OCR
RECOGNISING ACHIEVEMENT

Friday 18 January 2013 – Afternoon

A2 GCE MATHEMATICS (MEI)

4754/01B Applications of Advanced Mathematics (C4) Paper B: Comprehension

QUESTION PAPER

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

Duration: Up to 1 hour

* 4 7 5 4 0 1 B *

* 4 7 3 4 0 4 0 1 1 3 *

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.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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).
- 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.

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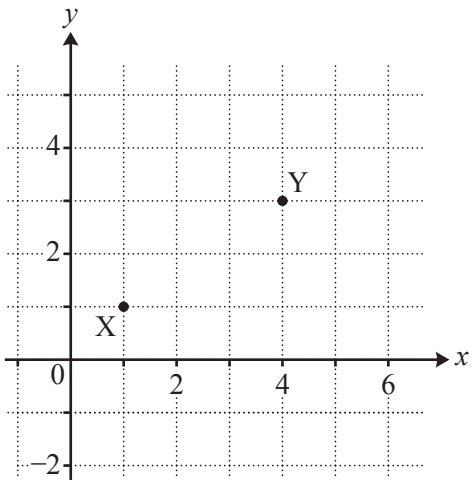
PLEASE DO NOT WRITE ON THIS PAGE

1 On the grid below mark all three possible positions of the point P with integer coordinates for which $t(P,X) = 4$ and $t(P,Y) = 3$. **[3]**

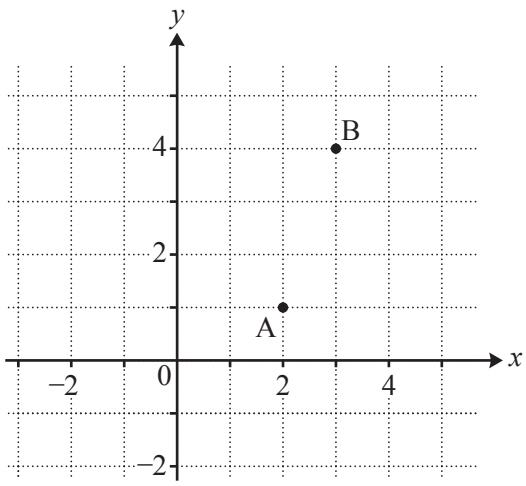
1



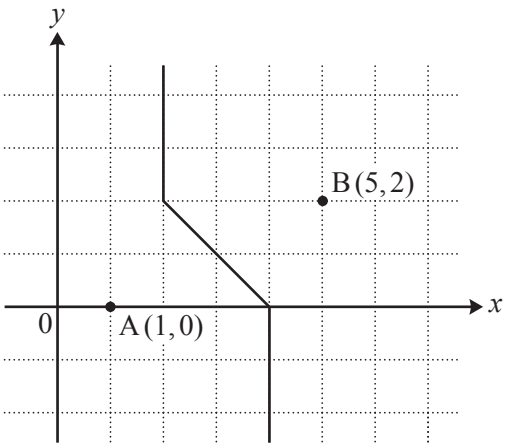
2 This question is concerned with generalised taxicab geometry.

On the grid below, show the locus of a point P where $t(P,A) = t(P,B)$. **[3]**

2

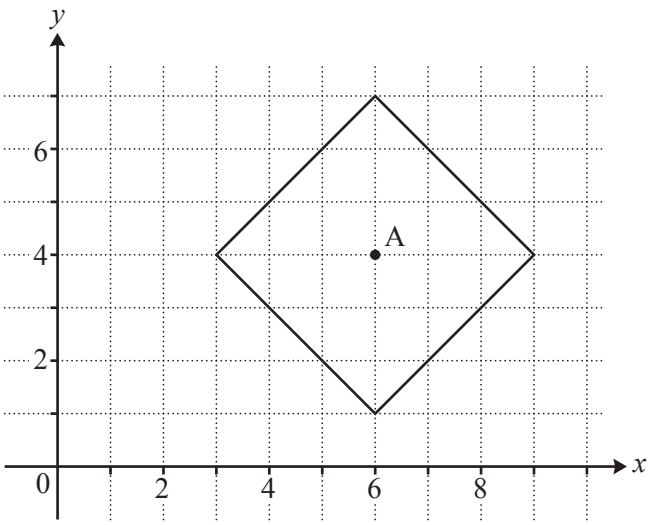


3 **(i)** Describe the following locus of a point P, using the notation $t(P, A)$ and $t(P, B)$ as appropriate.



[1]

(ii) Describe the following locus of a point P, using the notation $t(P, A)$ as appropriate.



[1]

3 (i)	
3 (ii)	

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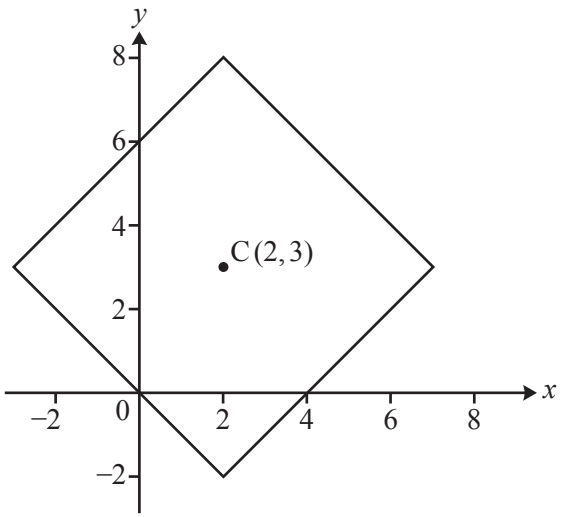
4 Referring to Fig. 5, or otherwise, find the value of $n(4,4)$. **[2]**

4	

5 In lines 54 and 55 it says there are 35 minimum distance routes from A $(0,0)$ to B $(4,3)$. Determine how many of these routes pass through the point with coordinates $(3,2)$, explaining your reasoning. **[2]**

5	

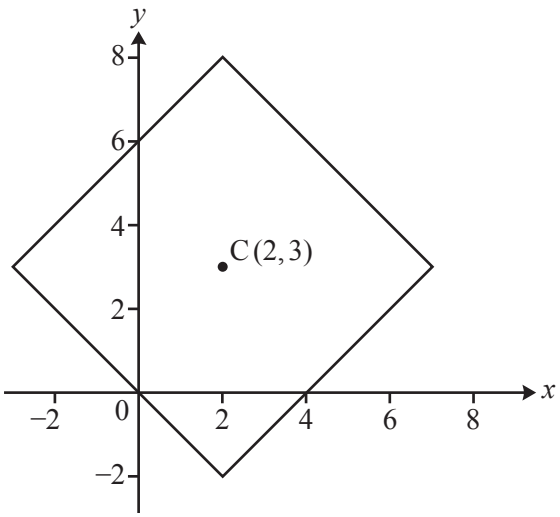
6 Fig. 7 is reproduced below.



(i) Two points on this locus have x-coordinate -0.7. Write down the coordinates of each of these points. **[2]**

(ii) In lines 77 to 78 it says "adding a second taxicab circle with centre $(2,0)$ and radius 2 shows that in generalised taxicab geometry two different circles can have an infinite number of points in common!"

On the copy of Fig. 7 given below, draw the taxicab circle with centre $(2,0)$ and radius 2. **[1]**

6 (i)	
6 (ii)	

7 In lines 23 and 24 it says that "if the Pythagorean distance between two points A and B is $\mathrm{d}(\mathrm{A},\mathrm{B})$ then the taxicab distance satisfies the inequalities $\mathrm{d}(\mathrm{A},\mathrm{B}) \leqslant \mathrm{t}(\mathrm{A},\mathrm{B}) \leqslant \sqrt{2} \times \mathrm{d}(\mathrm{A},\mathrm{B})$."

This question is about using this result in generalised taxicab geometry.

(i) Given that A is the point $(0,0)$, describe all possible positions of B for which $\mathrm{d}(\mathrm{A},\mathrm{B}) = \mathrm{t}(\mathrm{A},\mathrm{B})$. **[1]**

(ii) Given that A is the point $(0,0)$, describe all possible positions of B for which $\mathrm{t}(\mathrm{A},\mathrm{B}) = \sqrt{2} \times \mathrm{d}(\mathrm{A},\mathrm{B})$. **[2]**

7 (i)	
7 (ii)	