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Mark Scheme (Results)

January 2014

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

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 cso – correct solution only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: AST30_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	$\sum fx$ = (1x7) + (2x8) + ... = 119	2.975	2	M1 for $\frac{\sum fx}{40}$ A1 for 2.975 or 2.98 oe
	(b)	$\sum fx^2$ = (1^2x7) + (2^2x8) + ... = 435 $\frac{435}{40} - \left(\frac{119}{40}\right)^2$	1.42	2	M1 for $\frac{\sum fx^2}{40} - (\text{'}2.975\text{'})^2$ A1 cao
2	(a)	7 6 **5** 977321 **6** 478 98521 **7** 358 30 **8** 6689 **9** 24889 Key: 6|5 means 56 (beats per minute) for seated 6|4 means 64 (beats per minute) for After running	Stem & leaf and key	3	M1 for correct ordered or unordered stem and leaf for seated OR after running A1 for both correctly ordered B1 for two correct keys
	(b)		2 comparisons	2	B2 for two correct comparisons from 1. Medians or means 2. IQRs or ranges 3. Skews
3	(a)		Complete probability tree diagram	2	B1 for correct probabilities on Jack's branches (0.7, 0.3) B1 for correct probabilities on Phil's branches (0.8, 0.2)
	(b)		0.06	2	M1 for 0.3 × 0.2 A1 0.06 oe
	(c)		0.38	3	M1 for (0.7 × 0.2) or (0.3 × 0.8) oe M1 for (0.7 × 0.2) + (0.3 × 0.8) oe A1 for 0.38 oe

PAPER: AST30_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(a)	See Appendix 1	5 16,12,14 7,11,15 20	4	B1 for 5 B1 for 16,12,14 B1 for 7,11,15 B1 for 20
	(b)		$\frac{33}{100}$	2	M1 for $\frac{'7'+'11'+'15'}{100}$ A1 for $\frac{33}{100}$ or 0.33, ft provided numerator is less than 100
5			10	2	M1 for $\frac{47}{280} \times 60$ A1 for 10
6	(a)		128.6	2	M1 for $\frac{1260}{980} \times 100$ A1 for 128.5 – 128.6
	(b)		117.4	2	M1 for $\sqrt[3]{114.3 \times 110.2 \times '128.6'}$ A1 For 117.4 – 117.5
	(c)		Correct statement	2	B2 for correct statement, e.g., had the price of gas gone up by 14.3%, 10.2% and 28.6% in 2010, 2011 and 2012, the average annual increase would have been 17.4%. (SC B1 for 17.4% - 17.5% seen)

PAPER: AST30_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)		Histogram	4	M1 for calculating frequency density ratios, eg $^{20}/_{10}$, $^{58}/_{20}$, $^{102}/_{30}$, $^{32}/_{40}$ A2 for four blocks with correct widths and correct heights (A1 for 2 correct) B1 for correct vertical scale or key
	(b)		39.7	3	M1 for $5 \times 20 + 20 \times 58 + 45 \times 102 + 80 \times 32$ (=8410) condone one error M1 (dep M1) for '8410'/212 A1 39.6 – 39.7
8			450 + assumption	3	M1 for e.g. $^{60}/_{n} = {}^{8}/_{60}$ A1 for 450 B1 for correct assumption, e.g., *n* constant or random selection (of ants) or dye not washed
9	(a)(i)		Disadvantage	1	B1 for correct disadvantage e.g. may not be reliable
	(a)(ii)		Continuous	1	B1 for continuous accept quantitative
	(b)		2 comparisons	2	B2 for two correct comparisons from 1. Comparison of skew 2. Comparison of corresponding frequencies/ areas 3. Larger pebbles on beach A oe 4. Comparisons of medians and means 5. Comparison of spread.

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Question		**Working**	**Answer**	**Mark**	**Notes**
10			$\frac{42}{90}$	3	M1 for $\frac{6}{10} \times \frac{5}{9}$ or $\frac{4}{10} \times \frac{3}{9}$ M1 for $\frac{6}{10} \times \frac{5}{9} + \frac{4}{10} \times \frac{3}{9}$ A1 for $\frac{42}{90}$ oe (SC B2 for 0.52 oe)
11	(a)		Reason	3	M1 for (IQR =) 51 – 39 or 12 seen M1 (dep M1) for using LQ – (1.5 × '12') A1 for e.g. 19 < 21 oe
	(b)	See appendix 2	Correct boxplot and outlier	3	M1 for box plot with any one correct value A1 for 3 or 4 correct values A1 for all 5 with outlier correctly shown
12	(a)		310	2	M1 for $\frac{(460+260+210)}{3}$ A1 cao
	(b)		Points plotted at (Sum,287), (Aut,297) and (Spr, 310)	2	M1 for two points plotted correctly at (Sum, 287), (Aut 297) or (SPR, '310') A1 for all three points plotted correctly, (ft fom their (a) throughout)
	(c)		Line of best fit	1	B1 for suitable line of best fit for their points
	(d)(i)		130 - 170	2	M1 for [(330 – est from LOBF)+(390 – est from LOBF) + (460 – est from LOBF)]/3 A1 for 130 – 170
	(d)(ii)	Eg 340+150	470 - 540	2	M1 for 'est from LOBF' + 'their (d)(i)' ('350'+'148') A1 for 470 – 540

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Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)(i)		0.75	1	B1 for 0.75 oe
	(a)(ii)		0.135	1	B1 for 0.135 oe
	(b)		0.5	3	M1 for 0.6 × 0.25 or 0.15 seen M1(dep M1) for '0.15'/0.3 A1 for 0.5 oe
14	(i)		0.0952	3	M1 for finding $\sum d^2$ for at least 5 pairs (must be a difference of ranks) or 76 seen. M1 for 1– $\frac{6\times'76'}{8(8^2-1)}$ A1 for 0.09 – 0.1 accept $\frac{2}{21}$
	(ii)		Interpretation	1	B1 for correct interpretation, e.g. 'little or no correlation' oe
15	(a)		1.625	2	M1 for $\frac{\pm(70-57)}{8}$ A1 for 1.625 accept 1.63
	(b)		Andrew and reason	1	B1 for Andrew and reason e.g. (He was faster as) his standardised score was smaller

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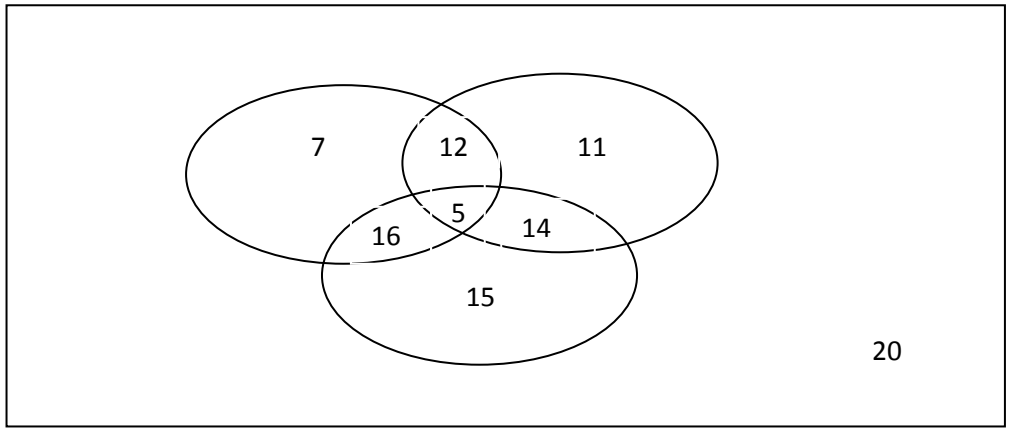
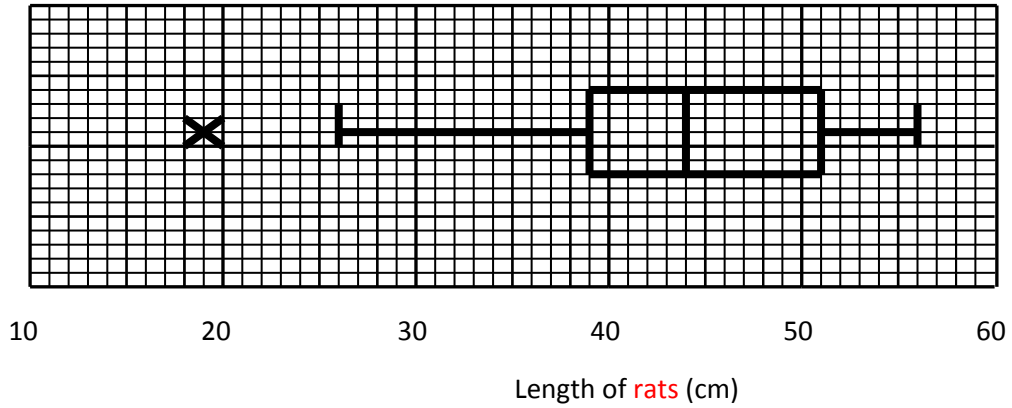
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		0.8944	2	M1 for $\pm\left(\frac{105-90}{12}\right)$ A1or 0.8944 accept 0.894
	(b)		0.0401	3	M1 for $\pm\left(\frac{111-90}{12}\right)$ M1 for $1-P\left(z<\frac{111-90}{12}\right)$ A1 for 0.0401 accept 0.04(0)
17	(a)		0.663	2	M1 for $(1-0.05)^8$ A1 for 0.663 – 0.664
	(b)		0.279	2	M1 for $8\times0.05\times(1\text{-}0.05)^7$ A1 for 0.279-0.28
	(c)		41 or 42	2	M1 for 150 × 'their (b)' or 41.9(0) seen A1 for 41 or 42

PAPER: AST30_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)	$\sum x$ = 23.3 $\sum y$ = 62.2 $\sum xy$ = 215.12	8.08	2	M1 for $'215.12' - \frac{'23.3' \times '62.2'}{7}$ A1 for 8 – 8.1
	(b)		0.83 - 0.84	2	M1 for $\frac{'8.08'}{\sqrt{15.8 \times 5.97}}$ A1 for 0.83 - 0.84
	(c)		Comment	1	B1 for positive correlation or more fertiliser more growth or ft (b) provided – 1 < r < 1

Appendix 1



Appendix 2



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