB other correct eg $2 \times 4 \times 5 + \frac{4}{5} \times 2 \times 5$ Alt method: estimate: 46-50 SC B1
(ii)(a)	Box & whisker	B1	1	
(b)	Cum freq diag	B1	1	
Total			9	
5(i)(a)	$(\frac{3}{5})^4 \times \frac{2}{5}$ = 0.0518 (3sfs) or $\frac{162}{3125}$ oe	M1 A1	2	Allow index 3 or 5
(b)	$(\frac{3}{5})^4$ $1 - (\frac{3}{5})^4$ = 0.870 (3 sfs) or $\frac{544}{625}$ oe	M1 M1 A1	3	$\frac{2}{5} + \frac{3}{5} \times \frac{2}{5} + (\frac{3}{5})^2 \times \frac{2}{5} + (\frac{3}{5})^3 \times \frac{2}{5}$: M2 (1extra or omit or wrong: M1) Allow $1 - (\frac{3}{5})^3$ or $1 - (\frac{3}{5})^5$
(ii)(a)	$B(5, \frac{2}{5})$ stated $5 \times \frac{2}{5} \times (\frac{3}{5})^4$ or 0.3370 – 0.0778 = 0.259 (3 sfs) or $\frac{162}{625}$ oe	M1 M1 A1	3	or $({}^5C_a \text{ or } {}^5C_b) \times (\frac{2}{5})^a \times (\frac{3}{5})^b$ & $a + b = 5$
(b)	“0.259” $\times \frac{2}{5}$ = 0.104 (3 sfs) or $\frac{324}{3125}$ oe	M1 A1f	2	eg ft: (a) 0.0518 → 0.0207 (a) 0.922 → 0.369
Total			10	
6(i)	${}^4C_3 \times {}^7C_4$ = 140	M1M1 A1	3	M1 either comb. 140/330: M1M1
(ii)	${}^3C_2 \times {}^6C_4$ or $\frac{{}^3C_2}{{}^4C_3}$ or $\frac{{}^6C_4}{{}^7C_4}$ $\frac{{}^3C_2 \times {}^6C_4}{\text{“140”}}$ or $\frac{3}{4} \times (1 - \frac{4}{7})$ = $\frac{9}{28}$ oe or 0.321 (3 sfs)	M1 M1 A1	3	or ${}^3C_2(x..)/\text{“140”}$ or $(...x) {}^6C_4/\text{“140”}$ or $({}^3C_2 + {}^6C_4)/\text{“140”}$ or $(3+15)/\text{“140”}$ or $\frac{3}{4}$ or $1 - \frac{4}{7}$ seen all correct
(iii)	${}^3C_2 \times {}^6C_4$ (or i x ii) or $({}^3C_3 \times) {}^7C_4$ or 45 or 35 or $\frac{1}{4} \times {}^4C_3 \times {}^7C_4$ or $\frac{3}{4} \times {}^4C_3 \times {}^6C_4$ ${}^3C_2 \times {}^6C_4 + ({}^3C_3 \times) {}^7C_4$ or “140” – ${}^3C_2 \times {}^6C_3$ = 80	M1 M1 A1ft	3	1 correct prod or “140” – any prod or $\frac{1}{4} \times {}^4C_3 \times {}^7C_4 + \frac{3}{4} \times {}^4C_3 \times {}^6C_4$ ft only “140”
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7(i)	<p>Binomial $n = 10, p = 0.9$</p> <p>Each seed equally likely germ or P(germ) same for all seeds oe Seeds independent oe</p>	<p>B1 B1</p> <p>B1 B1</p> <p>4</p>	<p>Both requ'd. Ignore $q = 0.1$ or seeds grown in same conditions Context nec'y for each B1</p>
(ii)	0.0702 (3 sfs)	<p>B2</p> <p>2</p>	<p>0.07 or 0.2639: B1 Σ or $1-\Sigma$: 1 term extra or omit or wrong: M1</p>
(iii)	<p>$1 - "0.0702"$ $0.9298^{20} + {}^{20}C_1 \times 0.0702 \times 0.9298^{19}$ $= 0.585$ (3 sfs)</p>	<p>M1 M1M1</p> <p>A1 4</p>	<p>Or 0.9298 or 0.93(0) seen M1 each term cao eg ft (ii) 0.2639 \rightarrow (iii) 0.0178 from correct wking: M3A0</p> <p>$0.0702^{20} + {}^{20}C_1 \times 0.9298 \times 0.0702^{19}$ (=2.25x10⁻²¹): SC M1M1 NB ft (ii) for all M mks. But if 0.1, 0.9 used, must be clear using (ii) rounded</p>
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8(i)(a)	<p>Ranks 1 2 3 4 5 6 7 8 9 9 8 7 6 5 4 3 2 1 3 2 1 5 4 7 8 6 9 7 8 9 5 6 3 2 4 1</p> <p>Σd^2 (= 16)</p> <p>$r_s = 1 - \frac{6 \times \text{their } 16}{9 \times (9^2 - 1)}$ = 0.867 (3 sfs) or $^{13}/_{15}$ oe</p>	<p>M1 A1</p> <p>M1dep</p> <p>M1dep</p> <p>A1 5</p>	<p>Attempt ranks, same dir'n Correct ranks</p> <p>Dep ranks attempted</p> <p>Correct formula with $n = 9$, dep M1M1</p>
(b)	<p>Countries with larger pops tend to have larger capital pops. oe</p>	<p>B1ft 1</p>	<p>or ft (a) Must <u>interp</u> & refer to context. Not "Gd corr'n country & cap pops" Not "Gd agree't country & cap pops" Not "Gd rel'nship country & cap pops" Not "proportional"</p>
(ii)	<p>$\frac{1533.76 - (337.5 \times 28.3)/9}{\sqrt{((18959.11 - 337.5^2/9)(161.65 - 28.3^2/9))}}$ = 0.698 (3 sfs)</p>	<p>M1</p> <p>A1 2</p>	<p>(= $472.51/\sqrt{(6302.86 \times 72.66)}$) Or correct subst in 2 "S" formulae, any version</p> <p>No wking: 0.7 M0A0; 0.70: M1A0</p>
(iii)	<p>Increase</p>	<p>B1 1</p>	<p>or nearer to 1</p>
(iv)(a)	<p>Est country pop from cap or x from y oe</p>	<p>B1ind B1ind 2</p>	<p>y indep or known or given or x unknown or x dep on y oe</p>
(b)	<p>any indication-different context, eg "Africa", "remote areas" unreliable</p>	<p>B1 B1dep 2</p>	<p>or reliable because r (or r_s) high: B1 or unreliable because r (or r_s) not hi: B1 "accurate": B0</p>
Total		13	

Total 72 marks