

Mark Scheme (Results)

Summer 2013

Edexcel Level 2 Award (AST20)
Statistical Methods

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

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	(a)		discrete	1	B1 cao
	(b)		categorical	1	B1 cao
2	(a)		19, 13	2	B2 cao (B1 for 19 or 13)
	(b)		Composite bar chart	2	B2 for correct composite bar chart with correct shading (B1 for 65 or 36 marked or correct shading in the correct order)
3	(a)		negative (correlation)	1	B1 cao
	(b)(i)		point + lobf	2	B1 for (44 500, 7400) plotted
	(ii)				B1 for line drawn
	(c)		46 000 – 50 000	1	B1 for 46 000 – 50 000 or ft their line of best fit
4	(a)	$0.10 + 0.35$	0.45	1	B1 for 0.45 oe
	(b)	$1 - 0.25$	0.75	2	M1 for $1 - 0.25$ A1 for 0.75 oe
	(c)	$1 - (0.25 + 0.10 + 0.35)$	0.3	2	M1 for $1 - (0.25 + 0.10 + 0.35)$ or ft '0.8' – 0.15 – 0.25 A1 for 0.3 oe

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Question		Working	Answer	Mark	Notes
5	(a)		$20 < t \leq 30$	1	B1 for $20 < t \leq 30$ oe
	(b)	$(4 \times 5) + (7 \times 15) + (9 \times 25) + (5 \times 35)$ $= 525$ $\frac{525}{25}$	21	4	M1 for using a value of x consistently in each interval M1 for $(4 \times 5) + (7 \times 15) + (9 \times 25) + (5 \times 35)$ or 525 M1 for $\frac{[(4 \times 5) + (7 \times 15) + (9 \times 25) + (5 \times 35)]}{25}$ A1 cao
	(c)		(5,4), (15,7), (25,9), (35,5) joined with line segments	2	B2 for fully correct frequency polygon. Points plotted at mid points (B1 for all points plotted accurately not joined or one error or one omission in plotting but joined or all points plotted accurately and joined with first joined to last or all points at the correct heights and consistently within or at ends of interval and joined- can include joining last to first to make a polygon
6	(a)		$0 \mid 5 \ 8$ $1 \mid 1 \ 2 \ 4 \ 7 \ 9$ $2 \mid 1 \ 3 \ 5 \ 5 \ 5 \ 7$ $3 \mid 0 \ 3$ Key: $0 \mid 5$ represents 5	3	M1 for ordered stem and leaf diagram condone one error or omission or for correct unordered stem and leaf diagram A1 cao B1 for key, eg $0 \mid 5$ represents 5
	(b)		21	1	B1 for 21 or ft (a)
	(c)	25 – 12	13	2	M1 for 25 – 12 or 12 to 25 oe or ft (a) A1 cao

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Question		Working	Answer	Mark	Notes
7		$\frac{3}{7} \times 140$	60	3	M2 for $\frac{3}{7} \times 140$ (M1 for $p \times 140, p < 1$ or $\frac{3}{7} \times N$) A1 cao
8			10.5 + reason	1	B1 for 10.5 with reason, eg unusually large or not typical, oe
9			3 reasons	3	B3 for 3 correct aspects (B2 for 2 correct aspects B1 for 1 correct aspect) from: 1. error in vertical scale 2. 3D misrepresents visually 3. 0 omitted 4. different shapes/widths used
10	(a)		0.8, 0.2 0.4, 0.6 0.4, 0.6	3	B3 cao (B2 for 4 correct B1 for 2 correct or 0.4 and 0.6 or 0.2 and 0.8 in two adjoining branches)
	(b)	0.8×0.4	0.32	2	M1 for 0.8×0.4 or ft 'tree diagram' A1 for 0.32 oe
	(c)	$0.8 \times 0.6 + 0.2 \times 0.4$	0.56	2	M1 for $0.8 \times 0.6 + 0.2 \times 0.4$ or ft 'tree diagram' A1 for 0.56 oe

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Question		Working	Answer	Mark	Notes
11		$\frac{278}{236} \times 100$	117.8	2	M1 for $\frac{278}{236} \times 100$ A1 for 117–118
12	(a)		box plot	3	B3 for box plot with: 1. correct whiskers 2. correct median 3. correct quartiles (B2 for 2 correct, B1 for 1 correct)
	(b)		3 comparisons	3	B3 for 3 from 1. correct comparison of a point, eg medians, largest values 2. correct comparison of spread, eg interquartile range 3. correct comparison of skew B2 for 2 correct comparisons, B1 for 1 correct comparison)

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Question		Working	Answer	Mark	Notes
13	(a)	$\frac{(290+193+309+292)}{4}$ $\frac{(193+309+292+202)}{4}$	271, 249	2	M1 for $\frac{(290+193+309+292)}{4}$ (=271) or $\frac{(193+309+292+202)}{4}$ (=249) may be implied by one correct answer A1 cao
	(b)		(2.5, 319), (3.5, 302), (4.5, 291), (5.5, 271), (6.5, 249)	2	M1 for 'moving averages' plotted consistently condone one error A1 cao
	(c)		downwards trend	1	B1 for downwards (trend) oe or number of people staying is decreasing oe
14	(a)		(2, 2), (2, 3), (2, 4), (2, 5) (3, 2), (3, 3), (3, 4), (3, 5) (4, 2), (4, 3), (4, 4), (4, 5)	2	M1 for one correct row or column A1 cao
	(b)		$\frac{3}{20}$	2	M1 for $\frac{a}{20}$ for $a < 20$ or $\frac{3}{b}$ for $b > 3$ A1 for $\frac{3}{20}$ oe

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Question		Working	Answer	Mark	Notes
15	(a)		advantage	1	B1 for correct advantage, eg cheaper, quicker, easier, less data
	(b)		question	2	B1 for a suitable question with time interval, eg month B1 for at least 3 non overlapping exhaustive intervals (time period may appear with response boxes)
	(c)		two reason	2	B2 for two correct reasons, eg all girls all similar age not independent all come from the same school bias all from same class sample too small (B1 for one correct reason)
16		$12.5 \times 4 + 14 = 64$ $\frac{64}{5}$	12.8	3	M1 for 12.5×4 M1 for $\frac{(12.5 \times 4 + 14)}{5}$ A1 cao

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Question		Working	Answer	Mark	Notes
17	(a)		$50 < h \leq 100$	1	B1 for $50 < h \leq 100$ oe
	(b)	(9), 23, 35, 45, 50	23, 35, 45, 50	1	B1 for cao
	(c)		(50,9), (100,23), (150,35), (200,45), (250,50) with curve or line segments	2	M1 for points plotted consistently in each interval and joined with a curve or line segments ft part (c) A1 cao
	(d)(i)		110	3	B1 for 105 – 115 or ft from their sensible cumulative frequency graph
	(ii)		100		M1 for lines drawn at 12.5 and 37.5 (± 1 square) A1 for 90 – 110 or ft from their sensible cumulative frequency graph
18		$\frac{286}{(79 + 436 + 286 + 178)} \times 50$ $= \frac{286}{979} \times 50$	15	2	M1 for $\frac{286}{979} \times 50$ A1 for 14 or 15
19		$\frac{60}{6} = 10$	Gets many more 6s than expected	1	B1 for correct reason, eg gets many more 6s than expected or frequencies are very different or 1 recorded only 4 times oe

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Question		Working	Answer	Mark	Notes
20		$\sum x = 17.32$ $\sum x^2 = 61.781$ $\sqrt{(61.781 \div 5 - (17.32 \div 5)^2)}$ $= \sqrt{0.356904}$	0.597	3	B3 for 0.59 – 0.6 (B2 for (variance =) 0.35(69...)) B1 for ($\sum x^2 =$) 61.7(81))

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