

**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.

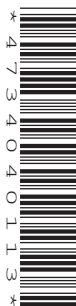
**OCR supplied materials:**

- Insert (inserted)
- MEI Examination Formulae and Tables (MF2)

**Other materials required:**

- Scientific or graphical calculator
- Rough paper

**Duration:** Up to 1 hour



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.

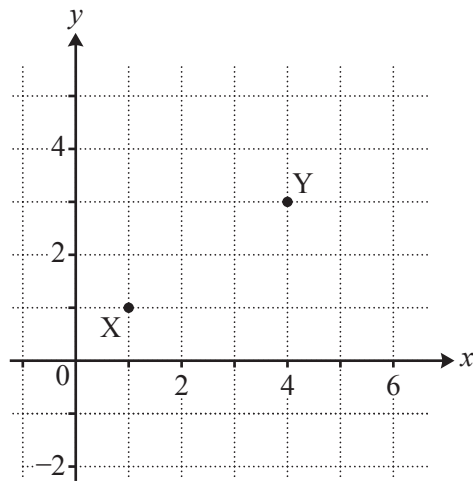
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3

- 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

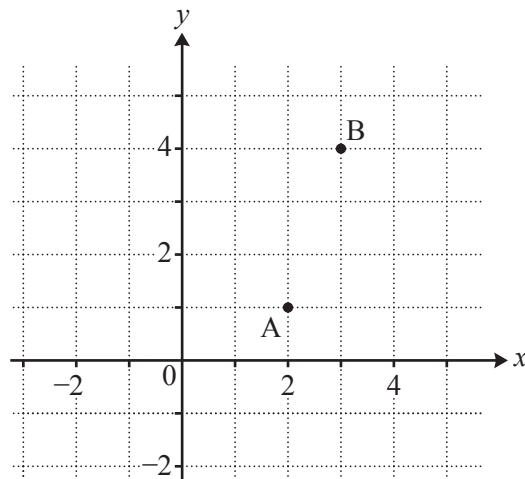


- 2 This question is concerned with generalised taxicab geometry.

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

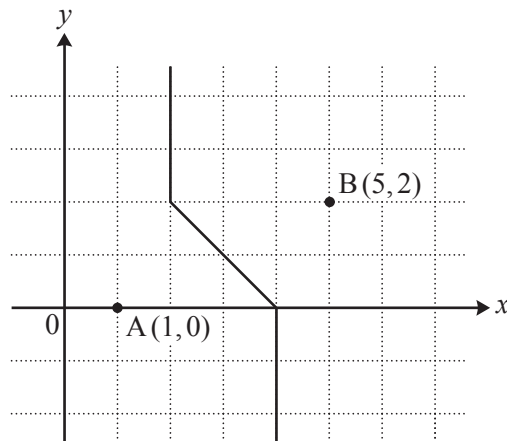
[3]

2



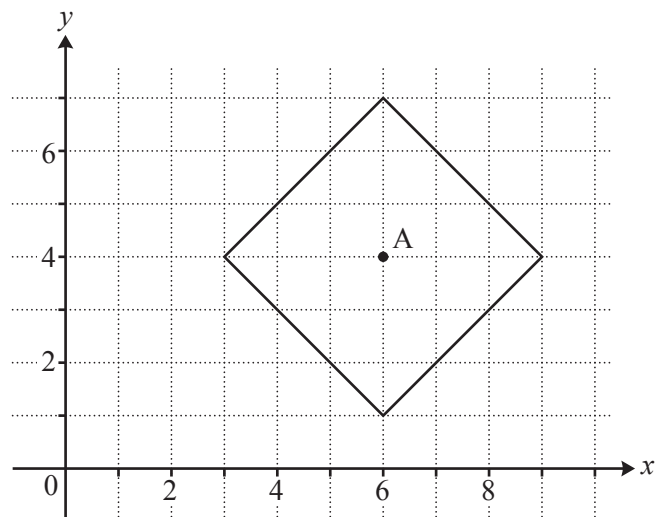
4

- 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]

<b>3 (i)</b>	
<b>3 (ii)</b>	

**PLEASE DO NOT WRITE IN THIS SPACE**

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

[2]

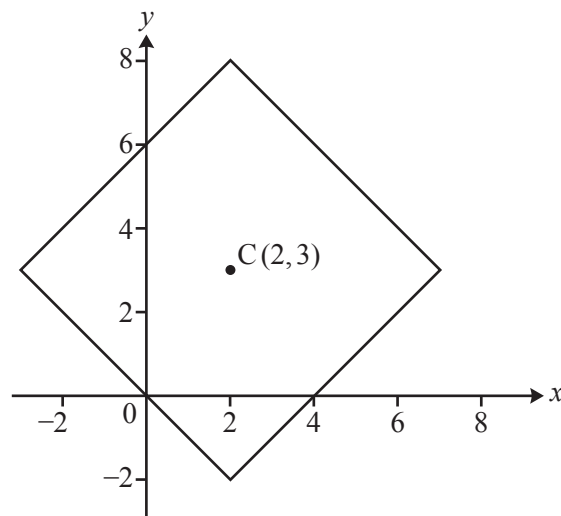
4	

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  $d(A,B)$  then the taxicab distance satisfies the inequalities  $d(A,B) \leq t(A,B) \leq \sqrt{2} \times d(A,B)$ .”

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  $d(A,B) = t(A,B)$ . [1]

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

7(i)	
7(ii)	

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