Pearson
Edexcel

Mark Scheme (Results)

January 2020

Pearson Edexcel Award
In Statistical Methods (AST20)
Paper 1

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NOTES ON MARKING PRINCIPLES

1 Types of mark

M marks: method marks
A marks: accuracy marks
B marks: unconditional accuracy marks (independent of M marks)

2 Abbreviations

cao – correct answer only
isw – ignore subsequent working
oe – or equivalent (and appropriate)
indep – independent
ft – follow through
SC: special case
dep – dependent

3 No working

If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

5 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.

6 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 cancelling 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.

7 Parts of questions

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

8 Use of ranges for answers

If an answer is within a range this is inclusive, unless otherwise stated.

9 Probability

Probability answers must be given as 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.

PAPER: AST20_01

Question	Working	Answer	Mark	Notes
1 (a)		w | Frequency $110 < w \leqslant 115$ | 8 $115 < w \leqslant 120$ | 5 $120 < w \leqslant 125$ | 6 $125 < w \leqslant 130$ | 9 $130 < w \leqslant 135$ | 2	3	B1 for class intervals $115 < w \leqslant 120$, $120 < w \leqslant 125$, $125 < w \leqslant 130$, $130 < w \leqslant 135$ B2 for 5, 6, 9, 2 correct tallies/frequencies **or** ft their class intervals (B1 for 2 **or** 3 correct tallies/frequencies **or** ft their class intervals)
(b)		$125 < w \leqslant 130$	1	B1 for $125 < w \leqslant 130$ or ft their class intervals
2 (a)		BOX A / BOX B: R, W, Y, G R: (R, R) (R, W) (R, Y) (R, G) Y: (Y, R) (Y, W) (Y, Y) (Y, G) W: (W, R) (W, W) (W, Y) (W, G)	3	M1 for sample space diagram labelled red, yellow and white for box A **and** red, white, yellow and green for box B A2 for all 12 correct combinations (A1 for 9 **or** 10 **or** 11 correct)
(b)(i)		$\frac{1}{12}$	1	B1 for $\frac{1}{12}$ oe
(ii)		$\frac{3}{12}$	2	M1 for $\frac{a}{12}$ $a < 12$ **or** $\frac{3}{b}$ $b > 3$ (ft part (a)) A1 for $\frac{3}{12}$ oe
(iii)		$\frac{9}{12}$	2	M1 for 1 – (ii) A1 for $\frac{9}{12}$ oe

<table>
<tr><th colspan="5">PAPER: AST20_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>Correct explanation</td><td>1</td><td>B1 for a correct explanation e.g. expect to get 10 tails oe</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Correct explanation</td><td>1</td><td>B1 for a correct explanation e.g. not enough spins to be reliable oe</td></tr>
<tr><td>4</td><td></td><td>$\frac{740}{900}\times 50$</td><td>41</td><td>2</td><td>M1 for $\frac{740}{900}\times 50$
(may be implied by an answer of 41.1)
A1 cao</td></tr>
<tr><td>5</td><td></td><td></td><td><table><tr><td></td><td>C</td><td>T</td><td>HC</td><td>T</td></tr><tr><td>M</td><td>8</td><td>7</td><td>5</td><td>20</td></tr><tr><td>F</td><td>10</td><td>6</td><td>4</td><td>20</td></tr><tr><td>T</td><td>18</td><td>13</td><td>9</td><td>40</td></tr></table></td><td>4</td><td>M1 for column/row labelled male, female and total and column/row labelled coffee, tea, hot chocolate and total
A3 for all rows and columns correct
(A2 for 2 rows or 3 columns correct)
(A1 for 1 row or 2 columns correct)
NB Fully correct but with totals missing is SC B2</td></tr>
<tr><td>6</td><td>(a)</td><td></td><td>Suitable question with response boxes</td><td>2</td><td>B1 for appropriate question + time frame (may appear with answer boxes) e.g. How many take away do you eat each week?
B1 for at least 3 non-overlapping answer boxes</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Advantage</td><td>1</td><td>B1 for a correct advantage e.g. quicker, cheaper, less data to handle oe</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Correct reason</td><td>1</td><td>B1 for a correct reason e.g. biased, only 10 people, only teachers at her school oe</td></tr>
</table>

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<tr><th>Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>7</td><td>$\frac{56}{300} \times 360$</td><td>67</td><td>2</td><td>M1 for $\frac{56}{300} \times 360$ (may be implied by an answer of 67.2)
A1 cao</td></tr>
<tr><td>8</td><td></td><td><table><tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr><tr><td>20</td><td>24</td><td>30</td><td>10</td><td>16</td></tr></table></td><td>3</td><td>B3 cao
(B2 for 4 correct values)
(B1 for 2 or 3 correct values)</td></tr>
<tr><td>9</td><td></td><td>2 correct statements</td><td>2</td><td>B2 for 2 correct statements from
• Quarter 2 is repeated in 2018/Quarter 3 is missing in 2018
• Quarter 1 2019 has not been plotted
• No title
(B1 for 1 correct reason)</td></tr>
<tr><td>10 (a)</td><td></td><td>Correct box plot drawn</td><td>4</td><td>B1 for median (1.5) identified
B1 for quartiles (1.2 and 1.8) identified
M1 for box plot with at least one correct value from 0.7, 1.2, 1.5. 1.8, 2.3
A1 cao</td></tr>
<tr><td>(b)</td><td></td><td>Symmetrical</td><td>1</td><td>B1 for symmetrical/no skew oe (ft part (a))</td></tr>
<tr><td>11 (i)</td><td></td><td>73</td><td>1</td><td>B1 for 73</td></tr>
<tr><td>(ii)</td><td>80 – 65</td><td>15</td><td>2</td><td>M1 for 80 or 65 identified
A1 for 15</td></tr>
</table>

PAPER: AST20_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
12 (a)		0 | 2 4 4 5 6 7 8 8 9 9 1 | 0 1 2 2 3 5 5 6 7 8 8 9 2 | 1 2 3 5 3 | 0 Key: 0 | 2 represents 2 minutes	3	B2 cao (B1 for unordered diagram **or** ordered diagram with no more than 2 errors or omissions) B1 for correct key
(b)		12	1	B1 for 12 **or** ft an ordered stem and leaf diagram
(c)		10	2	M1 for 18 – 8 **or** 18 **and** 8 identified **or** ft an ordered stem and leaf diagram A1 for 10 **or** ft an ordered stem and leaf diagram
13 (a)		$\frac{4}{10}, \frac{6}{10}$ & $\frac{3}{7}, \frac{4}{7}, \frac{3}{7}, \frac{4}{7}$	2	B1 for $\frac{4}{10}$, $\frac{6}{10}$ in the correct place B1 for $\frac{3}{7}$, $\frac{4}{7}$, $\frac{3}{7}$, $\frac{4}{7}$ in the correct places
(b)(i)	$\frac{4}{10} \times \frac{3}{7}$	$\frac{12}{70}$	2	M1 for '$(\frac{4}{10})$' × '$(\frac{3}{7})$' A1 for $\frac{12}{70}$ oe
(ii)	$1 - (\frac{12}{70})$	$\frac{58}{70}$	2	M1 for 1 – '$(\frac{12}{70})$' or '$(\frac{4}{10})$' × '$(\frac{4}{7})$' + '$(\frac{6}{10})$' × '$(\frac{3}{7})$' + '$(\frac{6}{10})$' × '$(\frac{4}{7})$' A1 for $\frac{58}{70}$ oe

PAPER: AST20_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)		Correct relationship	1	B1 for as length of leaves increase the width of leaves increase (accept positive correlation)
	(b)	$\frac{22}{8}$ $\frac{20}{8}$	(2.75, 2.5)	2	M1 for $\frac{22}{8}$ **or** $\frac{20}{8}$ (may be implied by one correct answer) A1 for (2.75, 2.5) or (2.8, 2.5)
	(c)(i)		Point plotted	1	B1 ft for the mean point plotted ft part (b)
	(ii)		Sensible line of best fit	1	B1 for a sensible line of best fit
	(d)		3.6	1	B1 for answers in the range 3.3 – 3.9
15	(a)	(8 + 12 + 22 + 9) ÷ 4 (12 + 22 + 9 +7) ÷ 4	12.75 12.5	2	M1 for (8 + 12 + 22 + 9) ÷ 4 **or** (12 + 22 + 9 +7) ÷ 4 (may be implied by one correct answer) A1 cao
	(b)		Downward	1	B1 for downward oe

PAPER: AST20_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$(2.7 + \ldots + 1.5) \div 8$	2.4	2	M1 for $(2.7 + \ldots + 1.5) \div 8$ A1 cao
	(b)	$\sqrt{\frac{49.88}{8} - 2.4^2}$	0.689	2	M1 for $\sqrt{\frac{49.88}{8} - 2.4^2}$ ft part (a) A1 for 0.689
	(c)		Correct comparisons	2	B1 for a correct comparison of means ft part (a) e.g. the mean for Wednesday > the mean for Thursday B1 for a correct comparison of standard deviation ft part (b) e.g. the standard deviation for Wednesday > the standard deviation for Thursday
	(d)		16.5	1	B1 cao
17	(a)		Continuous	1	B1 for continuous (accept quantitative, numerical)
	(b)		$25 < w \leqslant 30$	1	B1 cao
	(c)	$(22.5 \times 12 + \ldots + 42.5 \times 3) \div 48$	29.6	4	M1 for $\sum fx$ (x consistent within interval) M1 for $\sum fx$ (=1420) must use mid points M1 dep on previous M1 for '$\sum fx$' ÷ 48 A1 for 29.5 – 29.6

PAPER: AST20_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
18 (a)	$(\frac{23.70}{20.80}) \times 100$	113.9	2	M1 for $(\frac{23.70}{20.80}) \times 100$ A1 for 113.9 (allow 114 if correct method is shown)
(b)		Correct interpretation and comparison	2	B1 for Michael's fare has increased by 13.9% **and** Kate's fare has increased by 8.5% B1 for Michael's fare has increased by a greater percentage
19	(10 × 163 + 15 × 177) ÷ 25	171.4	3	M1 for 10 × 163 (= 1630) **or** 15 × 177 (= 2655) (may be implied by 4285) M1 for (10 × 163 + 15 × 177) ÷ 25 A1 for 171.4 **or** 171 with correct working

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