OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

MATHEMATICS (MEI) 4754B

Applications of Advanced Mathematics (C4) Paper B: Comprehension

Candidates answer on the question paper.

OCR supplied materials:
- Insert (inserted)
- MEI Examination Formulae and Tables (MF2)

Other materials required:
- Scientific or graphical calculator
- Rough paper

Friday 14 January 2011
Afternoon

Duration: Up to 1 hour

Candidate forename		Candidate surname	

Centre number						Candidate number				

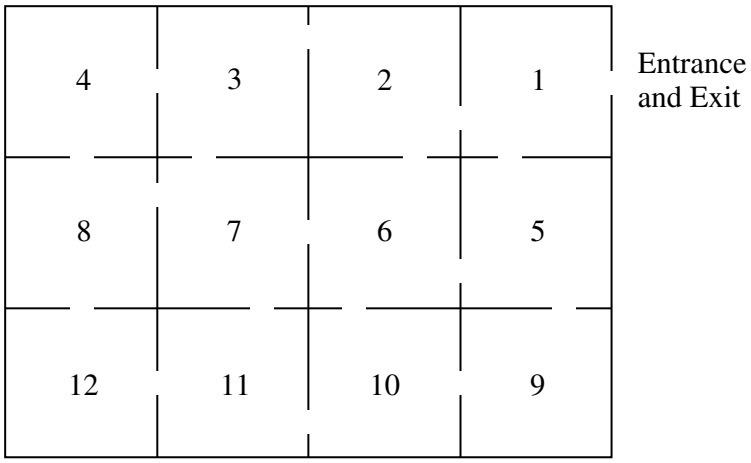
INSTRUCTIONS TO CANDIDATES
- The insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. 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.
- The insert contains the text for use with the questions.
- 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
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- You may find it helpful to make notes and do some calculations as you read the passage.
- You are **not** required to hand in these notes with your 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 **18**.
- This document consists of **8** pages. Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER / INVIGILATOR
- This paper should be attached to the candidate's paper A script before sending to the examiner.

Examiner's Use Only:	
1	
2	
3	
4	
5	
6	
Total	

1 The gallery shown below is a 3 by 4 grid of rectangular rooms.



(i) Mark on the diagram the positions of six guards so that the whole gallery can be observed. **[1]**

(ii) Give a counterexample to disprove the following proposition:

For an m by n grid of rectangular rooms, $\left\lfloor \frac{mn}{2} \right\rfloor$ guards are required. **[2]**

For Examiner's Use

2 **(i)** Show that $\frac{(2r+1)-(-1)^r}{4} = \left\lfloor \frac{r+1}{2} \right\rfloor$ in the case where $r = 4$. **[2]**

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(ii) The ceiling function, $\lceil x \rceil$, is defined as the smallest integer greater than or equal to x.

Complete the following table. **[2]**

x	1	2	3	4	5
$\left\lceil \frac{x}{2} \right\rceil$					

3 Justify the statement in lines 79 and 80. **[2]**

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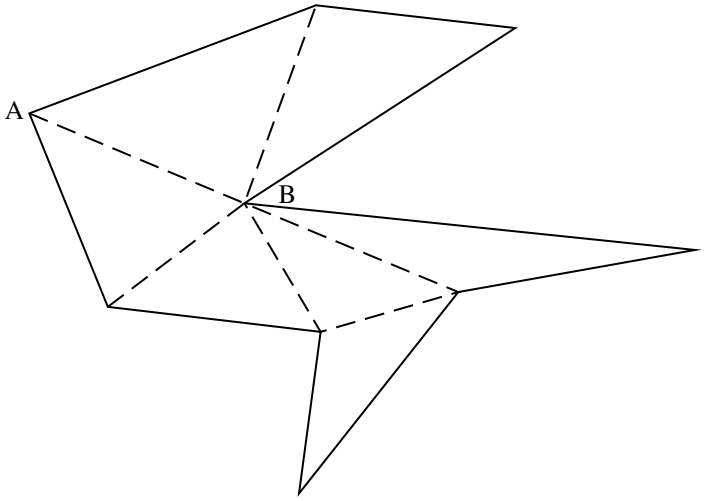
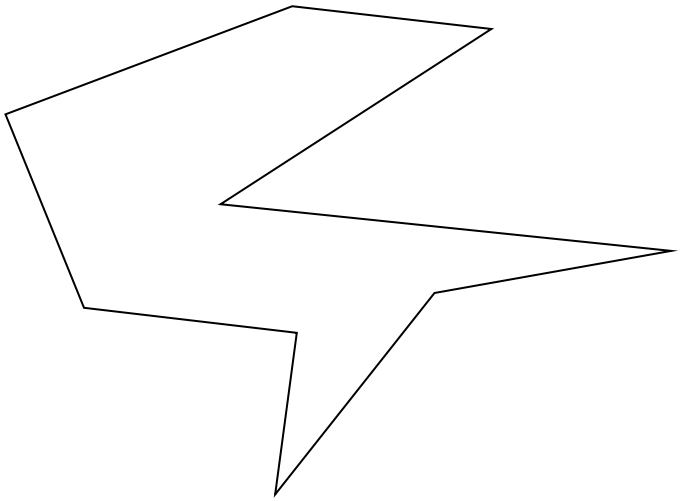
For Examiner's Use

4 **(i)** Following the procedure in Fig. 6, complete the labelling of the polygon shown below. **[2]**

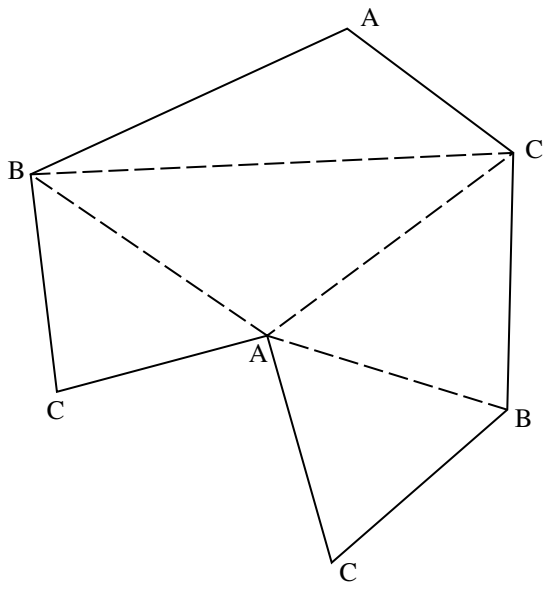


(ii) In order to use the minimum number of cameras, show on the diagram below where your answer to part **(i)** indicates the cameras should be placed. **[1]**



For Examiner's Use

5 With reference to the labelled triangulation shown below, state with a reason whether each of the following statements is true or false.



(i) The triangulation shows that 2 cameras are sufficient. **[2]**

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Reason: .....

.....

(ii) The triangulation shows that 2 cameras are necessary. **[2]**

.....

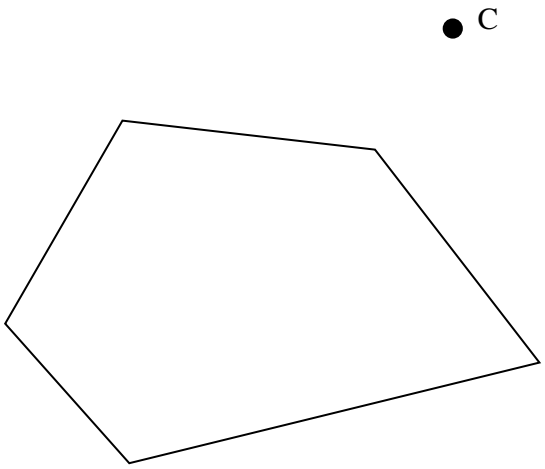
Reason: .....

.....

For Examiner's Use

6 On lines 96 and 97 it says "If the cameras did not need to be mounted on the walls, but could be positioned further away from the building, then fewer cameras would usually suffice."

Using the diagram below, which shows a pentagon and one external camera, C, indicate by shading the region in which a second camera must be positioned so that all the walls could be observed by the two cameras. **[2]**



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