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Mark Scheme (Results)

Summer 2016

Pearson Edexcel Level 3 Award in Statistical Methods (AST30)

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where QWC is being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working awrt – answer which rounds to

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Question		**Working**	**Answer**	**Mark**	**Notes**
1			70	2	M1 for 200 × 0.35 A1 cao
2	(a)		Disadvantage	1	B1 for correct disadvantage, eg may not be representative
	(b)		List of all the staff	1	B1 for list/register/database of all the people (working at the school) oe
	(c)		7	2	M1 for (21 ÷ "95") × 30 (=6.6…) A1 for 7 (accept 6)
3	(a)		8 4 5 2 7 6	3	B3 cao (B2 for 4 or 5 correct entries B1 for 2 or 3 correct entries)
	(b)		32	1	B1 for 32 or ft their 6 entries
	(c)		$\frac{4}{11}$	2	M1 for $\frac{a}{11}$, for $a < 11$ A1 for $\frac{4}{11}$ oe or ft their a

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4	(a)		98853 | 4 | 2555899 9776543 | 5 | 011235 531 | 6 | 19 (Josh) 3|4 represents 43 (Freda) 4|2 represents 42	3	B2 for correct ordered stem and leaf diagram (B1 for correct ordered stem and leaf diagram for Josh or Freda) B1 for correct key for both Josh and Freda Eg 3 ⎪ 4 ⎪ 2 represents 43 for Josh and 42 for Freda
	(b)	Josh's median = 55 Freda's median = 50	55 and 50, Josh's median higher	2	M1 for 55 or 50 A1 55 and 50 and Josh's median higher oe
	(c)	IQR = 53 – 45 = 8 UQ = 53 53 + 1.5×8 = 65	Outlier as 69 > 65	3	M1 for "UQ" + 1.5×("IQR") A1 for 53 + 1.5×(53 - 45) (=65) A1 for correct conclusion, e.g. outlier as 69 > 65 oe
5	(a)		Continuous	1	B1 for continuous (accept quantitative)
	(b)		Comparisons	3	B1 for correct comparison of 2 or more medians B1 for correct comparison of 2 or more IQRs or ranges B1 for correct comparison of 2 or more skews
6			143	2	M1 for $^{50}/_{N} = {}^{7}/_{20}$ oe A1 cao

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Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)		Tree diagram	3	M1 for (0.65 and 0.35) **or** (0.15 and 0.85) A1 for correct tree diagram B1 for correct labels
	(b)		0.0975	2	M1 for "0.65" × "0.15" A1 for 0.0975 oe
	(c)		0.7025	2	M1 for (1 – "0.35" × "0.85") oe **or** (0.65 × 0.85 + 0.35 × 0.15 + "0.0975") oe A1 for 0.7025 oe
8	(a)	CFs = 3, 15, 47, 95, 100	cf graph	3	M1 for points plotted at (4,3), (8,15), (12,47), (16,95), (20, 100) condone one plotting error A1 for correct cf graph (condone line segments) (SC B1 for cf graph with points plotted consistently within each interval and joined with curve or line segments) B1 for correct scales and labels (cf and height)
	(b)		box plot	3	M1 for correct box plot with at least one of (i) correct median for their scale (ii) correct upper quartile and lower quartile for their scale (iii) shortest tree drawn at 2 and tallest tree drawn at 17 A1 for 2 correct features A1 for all 3 correct

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Question		**Working**	**Answer**	**Mark**	**Notes**
9	(i)	d = 0, 1, 2, 2, 2, 3, 1, 1 d^2=24	0.714	3	M1 for Σd^2 condone one error M1 for $1 - 6\times$"Σd^2" $\div [8\times(8^2 - 1)]$ A1 for 0.714 – 0.715
	(ii)		Correct interpretation		B1 ft (from sensible part a) for eg (some) agreement (accept positive correlation, ignore reference to strength)
10	(a)		0.75	2	M1 for $\pm(118 - 115) \div 4$ A1 cao
	(b)		Pierre with correct reason	1	B1 for Pierre with correct reason, eg greater standardised score
	(c)		119.8	2	M1 for $1.2\times4 + 115$ A1 cao
11	(a)	280, 650, 960, 600	1.779	3	M1 for Σfx condone one error (=2490) M1 for "2490"÷1400 A1 for 1.77 – 1.78
	(b)		0.48	2	M1 for $(4756.25\div1400 - \text{"}1.779\text{"}^2)^{0.5}$ oe A1 for 0.48 – 0.49
	(c)	Eg bars of height 280, 1600, 960, 480	histogram	4	M1 for calculating frequency density A2 for four blocks with correct widths and correct heights (A1 for 2 or 3 correct blocks) B1 for correct vertical scale with label or key

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Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		1231.25	2	M1 for 0.985×1250 oe A1 cao
	(b)		100.31	2	M1 for $(98.5\times101.5\times102.1\times99.2)^{0.25}$ oe A1 for 100.31 – 100.314 or 100.3 provided M1 is awarded
	(c)		Average yearly increase of 0.31%	2	B2 for (average) yearly/annual increase **and** 0.31% oe (B1 for (average) yearly/annual increase or 0.31% oe or ft their sensible part (b)
13	(a)		3.3	1	B1 for 3.25 – 3.5
	(b)		comparisons	2	B1 for correct comparison of mean/mode/median condone average B1 for correct comparison of standard deviations (accept ranges)
14	(a)		Downwards	1	B1 for downwards oe
	(b)		135 - 140	2	M1 for $\pm(a + 160) \div 2$ where $110\leq a\leq120$ A1 for 135 - 140
	(c)		435 - 440	2	M1 for 300 + ”part(b)” A1 for 435 - 440

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Question	**Working**	**Answer**	**Mark**	**Notes**
15 (a)		0.75	1	B1 for 0.75 oe
(b)	$P(X \cap Y)=0.6\times0.8=0.48$ $P(X \cap Y)= 0.6+0.8-0.92=0.48$	Yes with reasons	3	M1 for using $P(X \cup Y) = P(X) + P(Y) - P(X \cap Y)$ M1 for using $P(X \cap Y)=P(X) \times P(Y)$ A1 for yes with supporting work
16		$^{44}/_{72}$	3	M1 for multiplying $(^{2}/_{9} \times {}^{1}/_{8})$ or $(^{7}/_{9} \times {}^{6}/_{8})$ M1 for $(^{2}/_{9} \times {}^{1}/_{8}) + (^{7}/_{9} \times {}^{6}/_{8})$ A1 for $^{44}/_{72}$ oe
17 (a)(i)		0.7422	4	M1 for $\pm(16 - 13.4) \div 4$ (=0.65) A1 for 0.7422
(ii)		0.6368		M1 for $\pm(12 - 13.4) \div 4$ (=−0.35) A1 for 0.6368
(b)		0.426	3	M1 for 1 – "0.7422" (=0.2578) M1 for 3 × "0.7422"^{2}×"0.2578" A1 for 0.426 – 0.427

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Question	**Working**	**Answer**	**Mark**	**Notes**
18 (a)		0.831	4	M1 for Σx (=340) or Σy (=1440) M1 for 49378 – (“340”×”1440”÷10) (=418) M1 for “418”÷$(154\times1642)^{0.5}$ A1 for 0.831 – 0.832
(b)		The greater the body mass the greater the heart mass	1	B1 for the greater the body mass the greater the heart mass oe, or ft their sensible part (a)

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