

4732 Probability & Statistics 1

1			Q1: if consistent "0.8" incorrect or $1/8, 7/8$ or 0.02 allow M marks in ii, iii & 1 st M1 in i
i	Binomial stated $0.9437 - 0.7969$ or ${}^8C_3 \times 0.2^3 \times 0.8^5$ $= 0.147$ (3 sfs)	M1 M1 A1 3	or implied by use of tables or 8C_3 or $0.2^a \times 0.8^b$ ($a+b = 8$)
ii	$1 - 0.7969$ $= 0.203$ (3 sf)	M1 A1 2	allow $1 - 0.9437$ or 0.056(3) or equiv using formula
iii	8×0.2 oe 1.6	M1 A1 2	$8 \times 0.2 = 2$ M1A0 $1.6 \div 8$ or $1/1.6$ M0A0
Total		7	
2	first two d' s = ± 1 Σd^2 attempted (= 2) $1 - \frac{6 \times "2"}{7(7^2 - 1)}$ $= {}^{27}/_{28}$ or 0.964 (3 sfs)	B1 M1 M1dep A1	S_{xx} or $S_{yy} = 28$ B1 $S_{xy} = 27$ B1 $S_{xy} / \sqrt{(S_{xx}S_{yy})}$ M1 dep B1 1234567 & 1276543 (ans ${}^2/7$): MR, lose A1
Total		4	
3 i	x independent or controlled or changed Value of y was measured for each x x not dependent	B1 1	Allow Water affects yield, or yield is dependent or yield not control water supply Not just y is dependent Not x goes up in equal intervals Not x is fixed
ii	(line given by) minimum sum of squs	B1 B1 2	B1 for "minimum" or "least squares" with inadequate or no explanation
iii	$S_{xx} = 17.5$ or 2.92 $S_{yy} = 41.3$ or 6.89 $S_{xy} = 25$ or 4.17 $r = \frac{S_{xy}}{\sqrt{(S_{xx}S_{yy})}}$ $= 0.930$ (3 sf)	B1 M1 A1 3	or $91 - 21^2/6$ or $394 - 46^2/6$ B1 for any one or $186 - 21 \times 46/6$ dep B1 0.929 or 0.93 with or without wking B1M1A0 SC incorrect n : max B1M1A0
iv	Near 1 or lg, high, strong, good corr'n or relnshp oe Close to st line or line good fit	B1ft B1 2	$ r $ small: allow little (or no) corr'n oe Not line accurate. Not fits trend
Total		8	

6i	$\Sigma x \div 11$ 70 Σx^2 attempted $\sqrt{\frac{\Sigma x^2}{11} - \bar{x}^2} = \sqrt{(54210/11 - 70^2)}$ or $\sqrt{28.18}$ or 5.309 $(= 5.31)$ AG	M1 A1 M1 A1 4	≥ 5 terms, or $\Sigma(x - \bar{x})^2$ or $\sqrt{\frac{\Sigma(x - \bar{x})^2}{11}} = \sqrt{310/11}$ or $\sqrt{28.18}$ ie correct substn or result If $\times^{11/10}$: M1A1M1A0
ii	Attempt arrange in order med = 67 74 and 66 IQR = 8	M1 A1 M1 A1 4	or $(72.5 - 76.5) - (65.5 - 66.5)$ incl must be from 74 – 66
iii	no (or fewer) extremes this year oe sd takes account of all values sd affected by extremes less spread tho' middle 50% same less spread tho' 3 rd & 9 th same or same gap	B1 1	iii, iv & v: ignore extras fewer high &/or low scores highest score(s) less than last year Not less spread or more consistent Not range less
iv	sd measures spread or variation or consistency oe	B1 1	sd less means spread is less oe or marks are closer together oe
v	more consistent, more similar, closer together, nearer to mean less spread	B1 1	allow less variance Not range less Not highest & lowest closer
Total		11	
7i	8C_3 $= 56$	M1 A1 2	
ii	7C_2 or or ${}^7P_2 / {}^8P_3$ $\div ({}^8C_3$ or “56”) only $= \frac{3}{8}$	$\frac{1}{8}$ not from incorrect $\times 3$ only or $\frac{1}{8} + \frac{7}{8} \times \frac{1}{7} + \frac{7}{8} \times \frac{6}{7} \times \frac{1}{6}$	${}^8C_1 + {}^7C_1 + {}^6C_1$ or 21 or $8 \times 7 \times 6$ or $\frac{1}{8} \times \frac{1}{7} \times \frac{1}{6}$ indep, dep ans < 1 $\frac{7}{8} \times \frac{6}{7} \times \frac{5}{6}$ 1 – prod 3 probs
iii	8P_3 or $8 \times 7 \times 6$ or ${}^8C_1 \times {}^7C_1 \times {}^6C_1$ or 336 $1 \div {}^8P_3$ only $= \frac{1}{336}$ or 0.00298 (3 sf)	M1 M1 A1 3	$\frac{1}{8} \times \frac{1}{7} \times \frac{1}{6}$ only M2 If \times or \div : M1 $(\frac{1}{8})^3$ M1
Total		8	

8ia	$\frac{18}{19}$ or $\frac{1}{19}$ seen $\frac{17}{18}$ or $\frac{1}{18}$ seen structure correct ie 6 branches all correct incl. probs and W & R	B1 B1 B1 B1 4	regardless of probs & labels (or 14 branches with correct 0s & 1s)
b	$\frac{1}{20} + \frac{19}{20} \times \frac{1}{19} + \frac{19}{20} \times \frac{18}{19} \times \frac{1}{18}$ $= \frac{3}{20}$	M2 A1 3	M1 any 2 correct terms added $\frac{19}{20} \times \frac{18}{19} \times \frac{17}{18}$ $1 - \frac{19}{20} \times \frac{18}{19} \times \frac{17}{18}$
ia	$\frac{19}{20} \times \frac{18}{19}$ $= \frac{9}{10}$ oe	M1 A1 2	$\frac{19}{20} \times \frac{18}{19} \times \frac{1}{18} + \frac{19}{20} \times \frac{18}{19} \times \frac{17}{18}$ or $\frac{1}{20} + \frac{17}{20}$
b	$(P(X=1) = \frac{1}{20})$ $\frac{19}{20} \times \frac{1}{19}$ $= \frac{1}{20}$ Σxp $= \frac{57}{20}$ or 2.85	M1 A1 M1 A1 4	or $1 - (\frac{1}{20} + \frac{9}{10})$ or 2 probs of $\frac{1}{20}$ M1A1 ≥ 2 terms, ft their p 's if $\Sigma p = 1$ NB: $\frac{19}{20} \times 3 = 2.85$ no mks
ia			With replacement:
ib			Original scheme $\frac{1}{20} + \frac{19}{20} \times \frac{1}{20} + (\frac{19}{20})^2 \times \frac{1}{20}$ or $1 - (\frac{19}{20})^2$ M1
ia			$(\frac{19}{20})^2$ or $(\frac{19}{20})^2 \times \frac{1}{20} + (\frac{19}{20})^2 \times \frac{19}{20}$ M1
b			Original scheme But NB ans 2.85(25...) M1A0M1A0
Total		13	

9i	$(1 - 0.12)^n$ $\frac{\log 0.05}{\log 0.88}$ $n = 24$	or $0.88^{23} = 0.052\dots$ or $0.88^{24} = 0.046\dots$	M1 M1 A1 3	Can be implied by 2 nd M1 allow $n - 1$ or $\log_{0.88} 0.05$ or 23.4(...) Ignore incorrect inequ or equals signs
ii	${}^6C_2 \times 0.88^4 \times 0.12^2$ $\times 0.12$ $= 0.0155$	(= 0.1295...)	M3 M1 A1 5	or $0.88^4 \times 0.12^2$ M2 or ${}^6C_2 \times 0.88^4 \times 0.12^2$ + extra M2 or 2 successes in 6 trials implied or 6C_2 M1 dep \geq M1 $0.88^4 \times 0.12^2 \times 0.12$: M2M1 $0.88^4 \times 0.12^3$ M0M0A0 unless clear P(2 success in 6 trials) $\times 0.12$ in which case M2M1A0
Total			8	

Total 72 marks