OCR
Oxford Cambridge and RSA

Wednesday 20 May 2015 – Morning

AS GCE MATHEMATICS (MEI)

4766/01 Statistics 1

QUESTION PAPER

Candidates answer on the Printed Answer Book.

OCR supplied materials:
- Printed Answer Book 4766/01
- MEI Examination Formulae and Tables (MF2)

Other materials required:
- Scientific or graphical calculator

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.

- The Question Paper will be found inside the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the Printed Answer Book**. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are permitted to use a scientific or graphical calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

INFORMATION FOR CANDIDATES

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER / INVIGILATOR

- Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.

Section A (36 marks)

1 The amounts of electricity, x kW h (kilowatt hours), used by 40 households in a three-month period are summarised as follows.

$$n = 40 \qquad \Sigma x = 59\,972 \qquad \Sigma x^2 = 96\,767\,028$$

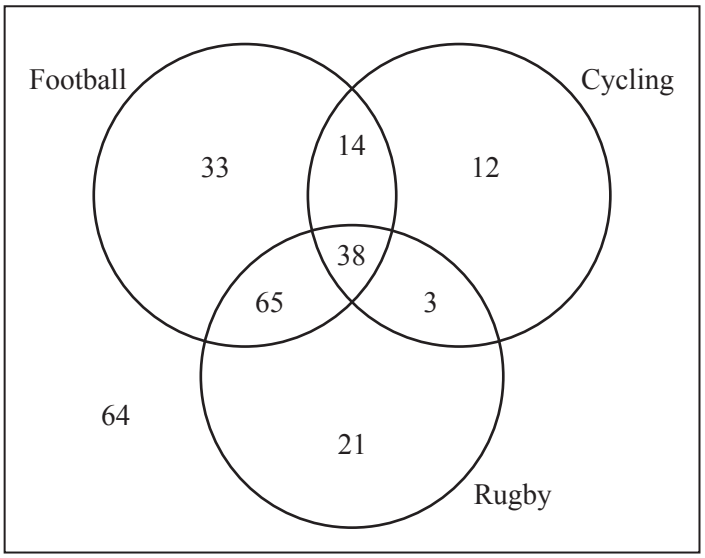
(i) Calculate the mean and standard deviation of x. **[3]**

(ii) The formula $y = 0.163x + 14.5$ gives the cost in pounds of the electricity used by each household. Use your answers to part **(i)** to deduce the mean and standard deviation of the costs of the electricity used by these 40 households. **[3]**

2 A survey is being carried out into the sports viewing habits of people in a particular area. As part of the survey, 250 people are asked which of the following sports they have watched on television in the past month.

- Football
- Cycling
- Rugby

The numbers of people who have watched these sports are shown in the Venn diagram.



One of the people is selected at random.

(i) Find the probability that this person has in the past month

(A) watched cycling but not football, **[1]**

(B) watched either one or two of the three sports. **[2]**

(ii) Given that this person has watched cycling, find the probability that this person has not watched football. **[2]**

3 A normal pack of 52 playing cards contains 4 aces. A card is drawn at random from the pack. It is then replaced and the pack is shuffled, after which another card is drawn at random.

(i) Find the probability that neither card is an ace. **[2]**

(ii) This process is repeated 10 times. Find the expected number of times for which neither card is an ace. **[1]**

4 A rugby team of 15 people is to be selected from a squad of 25 players.

(i) How many different teams are possible? **[2]**

(ii) In fact the team has to consist of 8 forwards and 7 backs. If 13 of the squad are forwards and the other 12 are backs, how many different teams are now possible? **[2]**

(iii) Find the probability that, if the team is selected at random from the squad of 25 players, it contains the correct numbers of forwards and backs. **[2]**

5 At a tourist information office the numbers of people seeking information each hour over the course of a 12-hour day are shown below.

6 25 38 39 31 18 35 31 33 15 21 28

(i) Construct a sorted stem and leaf diagram to represent these data. **[3]**

(ii) State the type of skewness suggested by your stem and leaf diagram. **[1]**

(iii) For these data find the median, the mean and the mode. Comment on the usefulness of the mode in this case. **[4]**

6 Three fair six-sided dice are thrown. The random variable X represents the highest of the three scores on the dice.

(i) Show that $\mathrm{P}(X = 6) = \frac{91}{216}$. **[3]**

The table shows the probability distribution of X.

r	1	2	3	4	5	6
$\mathrm{P}(X = r)$	$\frac{1}{216}$	$\frac{7}{216}$	$\frac{19}{216}$	$\frac{37}{216}$	$\frac{61}{216}$	$\frac{91}{216}$

(ii) Find $\mathrm{E}(X)$ and $\mathrm{Var}(X)$. **[5]**

Section B (36 marks)

7 A drug for treating a particular minor illness cures, on average, 78% of patients. Twenty people with this minor illness are selected at random and treated with the drug.

(i) (A) Find the probability that exactly 19 patients are cured. **[3]**

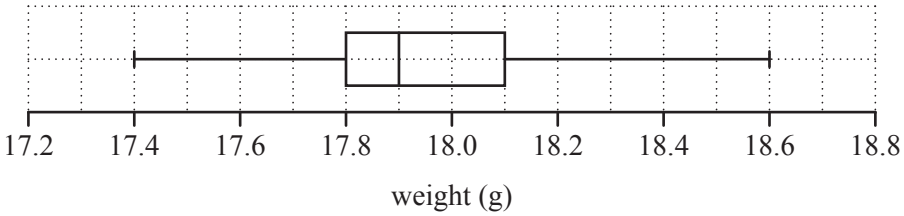
(B) Find the probability that at most 18 patients are cured. **[3]**

(C) Find the expected number of patients who are cured. **[1]**

(ii) A pharmaceutical company is trialling a new drug to treat this illness. Researchers at the company hope that a higher percentage of patients will be cured when given this new drug. Twenty patients are selected at random, and given the new drug. Of these, 19 are cured. Carry out a hypothesis test at the 1% significance level to investigate whether there is any evidence to suggest that the new drug is more effective than the old one. **[8]**

(iii) If the researchers had chosen to carry out the hypothesis test at the 5% significance level, what would the result have been? Justify your answer. **[2]**

8 The box and whisker plot below summarises the weights in grams of the 20 chocolates in a box.



(i) Find the interquartile range of the data and hence determine whether there are any outliers at either end of the distribution. **[5]**

Ben buys a box of these chocolates each weekend. The chocolates all look the same on the outside, but 7 of them have orange centres, 6 have cherry centres, 4 have coffee centres and 3 have lemon centres.

One weekend, each of Ben's 3 children eats one of the chocolates, chosen at random.

(ii) Calculate the probabilities of the following events.

A: all 3 chocolates have orange centres

B: all 3 chocolates have the same centres **[6]**

(iii) Find $\mathrm{P}(A|B)$ and $\mathrm{P}(B|A)$. **[3]**

The following weekend, Ben buys an identical box of chocolates and again each of his 3 children eats one of the chocolates, chosen at random.

(iv) Find the probability that, on both weekends, the 3 chocolates that they eat all have orange centres. **[2]**

(v) Ben likes all of the chocolates except those with cherry centres. On another weekend he is the first of his family to eat some of the chocolates. Find the probability that he has to select more than 2 chocolates before he finds one that he likes. **[3]**

END OF QUESTION PAPER

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Candidate forename		Candidate surname	

Centre number						Candidate number				

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This paper has been pre modified for carrier language

Section A (36 marks)

1 (i)	
1 (ii)	
2 (i) (*A*)	
2 (i) (*B*)	
2 (ii)	

3 (i)	
3 (ii)	

PLEASE DO NOT WRITE IN THIS SPACE

4 (i)

4 (ii)

4 (iii)

5 (i)	
5 (ii)	
5 (iii)	

6 (i)	
6 (ii)	

Section B (36 marks)

7 (i) (*A*)	
7 (i) (*B*)	
7 (i) (*C*)	

7 (ii)	

7 (iii)	

PLEASE DO NOT WRITE IN THIS SPACE

8 (i)

8 (ii)

(answer space continued on next page)

8 (ii)	**(continued)**
8 (iii)	

8 (iv)	
8 (v)	

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)		Mean $= \frac{59972}{40} = 1499$ Condone full answer of 1499.3 (despite over-specification rule) $Sxx = 96767028 - \frac{59972^2}{40} = 6851008$ $s = \sqrt{\frac{6851008}{39}} = \sqrt{175667} = 419$ NB Full answer is 419. 1263 (but only allow to 4sf due to over-specification rule)	B1 M1 A1 **[3]**	CAO Ignore units For S*xx* CAO ignore units	NB Allow 1500 NB Answer must be decimal M1 for 96767028 - 40 × their mean^2 BUT NOTE M0 if their $S_{xx} < 0$ For s^2 of 176000 (or better) allow M1A0 with or without working For RMSD of 414 (or better) allow M1A0 provided working seen For RMSD^2 of 171000 (or better) allow M1A0 provided working seen For use of 1499: S*xx* = 6886988, s^2 = 176589, *s* = 420.225, RMSD = 414.9 For use of 1500: S*xx* = 6767028, s^2 = 173513.5, *s* = 416.549, RMSD = 411.3 Give same credit to answers as for correct answers
1	(ii)		New mean = (0.163 × 1499) + 14.5 = £258.84 (No penalty for giving to 5sf as this is an exact sum of money) New sd = 0.163 × 419 = £68.30	B1 M1 A1 **[3]**	FT their mean provided answer is positive FT their sd for M1 and A1 Allow £68.29 to £68.32 Allow 68.3	If candidate 'starts again' only award marks for CAO Allow £259 or £259.00 from 1500 or £258.89 from 1499.3 Condone 258.8 and 258.9 Accept answers rounded to 3 sf or more eg £258.80, £258.90 Or for 0.163×419.1 oe Do not penalise lack of units in mean or sd Deduct at most 1 mark overall in whole question for over-specification of either mean or SD or both

Question			Answer	Marks	Guidance	
2	(i)	(*A*)	P(Watched cyc but not fb) = $\frac{15}{250} = \frac{3}{50}$ = 0.06	B1 **[1]**	CAO (aef)	
2	(i)	(*B*)	P(Watched one or two) = $\frac{33+12+21+14+3+65}{250}$ $= \frac{148}{250} = \frac{74}{125}$ = 0.592	M1 A1 **[2]**	OR: $\frac{250-(64+38)}{250}$ = CAO (aef)	For M1 terms must be added with no extra terms (added or subtracted)
2	(ii)		P(Not watched fb|watched cyc) = $\frac{15}{67}$ = 0.224 (0.223880597…)	M1 A1 **[2]**	 CAO (aef)	For denominator of either 67 or 67/250 or 0.268 Allow 0.22 with working
3	(i)		P(Neither is an ace) = $\left(1-\frac{4}{52}\right)^2$ $= \frac{2304}{2704} = \frac{144}{169} = 0.852$ (0.8572071…)	M1 A1 **[2]**	For 48/52 oe seen CAO	 Allow 0.85 with working
3	(ii)		Expected number = 10 × 0.852 = 8.52	B1 **[1]**	FT their (i) if seen	Do <u>not</u> allow whole number final answer even if 8.52 seen first. Allow fractional answer
4	(i)		$\binom{25}{15}$ = 3268760	M1 A1 **[2]**		Accept $^{25}C_{15}$ or $^{25!}/_{(15!10!)}$ or equivalent for M1 No marks for permutations Exact answer required
4	(ii)		$\binom{13}{8} \times \binom{12}{7}$ = 1287 × 792 = 1019304	M1 A1 **[2]**	For product of both correct combinations CAO	No marks for permutations Exact answer required

Question			Answer	Marks	Guidance	
4	(iii)		1019304/3268760 = 0.312 (0.311832) Allow fully simplified fraction11583/37145	M1 A1 FT **[2]**	For their (ii) divided by their (i)	Allow 0.31 with working
			OR			
			$\binom{15}{8}\times\frac{13}{25}\times\frac{12}{24}\times\frac{11}{23}\times\frac{10}{22}\times\frac{9}{21}\times\frac{8}{20}\times\frac{7}{19}\times\frac{6}{18}\times\frac{12}{17}\times\frac{11}{16}\times\frac{10}{15}\times\frac{9}{14}\times\frac{8}{13}\times\frac{7}{12}\times\frac{6}{11}$	(M1)	For product of fractions with coefficient	SC1 for $\binom{15}{8}\times\left(\frac{13}{25}\right)^{8}\times\left(\frac{12}{25}\right)^{7}$ Allow $\binom{15}{8}$ or $\binom{15}{7}$
			= 0.312	(A1)		
5	(i)		0 | 6 1 | 5 8 2 | 1 5 8 3 | 1 1 3 5 8 9 Key 1 | 8 represents 18 people	G1 G1 G1 **[3]**	Stem (in either order) and leaves Sorted and aligned Key	Do not allow leaves 21 ,25, 28 etc Ignore commas between leaves Allow stem 0, 10, 20, 30 Allow errors in leaves if sorted and aligned**.** 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 then deem this as non-alignment. Highlight this error
5	(ii)		Negative	B1 **[1]**		Allow -ve but NOT skewed to the left Do not allow 'negative correlation'
5	(iii)		Median = 29.5 Mean = 26.7 (26.6666) or $26^{2}/_{3}$ or $^{80}/_{3}$ or $26.\dot{6}$ Mode = 31 The mode is not at all useful as it is just by chance that it is 31.	B1 B1 B1 E1	CAO CAO CAO Allow any reasonable	Do not allow 27 but condone 26.6 www

Question			Answer	Marks	Guidance	
			Mark awarded for stating not useful and -not representative of data -does not represent Central Tendency -happened by chance (or similar) -comment about not appearing significantly more (only one repetition/only twice/ etc) No mark for stating it would be useful OR NOT USEFUL because of -spread/range -sample size -negatively skewed -unaffected by outliers -isn't close to mean and median	**[4]**	comment	
6	**(i)**		$P(X = 6) = 1 - P(X < 6) = 1 - \left(\frac{5}{6}\right)^3 = 1 - \frac{125}{216}$ $= \frac{91}{216}$	M1 M1 A1 **[3]**	For $\left(\frac{5}{6}\right)^3$ For $1-\left(\frac{5}{6}\right)^3$ **NB ANSWER GIVEN**	
			OR: $=\left(\frac{1}{6}\right)^3 + 3\times\left(\frac{5}{6}\right)\times\left(\frac{1}{6}\right)^2 + 3\times\left(\frac{5}{6}\right)^2\times\left(\frac{1}{6}\right)$ $=\frac{91}{216}$	M1 M1 A1	For second or third product term For attempt at three terms **NB ANSWER GIVEN**	Correct, including ×3 or probabilities seen on correct tree diagram With no extras, but allow omission of ×3 NB Zero for 1 – (sum of probs given in part (ii))
			OR: 1 + 15 + 75 $=\frac{1+15+75}{216}$	M1 M1	for 15 or 75 seen	

Question			Answer	Marks	Guidance	
			$= \frac{91}{216}$	A1	**NB ANSWER GIVEN**	
6	**(ii)**		E(X) = $\left(1\times\frac{1}{216}\right)+\left(2\times\frac{7}{216}\right)+\left(3\times\frac{19}{216}\right)+\left(4\times\frac{37}{216}\right)+\left(5\times\frac{61}{216}\right)+\left(6\times\frac{91}{216}\right)$	M1	For Σrp (at least 3 terms correct)	
			$= \frac{1071}{216} = \frac{119}{24} = 4.96$ (exact answer 4.9583333)	A1	CAO	Accept fractional answers Do not allow answer of 5 unless more accurate answer given first
			E(X^2) = $\left(1\times\frac{1}{216}\right)+\left(4\times\frac{7}{216}\right)+\left(9\times\frac{19}{216}\right)+\left(16\times\frac{37}{216}\right)+\left(25\times\frac{61}{216}\right)+\left(36\times\frac{91}{216}\right)$	M1*	For $\Sigma r^2 p$ (at least 3 terms correct)	Use of E$(X-\mu)^2$ gets M1 for attempt at $(x-\mu)^2$ should see $(-3.96)^2$, $(-2.96)^2$, $(-1.96)^2$, $(-0.96)^2$ 0.04^2, 1.04^2, (if E(X) wrong FT their E(X)) (all 6 correct for M1), then M1 for $\Sigma p(x-\mu)^2$ (at least 3 terms correct) Division by 6 or other spurious value at end and/or rooting final answer gives max M1A1M1M1A0, or M1A0M1M1A0 if E(X) also divided by 6.
			$= \frac{5593}{216} = 25.89$ Var(X) = 25.89.. – 4.958…^{2}	M1* dep	for – their (E(X))^2	
			= 1.31 Accept answers in range 1.28 to 1.31 with correct working or 2261/1728 (Exact answer 1.308449…)	A1	FT their E(X) provided Var(X) > 0	Do not FT E(X) = 5 if full marks given for E(X) Deduct at most 1 mark for over-specification of either mean or variance or both Unsupported correct answers get 5 marks (Probably from calculator)
				[5]		
7	**(i)**	(*A*)	$X \sim$ B(20, 0.78)			

Question			Answer	Marks	Guidance	
			P(Exactly 19 cured) = $\binom{20}{19} \times 0.78^{19} \times 0.22^{1}$	M1	For $0.78^{19} \times 0.22^{1}$	Allow M2A0 for linear interpolation from tables leading to 0.9918 – 0.9488 = 0.0430 But zero for use of tables with 0.8 leading to 0.9885 - 0.9308 = 0.0577
				M1	For $\binom{20}{19} \times p^{19} \times q^{1}$	With $p + q = 1$ Also for 20×0.00196
			= 0.0392 (0.039197)	A1	CAO	Allow 0.039 or better Condone 0.03919 but not 0.0391
				[3]		
7	**(i)**	(*B*)	P(Exactly 20 cured) = $\binom{20}{20} \times 0.78^{20} \times 0.22^{0} = 0.0069$	M1	For 0.78^{20} oe	Allow M2 for 0.9488 for linear interpolation from tables or M1 for 1 – 0.9918 = 0.0082 and second M1 for correct FT using answer to (i)(*A*) Zero for use of $p = 0.8$ here
			P(At most 18 cured) = 1 – (0.0069 + 0.0392)	M1	For P(19) + P(20)	Not necessarily correct, but both attempts at binomial, including coefficient in (i) and no extra terms (such as P(X=18)) Condone use of $p = 0.8$
			= 0.954 (0.95385)	A1 **[3]**	CAO	Allow 0.95 with working
7	**(i)**	(*C*)	E(X) = $np = 20 \times 0.78 = 15.6$	B1 **[1]**	CAO	Do not allow final answer of 15 or 16 even if correct 15.6 given earlier
7	**(ii)**		Let $X \sim$ B(20, 0.78)			
			Let p = probability of a patient being cured (for population)	B1	For definition of p	In context See below for additional notes
			H_0: $p = 0.78$	B1	For H_0	
			H_1: $p > 0.78$	B1	For H_1	
						No further marks if point probabilities

Question	Answer	Marks	Guidance	
				used
	$P(X \geq 19) = 0.0392 + 0.0069$	B1	For **NOTATION** $P(X \geq 19)$ or $P(X > 18)$ or $1 - P(X \leq 18)$ or $1 - P(X < 19)$	Notation $P(X = 19)$ scores B0. If they have the correct $P(X \geq 19)$ then give B1 and ignore any further incorrect notation.
	$= 0.0461$	B1*	CAO For 0.0461 allow 0.0462	
				FT answer to (i)B for following three marks provided based on 1 – (P(19) + P(20))
	$0.0461 > 1\%$	M1* dep	For comparison with 1%	Dep on sensible attempt at $P(X \geq 19)$
	So not significant.	A1		Allow 'accept H_0' or 'reject H_1'
	Conclude that there is not enough evidence to suggest that the new drug is more effective than the old one.	E1		Must include 'insufficient evidence' or something similar such as 'to suggest that' ie an element of doubt either in the A or E mark. Must be in context to gain E1 mark. Do NOT allow 'sufficient evidence to suggest proportion cured is 0.78' or similar
				<u>99% method:</u> $P(X \leq 18) = 0.9539$ B1B1* CAO $0.9539 < 99\%$ M1* then as per scheme
		[8]		
	ALTERNATIVE METHOD FOR FINAL 5 MARKS		If combination of methods used, mark both and give higher mark.	No further marks if point probabilities used
	$P(X \geq 19) = 0.0461 > 1\%$	B1	For either probability	Do not insist on correct notation as candidates have to work out two probabilities for full marks.

Question			Answer	Marks	Guidance	
			$P(X \geq 20) = 0.0069 < 1\%$	M1	For at least one comparison with 1%	Allow comparison in form of statement 'critical region at 1% level is …'
			So critical region is {20}	B1*	CAO dep on the two correct probabilities	No marks if CR not justified Condone $X \geq 20$, $X = 20$, oe but not $P(X \geq 20,)$ etc
			(19 not in CR so) not significant.	A1* dep	Dep on correct CR	Allow 'accept H_0' or 'reject H_1'
			Conclude that there is not enough evidence to suggest that the new drug is more effective than the old one.	E1* dep	Ignore any work on lower critical region	
7	**(iii)**		With a 5% significance level rather than a 1% level, the null hypothesis would have been rejected. OR: 'there would be enough evidence to suggest that the new drug is more effective than the old one.'	B1*	oe	FT their probability from (ii) but NO marks if point probabilities used There must be a sensible attempt to use $P(X = 19) + P(X = 20)$ or must have correct CR.
			This is because $0.0461 < 5\%$	B1* dep **[2]**	oe	Dep on correct answer of 0.0461 compared with 5% or 0.9539 compared with 95% or correct CR.
8	**(i)**		Inter-quartile range $= 18.1 - 17.8 = 0.3$	B1		
			Lower limit $17.8 - (1.5 \times 0.3)$ $(= 17.35)$	M1		FT their IQR for M marks only
			No outliers at lower end.	A1	dep on 17.35	Allow 'No values below 17.35 for first A1 Allow 'Lower limit = 17.35 so no outliers (at lower end)' Watch for use of median giving 17.45 which gets M0A0 You must be convinced that comments about no outliers refer to lower tail only.
			Upper limit $18.1 + (1.5 \times 0.3)$ $(= 18.55)$	M1		
			(Max is 18.6) so at least one outlier at upper end.	A1	dep on 18.55	Allow 'At least one value above 18.55' for second A1 Allow 'any value above 18.55 is an outlier' so at least one outlier.

Question			Answer	Marks	Guidance	
				[5]		Do not allow 'There MAY be one outlier' oe Condone 'one outlier' Condone 'there are outliers' Watch for use of median giving 18.35 which gets M0A0 You must be convinced that comments about some outliers refer to upper tail only.
8	(ii)		P(A) = P(All 3 have orange centres) = $\frac{7}{20}\times\frac{6}{19}\times\frac{5}{18}=\frac{7}{228}$	M1	For 7/20×	Allow final answer of 0.031 with working ALTERNATIVE SCHEME $^{7}C_{3}/^{20}C_{3}$ = 35/1140 = 7/228 = 0.0307 M1 for either term in correct position in a fraction M1 for correct fraction A1 CAO
				M1	For product of correct three fractions Without extra terms	
			= 0.0307 (0.030702)	A1	CAO Allow full marks for fully simplified fractional answers	
			P(B) = P(All 3 have same centres) = $\left(\frac{7}{20}\times\frac{6}{19}\times\frac{5}{18}\right)+\left(\frac{6}{20}\times\frac{5}{19}\times\frac{4}{18}\right)+\left(\frac{4}{20}\times\frac{3}{19}\times\frac{2}{18}\right)+\left(\frac{3}{20}\times\frac{2}{19}\times\frac{1}{18}\right)=$	M1	For at least two correct triple products or fractions or decimals	ALTERNATIVE SCHEME $^{7}C_{3}/^{20}C_{3}$ + $^{6}C_{3}/^{20}C_{3}$ + $^{4}C_{3}/^{20}C_{3}$ + $^{3}C_{3}/^{20}C_{3}$ M1 for at least two correct terms
			$=0.0307+0.0175+0.0035+0.0009$	M1	For sum of all four correct	M1 for sum of all four (all correct) either as combinations or decimals
			$=0.0526 \quad =\frac{1}{19}$ (0.052632) $\left(=\frac{7}{228}+\frac{1}{57}+\frac{1}{285}+\frac{1}{1140}\right)$	A1 [6]	CAO Allow 0.053 or anything which rounds up to 0.053 with working	A1 CAO **Please check all of the answer space for this part**
8	(iii)		$\mathrm{P}(A\mid B) = \frac{0.0307..}{0.0526..}$	M1	For their 'A' divided by their 'B'	Allow 0.584 from $\frac{0.0307}{0.0526}$

Question			Answer	Marks	Guidance	
			= 0.583 (= 0.58333)	A1	FT their answers to (ii) provided answer < 1	Allow $\frac{7}{12}$
			$P(B \mid A) = 1$	B1 **[3]**	CAO	
8	**(iv)**		P(All have orange centres) = $0.0307^2 = 0.00094$ or = $\frac{49}{51984}$ = (0.00094260)	M1 A1 **[2]**	For their 0.0307^2 FT	Allow 9.4×10^{-4} condone 0.0009 or 9×10^{-4}
8	**(v)**		P(Has to select > 2) = 1 - P(Has to select ≤ 2) $= 1-\left(\frac{14}{20}+\left(\frac{6}{20}\times\frac{14}{19}\right)\right)=1-\left(0.7+0.221\right)=1-0.921$	M1	For $\left(\frac{6}{20}\times\frac{14}{19}\right)$	For any of the methods below allow SC2 for 1 – 0.079 = 0.921 or 1 – 3/38 = 35/38 o.e. as final answer
			= 0.079 (=0.078947)	M1 A1 **[3]**	For 1 – sum of both CAO	This is 1 – P(C' + CC')
			OR P(Has to select > 2) = P(First 2 both cherry) = $\left(\frac{6}{20}\times\frac{5}{19}\right)$	M2	For whole product	Without extra terms added M1 if multiplied by k/18 only where 0<k<18 (seen as a triple product only)
			= 0.079 $= \frac{3}{38}$	A1	CAO	This is P(CC).
			OR 1 – (P(0 cherries) + P(1 cherry))= $1-\left(\frac{14}{20}\times\frac{13}{19}+\left(\frac{6}{20}\times\frac{14}{19}\right)+\left(\frac{14}{20}\times\frac{6}{19}\right)\right)$ $=1-\left(0.4789+0.2211+0.2211\right)=1-0.9209$ = 0.079	M1 M1 A1	For any term For 1 – sum of all three CAO	This is 1 – P(C'C' + CC' + C'C)
			OR $\left(\frac{6}{20}\times\frac{5}{19}\times\frac{14}{18}\right)+\left(\frac{6}{20}\times\frac{5}{19}\times\frac{4}{18}\times\frac{14}{17}\right)+\left(\frac{6}{20}\times\frac{5}{19}\times\frac{4}{18}\times\frac{3}{17}\times\frac{14}{16}\right)+\left(\frac{6}{20}\times\frac{5}{19}\times\frac{4}{18}\times\frac{3}{17}\times\frac{2}{16}\times\frac{14}{15}\right)+\left(\frac{6}{20}\times\frac{5}{19}\times\frac{4}{18}\times\frac{3}{17}\times\frac{2}{16}\times\frac{1}{15}\times\frac{14}{14}\right)$	M1	For any term	This is P(CCC' + CCCC' + CCCCC' + CCCCCC' + CCCCCCC')

Question			Answer	Marks	Guidance	
			$= \frac{7}{114} + \frac{14}{969} + \frac{7}{2584} + \frac{7}{19380} + \frac{1}{38760}$ = 0.079	M1 A1	For sum of all five terms (all correct) CAO	

NOTE RE OVER-SPECIFICATION OF ANSWERS
If answers are grossly over-specified, deduct the final answer mark (max once per question). Probabilities should also be rounded to a sensible degree of accuracy. In general final non probability answers should not be given to more than 4 significant figures. Allow probabilities given to 5 sig fig.

PLEASE HIGHLIGHT ANY OVER-SPECIFICATION and also non alignment in question 5(i)

Please note that there are no G or E marks in scoris, so use B instead

NB Please annotate every additional answer sheet even if full marks awarded or the page is blank – Use BP symbol

Other rules for annotation: In the 10 standardisation scripts annotate everything that gets anything other than zero or full marks. After this, annotate down the right hand side in Q7(ii), up to where marks stop being scored, in the order given in the mark scheme. Annotate anywhere else where necessary to clarify how you have awarded the marks.

Additional notes re Q7 part ii (first three marks)

Minimum needed for B1 is p = probability of being cured.
Allow p = P(patient being cured)
Definition of p must include word probability (or chance or proportion or percentage or likelihood but NOT possibility, number or amount).
Preferably given as a separate comment. However can be at end of H_0 as long as it is a clear definition 'p = the probability of patient being cured.'
Do NOT allow 'p = probability of patient in the sample being cured'

Do NOT allow 'p = the probability of patient being cured is different'
Allow p=78%, allow only p or θ or π or ρ. However allow any single symbol <u>if defined</u> (including *x*)
Allow $H_0 = p=0.78$, Allow $H_0 : p={}^{39}/_{50}$ or $p={}^{78}/_{100}$
Allow NH and AH in place of H_0 and H_1
Do not allow $H_0 : P(X=x) = 0.78$
Do not allow H_0: =0.78, =78%, P(0.78), p(*x*)=0.78, *x*=0.78 (unless *x* correctly defined as a probability)
Do not allow H_0 and H_1 reversed
For hypotheses given in words allow Maximum B0B1B1
Hypotheses in words must include probability (or chance or proportion or percentage) and the figure 0.78 oe
Thus eg H_0 : P(patient being cured) = 0.78, H_1 : P(patient being cured) > 0.78 gets B0B1B1
Do not allow if H_1 wrong

Additional notes re Q7 part ii

<u>Smallest critical region method:</u>
Smallest critical region that 19 could fall into is {19, 20} and has size 0.0461 gets B1, This is > 1% gets M1, B1, A1, E1 as per scheme
NB These marks only awarded if 19 used, not other values.

<u>Use of k method with no probabilities quoted:</u>
This gets zero marks.

<u>Use of k method with one probability quoted:</u>
Mark as per scheme

<u>Line diagram method and Bar chart method</u>
No marks unless correct probabilities shown on diagram, then mark as per scheme.

<u>Lower tailed test done with H_1: p<0.78</u>
Hyp gets max B1B1B0
If compare with 1% give SC2 for $P(X \leq 19) = 1 - 0.0069 = 0.9931 > 1\%$ and SC1 for final conclusion, otherwise give zero.

<u>Two-tailed test done with H_1: $p \neq 0.78$</u>
Provided compare with 0.5% give SC2 for $P(X \geq 19) = 0.0461 > 0.5\%$ and SC1 for final conclusion

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4766 Statistics 1

General Comments

The majority of candidates coped very well with this paper and a large number scored at least 60 marks out of 72. There was no evidence of candidates being unable to complete the paper in the allocated time. Most candidates had adequate space in the answer booklet without having to use additional sheets.

Candidates performed fairly well on the first conditional probability question (question 2(ii)) but not very well on the second one (question 8(iii)). In question 5(iii), although candidates usually found the mean, median and mode correctly, many gave a poor explanation of whether or not the mode was useful. Many candidates found question 6(i) very difficult, often providing explanations that were not convincing. Question 7 on the binomial distribution and hypothesis testing was fairly well answered, with many candidates defining the hypotheses correctly, defining p, carrying out the hypothesis test correctly and also giving their final answer in context with an element of doubt. Question 8(v) was sufficiently challenging to differentiate between the best candidates.

As last year, most candidates supported their numerical answers with appropriate working, but when written explanations were required, the poor handwriting and in some cases the poor use of English of some candidates made it difficult to determine what they were trying to say.

Too many candidates are still losing marks due to over specification of some of their answers. Over a third of candidates lost a mark in question 1 and/or in question 6 part (ii) due to this. For example in Q1(i) candidates often gave an answer of 419.13, some adding 'to 2dp', which they thought was appropriate accuracy. Of course it is the number of significant figures rather than the number of decimal places that is important, and giving a standard deviation to 5 significant figures is not sensible and so attracted a penalty.

Comments on Individual Questions

Q1(i) Almost all candidates found the mean and most also found the standard deviation correctly, although this answer was often over specified to 419.13. It seems that candidates incorrectly think that the number of decimal places is the crucial thing rather than the number of significant figures. A few candidates made errors in calculating S_{xx} or calculated the variance or the root mean square deviation.

Q1(ii) This question was very well-answered with about two thirds of candidates scoring full marks. Full follow-through was allowed from answers to part (i). Few candidates lost marks for over-specification here as those who did had already lost a mark for this in part (i). The most common error was to add 14.5 to the standard deviation as well as the mean. A few candidates multiplied their answers by 40.

Q2(i)A This was answered very well, although a number of candidates gave the number that watched cycling and not football rather than the probability. A few had the wrong divisor, usually 186 or 100.

Q2(i)B Again this was very well-answered with only a small minority of candidates making errors. The most common errors were to include those people who watched all three sports or to miss out one of the six who watched 1 or 2 sports..

Q2(ii) Approximately two thirds of candidates answered this correctly. Of the rest, some were able to get a method mark for the correct denominator but then failed to get the correct numerator, often thinking that it was 12 rather than 15. Some candidates either did not recognize this as a conditional probability question, or did not know about conditional probability.

Q3(i) This was answered very well. However a few ignored the question and assumed 54 or 50 cards in a pack, or that the card had not been replaced. Another common wrong method was to find 1 - P(both aces) = $1 - (4/52)^2 = 168/169$.

Q3(ii) Surprisingly, only two thirds of candidates scored this easy mark. Most realised that they had to multiply their answer to part (i) by 10 but some then rounded their answer to a whole number, thus losing the mark. A smaller number incorrectly raised their answer to part (i) to the power of 10.

Q4(i) This was very well-answered.

Q4(ii) This was again usually answered well although a fairly common error was to add the two combinations rather than to multiply them.

Q4(iii) This was another well-answered question with even those who had added in part (ii) still usually scoring both marks on follow through. Candidates who tried to use a probability method (instead of simply dividing their answer to part (i) by their answer to part (ii)) were rarely successful, and even if they did have the correct product of 15 probabilities, they rarely multiplied this by any, let alone the correct combination.

Q5(i) Most candidates scored all three marks, although some did not accurately align the leaves or did not provide a suitable key and thus scored only 2 marks. Very few candidates scored less than 2 out of 3.

Q5(ii) This was very well-answered with only a few thinking that the skew was positive.

Q5(iii) The mean, median and mode were usually given correctly although one or two candidates lost a mark due to over-specification of the mean or rounding of the median. However the final mark for the comment was awarded to only under a quarter of candidates. Many candidates gave general descriptions of the usefulness of the mode rather than commenting on this particular case. Too many candidates stated incorrectly that the mode was useful. Those who correctly stated that it was not useful, often followed this with an incorrect reason such as being unaffected by outliers; data being negatively skewed; or not being close to the mean and/or median.

Q6(i) A variety of techniques was used to answer this question, including some novel approaches that at times were hard to follow. The most common approach was to sum the required combinations of 1, 2 and 3 sixes in the set rather than the neater solution of subtracting from 1 the combinations that were not required (no sixes). Unsurprisingly many candidates subtracted the other given probabilities from 1, gaining no marks.

Q6(ii) Candidates who worked in fractions almost always gained full credit, whether or not they converted to decimals at the end. Many candidates who worked in decimals lost a mark for over-specification. Some candidates also lost marks by not showing sufficient working despite getting answers fairly close to the correct ones. However, over three-quarters of candidates gained at least 4 marks out of 5.

Q7(i)A This was generally very well-answered.

Q7(i)B Although around two-thirds of candidates answered this correctly, some candidates included P(X=18) in their method and thus were only able to gain 1 mark out of 3.

Q7(i)C The majority of the candidates found this part straightforward, but a minority lost the mark when they rounded their final answer to 15 or 16.

Q7(ii) In recent years, candidates have been doing better on hypothesis test questions than in the past, and this was again the case this year. Many fully correct responses were seen. Most candidates scored the first three marks for the hypotheses, with most now knowing that they need to define p. The vast majority of successful candidates used the

probability method, finding P($X \geq 19$) and then comparing this to 1%. It was pleasing to see that most candidates gave their final answer in context and with an element of doubt stating something to the effect of 'there is not enough evidence to suggest that…'. Those who tried to use the critical region method were less successful on the whole. Again some tried to use point probabilities, being able to gain only the first three marks for the hypotheses. A few candidates tried to use tables and there full marks available for correct interpolation from tables.

Q7(iii) Candidates who gained more or less full marks in part (ii) tended to gain full marks in this part. In this part no marks were available if point probabilities were used.

Q8(i) Most candidates calculated the inter-quartile range and used it correctly to find the limits for outliers. However a few used the median instead of the quartiles to add to and subtract from 1.5 × inter-quartile range. Many candidates neglected to comment on outliers at each end separately (only commenting if there were outliers overall).

Q8(ii) This question was answered well (even by candidates who had struggled with earlier questions). Many answers were left as fractions (which were exact) with very few marks lost for over-specification. However many candidates squashed their work up into the first part of the answer space, not realising that there was more space on the next page. A few candidates forgot to take into consideration 'non replacement' and starting with $(7/20)^3$, gained only 1 mark, although plenty of follow through marks were available in parts (iii) and (iv).

Q8(iii) Although over half of candidates gained at least 2 marks out of 3 here, a number of candidates did not use the straightforward $P(A|B) = P(A)/P(B)$ here, and instead mistakenly calculated $P(A \cap B) = P(A) \times P(B)$, and then cancelled out a term on the top and bottom of the fraction. This illustrates the lack of deep understanding here of independence and conditionality. A disappointing number of candidates were quite happy to give an answer greater than 1 for $P(B|A)$.

Q8(iv) This was well-answered although a common incorrect method was $2 \times P(A)$.

Q8(v) Only approximately a quarter of candidates produced a completely correct answer, although many went through the correct answer on the way to a wrong one. Most of the correct answers used the $6/20 \times 5/19$ method, with a large minority then compromising this with another term multiplied or added.

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GCE Mathematics (MEI)

				Max Mark	a	b	c	d	e	u
4751	01	C1 – MEI Introduction to advanced mathematics (AS)	Raw	72	63	58	53	48	43	0
			UMS	100	80	70	60	50	40	0
4752	01	C2 – MEI Concepts for advanced mathematics (AS)	Raw	72	56	50	44	39	34	0
			UMS	100	80	70	60	50	40	0
4753	01	(C3) MEI Methods for Advanced Mathematics with Coursework: Written Paper	Raw	72	56	51	46	41	36	0
4753	02	(C3) MEI Methods for Advanced Mathematics with Coursework: Coursework	Raw	18	15	13	11	9	8	0
4753	82	(C3) MEI Methods for Advanced Mathematics with Coursework: Carried Forward Coursework Mark	Raw	18	15	13	11	9	8	0
			UMS	100	80	70	60	50	40	0
4754	01	C4 – MEI Applications of advanced mathematics (A2)	Raw	90	74	67	60	54	48	0
			UMS	100	80	70	60	50	40	0
4755	01	FP1 – MEI Further concepts for advanced mathematics (AS)	Raw	72	62	57	53	49	45	0
			UMS	100	80	70	60	50	40	0
4756	01	FP2 – MEI Further methods for advanced mathematics (A2)	Raw	72	65	58	52	46	40	0
			UMS	100	80	70	60	50	40	0
4757	01	FP3 – MEI Further applications of advanced mathematics (A2)	Raw	72	59	52	46	40	34	0
			UMS	100	80	70	60	50	40	0
4758	01	(DE) MEI Differential Equations with Coursework: Written Paper	Raw	72	63	57	51	45	38	0
4758	02	(DE) MEI Differential Equations with Coursework: Coursework	Raw	18	15	13	11	9	8	0
4758	82	(DE) MEI Differential Equations with Coursework: Carried Forward Coursework Mark	Raw	18	15	13	11	9	8	0
			UMS	100	80	70	60	50	40	0
4761	01	M1 – MEI Mechanics 1 (AS)	Raw	72	62	54	46	39	32	0
			UMS	100	80	70	60	50	40	0
4762	01	M2 – MEI Mechanics 2 (A2)	Raw	72	54	47	40	33	27	0
			UMS	100	80	70	60	50	40	0
4763	01	M3 – MEI Mechanics 3 (A2)	Raw	72	64	56	48	41	34	0
			UMS	100	80	70	60	50	40	0
4764	01	M4 – MEI Mechanics 4 (A2)	Raw	72	53	45	38	31	24	0
			UMS	100	80	70	60	50	40	0
4766	01	S1 – MEI Statistics 1 (AS)	Raw	72	61	54	47	41	35	0
			UMS	100	80	70	60	50	40	0
4767	01	S2 – MEI Statistics 2 (A2)	Raw	72	65	60	55	50	46	0
			UMS	100	80	70	60	50	40	0
4768	01	S3 – MEI Statistics 3 (A2)	Raw	72	64	58	52	47	42	0
			UMS	100	80	70	60	50	40	0
4769	01	S4 – MEI Statistics 4 (A2)	Raw	72	56	49	42	35	28	0
			UMS	100	80	70	60	50	40	0
4771	01	D1 – MEI Decision mathematics 1 (AS)	Raw	72	56	51	46	41	37	0
			UMS	100	80	70	60	50	40	0
4772	01	D2 – MEI Decision mathematics 2 (A2)	Raw	72	54	49	44	39	34	0
			UMS	100	80	70	60	50	40	0
4773	01	DC – MEI Decision mathematics computation (A2)	Raw	72	46	40	34	29	24	0
			UMS	100	80	70	60	50	40	0
4776	01	(NM) MEI Numerical Methods with Coursework: Written Paper	Raw	72	56	50	45	40	34	0
4776	02	(NM) MEI Numerical Methods with Coursework: Coursework	Raw	18	14	12	10	8	7	0
4776	82	(NM) MEI Numerical Methods with Coursework: Carried Forward Coursework Mark	Raw	18	14	12	10	8	7	0
			UMS	100	80	70	60	50	40	0
4777	01	NC – MEI Numerical computation (A2)	Raw	72	55	47	39	32	25	0
			UMS	100	80	70	60	50	40	0
4798	01	FPT - Further pure mathematics with technology (A2)	Raw	72	57	49	41	33	26	0
			UMS	100	80	70	60	50	40	0

GCE Statistics (MEI)									
			Max Mark	a	b	c	d	e	u
G241	01 Statistics 1 MEI (Z1)	Raw	72	61	54	47	41	35	0
		UMS	100	80	70	60	50	40	0
G242	01 Statistics 2 MEI (Z2)	Raw	72	55	48	41	34	27	0
		UMS	100	80	70	60	50	40	0
G243	01 Statistics 3 MEI (Z3)	Raw	72	56	48	41	34	27	0
		UMS	100	80	70	60	50	40	0

GCE Quantitative Methods (MEI)									
			Max Mark	a	b	c	d	e	u
G244	01 Introduction to Quantitative Methods MEI	Raw	72	58	50	43	36	28	0
G244	02 Introduction to Quantitative Methods MEI	Raw	18	14	12	10	8	7	0
		UMS	100	80	70	60	50	40	0
G245	01 Statistics 1 MEI	Raw	72	61	54	47	41	35	0
		UMS	100	80	70	60	50	40	0
G246	01 Decision 1 MEI	Raw	72	56	51	46	41	37	0
		UMS	100	80	70	60	50	40	0