OCR
Oxford Cambridge and RSA

GCE

Mathematics (MEI)

Unit **4766**: Statistics 1

Advanced Subsidiary GCE

Mark Scheme for June 2018

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

Annotations and abbreviations

Annotation in scoris	**Meaning**
✓and ✗	
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working
M0, M1	Method mark awarded 0, 1
A0, A1	Accuracy mark awarded 0, 1
B0, B1	Independent mark awarded 0, 1
SC	Special case
^	Omission sign
MR	Misread
Highlighting	
Other abbreviations in mark scheme	**Meaning**
E1	Mark for explaining
U1	Mark for correct units
G1	Mark for a correct feature on a graph
M1 dep*	Method mark dependent on a previous mark, indicated by *
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working

Subject-specific Marking Instructions for GCE Mathematics (MEI) Statistics strand

a Annotations should be used whenever appropriate during your marking.

The A, M and B annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks. It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

For subsequent marking you must make it clear how you have arrived at the mark you have awarded.

b An element of professional judgement is required in the marking of any written paper. Remember that the mark scheme is designed to assist in marking incorrect solutions. Correct *solutions* leading to correct answers are awarded full marks but work must not be judged on the answer alone, and answers that are given in the question, especially, must be validly obtained; key steps in the working must always be looked at and anything unfamiliar must be investigated thoroughly.

Correct but unfamiliar or unexpected methods are often signalled by a correct result following an *apparently* incorrect method. Such work must be carefully assessed. When a candidate adopts a method which does not correspond to the mark scheme, award marks according to the spirit of the basic scheme; if you are in any doubt whatsoever (especially if several marks or candidates are involved) you should contact your Team Leader.

c The following types of marks are available.

M
A suitable method has been selected and *applied* in a manner which shows that the method is essentially understood. Method marks are not usually lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, eg by substituting the relevant quantities into the formula. In some cases the nature of the errors allowed for the award of an M mark may be specified.

A
Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated Method mark is earned (or implied). Therefore M0 A1 cannot ever be awarded.

B
Mark for a correct result or statement independent of Method marks.

E

A given result is to be established or a result has to be explained. This usually requires more working or explanation than the establishment of an unknown result.

Unless otherwise indicated, marks once gained cannot subsequently be lost, eg wrong working following a correct form of answer is ignored. Sometimes this is reinforced in the mark scheme by the abbreviation isw. However, this would not apply to a case where a candidate passes through the correct answer as part of a wrong argument.

d When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. (The notation 'dep *' is used to indicate that a particular mark is dependent on an earlier, asterisked, mark in the scheme.) Of course, in practice it may happen that when a candidate has once gone wrong in a part of a question, the work from there on is worthless so that no more marks can sensibly be given. On the other hand, when two or more steps are successfully run together by the candidate, the earlier marks are implied and full credit must be given.

e The abbreviation ft implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only — differences in notation are of course permitted. A (accuracy) marks are not given for answers obtained from incorrect working. When A or B marks are awarded for work at an intermediate stage of a solution, there may be various alternatives that are equally acceptable. In such cases, exactly what is acceptable will be detailed in the mark scheme rationale. If this is not the case please consult your Team Leader.

Sometimes the answer to one part of a question is used in a later part of the same question. In this case, A marks will often be 'follow through'. In such cases you must ensure that you refer back to the answer of the previous part question even if this is not shown within the image zone. You may find it easier to mark follow through questions candidate-by-candidate rather than question-by-question.

f Wrong or missing units in an answer should not lead to the loss of a mark unless the scheme specifically indicates otherwise.

Candidates are expected to give numerical answers to an appropriate degree of accuracy. 3 significant figures may often be the norm for this, but this always needs to be considered in the context of the problem in hand. For example, in quoting probabilities from Normal tables, we generally expect *some* evidence of interpolation and so quotation to 4 decimal places will often be appropriate. But even this does not always apply – quotations of the standard critical points for significance tests such as 1.96, 1.645, 2.576 (maybe even 2.58 – but not 2.57) will commonly suffice, especially if the calculated value of a test statistic is nowhere near any of these values. Sensible discretion *must* be exercised in such cases.

Discretion must also be exercised in the case of small variations in the degree of accuracy to which an answer is given. For example, if 3 significant figures are expected (either because of an explicit instruction or because the general context of a problem demands it) but only 2 are given, loss of an accuracy ("A") mark is likely to be appropriate; but if 4 significant figures are given, this should not normally be penalised. Likewise, answers which are slightly deviant from what is expected in a very minor manner (for example a Normal probability

given, after an attempt at interpolation, as 0.6418 whereas 0.6417 was expected) should not be penalised. However, answers which are *grossly* over- or under-specified should normally result in the loss of a mark. This includes cases such as, for example, insistence that the value of a test statistic is (say) 2.128888446667 merely because that is the value that happened to come off the candidate's calculator. Note that this applies to answers that are given as final stages of calculations; intermediate working should usually be carried out, and quoted, to a greater degree of accuracy to avoid the danger of premature approximation.

The situation regarding any particular cases where the accuracy of the answer may be a marking issue should be detailed in the mark scheme rationale. If in doubt, contact your Team Leader.

g Rules for replaced work

If a candidate attempts a question more than once, and indicates which attempt he/she wishes to be marked, then examiners should do as the candidate requests.

If there are two or more attempts at a question which have not been crossed out, examiners should mark what appears to be the last (complete) attempt and ignore the others.

NB Follow these maths-specific instructions rather than those in the assessor handbook.

h Genuine misreading (of numbers or symbols, occasionally even of text) occurs. If this results in the object and/or difficulty of the question being considerably changed, it is likely that all the marks for that question, or section of the question, will be lost. However, misreads are often such that the object and/or difficulty remain substantially unaltered; these cases are considered below.

The simple rule is that *all* method ("M") marks [and of course all independent ("B") marks] remain accessible but at least some accuracy ("A") marks do not. It is difficult to legislate in an overall sense beyond this global statement because misreads, even when the object and/or difficulty remains unchanged, can vary greatly in their effects. For example, a misread of 1.02 as 10.2 (perhaps as a quoted value of a sample mean) may well be catastrophic; whereas a misread of 1.6748 as 1.6746 may have so slight an effect as to be almost unnoticeable in the candidate's work.

A misread should normally attract *some* penalty, though this would often be only 1 mark and should rarely if ever be more than 2. Commonly in sections of questions where there is a numerical answer either at the end of the section or to be obtained and commented on (eg the value of a test statistic), this answer will have an "A" mark that may actually be designated as "cao" [correct answer only]. This should be interpreted *strictly* – if the misread has led to failure to obtain this value, then this "A" mark must be withheld even if all method marks have been earned. It will also often be the case that such a mark is implicitly "cao" even if not explicitly designated as such.

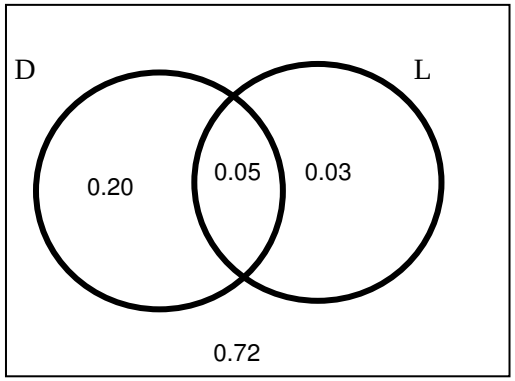
On the other hand, we commonly allow "fresh starts" within a question or part of question. For example, a follow-through of the candidate's value of a test statistic is generally allowed (and often explicitly stated as such within the marking scheme), so that the candidate may exhibit knowledge of how to compare it with a critical value and draw conclusions. Such "fresh starts" are not affected by any earlier misreads.

A misread may be of a symbol rather than a number – for example, an algebraic symbol in a mathematical expression. Such misreads are more likely to bring about a considerable change in the object and/or difficulty of the question; but, if they do not, they should be treated as far as possible in the same way as numerical misreads, *mutatis mutandis*. This also applied to misreads of text, which are fairly rare but can cause major problems in fair marking.

The situation regarding any particular cases that arise while you are marking for which you feel you need detailed guidance should be discussed with your Team Leader.

Note that a miscopy of the candidate's own working is not a misread but an accuracy error.

Question			Answer	Marks	Guidance	
1	(i)		5 | 9 6 | 7 9 7 | 3 4 7 8 8 | 0 0 3 5 6 8 8 9 9 | 0 0 2 3 5 Key 7 | 3 represents 7.3	B1 B1 B1 **[3]**	Stem (in either order) and leaves Sorted and aligned (**not** dep on first B1) Key For alignment mark if a figure is crossed out but then replaced in the next column then do **not** allow this mark	Do not allow leaves 5.9, 6.7, 6.9, etc Ignore commas between leaves Do not allow decimal points before leaves Use paper test if unsure about alignment – hold a piece of paper vertically and the columns of leaves should all be separate. Alternatively place a pencil vertically over each column. If any figures protrude into the next column then deem this as non-alignment. Highlight this error
1	(ii)		Negative (skewness)	B1 **[1]**		Allow -ve but NOT skewed to the left Do not allow 'negative correlation'
1	(iii)		Median = 8.4 Midrange = 7.7	B1 B1 **[2]**		SC1 if median and midrange both given as 84 and 77
1	(iv)		Because the data are negatively skewed and so the midrange will give a value that is unrepresentative of most of the data.	E1 **[1]**	Must be related to data rather than a general statement EG 'Median better as mid-range affected by the outlier of 5.9' gets E1	Eg 'median is not affected by extreme values' gets E0 Eg 'median is located where the majority of the data is' gets E1 BOD

Question			Answer	Marks	Guidance	
2	(i)	A	$P(D \cap L) = P(L\|D) \times P(D) = 0.2 \times 0.25$ $= 0.05$	M1 A1 **[2]**	For 0.2×0.25 CAO	
2	(i)	B		G1 G1 G1 **[3]**	For two labelled intersecting circles provided no incorrect labelling For at least 2 correct probabilities. FT their $P(L \cap D)$ provided < 0.08 For remaining probabilities. FT their $P(L \cap D)$	Condone labels such as P(L) etc Allow other shapes in place of circles No need for 'box' In general the four probabilities are $0.25 - x$, x, $0.08 - x$, $0.67 + x$ EG 0.234, 0.016, 0.064, 0.686 EG 0.23, 0.02, 0.06, 0.69
2	(ii)		$P(L\|D) = 0.2$, $P(L) = 0.08$ So $P(L\|D) \neq P(L)$ so D and L are not independent. OR $P(D \cap L) = 0.05$. $P(L) \times P(D) = 0.08 \times 0.25 = 0.02$ So $P(D \cap L) \neq P(L) \times P(D)$ so D and L are not independent	M1 A1 **[2]**	For second method M1 is for $P(L) \times P(D) = 0.08 \times 0.25$ (must have correct 0.08 and 0.25). For A1 need correct value of $P(D \cap L) = 0.05$.	If no values given for $P(L\|D) \neq P(L)$ or if wrong value given for either give M1A0. (NB allow values given in part (i)) Use vertical highlight to indicate Must be L and D, not A and B (unless defined) For either method A1 only available if mention 'not equal' and 'not indep.' SC1 if two probabilities compared correctly without saying what they are so eg $0.05 \neq 0.02$ and so not independent gets SC1

Question			Answer	Marks	Guidance	
3	(i)		$^{25}C_{12}$ = 5 200 300	M1 A1 **[2]**	For $^{25}C_{12}$ seen CAO	Accept $^{25!}/_{(12!13!)}$ or equivalent for M1 No marks for permutation Exact answer required
3	(ii)	A	$^{14}C_6 \times {}^{11}C_6$ = 3003 × 462 = 1 387 386	M1 A1 **[2]**	For product of both correct combinations seen CAO	No marks for permutations Exact answer required
3	(ii)	B	$\frac{6}{12}\times\frac{5}{11}\times\frac{4}{10}\times\frac{3}{9}$ $= \frac{1}{33} = 0.0303$ Or: $^6C_4 / {}^{12}C_4$ = 0.0303	M1 M1 A1 **[3]** M1 M1 A1	For 6/12 or 1/2 × For product of four correct fractions without extra terms CAO If fractional answer only, must be fully simplified For division by $^{12}C_4$ For $^6C_4$ divided by an integer > $^6C_4$	No marks for binomial even if includes 6/12× but $(1/2)^4$ gets M1M0A0 even if $\times{}^4C_4$ Allow 0.030 or $0.\dot{0}\dot{3}$ but not 0.03 SC1 for $\frac{14}{25}\times\frac{13}{24}\times\frac{12}{23}\times\frac{11}{22} = \frac{91}{1150} = 0.079$ OR $^{14}C_4 / {}^{25}C_4$ =0.079 SC2 if use permutations and fully correct
4	(i)		k ×7 + k ×26 + k ×63 + k ×124 = 1 (7 + 26 + 63 + 124)k = 1 220k = 1 $k = \frac{1}{220}$ NB $\frac{26}{220} = \frac{13}{110}$ and $\frac{124}{220} = \frac{31}{55}$ r | 2 | 3 | 4 | 5 P(X = r) | $\frac{7}{220}$ | $\frac{26}{220}$ | $\frac{63}{220}$ | $\frac{124}{220}$	M1 A1 B1 **[3]**	For correct equation including = 1 Need one further intermediate step NB **Answer Given** Complete correct table with exact fractions (not decimals and not in terms of k)	Allow substitution of $k = \frac{1}{220}$ to show probabilities add to 1 with convincing working which must be more than just $\frac{1}{220}\times 7+\frac{1}{220}\times 26+\frac{1}{220}\times 63+\frac{1}{220}\times 124 = 1$ This latter gets M1A0 Must be some indication of summation Allow if table given in part (ii) but B0 if no table given anywhere (even if correct probabilities used in part (ii))

Question			Answer	Marks	Guidance	
4	(ii)		$E(X) = (2\times\frac{7}{220})+(3\times\frac{26}{220})+(4\times\frac{63}{220})+(5\times\frac{124}{220})$	M1	For Σrp (at least 3 terms correct)	If probs wrong but sum = 1 allow allow max M1A0M1M1A1. If sum ≠ 1 allow max M1A0M1M1A0.
			$E(X) = \frac{964}{220}=\frac{482}{110}=\frac{241}{55}=4.38(18\ldots)$	A1	CAO Allow unsimplified fraction. awrt 4.38 Allow 4.4 with working If correct fractional ans then overspec as decimal give A1 ISW	Allow max M1A0M1M1A0 if correct answers divided by eg 4 and max M1A0M1M1A1 if only E(X) divided by eg 4 but VAR ok on FT
			$E(X^2) = (4\times\frac{7}{220})+(9\times\frac{26}{220})+(16\times\frac{63}{220})+(25\times\frac{124}{220})$ $=\frac{437}{22}=19.86(36\ldots)$	M1*	For Σr^2p (at least 3 terms correct)	Use of $E(X-\mu)^2$ gets M1 for attempt at $(x-\mu)^2$ should see $(-2.38)^2$, $(-1.38)^2$, $(-0.38)^2$, 0.62^2, (all 4 correct for M1) (if E(X) wrong FT their E(X))
			$Var(X) = \frac{437}{22}-\left(\frac{964}{220}\right)^2=\frac{4013}{6050}=0.663(3\ldots)$	M1* dep A1 **[5]**	for – their $E(X)^2$ FT their E(X) provided Var(X) > 0 Allow 0.66 to 0.665 with working	then M1 for $\Sigma p(x-\mu)^2$ (at least 3 terms correct with their probabilities)
5	(i)		$0.75\times0.25\times0.7^2 + 0.25\times0.75\times0.7^2 + 0.25^2\times0.3\times0.7 + 0.25^2\times0.7\times0.3$	M1 M1 M1	For one quadruple For one correct quadruple For sum of four quadruples	With at least two correct decimals Not necessarily correct For first and third M marks allow any coefficient, but only give second if there is a correct 2×
			$= 2\times0.013125 + 2\times0.091875 = 2\times\frac{21}{1600}+2\times\frac{147}{1600}$ $= 0.21$	A1 **[4]**	CAO	This answer is exact NB Could use B(2, 0.25) and B(2, 0.7) gives $0.0625\times0.42 + 0.375\times0.49$
5	(ii)		$(0.25^2\times0.3\times0.7 + 0.25^2\times0.7\times0.3)/0.21$ $= 0.02625/0.21$ $= 0.125$	M1 M1 A1 **[3]**	For correct numerator as part of fraction For correct denominator as part of fraction (indep) FT FT their 0.21 (provided answer < 1)	This answer is exact (Do not allow 0.13 unless correct answer given first in which case ISW) Watch for 0.125 from incorrect working

Question			Answer	Marks	Guidance	
6	(i)	A	$X \sim B(20, 0.5)$ $P(X = 8) = {}^{20}C_8 \times 0.5^8 \times 0.5^{12} = 0.1201$	M1 A1	For $0.5^8 \times 0.5^{12}$ or 0.5^{20} CAO Allow correct answer from calculator	Allow 0.12 or better with working Check working even if correct answer
			Or: From tables $P(X \leq 8) - P(X \leq 7) = 0.2517 - 0.1316 = 0.1201$	M1 A1 **[2]**	For 0.2517 – 0.1316 CAO	
6	(i)	B	$P(X \geq 8) = 1 - P(X \leq 7) = 1 - 0.1316 = 0.8684$	M1 A1 **[2]**	For 0.1316 CAO Allow correct answer from calculator	Accept 0.868 Allow 0.87 with working For P(X=8) + P(X=9)+ P(X=10) + ... allow M1A1 for 0.868 or better. Otherwise M0A0
6	(ii)		Let $X \sim B(20, 0.5)$ Let p = probability that a male between the ages of 16 and 24 has drunk alcohol in the last week. (for population) H_0: $p = 0.5$ H_1: $p < 0.5$ The alternative hypothesis has this form as the student thinks that the proportion may now be lower than 50%.	B1 B1 B1 E1	For definition of p (in context) Do not allow '... in sample.' For H_0 For H_1 Dep on < (or ≤) 0.5 used in H_1 E0 for simply stating H_1 in words Condone number instead of proportion in this part.	**See below for additional notes** Do NOT allow number in place of probability. For H_1: $p \leq 0.5$ only deduct this B mark but allow all the rest that are scored. No further marks if point probabilities used
			$P(X \leq 6) = 0.0577$ $0.0577 > 5\%$	B1 B1* *M1 dep	For notation $P(X \leq 6)$ For 0.0577 For comparison with 5% Dep on correct value of 0.0577.	Allow 0.058 For (explicit) comparison with 5% or 0.05 Do NOT FT wrong H_1 but first two marks available
			So not significant. Accept H_0 Conclude that there is not enough evidence to support the student's suggestion.	A1* *E1 dep	Must be in context Do NOT condone 'number' here	Must mention 'insufficient evidence' oe but NOT 'no evidence'

Question			Answer	Marks	Guidance	
			OR 'There is not enough evidence that the probability that a male between the ages of 16 and 24 has drunk alcohol in the last week has decreased.'	**[9]**	Sufficient evidence to suggest that the percentage is lower gets B0 as not in context	Allow SC2 (out of these 5 marks) for clearly indicating use of B(20, 0.5) but with no mention of 0.0577 with convincing reasoning and final answer correct No marks if point probabilities used.
			ALTERNATIVE METHOD FOR 5th TO 9th MARK			
			$P(X \leq 6) = 0.0577 > 5\%$	B1	For either probability	If critical region stated but not justified, allow SC2 (out of these 5 marks) if all correct.
			$P(X \leq 5) = 0.0207 < 5\%$	M1	For at least one comparison with 5%	
			So critical region is {0, 1, 2, 3, 4, 5}	A1*		If unclear which method is being used, or if both, give the better mark of the two.
			So not significant. Accept H_0	*A1*		
			Conclude that there is not enough evidence to support the student's suggestion. oe	*E1 dep	Must be in context Do NOT condone 'number' here	No marks if point probabilities used
6	**(iii)**		$P(X \leq 41) = 0.0443$	B1	For use of $P(X \leq 41)$ only Notation $P(X \leq 41)$ not needed	NB If more than one attempt please mark the final one.
			$0.0443 < 0.05$	M1	For comparison with 5% NB No marks unless using $P(X \leq 41)$	
			So significant. Reject H_0	A1	Dep on first two marks	
			Conclude that there is enough evidence to support the student's suggestion. oe	E1 **[4]**	Do not penalise in this part for 'number' if already penalised in part (ii). Must be in context	
7	**(i)**		$a = 25 \times 0.4 = 10$	B1 **[1]**		
7	**(ii)**		$8 + 13 + 18 + 16 + 6/10 \times 14 = 55 + 8.4 = 63.4$ $63.4/79 = 0.8025$	M1 M1	For $6/10 \times 14$ For any value between 55 and 69 (non-inclusive) divided by	Allow M1 for $4/10 \times 14$ if clearly using upper end Then M1 for (1 – their a - $4/10 \times$

Question			Answer	Marks	Guidance	
			So 80.3%	A1 **[3]**	79 or by 69 + their a CAO May round 8.4 to 8 so 63/79 and can get M1M1A1 (Ans 79.7%)	14)/79 or by 69 + their a Allow 80% with working Do not allow 0.803
7	**(iii)**		Mean = $\frac{(42.5\times4)+(55\times12)+(65\times30)+(72.5\times16)+(80\times22)+(95\times16)}{100}$ $=\frac{7220}{100}=72.20$	M1 A1	For midpoints (at least 3 correct) (allow 42.25, 54.75 etc leading to answer 71.95 for M1) CAO Correct answers obtained from use of calculator statistical functions gain full marks even if eg wrong Sxx given	M0A0M0A0 unless using midpoints Answer must NOT be left as improper fraction as this is an estimate Allow 42, 54.5, 64.5 etc from assuming data is discrete, leading to answer 71.7 for M1A0 but can get M1A1 for sd.
			$\Sigma x^2 f = (42.5^2\times4)+(55^2\times12)+(65^2\times30)+(72.5^2\times16)+(80^2\times22)+(95^2\times16)$ = 7225 +36300 + 126750 + 84100 + 140800 + 144400 = 539575	M1	For attempt at S_{xx} Must include sum of at least 3 correct multiples $fx^2 - (\Sigma x)^2/n$	If using $(x - \bar{x})^2$ method, B2 if 13.6 or better, otherwise B0 Or $fx^2 - n\times\text{mean}^2$
			$S_{xx}=539575-\frac{7220^2}{100}=18291$ $s=\sqrt{\frac{18291}{99}}=\sqrt{184.76}=13.6\ (13.59...)$	A1 **[4]**	Do not FT their incorrect mean for A1 If both mean and sd over-specified, just deduct one mark	Allow any answer between 13.59 and 13.60 without checking working RMSD = 13.52 gets M0A0 unless working shown
7	**(iv)**		Lower limit = 72.2 – 2 × 13.6 = 45.0	M1 A1*	Method for either FT sensible mean and sd SD must be < 20	No marks unless using $\bar{x}$ + 2s or $\bar{x}$ – 2s Only follow through numerical values, not variables such as s, so if a candidate does not find s but then

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th><th></th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>writes here ‘limit is 72.2 + 2 × standard deviation’, do NOT award M1</td></tr>
<tr><td></td><td></td><td></td><td>Upper limit = 72.2 + 2 × 13.6 = 99.4

So there are probably outliers (at both ends of the distribution)</td><td>A1*

B1* dep on both A
[4]</td><td>FT sensible mean and sd
SD must be < 20

Must include an element of doubt
If one end mentioned then other must also mention other.</td><td>Do not penalise for over-specification.

B1 only if lower limit beween 35 and 50 and upper between 85 and 105
If mention both ends separately must be correct for both.</td></tr>
<tr><td>7</td><td>(v)</td><td></td><td>
<table>
<tr><th>Resting heart rate</th><th>Frequency</th><th>Group width</th><th>Frequency density</th></tr>
<tr><td>35 ≤ x < 50</td><td>4</td><td>15</td><td>0.27</td></tr>
<tr><td>50 ≤ x < 60</td><td>12</td><td>10</td><td>1.2</td></tr>
<tr><td>60 ≤ x < 70</td><td>30</td><td>10</td><td>3</td></tr>
<tr><td>70 ≤ x < 75</td><td>16</td><td>5</td><td>3.2</td></tr>
<tr><td>75 ≤ x < 85</td><td>22</td><td>10</td><td>2.2</td></tr>
<tr><td>85 ≤ x < 105</td><td>16</td><td>20</td><td>0.8</td></tr>
</table>
</td><td>M1

A1

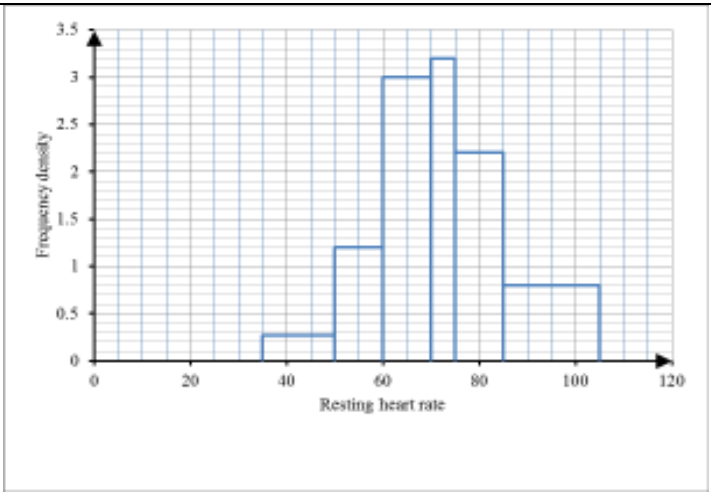
B1

B1</td><td>For fds- at least 4 correct
Accept any suitable unit for fd such as eg freq per beat.
Allow 0.3 in place of 0.27, but not 0.26

Width of bars (Must all be correct)

Height of bars (within half square) .</td><td>M1 can be also be gained from freq per 10 – 2.7, 12, 30, 32, 22,8 (at least 4 correct) or similar.
If fd not explicitly given, M1 A1 can be gained from all heights correct (within ≤ one square) on histogram (and M1A0 if at least 4 correct)

NB Use the template to check</td></tr>
</table>

Question			Answer	Marks	Guidance	
				**[4]**	All correct or otherwise all must agree with calculated values (and at least 3 of these must be correct)	
7	**(vi)**		The central tendency for 4-year-olds is clearly far higher than that for 18-year-olds. The modal class is higher for 4-year-olds. Allow the histogram for 4-year-olds is more 'peaked'. Both groups have roughly the same amount of variation (since the ranges are similar).	E1 E1 E1 **[3]**	Must mention central tendency or mean or median or average If mean and SD used to compare give max SC2 as question says to use histogram	No justification required for first mark Must give some justification to gain any credit for variation if candidate claims it is more for one group than the other such as higher range for 4-year olds or ranges 75 and 70. Allow '4-year olds have a higher range' for B1 (no mention of variation or numbers) 4-year olds have a higher interquartile range gets B0 unless worked out (no mention of variation)

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