OCR
Oxford Cambridge and RSA

Friday 5 June 2015 – Morning

AS GCE MATHEMATICS (MEI)

4771/01 Decision Mathematics 1

QUESTION PAPER

Candidates answer on the Printed Answer Book.

OCR supplied materials:
- Printed Answer Book 4771/01
- 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.

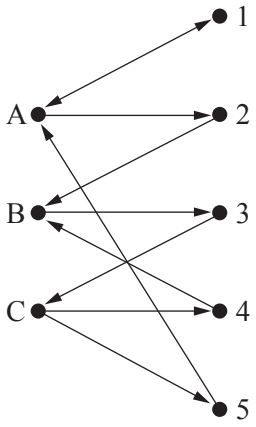
- The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **8** pages. Any blank pages are indicated.

INSTRUCTIONS 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 (24 marks)

1 The directed bipartite graph represents links between chairlifts and ski runs in one part of a ski resort. Chairlifts are represented by capital letters, and ski runs are represented by numbers. For example, chairlift A takes skiers to the tops of ski runs 1 and 2, whereas ski run 2 takes skiers to the bottom of chairlift B.



(i) The incomplete map in your answer book represents the three chairlifts and ski run 2. Complete the map by drawing in the other 4 ski runs. **[2]**

Angus wants to ski all 5 ski runs, starting and finishing at the bottom of chairlift A.

(ii) Which chairlifts does Angus have to repeat, and why? **[3]**

(iii) Which ski runs does Angus have to repeat, and why? **[2]**

The chairlifts and ski runs shown above form only part of the resort. In fact, chairlift C also takes skiers to the bottom of chairlift D.

(iv) Why can this information not be represented in a bipartite graph? **[1]**

2 The following algorithm operates on the equations of 3 straight lines, each in the form $y = m_i x + c_i$.

Step 1	Set $i = 1$
Step 2	Input m_i and c_i
Step 3	If $i = 3$ then go to Step 6
Step 4	Set $i = i + 1$
Step 5	Go to Step 2
Step 6	Set $j = 1$
Step 7	Set $a = j + 1$
Step 8	If $a > 3$ then set $a = a - 3$
Step 9	Set $b = j + 2$
Step 10	If $b > 3$ then set $b = b - 3$
Step 11	Set $d_j = m_b - m_a$
Step 12	If $d_j = 0$ then go to Step 20
Step 13	Set $x_j = \dfrac{c_a - c_b}{d_j}$
Step 14	Set $y_j = m_a \times x_j + c_a$
Step 15	Record (x_j , y_j) in the print area
Step 16	If $j = 3$ then go to Step 19
Step 17	Set $j = j + 1$
Step 18	Go to Step 7
Step 19	Stop
Step 20	Record "parallel" in the print area
Step 21	Go to Step 16

(i) Run the algorithm for the straight lines $y = 2x + 8$, $y = 2x + 5$ and $y = 4x + 3$ using the table given in your answer book. The first five steps have been completed, so you should continue from Step 6. **[7]**

(ii) Describe what the algorithm achieves. **[1]**

3 Mary takes over a small café. She will sell two types of hot drink: tea and coffee.

A coffee filter costs her £0.10, and makes one cup of coffee. A tea bag costs her £0.05 and makes one cup of tea. She has a total weekly budget of £50 to spend on coffee filters and tea bags.

She anticipates selling at least 500 cups of hot drink per week. She estimates that between 50% and 75% of her sales of cups of hot drink will be for cups of coffee.

Mary needs help to decide how many coffee filters and how many tea bags to buy per week.

(i) Explain why the number of tea bags which she buys should be no more than the number of coffee filters, and why it should be no less than one third of the number of coffee filters. **[2]**

(ii) Allocate appropriate variables, and draw a graph showing the feasible region for Mary's problem. **[5]**

Mary's partner suggests that she buys 375 coffee filters and 250 tea bags.

(iii) How does this suggestion relate to the estimated demand for coffee and tea? **[1]**

Section B (48 marks)

4 The table defines a network on 6 nodes, the numbers representing distances between those nodes.

	A	B	C	D	E	F
A		3	2	7	8	3
B	3		4	5		
C	2	4			6	
D	7	5				
E	8		6			2
F	3				2	

(a) Use Dijkstra's algorithm to find the shortest routes from A to each of the other vertices. Give those routes and their lengths. **[6]**

(b) Jack wants to find a minimum spanning tree for the network.

(i) Apply Prim's algorithm to the network, draw the minimum spanning tree and give its length. **[3]**

Jill suggests the following algorithm is easier.

Step 1 Remove an arc of longest length which does not disconnect the network
Step 2 If there is an arc which can be removed without disconnecting the network then go to Step 1
Step 3 Stop

(ii) Show the order in which arcs are removed when Jill's algorithm is applied to the network. **[2]**

(iii) Explain why Jill's algorithm always produces a minimum spanning tree for a connected network. **[3]**

(iv) In a complete network on n vertices there are $\frac{n(n-1)}{2}$ arcs. There are $n - 1$ arcs to include when using Prim's algorithm. How many arcs are there to remove using Jill's algorithm?

For what values of n does Jill have more arcs to remove than Prim has to include? **[2]**

5 The table lists activities which are involved in framing a picture. The table also lists their durations and their immediate predecessors. Except for activities C and H, each activity is undertaken by one person. Activities C and H require no people.

Activity		Duration (mins)	Immediate predecessor(s)
A	select mounting	5	–
B	glue picture to mounting	5	A
C	allow mounting glue to dry	20	B
D	measure for frame	5	A
E	select type of frame	10	A
F	cut four frame pieces	5	D, E
G	pin and glue frame pieces together	5	F
H	allow frame glue to dry	20	G
I	cut and bevel glass	30	D
J	fit glass to frame	5	H, I
K	fit mounted picture to frame	5	C, J

(i) Draw an activity on arc network for these activities. **[5]**

(ii) Mark on your diagram the early time and the late time for each event. Give the minimum completion time and the critical activities. **[6]**

A picture is to be framed as quickly as possible. Two people are available to do the job.

(iii) Produce a schedule to show how two people can complete the picture framing in the minimum time. **[3]**

To reduce the completion time an instant glue is to be used. This will reduce the time for activities C and H to 0 minutes.

(iv) Produce a schedule for two people to complete the framing in the new minimum completion time, and give that time. **[2]**

Question 6 begins on page 6

6 Adrian and Kleo like to go out for meals, sometimes to a French restaurant, and sometimes to a Greek restaurant. If their last meal out was at the French restaurant, then the probability of their next meal out being at the Greek restaurant is 0.7, whilst the probability of it being at the French restaurant is 0.3. If their last meal out was at the Greek restaurant, then the probability of their next meal out being at the French restaurant is 0.6, whilst the probability of it being at the Greek restaurant is 0.4.

(i) Construct two simulation rules, each using single-digit random numbers, to model their choices of where to eat. **[3]**

(ii) Their last meal out was at the Greek restaurant. Use the random digits printed in your answer book to simulate their choices for the next 10 of their meals out. Hence estimate the proportion of their meals out which are at the French restaurant, and the proportion which are at the Greek restaurant. **[4]**

Adrian and Kleo find a Hungarian restaurant which they like. The probabilities of where they eat next are now given in the following table.

last meal out \ next meal out	French	Greek	Hungarian
French	$\frac{1}{5}$	$\frac{3}{5}$	$\frac{1}{5}$
Greek	$\frac{1}{2}$	$\frac{3}{10}$	$\frac{1}{5}$
Hungarian	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

(iii) Construct simulation rules, each using single-digit random numbers, to model this new situation. **[5]**

(iv) Their last meal out was at the Greek restaurant. Use the random digits printed in your answer book to simulate their choices for the next 10 of their meals out. Hence estimate the proportion of their meals out which are at each restaurant. **[4]**

END OF QUESTION PAPER

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Friday 5 June 2015 – Morning

AS GCE MATHEMATICS (MEI)

4771/01 Decision Mathematics 1

PRINTED ANSWER BOOK

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Other materials required:
- Scientific or graphical calculator

Duration: 1 hour 30 minutes

* 4 7 7 1 0 1 *

* 3 1 6 8 0 3 3 4 9 8 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

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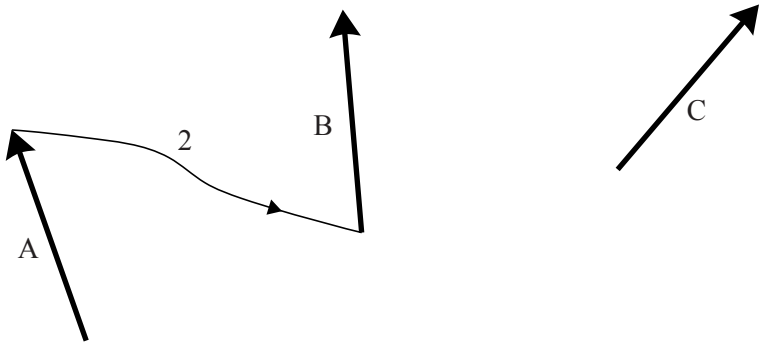
Section A (24 marks)

1 (i)



1 (ii)

1 (iii)

1 (iv)

2 (i)

i	1	2	3						
m_1	2								
c_1	8								
m_2		2							
c_2		5							
m_3			4						
c_3			3						
j									
a									
b									
d_1									
x_1									
y_1									
d_2									
x_2									
y_2									
d_3									
x_3									
y_3									

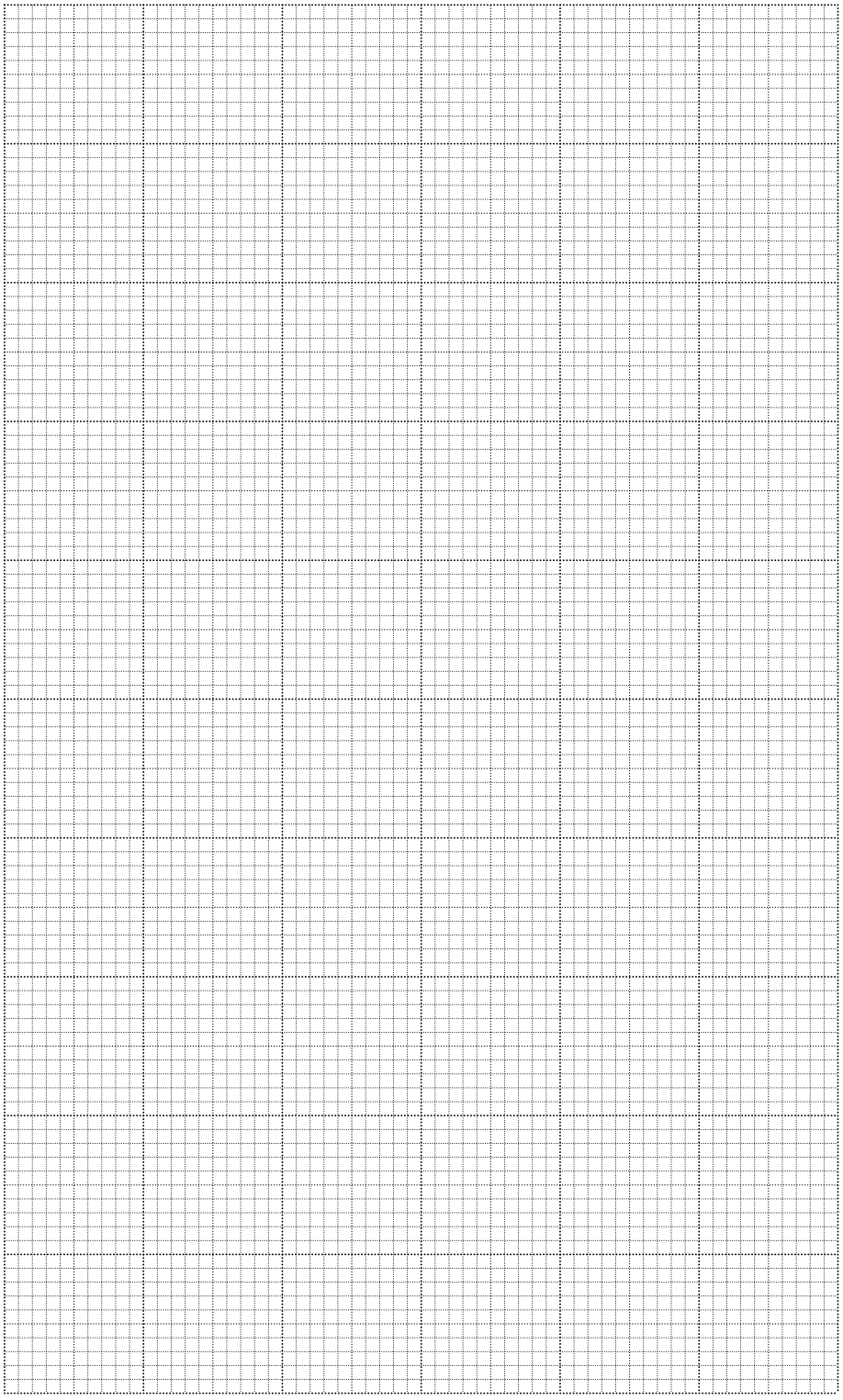
Print area

2 (ii)

3 (i)	
3 (ii)	
	(answer space continued on next page)

PLEASE DO NOT WRITE IN THIS SPACE

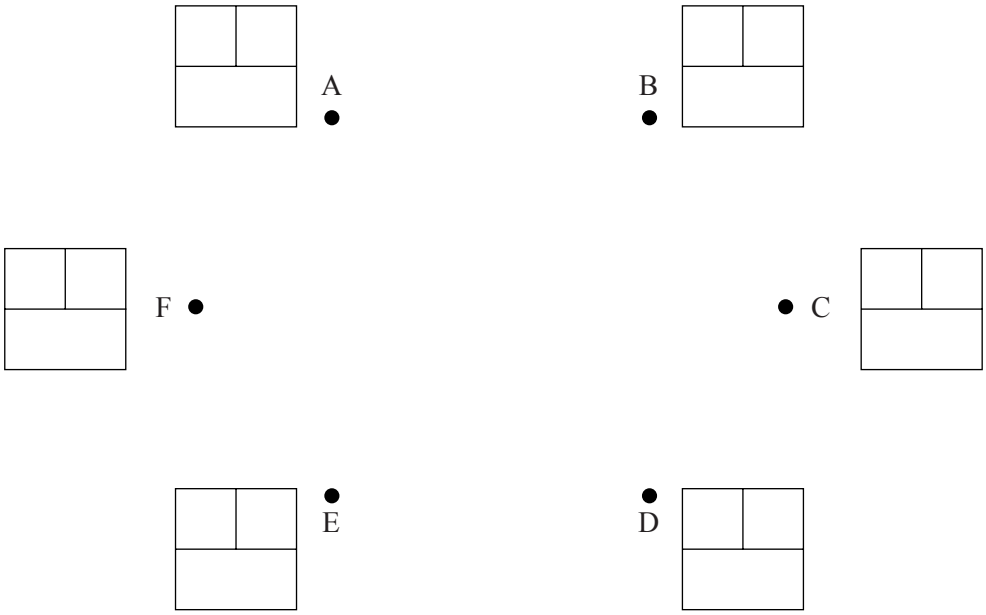
3 (ii) **(continued)** **A spare copy of this graph can be found on page 11**



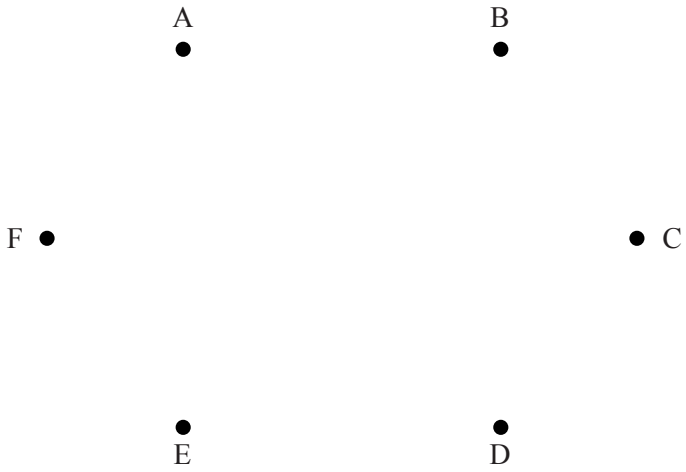
3 (iii)

Section B (48 marks)

4 (a)



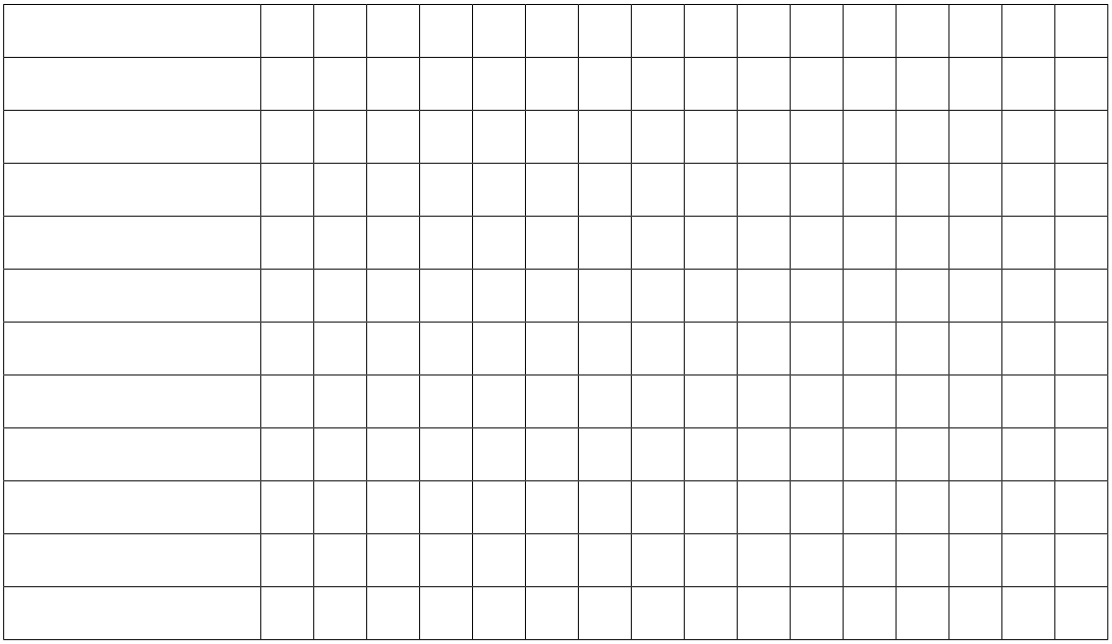
4 (b) (i)



4 (b) (ii)	
4(b)(iii)	
4(b)(iv)	

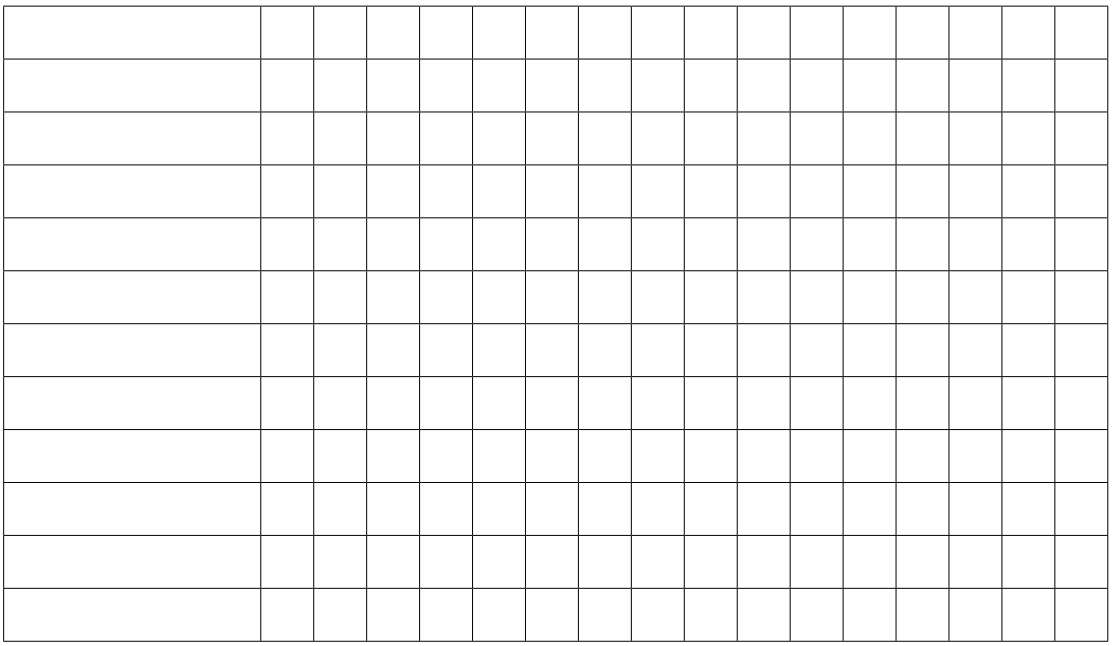
5 (i) & (ii)	

5 (iii)



A spare copy of this diagram can be found on page 12

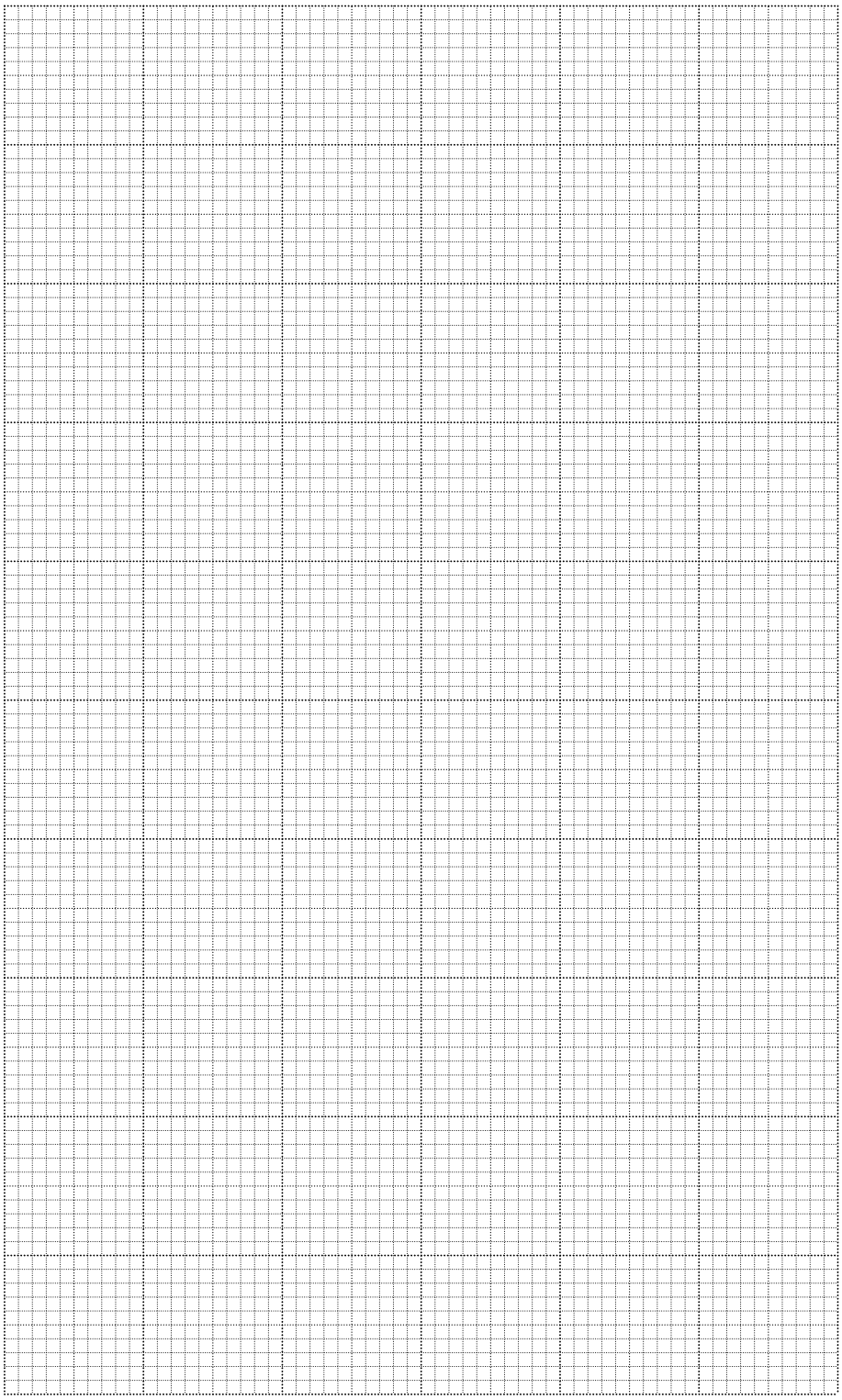
5 (iv)



A spare copy of this diagram can be found on page 12

6 (i)	
6 (ii)	**Random digits: 3 0 8 6 0 0 1 2 8 6**
6 (iii)	
6 (iv)	**Random digits: 2 0 8 9 1 7 9 1 2 3 0 6 5 2 6**

3 (ii) **Spare copy of graph paper for question 3 (ii)**



5 (iii) **Spare copy of the diagram for question 5 (iii)**

5 (iv) **Spare copy of the diagram for question 5 (iv)**

OCR
Oxford Cambridge and RSA

GCE

Mathematics (MEI)

Unit **4771**: Decision Mathematics 1

Advanced Subsidiary GCE

Mark Scheme for June 2015

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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) Decision 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, with 3 significant figures often being the norm. Small variations in the degree of accuracy to which an answer is given (e.g. 2 or 4 significant figures where 3 is expected) should not normally be penalised, while answers which are grossly over- or under-specified should normally result in the loss of a mark. 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.

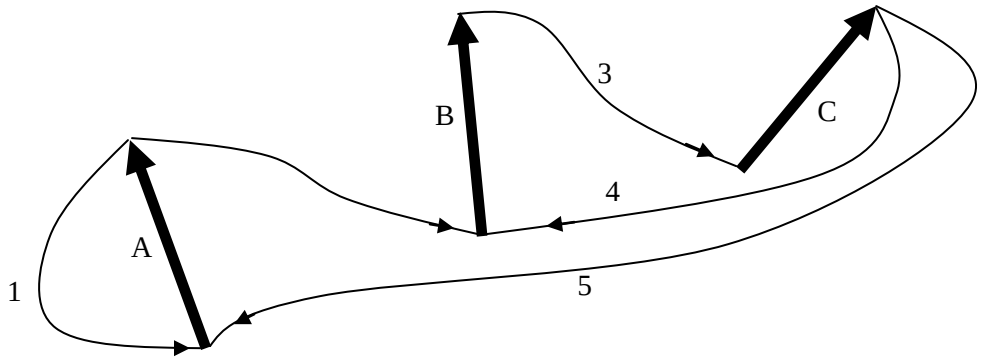
If there are two or more attempts at a question which have not been crossed out, examiners should mark what appears to be the last

(complete) attempt and ignore the others.

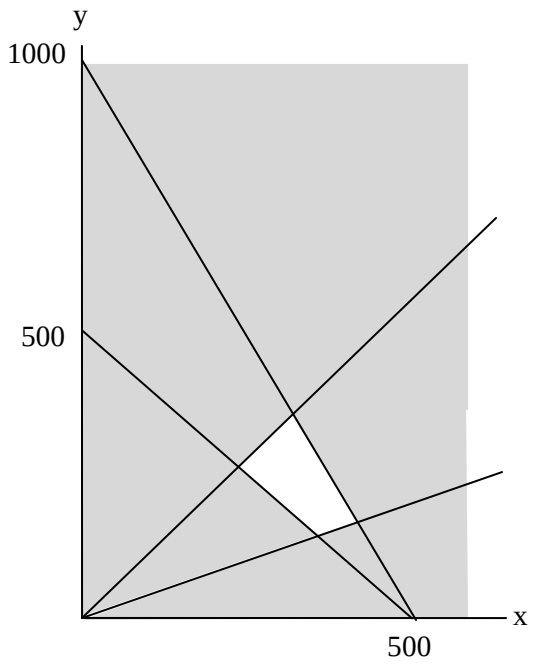
NB Follow these maths-specific instructions rather than those in the assessor handbook.

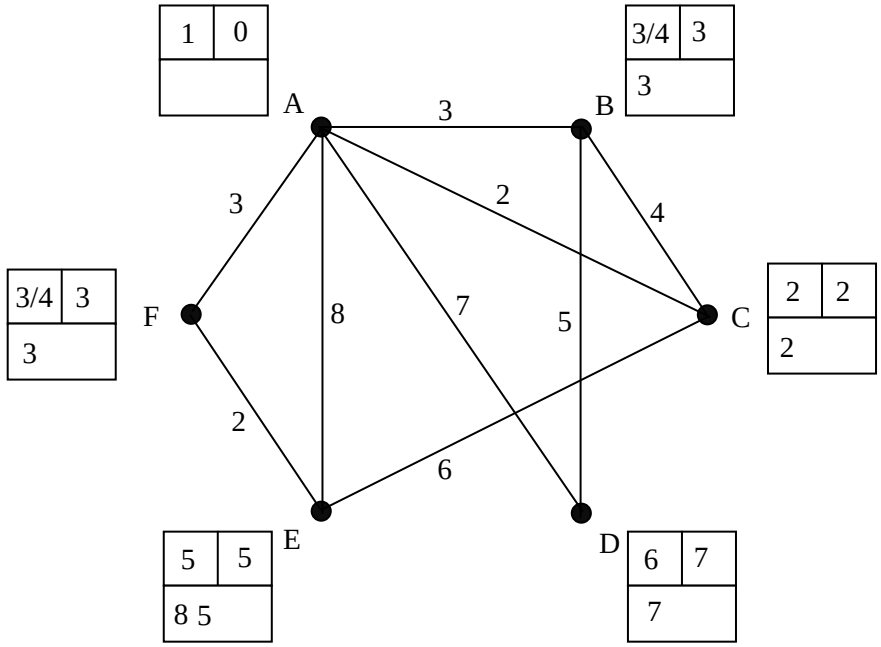
h For a *genuine* misreading (of numbers or symbols) which is such that the object and the difficulty of the question remain unaltered, mark according to the scheme but following through from the candidate's data. A penalty is then applied; 1 mark is generally appropriate, though this may differ for some units. This is achieved by withholding one A mark in the question.

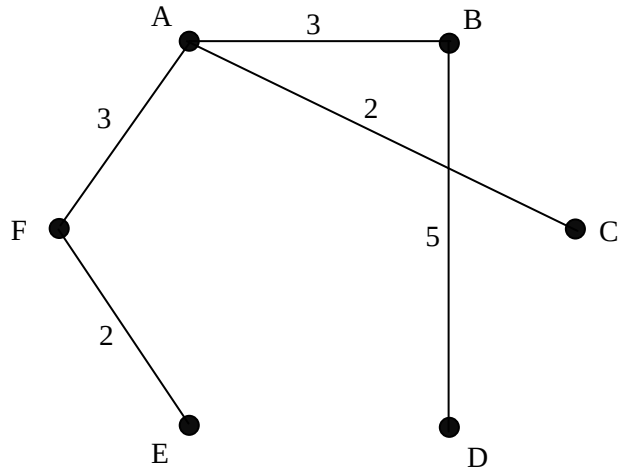
Note that a miscopy of the candidate's own working is not a misread but an accuracy error.

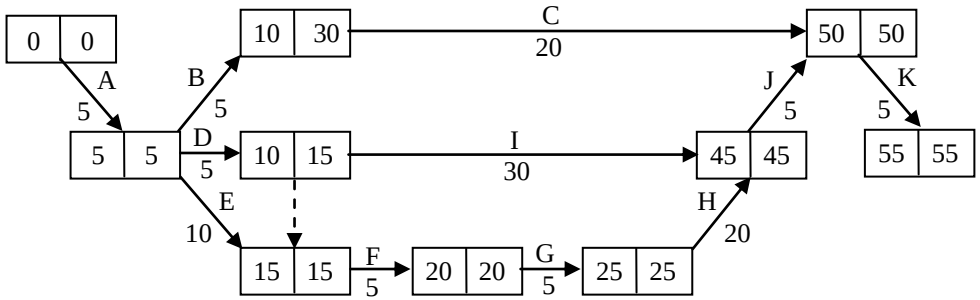
Question			Answer	Marks	Guidance
1	(i)			M1 A1 [2]	At least two directed arcs, each from the top of a lift to the bottom all 4 correct
1	(ii)		(Angus has to repeat all of the chairlifts.) He has to repeat A either because two ski runs deliver skiers to it, or because it serves two ski runs. He has to repeat B and C … … either because two ski runs deliver skiers to them, or because they serve two ski runs or because of ski run 4.	 B1 M1 A1 [3]	
1	(iii)		Angus has to repeat ski run 3 because he has to repeat chairlifts B and/or C (or runs 4 and 5).	M1 A1 [2]	run 3 for explanation
1	(iv)		This would have to be represented by an arc from chairlift C to chairlift D, but in a bipartite graph an arc can only connect two elements which are not in the same set. In this case the sets are chairlifts and ski runs.	B1 [1]	needs to be contextualised

Question			Answer	Marks	Guidance
2	(i)		i 1 2 3 m_1 2 c_1 8 m_2 2 c_2 5 m_3 4 c_3 3 j 1 2 3 a 2 3 4 1 b 3 4 1 5 2 d_1 2 x_1 1 y_1 7 d_2 -2 x_2 2.5 y_2 13 d_3 0 x_3 y_3 Print area (1, 7) (2.5, 13) parallel	M1 A1 B1 B1 B1 M1 A1√ **[7]**	j 1 a 2 b 3 as and bs (4's and 5's not essential) for 1 and 7 for 2.5 and 13 for 0 use of print area 3 copied, inc "parallel"
2	(ii)		Finds the line intersections	B1 **[1]**	

Question			Answer	Marks	Guidance
3	(i)		At least 50% coffee (allow more than) (so number of coffee filters ≥ number of tea bags, so number tea bags ≤ number of coffee filters.) At most 75% coffee (allow less than) so number of coffee filters ≤ 3× number of tea bags, so number of tea bags ≥ 1/3× number of coffee filters.	B1 B1 **[2]**	referral to sales info to get ≤ (allow <) referral to sales info + explanation of 1/3 to get ≥ (allow >)
3	(ii)		Let x be the number of coffee filters. Let y be the number of tea bags ... or vice versa.  	B1 B1 B1 B1cao **[5]**	"number of" essential "500" line £50 line lines from (i) shading
3	(iii)		Coffee – 75% of 500. Tea – 50% of 500.	B1cao **[1]**	

Question			Answer	Marks	Guidance
4	(a)		 AB 3 AC 2 AD 7 AFE 5 AF 3	B1 B1 B1 B1 B1 **[6]**	Dijkstra award only if correct at E other working values order of labelling labels routes lengths

Question			Answer	Marks	Guidance
4	(b)	(i)	 Length = 15	M1 A1 B1 **[3]**	tree or attempt at Prim
4	(b)	(ii)	Removes AE, AD, CE then BC	M1 A1 **[2]**	AE, AD, CE (in order) BC only
4	(b)	(iii)	It will remain connected. There will be no cycles left. Removing a largest possible arc at each stage guarantees a minimum spanning tree.	B1 B1 B1 **[3]**	
4	(b)	(iv)	$(n^2-3n+2)/2$ (or equivalent) arcs for Jill to remove. More than Prim if n is 5 or more	B1 B1 **[2]**	algebraic simplification not needed

Question			Answer	Marks	Guidance
5	(i)&(ii)		 minimum completion time = 55 minutes critical activities – A, E, F, G, H, J, K	M1 A1 A1 A1 A1 **[5]** M1A1√ M1A1√ B1cao B1cao **[6]**	activity on arc F & I J K rest forward pass backward pass time critical activities
5	(iii)		e.g. (each cell represents 5 minutes) 1st person: A E E F G J K 2nd person: B D I I I I I I other activities: C C C C H H H H	M1 A1 B1 **[3]**	A, E, F, G allocated OK B, D, I, J, K OK C and H correctly timed
5	(iv)		e.g. 1st person: A D I I I I I I J K 2nd person: B E E F G 50 minutes	B1 B1 **[2]**	a correct schedule for two people 50 minutes seen

Question			Answer	Marks	Guidance
6	(i)		e.g. French 0, 1, 2, 3, 4, 5, 6 → Greek 7, 8, 9 → French Greek 0, 1, 2, 3, 4, 5 → French 6, 7, 8, 9 → Greek	 B1 M1 A1 **[3]**	 French proportions efficient
6	(ii)		Using Greek rule Using French rule e.g. F G G G F G F G G G Computing observed probabilities e.g. P(F)=0.3 and P(G)=0.7 (Long run probabilities are 6/13 French and 7/13 Greek.)	M1 M1 A1√ B1√ **[4]**	Greek French
6	(iii)		e.g. French 0, 1 → French 2, 3, 4, 5, 6, 7 → Greek 8, 9 → Hungarian Greek 0, 1, 2, 3, 4 → French 5, 6, 7 → Greek 8, 9 → Hungarian Hungarian 0, 1, 2 → French 3, 4, 5 → Greek 6, 7, 8 → Hungarian 9 → reject and redraw	 B1 B1 M1 A1 A1 **[5]**	 reject one (or more) proportions efficient

6	**(iv)**		Greek rule applied in correct circumstances and correctly French rule applied in correct circumstances and correctly Hungarian rule applied in correct circumstances and correctly e.g. F F H F G H F G F F so P(F)=0.6, P(G)=0.2, P(H)=0.2 (Long run proportions are 56/169, 74/169 and 39/169.)	B1 B1 B1 B1√ **[4]**	

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4771 Decision Mathematics 1

General Comments

Arguably the most discriminating assessment task is to explain or to justify. This paper had 11 marks allocated to answers that required candidates to write in words, 4 on Q1, 1 on Q2, 3 on Q3 and 3 on Q4. Most candidates were sadly lacking in their ability to do this.

Good written communication and good mathematics go hand in hand. They require the same skills – clarity and precision of thought. At all stages of mathematical assessment candidates bemoan such questions, preferring algorithmic manipulative tasks. The fact is that these writing questions test higher-level skills and understanding … so they are inherently more difficult.

Many candidates lacked physical dexterity in writing, so examiners often had a difficult task just to decode what had been written, before trying to make sense of it. There was a high correlation between readability and sense, but there were some examples of poor readability allied with good sense.

Comments on Individual Questions

Question 1

(i) Many candidates lost one or both marks on this question by confusing tops and bottoms of chairlifts and ski runs.

Many candidates missed the word 'map' in the question, and tried to answer subsequent parts by referring to graph theoretic results. They missed the point that, in this part they were being asked to interpret a (bipartite) graph back to reality.

One or two very good candidates shrank the chairlifts to points, and then worked in the resulting directed graph. That was good, but not at all necessary.

(ii) Markers had a fine line to negotiate in awarding or not awarding the explanation marks here. Many candidates gave routes that did involve repetition. But that by itself does not mean that there must be repetition. On the other hand, one has only to say that there are, for instance, two runs served by C, so that C must be repeated. So, for instance, the candidate who stated that having arrived back at the bottom of B, run 5 still remained to be done, with no other details given, would not have been awarded the mark for explaining why B and C have to be repeated.

(iii) Comments as per part (ii).

(iv) The question referred to 'this information'. Candidates who described the characteristics of bipartite graphs in general, without reference to this specific situation, did not qualify for the mark.

Question 2

(i)&(ii) This question was answered well. Some candidates made mistakes with the arithmetic, but such errors escaped heavy penalty.

Question 3

(i) This question was conceived as an integer programming problem, which is why such phrases as 'no more than' and 'no less than' appear in part (i). With a discrete region the status of the boundaries is important, whereas for a continuous region, that is not the case. In the event, this was lost on nearly all candidates.

Only a minority of candidates realised that for the second mark, there had to be an explanation of how the 75% generated the 1/3.

(ii) Apart from testing understanding and the ability to explain, part (i) was intended to set up part (ii). Very few candidates appreciated this, and very few indeed scored all 5 marks here.

(Strictly, the feasible region should be a set of points, but the few candidates who identified the containing quadrilateral, as identified on the mark scheme, were allowed the mark.)

(iii) It seems an eminently sensible suggestion to purchase 75% of 500 coffee filters and 50% of 500 tea bags, especially since that happens to cost £50. Most candidates failed to score the mark. There really can be no complaints, since invariably they failed to answer the question. They were required to refer to the estimated demand, which was for 500 cups of hot drink per week, and they failed to do that.

Question 4

(a) Routine, and generally well-done.

(b)(i) Routine, and generally welldone.

(b)(ii) That there were 3 marks allocated to this part was a clue as to what was needed: connected, no cycles and minimal. Most scored the connected and minimal marks.

(Note that to prove minimality is taxing.)

(b)(iv) There is not a great demand placed on algebraic skills by Decision Maths, but this found the candidature wanting. Most could not write down $\frac{n(n-1)}{2}-(n-1)$, which was sufficient for the first of the two marks. Many did not appreciate that the first mark was for an algebraic expression and the second for a number.

Question 5

(i)&(ii) Routine and well-done. There were the usual popular errors, mostly relating to the dummy activity, and to slips. The mark scheme was designed so as not to penalise such slips too heavily.

(iii)&(iv) Scheduling questions such as these have appeared in the past and have caused problems. This was no exception. For candidates who appreciated what was required – showing who does what and when, this was difficult enough. But the majority of candidates wasted their time and effort. They could not score any marks because they failed to show who did what and when.

In part (iii) there was a mark for showing when activities C and H were scheduled. That information was needed, although those activities needed no resource.

Question 6

This question was answered very well. Some candidates failed to ignore ‘9’ when they needed to in their F/G/H simulation. Some failed to compute their proportions correctly in parts (ii) and (iv).

Some candidates were confused by the starting conditions … ‘Their last meal out was at the Greek restaurant’. They included this meal in their simulations, despite the instruction ‘… for the next 10 of their meals out’. This was quite an expensive mistake.

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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