

Mark Scheme (Results)

January 2014

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

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 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.

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: AST20_01				
Question	Working	Answer	Mark	Notes
1	weight of a dog → continuous number of eggs → discrete colour of a person's hair → categorical	types identified	2	B2 all 3 correct (B1 for 2 correctly identified)
2	(a)	2, 3, 8, 7, 3, 2	3	M1 for using tallies A1 for 3, 4 or 5 correct tallies or frequencies A1 for 6 correct tallies or 6 correct frequencies
	(b)	$25 < y \leq 30$	1	B1 for $25 < y \leq 30$ or ft from (a)
3		Correct Reasons	2	B2 for two correct reasons from <ul style="list-style-type: none"> the y axis does not start at 0 the y axis does not go up in equal amounts/70% is missing Joining the points with a straight line suggests linear increases oe (B1 for one correct reason)
4	(a)	20, 66, 14	3	B3 cao (B2 for any 2 correct, total need not equal 100%) (B1 for any one correct) (condone any missing % signs)
	(b)	complete bar chart	3	M1 for one correct partition A1 for all partitions correct B1 for correct shading for their partitions

PAPER: AST20_01					
Question	Working	Answer	Mark	Notes	
5	(a)	$1 - (0.15 + 0.25 + 0.1 + 0.2 + 0.15)$	0.15	2	M1 for $0.15 + 0.25 + 0.1 + 0.2 + 0.15$ or 0.85 seen A1 0.15 oe
	(b)	$0.15 + 0.1 + 0.15$	0.4	2	M1 for $0.15 + 0.1 + 0.15$ A1 0.4 oe
	(c)	0.2×300	60	2	M1 for 0.2×300 oe A1 cao
	(d)		Comparison	1	B1 for a correct comparison eg the biased dice will land on more 4s than the fair dice
6	(a)		complete diagram	2	B2 for fully correct entries, condone missing brackets (B1 for 6, 7 or 8 correct entries)
	(b)		$\frac{1}{12}$	1	B1 for $\frac{1}{12}$ oe
7	(a)		Reason	1	B1 for correct reason, eg testing the population destroys all the candles
	(b)		2 reasons	2	B2 for two correct reasons from <ul style="list-style-type: none"> • for sample not random oe • for sample too small oe • it is too late to change anything for that day • should test candles throughout the day

PAPER: AST20_01

Question		Working	Answer	Mark	Notes
8	(a)		2 things wrong	2	B2 for two correct features from: <ul style="list-style-type: none"> • there is no reference to a time frame e.g. per day/per week • the boxes overlap e.g. 10/20/30 appear in 2 boxes • the response boxes are not exhaustive e.g. there is no option for 0 or more than 40 (Do not allow no option for 0 and no option for more than 40 as 2 things wrong) (B1 for one correct feature)
	(b)		question and response boxes	2	B1 for an appropriate question with reference to a suitable time period e.g. How much time do you spend making phone calls on your mobile phone per day/week/month B1 for at least 3 non-overlapping exhaustive response boxes
9	(a)		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
	(b)		$30 < m \leq 40$	1	B1 cao
10	(a)	$21/2 = 10.5$ therefore the median is the 10th and 11th value.	2	2	M1 for 10th/11th value needed or $21/2 = (10.5)$ A1 cao
	(b)		3	1	B1 cao
	(c)	$(1 \times 9 + 2 \times 3 + 3 \times 5 + 4 \times 3) \div 20$	2.1	3	M1 for $f \times x$ (may be implied by 42) M1 for $\Sigma fx \div 20$ A1 for 2.1 oe

PAPER: AST20_01

Question		Working	Answer	Mark	Notes
11	(a)		outlier	1	B1 for outlier or accept rogue value, anomaly, exceptional value etc
	(b)		relationship stated	1	B1 for correct relationship, eg the higher the science mark the higher the maths mark or, accept positive correlation
	(c)		line of best fit	1	B1 for a suitable line of best fit
	(d)		32 – 38	1	B1 for answer between 32 and 38 inclusive or fit from their line of best fit
12	(a)(i)		167	1	B1 cao
	(a)(ii)		152	1	B1 cao
	(a)(iii)		177	1	B1 cao
	(b)		box plot	3	M1 for a box plot and one correct value plotted A1 for 3 or 4 correct values plotted A1 for 5 correct values plotted (follow through from (a) throughout)
	(c)		negative skew	1	B1 for negative (skew) or follow through from their box plot

PAPER: AST20_01					
Question		Working	Answer	Mark	Notes
13	(a)	$\frac{88000}{80000} \times 100$	110	2	M1 for $\frac{88000}{80000} \times 100$ oe A1 cao
	(b)		eg the value of a house in Ockenden increased by a greater percentage (with at least one percentage)	2	B1 for (Ockenden increased by) 10% or (Tilbury increased by) 8.5% or (Ockenden has increased by) 1.5% more B1 for eg Ockenden had the biggest percentage increase NB Do not allow comments about the price of a house
14	(a)	$\frac{255 + 309 + 285 + 243}{4}$ $\frac{309 + 285 + 243 + 294}{4}$ $\frac{285 + 243 + 294 + 330}{4}$	273, 282.75, 288	2	M1 for adding four consecutive numbers and dividing by 4 (maybe implied one correct moving average) A1 for 273, 282.75, 288
	(b)		upwards	1	B1 for upwards oe
15		$(5 \times 13 + 15 \times 12 + 25 \times 7 + 35 \times 3 + 45 \times 1) \div 36$	15.833...	4	M1 for $f \times x$ with x consistent within interval (including end points), may be implied by 570 M1 (dep) for use of mid points M1 (dep on 1 st M1) for use of $\Sigma fx \div 36$ A1 for answer in the range 15.8 – 16

PAPER: AST20_01				
Question	Working	Answer	Mark	Notes
16	(a)	$\frac{2}{5}, \frac{5}{7}, \frac{2}{7}$ and $\frac{5}{7}$	2	B2 for all 4 correct probabilities on correct branches (B1 for 2 or 3 correct probabilities on correct branches)
	(b)	$\frac{3}{5} \times \frac{5}{7}$	2	M1 for $\frac{3}{5} \times \frac{5}{7}$ A1 for $\frac{15}{35}$ oe
	(c)	$\frac{3}{5} \times \frac{2}{7} + \frac{2}{5} \times \frac{5}{7}$	2	M1 for $\frac{3}{5} \times \frac{2}{7} + \frac{2}{5} \times \frac{5}{7}$ A1 for $\frac{16}{35}$ oe
17		$\frac{195}{650} \times 50$	2	M1 for a correct method, eg $\frac{195}{650} \times 50$ A1 cao
18		3 comparisons	3	B3 for three from <ul style="list-style-type: none"> • correct comparison of a point, eg medians, largest values • correct comparison of spread, eg range, interquartile range • correct comparison of skew (B2 for two correct comparisons, B1 for one correct comparison)
19		mean = $240 \div 20 = 12$ (variance =) $3000 \div 20 - 12^2$ = 6 sd = $\sqrt{6}$	3	M1 for $240 \div 20 (= 12)$ and $3000 \div 20 (=150)$ M1 for $3000 \div 20 - (240 \div 20)^2$ A1 for answer between 2.44 – 2.45 accept $\sqrt{6}$

PAPER: AST20_01				
Question	Working	Answer	Mark	Notes
20	$\Sigma x = 328 \quad \Sigma y = 58$ $\frac{328 - 58}{6}$	45	4	M1 for either $8 \times 41 (=328)$ or $2 \times 29 (=58)$ M1 for both $8 \times 41 (=328)$ and $2 \times 29 (=58)$ M1 (dep on 1 st M1) $\frac{328 - 58}{6}$ A1 cao

