



Pearson

Mark Scheme (Results)

November 2020

Pearson Edexcel GCSE
In Statistics (1ST0)
Higher Tier
Paper 1H

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General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

- 1** All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first.

Where some judgement is required, mark schemes will provide the principles by which marks will be awarded; exemplification/indicative content will not be exhaustive. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the response should be sent to review.

- 2** All the marks on the mark scheme are designed to be awarded; mark schemes should be applied positively. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme. If there is a wrong answer (or no 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.

Questions where working is not required: In general, the correct answer should be given full marks.

Questions that specifically require working: In general, candidates who do not show working on this type of question will get no marks – full details will be given in the mark scheme for each individual question.

- 3** **Crossed out work**

This should be marked **unless** the candidate has replaced it with an alternative response.

- 4** **Choice of method**

If there is a choice of methods shown, mark the method that leads to the answer given on the answer line.

If no answer appears on the answer line then mark both methods **as far as they are identical** and award these marks.

- 5** **Incorrect method**

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

6 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working as you can check the answer, 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.

7 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 or its context. (eg an incorrectly cancelled fraction when the unsimplified fraction would gain full marks).

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect (eg incorrect algebraic simplification).

8 Probability

Probability answers must be given as a fraction, percentage or decimal. 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 fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

9 Range of answers

Unless otherwise stated, when an answer is given as a range (eg 3.5 – 4.2) then this is inclusive of the end points (eg 3.5, 4.2) and all numbers within the range.

Guidance on the use of abbreviations within this mark scheme

M	method mark awarded for a correct method or partial method
A	accuracy mark (awarded after a correct method; if no method is seen then full marks for the question are implied but see individual mark schemes for more details)
B	unconditional accuracy mark (no method needed)
oe	or equivalent
cao	correct answer only
ft	follow through (when appropriate as per mark scheme)
sc	special case
dep	dependent (on a previous mark)
indep	independent
awrt	answer which rounds to
isw	ignore subsequent working

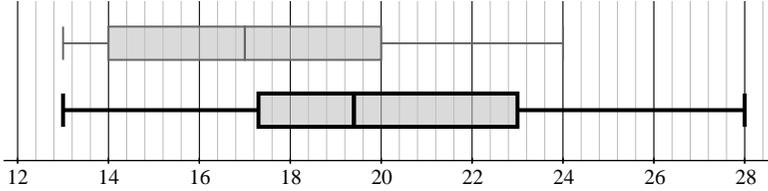
Question number	Answer	Additional guidance	Mark
1(a)	B1 ordinal		(1)
(b)	B1B1B1 <ul style="list-style-type: none"> • Number all the students (from e.g. 000 to 466) • Select students with corresponding number from random number list • Select 50 numbers ignoring any repeats / numbers out of range 	B1 for numbering B1 for selecting students with the corresponding selected numbers B1 for 50 unique numbers in range	(3)

Question number	Answer	Additional guidance	Mark
2(a)	B1 4.1(%) to 9.3(%) (decrease)		(1)
(b)	B1 13		(1)
(c)	B1 e.g. (Although more areas had a decrease) we do not know the numbers (of officers), only percentages. OR e.g. The fewer areas with a percentage increase might have more officers than those with a percentage decrease.	B1 Allow equivalent answers showing an understanding that we have percentages not numbers. Do not accept reference to total population (of officers) of England and Wales.	(1)
(d)	B1 Choropleth (map)	B1 Condone misspelling if intention is clear. (eg chloropeth)	(1)

Question number	Answer	Additional guidance	Mark
3(a)	M1 720 – 575 A1 145	M1 for identifying 720 and c where $560 < c \leq 580$ A1 for an answer in the range 140 to 159 Accept 140 000 to 159 000	(2)
(b)	B1 e.g. ‘exact values can’t be read off graph’	B1 for any equivalent reason	(1)
(c)	B2 <ul style="list-style-type: none"> • Italy has more alternative oe • Italy has more diesel oe • UK has more petrol oe 	B2 for all three bullet points (B1 for any one bullet point) Ignore extraneous non-contradictory comments Ignore figures	(2)
(d)	B1 e.g. ‘only shows the data for the 1 st quarter’	B1 for a suitable reason why the data is not valid to reach the given conclusion	(1)

Question number	Answer	Additional guidance	Mark
4(a)	B1 0.97 in correct position on 1st stage B1 0.03, 0.97, 0.03, 0.97 correctly on 2nd stage		(2)
(b)	B1 0.97×0.97 (= 0.9409)	B1 for correct product of probabilities from their tree. (Working may be seen with tree) Answer not required. Ignore 'incorrect' answer if B1 awarded.	(1)
(c)	<p>In part (c) allow follow through from their tree only if all are probabilities. Working may be seen with tree.</p> <p>M1 0.03×0.97 (= 0.0291)</p> <p>M1 '0.0291' $\times 2$ (= 0.0582)</p> <p>A1ft = 0.058(2) (< 0.06 so ...) Shreya is correct</p> <p>ALT 1 M1 M1 $1 - 0.03 \times 0.03 - 0.9409$ (= 0.0582)</p> <p>A1ft = 0.058(2) (< 0.06 so ...) Shreya is correct</p> <p>ALT 2 M1M1 $1 - 0.9409$ (= 0.0591) or $0.03 \times 0.97 + 0.03$ (= 0.0591) A1ft = 0.059(1) (< 0.06 so ...) Shreya is correct</p>	<p>1st M1 for one correct product using their '0.97' (Can be implied by 0.0291)</p> <p>2nd M1 for complete correct method using 0.03 and their '0.97'. (Answer not required for this mark.)</p> <p>A1ft for 'correct' ft probability and conclusion based on their probability. (Dependent on both M1 marks)</p> <p>1st M1 for subtraction from 1 using one correct product from their tree.</p> <p>2nd M1 for complete correct method for their tree. (Answer not required.)</p> <p>A1ft as above</p> <p>Using probability of at least one fake</p> <p>1st M1 for subtraction from 1 using one correct product from their tree.</p> <p>2nd M1 for complete correct method for their tree. (Answer not required.)</p> <p>A1ft as above</p>	(3)

Question number	Answer	Additional guidance	Mark
5(a)(i)	B1 (How well train company) deals with delays	Accept wording which clearly indicates this option	(1)
(a)(ii)	B1 toilet facilities		(1)
(b)	M1 $24868 \times \frac{72}{100}$ A1 = 17905	M1 for correct equivalent calculation M1 implied by 17904.96 For A1 accept 17900 or 17904	(2)
(c)	B1 it has the largest sample size	B1 for equivalent comment recognising that a larger sample size should lead to more reliable results. Do not accept reference to the highest percentage/number of people that were satisfied with it.	(1)

Question number	Answer	Additional guidance	Mark
6(a)(i)	B1 $(30 \times 0.9 = 27\text{th value} \Rightarrow) 26.2$	B1 for answer in range $26 < t < 26.4$	(1)
(a)(ii)	B1 e.g. Temperature does not exceed '26.2°C' on 27 days , or 10% chance any day of max temperature exceeding '26.2°C'	B1 for correct equivalent interpretation of 90th percentile. Do not accept interpretations not in context	(1)
(b)	M1 $Q1 = 17.3$ or $Q3 = 23$ M1 $23 + 1.5 \times (23 - 17.3)$ A1 $= 31.6$ A1 Maximum value (or 28) is less than 31.6	M1 accept $Q1$ in range 17.2 – 17.6 $Q3$ in range 22.8 – 23.6 Values may be seen on graph or next to box plot. M1 for correct calculation using their $Q1$ & $Q3$ (their $Q1 \neq 7.5$, their $Q3 \neq 22.5$) A1 for answer in range 30.6 – 33.2 A1 for correct conclusion making reference to two correct values	(4)
(c)	B1 B1ft 	1st B1 for a box + whiskers with correct min at 13 and max at 28 2nd B1ft for 'correct' box using their $Q1/Q3$ and median 19.2 – 19.6	(2)

(d)	<p>B1ft Bingley has higher <u>median</u> (as $19.4 > 17$), o.e.</p> <p>B1ft Similar <u>IQRs</u> (as both are approximately 6) OR Bingley has greater <u>range</u> (as $15 > 11$), o.e.</p> <p>B1ft Bingley has <u>positive skew</u> (but Aultbea has no skew)</p>	<p>Allow follow through from their box plot or Q1/Q3 values.</p> <p>Accept equivalent or converse statements.</p> <p>Accept Bingley has smaller IQR (as $5.7 < 6$)</p> <p>For IQR comment condone higher/lower. Do not condone wider/narrower, more spread out/less spread out.</p> <p>Statements may be in context but underlined statistical words must be used.</p> <p>Ignore additional non-contradictory comments.</p> <p>Comment on Aultbea skew does not have to be present, but if present must not be incorrect.</p>	(3)
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Question number	Answer	Additional guidance	Mark
7(a)	B1 Not appropriate as it is a question / is not a statement	B1 for recognising that a question is not a hypothesis	(1)
(b)	B1 e.g. Likely to be representative (with a small sample), or Age groups and genders will be fairly represented	B1 for recognising that stratifying will help give a representative sample	(1)

(c)	<p>B1 e.g. makes it easy to analyse responses / put into graphs</p> <p>B1 B1 for any two problems from:</p> <ul style="list-style-type: none"> • List is not exhaustive / too few options (e.g. no ‘radio’ / no ‘other’) • Students may use more than one option • Students may not follow the news • Accept: students’ ages not recorded • Not investigating effect of gender so no need to split into male and female 	<p>1st B1 for recognising the advantage that responses will be easy to work with</p> <p>2nd/3rd B1 for each of two appropriate problems identified</p>	(3)
(d)	<p>B1 The number of students at the university will be represented by the size of the pie charts</p>	<p>B1 for recognising that the ‘size’ of pie chart should represent the sample/ population size.</p>	(1)
(e)	<p>M1 $10 \times \sqrt{\frac{18}{12}}$ o.e.</p> <p>A1 12.2 (cm)</p>	<p>M1 for an appropriate method to find new diameter or area (if labelled area)</p> <p>A1 for answer in the range 12.2 – 12.3 (Accept 12 following correct working)</p>	(2)
(f)	<p>B1 B1 for any two correct comments from e.g.:</p> <ul style="list-style-type: none"> • Ensure sample size is not too small • Use similar criteria in selecting students (e.g. by gender/age) / same sampling method / similar proportions of ages and genders • Ask the question in the same way / ask the same question / give the same options / same method of data collection • Do at similar times • Ask in similar venues 	<p>B1 for each of two appropriate points (maximum 2) which would help improve reliability or validity</p>	(2)

Question number	Answer	Additional guidance	Mark
8(a)	B1 $\frac{62-59}{6}$ (= 0.5)	B1 for correct calculation (may be seen in stages). Answer not required.	(1)
(b)	<p>B1 should use standardised scores / $0.7 > 0.5$ / her standardised score for maths is higher than it is for statistics</p> <p>B1dep hence did better in Maths / Freya is not correct</p>	<p>1st B1 for explanation or comparison of standardised scores</p> <p>Do not accept reference to maths standardised score being closer to 1</p> <p>2nd B1 dependent for correct conclusion</p>	(2)
(c)	B1 (standardised score) would be negative	B1 for correct equivalent statement	(1)

Question number	Answer	Additional guidance	Mark
9(a)	M1 $\frac{48 \times 20}{240}$ or $\frac{48}{n} = \frac{240}{20}$ o.e. A1 = 4	M1 for attempt at correct equivalent calculation or equation A1 4 cao	(2)
(b)	B1 B1 Any two correct assumptions from <ul style="list-style-type: none"> • ‘closed’ population (e.g. no pigeons leave/die/arrive) • random samples assumed (but unlikely) • tagged pigeons mixed well with untagged pigeons • tags remained in place B1 dep e.g. estimate may not be reliable (as assumptions unlikely to hold)	1st/2nd B1 marks for any two correct assumptions from the list. Accept equivalent comments. 3rd B1 for appropriate assessment of reliability of estimate, dependent on at least B1 scored Do not award 3 rd B1 for answers that state both reliable and unreliable.	(3)

Question number	Answer	Additional guidance	Mark
10(a)	M1 $\frac{111.4}{110.1} \times 100$ A1 101.18	M1 for complete equivalent working A1 cao	(2)
(b)	B2 Not correct with acceptable reason e.g. <ul style="list-style-type: none"> • this is 1.3% of the 2012 average rail fare • should use chain base index number (so increase is '1.18%') • increase is 1.18% 	B2 for correct assessment of statement, with correct reasoning (allow FT from their (a)) (B1 Not correct (with attempt at reason))	(2)
(c)	B2 (on average) 2.18% <u>increase per year</u>	B2 for complete answer with figures and interpretation. (Otherwise B1 for 2.18% seen)	(2)

Question number	Answer	Additional guidance	Mark
11(a)	B1 Upward (trend), or number of visitors is increasing over time.	B1 for correct description of trend. Accept increasing or 'positive' (but not positive correlation). Accept correct interpretation of trend.	(1)
(b)	B1 (Quarter) 4 (each year)	Note '2015 Quarter 4' scores B0	(1)
(c)	B1 Number of visitors increases by 1400 <u>per quarter</u> (on average)	B1 for correct interpretation. Must have 'per quarter' o.e. and 1400 Allow 1.4 thousand for 1400	(1)
(d)	B1 e.g. Prediction may not be correct as it relies on extrapolation	B1 for a comment recognising that extrapolation is used or that the trend may not continue. (Accept as reason that seasonal variation for Q2 is not consistent)	(1)
(e)	B1 Q2 seasonal variations from graph: 16, -8, 7 M1 (mean seasonal variation =) $\frac{16 + (-8) + 7}{3}$ (= 5) M1dep (estimate =) 208 + '5' to 209 + '5' A1 = 213 A1ft (Difference is) 9.9 (thousand)	B1 for attempting 3 seasonal variations for Q2 (each ± 2 , condone \pm values here) 1st M1 for attempt at mean of 3 seasonal variations . 2nd M1dep for complete method with their 5 + trend line value (read at 2018 Q2) May be implied by their mean seasonal variation + 208 or +209 evaluated 1st A1 for answer in range 212 - 214 (or 212000 - 214000) 2nd A1ft for 'correct' numerical comparison of their estimate with true value. Accept e.g. estimate is about 10000 too high	(5)

Question number	Answer	Additional guidance	Mark
12	<p>M1 Judge's ranks: 2, 1, 3, 5, 6, 4</p> <p>M1 $d^2 = 0 + 0 + 4 + 1 + 0 + 1 (= 6)$</p> <p>M1 $1 - \frac{6 \times 6}{6 \times (6^2 - 1)}$</p> <p>A1 $= 0.828\dots$</p> <p>A1ft (positive correlation) so agreement between judge and Mayor.</p>	<p>1st M1 for correct ranks (accept reversed)</p> <p>2nd M1 for attempting sum of squared differences of ranks with at least 4 correct</p> <p>3rd M1 for complete attempt at formula, including '1 - ' (allow their '6')</p> <p>A1 for 0.83 or better</p> <p>A1ft for correct interpretation of their SRCC.</p> <p>Dependent on complete attempt to use formula and r value in range -1to +1</p>	(5)

Question number	Answer	Additional guidance	Mark
13(a)	B2 Suggestion is appropriate because (any two from): <ul style="list-style-type: none"> • Fixed number of sweets / 8 in each packet • Flavours are independent / random packing • Probability (of a strawberry Fruitee would be) constant • Strawberry & not strawberry are the only two outcomes 	B2 for at least two correct conditions referred to, with at least one in context. (Otherwise B1 for one correct condition mentioned, need not be in context.)	(2)
(b)	B1 (mean = $n \times p = 8 \times p = 2$, so $p = \frac{1}{4}$ o.e.		(1)
(c)	M1 $0.25^3 \times 0.75^5 \times {}^8C_3$ A1ft $= 0.2076$	M1 for correct combination of probabilities with attempt at binomial coefficient (e.g. from Pascal's triangle) For A1ft accept 0.21 or 0.208 with correct working. FT use of their 0.25 from (b) or (a).	(2)