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Mark Scheme (Results)

January 2018

Pearson Edexcel Level 2 Award
In Statistical Methods (AST20)

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

<table>
<tr><th colspan="5">PAPER: AST20_01</th></tr>
<tr><th>Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>1 (a)</td><td></td><td>10, 6
5
19, 45
46, 51</td><td>3</td><td>B3 cao
(B2 for 6 or 10 or 19 or 46 correct)
(B1 for 5 or 51 or 45 correct)</td></tr>
<tr><td>(b)</td><td></td><td>$\frac{43}{120}$</td><td>1</td><td>B1 for $\frac{43}{120}$ oe</td></tr>
<tr><td>2</td><td></td><td>
<table>
<tr><th>Statement</th><th>Categorical</th><th>Continuous</th><th>Discrete</th></tr>
<tr><td>The number of books</td><td></td><td></td><td>✓</td></tr>
<tr><td>The colour of a contact lens</td><td>✓</td><td></td><td></td></tr>
<tr><td>The height of a tower</td><td></td><td>✓</td><td></td></tr>
</table>
</td><td>2</td><td>B2 for discrete, categorical and continuous
(B1 for discrete or categorical or continuous</td></tr>
</table>

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Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)		63	1	B1 cao
	(b)		14	2	M1 for correctly ordering the number of minutes A1 cao
	(c)	22 – 6	16	2	M1 for 22 and 6 seen together or ft for 22 – *k* or *k* – 6 A1 cao
4	(a)		As the engine size increases the number of miles decreases	1	B1 for a correct statement or converse Condone negative correlation
	(b)		LOBF	1	B1 for suitable LOBF
	(c)		22 – 26	1	B1 for 22 – 26 or ft their LOBF provided it is a negative gradient
5	(a)	0.29 + 0.15	0.44	2	M1 for 0.29 + 0.15 A1 for 0.44 oe
	(b)	(1 – 0.44) ÷ 2	0.28	3	M1 for 1 – "0.44" M1 for (1 – "0.44") ÷ 2 A1 for 0.28 oe

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Question	**Working**	**Answer**	**Mark**	**Notes**
6 (a)		Question and suitable response boxes	2	B2 for suitable question with at least 3 non-overlapping response boxes with a time frame (B1 for suitable question or at least 3 non-overlapping response boxes)
(b)		Correct reason	1	B1 for correct reason from Quicker/cheaper/easier/less data to handle
(c)		Correct reason	1	B1 for a correct reason from Sample not random Sample too small It's only the students entering the library Sample not representative of the population Only Monday morning or only morning
7 (a)		Correct reason	1	B1 for a correct reason that implies that theoretical probability is different to experimental probability. eg it could land on green 30 times.
(b)		70	2	M1 for $\frac{2}{6} \times 210$ oe A1 for cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
8 (a)		$50 < w \leq 60$	1	B1 for cao
(b)		6, 28, 57, 98, 121	1	B1 for cao
(c)		(30, 6), (40, 28),(50, 57),(60, 98), (70, 121), (80, 130) with curve or line segments	2	M1 for points plotted consistently in each interval and joined with a curve or line segments ft part (b) allow one arithmetical error A1 cao
(d)		51-52	1	B1 for 51-52 or ft from their sensible CF graph
(e)		17-21	2	M1 for line drawn at 65 A1 for 17-21 or ft from their sensible CF graph

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Question	**Working**	**Answer**	**Mark**	**Notes**
9 (a)		Correct frequency polygon	2	M1 for all points plotted to the correct heights consistent with the interval **and** joined up with line segments. A1 cao (Ignore any line drawn outside of the data range or any bars drawn) (SC B1 for a fully correct frequency polygon but first point joined to the last point to make a polygon)
(b)	$3 \times 30 = 90$	$6 < w \leq 12$	1	B1 for cao
(c)	$9 \times 11 = 99$ $15 \times 23 = 345$ $21 \times 12 = 252$ $27 \times 4 = 108$ Total = 894 $894 \div 80 = 11.175$	11.2	4	M1 for fx with x consistent within intervals (including end points) condone one error in multiplication M1 for use of midpoints condone one error M1 (dep on first M1) for use of $\sum fx \div 80$ A1 for 11.1 – 11.2

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Question	Working	Answer	Mark	Notes
10 (a)	$\frac{11000}{10600} \times 100$	103.8	2	M1 for $\frac{11000}{10600} \times 100$ A1 for awrt 103.8
(b)		decrease of 36.3%	2	B2 for decrease of 36.3% or it is 63.7% of the previous year (B1 for decrease or 36.3%)
11	(1 × 16 + 3 × 14 + 5 × 17 + 7 × 13) ÷ 60	3.9	3	M1 for $\sum fx$ (may be implied by 234) M1 for $\sum fx \div 60$ A1 for 3.9
12 (a)		Positive	1	B1 for positive
(b)		Correct box plot drawn	2	M1 for box plot with 3 correct values plotted A1 for cao
(c)	<table><tr><td></td><td>Boys</td><td>Girls</td></tr><tr><td>Med</td><td>49</td><td>53</td></tr><tr><td>Range/ IQR</td><td>45/20</td><td>32/15</td></tr><tr><td>Skew</td><td>positive</td><td>negative</td></tr></table>	2 correct aspects	2	B2 for two correct comparisons from 1. Median for girls > Median for boys 2. Range for boys > Range for girls OR IQR for boys > IQR for girls 3. Boys positive skew AND girls negative skew ft part (a) and part (b) (B1 for 1 correct comparison)

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Question	**Working**	**Answer**	**Mark**	**Notes**
13		2 correct aspects	2	B2 for 2 correct aspects from 1. No key 2. No title 3. Line is not straight oe 4. Intersection of 4 lines is not at the centre of the circle oe (B1 for one correct aspect)
14 (a)		78 and 85	2	M1 for $\frac{53+82+99}{3}$ or $\frac{82+99+74}{3}$ A1 for 78 and 85
(b)(i)		Points plotted at (Feb,61), (Mar,70), (Apr,78) and (May, 85)	2	M1 for at least two points plotted at (Feb,61) or (Mar,70) or (Apr,78) ft or (May, 85) ft A1 cao
(ii)		Upwards	1	B1 for upwards oe

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Question	Working	Answer	Mark	Notes
15 (a)		<table><tr><td colspan="2"></td><td colspan="4">Second bag</td></tr><tr><td colspan="2"></td><td>blue</td><td>green</td><td>red</td><td>yellow</td></tr><tr><td rowspan="3">First bag</td><td>blue</td><td>(b, b)</td><td>(b, g)</td><td>(b, r)</td><td>(b, y)</td></tr><tr><td>pink</td><td>(p, b)</td><td>(p, g)</td><td>(p, r)</td><td>(p, y)</td></tr><tr><td>yellow</td><td>(y, b)</td><td>(y, g)</td><td>(y, r)</td><td>(y, y)</td></tr></table>	2	B2 for all 7 entries correct (B1 for 4 or 5 or 6 entries correct)
(b)		$\frac{2}{12}$	2	M1 for $\frac{k}{12}$ where $0 < k < 12$ A1 for $\frac{2}{12}$ oe or ft from their table
16	$\frac{(27\times14.75)+(33\times15.65)}{60}$ $\frac{398.25+516.45}{60}$ $\frac{914.7}{60}$	15.245	3	M1 for 27×14.75 (= 398.25) or 33×15.65 (= 516.45) or 914.7 M1 for $\frac{"398.25+516.45"}{60}$ or $914.7 \div 60$ A1 for 15.24 or 15.25 or 15.245
17 (a)		Complete probability tree diagram	2	B1 for correct probabilities on first counter branches (0.7, 0.3) oe B1 for correct probabilities on second counter branches (0.7, 0.3) and (0.3, 0.7) oe
(b)	$(0.7 \times 0.3) + (0.3 \times 0.7) = 0.42$	0.42	3	M1 for '0.7' × '0.3' or '0.3' × '0.7' oe M1 for '0.7' × '0.3' + '0.3' × '0.7' oe A1 0.42 oe

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Question	**Working**	**Answer**	**Mark**	**Notes**
18	$\frac{38}{160} \times 55$	13	2	M1 for $\frac{38}{160} \times 55$ oe A1 for 13
19	Mean = 1590 ÷ 60 Var = (42748 ÷ 60) – (1590 ÷ 60)^2 SD = 3.20	3.19 – 3.2(0)	3	M1 for 1590 ÷ 60 (= 26.5) M1 for (42748 ÷ 60) – (“26.5”)^2 A1 for 3.19 – 3.2(0)
20 (a)		36 and 29	2	M1 for 3.6 × 10 or 2.9 × 10 or 10 squares = 1 oe A1 for 36 and 29
(b)	25 ÷ 10 = 2.5 14 ÷ 10 = 1.4	Correct histogram	2	M1 for calculating frequency density eg 25/10, 14/10 oe A1 for two blocks with correct widths and correct heights

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