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Mark Scheme (Results)

Summer 2015

Pearson Edexcel Level 2 Award in Statistical Methods (AST20)

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

Paper: AST20_01

<table>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>1</td><td>(a)</td><td>17 – 12</td><td>5</td><td>2</td><td>M1 for 17 – 12
A1 cao</td></tr>
<tr><td></td><td>(b)</td><td>(12 + 12 + … + 16 + 17) ÷ 15</td><td>14.3</td><td>2</td><td>M1 for (12 + 12 + … + 16 + 17) ÷ 15
A1 for awrt14.3</td></tr>
<tr><td>2</td><td></td><td></td><td>
<table>
<tr><th>Statement</th><th>Discrete</th><th>Continuous</th><th>Categorical</th></tr>
<tr><td>The colour of a car</td><td></td><td></td><td>✓</td></tr>
<tr><td>The number of peas in a pod</td><td>✓</td><td></td><td></td></tr>
<tr><td>The length of a pencil</td><td></td><td>✓</td><td></td></tr>
</table>
</td><td>2</td><td>B2 cao
(B1 for two correct)</td></tr>
<tr><td>3</td><td></td><td></td><td>
<table>
<tr><th></th><th>Gold</th><th>Silver</th><th>Bronze</th></tr>
<tr><td>China</td><td>28</td><td>37</td><td>23</td></tr>
<tr><td>Russian Federation</td><td>24</td><td>26</td><td>32</td></tr>
</table>
</td><td>3</td><td>B3 cao
(B2 for any row or any two columns correct)
(B1 for any correct column)</td></tr>
<tr><td>4</td><td>(a)</td><td></td><td>$\frac{2}{5}$</td><td>1</td><td>B1 for $\frac{2}{5}$ oe</td></tr>
<tr><td></td><td>(b)</td><td>$400 \times \frac{2}{5}$</td><td>160</td><td>2</td><td>M1 for $400 \times$ '$\frac{2}{5}$'
A1 cao</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Any correct reason</td><td>1</td><td>For a correct reason e.g. It could land on green all 20 times.</td></tr>
</table>

Paper: AST20_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)		**Frequency** 4 8 16 10 2	2	B2 for all 5 frequencies correct (B1 for at 3 or 4 correct frequencies)
	(b)		Frequency Polygon	2	M1 for 'frequencies' plotted consistently within interval A1 for 'frequencies' plotted at mid intervals and joined with line segments, ignore line segments drawn outside range of points

Paper: AST20_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		question and response boxes	2	B1 for an appropriate question including suitable time unit e.g How many minutes does it take you to travel to work.
	(b)		reason	1	B1 for at least 3 non-overlapping exhaustive response boxes
	(c)		2 reasons	2	B1 for correct reason, e.g. it is quicker/cheaper/less data to handle B2 for two correct reasons from • for sample not random oe • for sample too small oe • It's only in the morning oe • It's only on a Monday oe • It's only people who use the bus oe • Sample not representative of the population oe (B1 for one correct reason)

Paper: AST20_01

Question		Working	Answer	Mark	Notes
7	(a)			2	B2 for all 9 entries correct (B1 for 6, 7 or 8 entries correct)
	(bi)		$\frac{1}{16}$	3	B1 for $\frac{1}{16}$ oe or ft from their table
	(ii)		$\frac{7}{16}$		M1 for $^{k}/_{16}$, $3 < k < 12$ A1 for $\frac{7}{16}$ oe or ft from their table
8	(a)		0 | 3 5 7 8 1 | 0 2 4 5 6 8 2 | 0 2 3 3 3 | 0 Key 0 | 3 means 3 minutes	3	B1 for correct stem (0, 1, 2, 3) B1 for correct leaves in order B1 for correct key
	(b)		15	1	B1 cao
	(c)	22 – 8	14	2	M1 for '22 – 8' A1 for 14 or ft from their ordered stem and leaf diagram

Spades \ Hearts	Ace (A)	King (K)	Queen (Q)	Jack (J)
Ace (A)	(A, A)	**(A, K)**	**(A, Q)**	**(A, J)**
King (K)	(K, A)	**(K, K)**	**(K, Q)**	**(K, J)**
Queen (Q)	(Q, A)	(Q, K)	**(Q, Q)**	**(Q, J)**
Jack (J)	(J, A)	(J, K)	(J, Q)	**(J, J)**

Paper: AST20_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)		relationship described	1	B1 for a correct description e.g. as the age of the motorcycle increases then the price of the motorcycle decreases. (Allow negative correlation)
	(b)		line drawn	1	B1 for a suitable line of best fit
	(c)		4.2	1	B1 for answer in the range $4 \leq y \leq 4.4$ or ft from their line of best fit
10			Two correct reasons	2	B2 for any two correct reasons from • It's 3D oe e.g Cannot read off the values accurately • No title • The horizontal axis has a year missing • The vertical axis does not start at zero • No label vertical axis • Meaning of top seven cricket batsmen is unclear • What average is meant (B1for any one correct reason)

Paper: AST20_01

Question		Working	Answer	Mark	Notes
11			<table><tr><td></td><td>Read</td><td>Not Read</td><td>Total</td></tr><tr><td>Men</td><td>7</td><td>23</td><td>30</td></tr><tr><td>Women</td><td>27</td><td>9</td><td>36</td></tr><tr><td>Total</td><td>34</td><td>32</td><td>66</td></tr></table>	3	B1 for a table with columns/rows for men and women and columns/rows for read/not read B1 for 23, 27, 30 and 66 in the correct place B1 for 7, 9, 32, 34 and 36 in the correct place
	(b)		line drawn	1	B1 for a suitable line of best fit
	(c)		4.2	1	B1 for answer in the range $4 \leq y \leq 4.4$ or ft from their line of best fit
12	(i)		72.5	3	M1 for a line drawn from 60 from the cumulative frequency axis to the curve and then to the weight axis or a line drawn from 70 or 90 from the weight axis to the curve and then to the cumulative frequency axis A1 for answer in the range 71 to 73 A1 for answer in the range 65 to 69
	(ii)	115 – 48	67		

Paper: AST20_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)	$\frac{2190+2220+2280}{3}$ $\frac{2220+2280+2250}{3}$ $\frac{2280+2250+2280}{3}$	2230, 2250, 2270	2	M1 for adding 3 consecutive numbers and dividing by 3 A1 cao
	(b)	2300×3 – (2250 + 2280)	2370	2	M1 for a fully correct method A1 cao
	(c)		upward	1	B1 for upward oe
14	(a)		$40 < t \leqslant 45$	1	B1 cao
	(b)		$35 < t \leqslant 40$	1	B1 cao
	(c)	(22.5 × 9 + 27.5 × 4 + 32.5 × 4 + 37.5 × 8 + 42.5 × 15) ÷ 40	34.5	4	M1 for $f \times x$ with x consistent within interval (including end points), may be implied by 1380 M1 (dep) for use of mid points M1 (dep on 1st M1) for use of $\Sigma fx \div 40$ A1 cao

Paper: AST20_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15		$\frac{66}{180} \times 30$	11	2	M1 for $\frac{66}{180} \times 30$ A1 cao
16	(a)		Box Plot	3	M1 for a box plot and one correct value plotted A1 for smallest, largest, median and upper quartile plotted correctly A1 156 for lower quartile plotted correctly
	(b)		Outlier	1	B1 for outlier oe
	(c)		3 comparisons	3	B3 for three from • correct comparison of median, e.g. the median for the boys is > than the median for the girls • correct comparison of range or interquartile range, e.g. the IQR for the boys is < than the IQR for the girls • correct comparison of skew, e.g. boys have negative skew and girls have positive skew (B2 for two correct comparisons, B1 for one correct comparison)

Paper: AST20_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17	(a)		Tree diagram drawn with $\frac{3}{5}, \frac{2}{5}, \frac{5}{8}, \frac{3}{8}, \frac{5}{8}, \frac{3}{8}$ on branches labelled black and not black	3	M1 for at least 2 branches drawn labelled black and not black. A2 for all 6 probabilities in the correct place (A1 for 4 or 5 probabilities in the correct place)
	(b)	$\frac{3}{5} \times \frac{5}{8}$	$\frac{15}{40}$	2	M1 for '$\frac{3}{5} \times \frac{5}{8}$, A1 for $\frac{15}{40}$ oe
	(c)	$\frac{3}{5} \times \frac{3}{8} + \frac{2}{5} \times \frac{5}{8}$	$\frac{19}{40}$	3	M1 for either '$\frac{3}{5} \times \frac{3}{8}$ *or* $\frac{2}{5} \times \frac{5}{8}$, M1 for '$\frac{3}{5} \times \frac{3}{8} + \frac{2}{5} \times \frac{5}{8}$, A1 for $\frac{19}{40}$ oe
18		(105 × 40 + 85 × 20)÷60	98.33	3	M1 for either 105 × 40 (=4200) or 85 × 20 (=1700) M1 for (105 × 40 + 85 × 20)÷60 Can be implied by 5900 ÷ 60 A1 cao
19	(a)	$\frac{3450}{230}$	15	2	M1 for $\frac{3450}{230}$ A1 cao
	(b)	$\sqrt{\frac{841250}{15} - 230^2}$	56.42	3	M1 for 841250÷'15' (=56083.33…) M1 for $\frac{841250}{'15'} - 230^2$ A1 awrt 56.4

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