Pearson

Mark Scheme (Results)

January 2018

Pearson Edexcel Level 3 Award
In Statistical Methods (AST30)

edexcel

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

January 2018
Publications Code AST30_01_1801_MS

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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: AST30_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
1 (a)		$\frac{2}{12}$	1	B1 for $\frac{2}{12}$ oe
(b)	$\frac{1}{12} \times 60$	5	2	M1 for $\frac{1}{12} \times 60$ A1 cao
2 (a) (i)		Correct definition	2	B1 for Values/observations that can be sorted into categories oe
(ii)		Correct definition		B1 for Numerical observations/measurements oe
(b)		Advantage for data collected by him	2	B1 for You know how the data were obtained/Accuracy is known oe
		Advantage for data collected on the internet		B1 for Easy/Cheap/Quicker to obtain oe
(c) (i)		Advantage of sampling	2	B1 for Cheaper/Less time consuming/Less data to handle
(ii)		Population described		B1 for **ALL** new cars sold in the UK in the last 12 months

PAPER: AST30_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
3 (a)	$x = \frac{60}{9} \times 30$	200	2	M1 for $30:n = 9:60$ oe A1 cao
(b)		Correct assumption	1	B1 for population not changed oe **or** the paint has not come off oe **or** snails have an equal chance of being selected oe
4 (a)		$\frac{3}{8}$ and $\frac{5}{8}$ correct on branches	2	B1 for $\frac{3}{8}$ **and** $\frac{5}{8}$ correct on first branch oe B1 for $\frac{3}{8}$ **and** $\frac{5}{8}$ correct on second branches oe
(b)	$\frac{3}{8} \times \frac{3}{8}$	$\frac{9}{64}$	2	M1 for $\frac{3}{8} \times \frac{3}{8}$ **or** ft from tree diagram A1 $\frac{9}{64}$ ft oe
5	$\frac{108}{400} \times 100$	27	2	M1 for $\frac{108}{400} \times 100$ oe A1 cao

PAPER: AST30_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		LQ = 20 UQ = 32 LQ – 1.5IQR = 2 UQ + 1.5IQR = 50	Yes with supporting calculations	4	M1 for LQ = 20 **and** UQ = 32 (maybe implied by IQR = 12) A1 2 A1 50 A1 Yes and no numbers below 2 and no numbers above 50 eg 2 < 3 and 48 < 50
7	(a)	$\frac{210000}{200000} \times 100$	105	2	M1 for $\frac{210000}{200000} \times 100$ oe A1 cao
	(b)	$\sqrt[4]{101.1 \times 102.2 \times 108.7 \times 105}$	104.2	2	M1 for $\sqrt[4]{101.1 \times 102.2 \times 108.7 \times "105"}$ A1 cao
	(c)		Correct Interpretation	2	B1 for **increase** of "**4.2**" **%** oe B1 for **per year/annual**

PAPER: AST30_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8	(a)	Frequency densities are 16, 4, 8, 10, 3	Correct histogram drawn	3	M1 for one correct frequency density calculated **or** one bar drawn to the correct height A1 all frequency densities correct **and** bars drawn to the correct heights A1 attempt at histogram including frequency density labelled on the vertical axis
	(b)	$(5 \times 160 + 17.5 \times 60 + \ldots + 60 \times 120) \div 480$	28.4	3	M1 for $f \times x$ (must be mid points) (condone one arithmetic error) (=13650) M1 (dep on 1st M) for $\frac{"13650"}{480}$ A1 for 28 to 28.44
	(c)	$\sqrt{\frac{607125}{480} - \left(\frac{13650}{480}\right)^2}$	21.4	2	M1 for $\frac{607125}{480}$ − (part (b))^2 A1 for 21 to 21.41

PAPER: AST30_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
9 (a)		<table><tr><td>8 6</td><td>0</td><td>7 9</td></tr><tr><td>8 4 2 2</td><td>1</td><td>0 4 8</td></tr><tr><td>7 4 0 0</td><td>2</td><td>0 0 2 4 9</td></tr><tr><td>0</td><td>3</td><td>3</td></tr></table> Key 2 | 1 | 0 represents 12 seconds for boys and 10 seconds for girls	4	M1 for correct leaves ordered **or** unordered for either boys or girls A1 for correct leaves ordered for boys A1 for correct leaves ordered for girls A1 correct key
(b)		Two correct comparisons	2	B2 for any 2 from • median for boys < median for girls • IQR/Range for boys < IQR/Range for girls • boys symmetrical and girls negative skew (B1 for any 1 correct comparison)
10 (a)		Correct box plot drawn	3	M1 for a box plot starting at 45 and ending at 86 A2 for Q1 plotted at 62, Q2 plotted at 70 and Q3 plotted at 75 (A1 for one quartile plotted correctly)
(b)		Three correct comparisons	3	B1 for a comparison of medians eg median for 1st class < median for 2nd class B1 for a comparison of spread eg IQR/range for 1st class > IQR/range for 2nd class B1 for 1st class negative skew and 2nd class positive skew

PAPER: AST30_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)	$\sum d^2 = 9 + 1 + 4 + 1 + 4 + 9 + 25 + 4 + 1 + 4 = 62$ $1 - \frac{6 \times 62}{10(10^2 - 1)}$	0.624	3	M1 for $\sum d^2 = 62$ M1 for $1 - \frac{6 \times 62}{10(10^2 - 1)}$ A1 for 0.624
	(b)		There was some agreement between the two judges	1	B1ft for There was (some) agreement between the two judges oe ft for values in the range $-1 < r < 1$
12	(a)		Downward	1	B1 for downward oe
	(b)	$(3 + 4 + 5) \div 3$	4000	2	M1 for $\pm(3 + 4 + 5) \div 3$ A1 for 4000 (accept 4)
13		$\frac{106 - 102}{4}$ $\frac{104 - 98}{3}$	Jane = 1 Greg = 2	3	M1 for either $\frac{106 - 102}{4}$ **or** $\frac{104 - 98}{3}$ A1 for Jane 1 A1 for Greg 2

PAPER: AST30_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
14 (a)		130	1	B1 cao
(b) (i)		$\frac{7}{130}$	3	B1 for $\frac{7}{part(a)}$
(ii)	$\frac{6+7}{130}$	$\frac{13}{130}$		M1 for $\frac{6+7}{part(a)}$ A1 $\frac{13}{130}$ oe
(c)	$\frac{9+7}{28+6+7+9}$	$\frac{16}{50}$	2	M1 for $\frac{a}{50}$ $0 < a < 50$ A1 for $\frac{16}{50}$ oe
15 (a)	$P\left(Z < \frac{312-300}{5}\right)$	0.9918	2	M1 for $\frac{312-300}{5}$ (may be implied by 2.4) A1 awrt 0.992
(b)	$P\left(\frac{305-300}{5} < Z < \frac{312-300}{5}\right)$	0.1505	3	M1 for $\frac{305-300}{5}$ (may be implied by 1) M1 for "0.9918" – 0.8413 ft A1 for 0.15(0) – 0.151

PAPER: AST30_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
16 (a)	$\sum x = 90.7 \quad \sum y = 303$ $S_{xt} = 1433.8 - \frac{90.7 \times 303}{20}$ $= 59.695$ $r = \frac{59.695}{\sqrt{82.4455 \times 306.55}}$	0.375	4	M1 for either $\sum x = 90.7$ **or** $\sum y = 303$ A1 for 59.695 M1 for $\frac{"59.695"}{\sqrt{82.4455 \times 306.55}}$ A1 for 0.375
(b)		Weak positive correlation	1	B1 for (weak) positive (correlation) ft $-1 \leq$ "a" ≤ 1
17 (a)	$\frac{1}{4} + \frac{2}{5} - \frac{3}{5}$	$\frac{1}{20}$	2	M1 for $\frac{1}{4} + \frac{2}{5} - \frac{3}{5}$ A1 for $\frac{1}{20}$ oe
(b)	$\frac{1/20}{1/4}$	$\frac{1}{5}$	2	M1 for $\frac{"(1/20)"}{1/4}$ A1 for $\frac{1}{5}$ oe
(c) (i)		Mutually exclusive	2	B1 for Mutually exclusive or $P(E \cap F) = 0$ or $E \cap F = 0$
(ii)		Independent		B1 for Independent

PAPER: AST30_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)		Correct curve drawn	3	M1 for a reasonable bell shaped curve centred on 35 A1 Curve starting at 20 and ends at 50 A1 Curve for road *X* "taller" than curve for road *Y*
	(b)		Two correct comparisons made	2	B1 for comparison of average eg mean/median/mode for road *X* < mean/median/mode for road *Y* (condone average) B1 for a comparison of spread eg range/standard deviation for road *X* < range/standard deviation for road *Y*
19	(a)	$^{10}C_2\ 0.1^2\ 0.9^8$	0.1937	2	M1 for $^{10}C_2\ 0.1^2\ 0.9^8$ ($^{10}C_2$ may be implied by 45) A1 awrt 0.194
	(b)	$P(X \geq 3) = 1 - P(X \leq 2)$ $1 - (0.3487 + 0.3874 + 0.1937)$	0.0702	3	M1 for $P(X \geq 3) = 1 - P(X \leq 2)$ M1 for $1 - (0.3487 + 0.3874 + '0.1937')$ A1 for 0.0702

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom