OXFORD CAMBRIDGE AND RSA EXAMINATIONS

A2 GCE

4754/01B

MATHEMATICS (MEI)

Applications of Advanced Mathematics (C4) Paper B: Comprehension

QUESTION PAPER

FRIDAY 18 JANUARY 2013: Afternoon

DURATION: Up to 1 hour plus your additional time allowance

MODIFIED ENLARGED 18pt

Candidate forename		Candidate surname	

Centre number						Candidate number				

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

READ INSTRUCTIONS OVERLEAF

DC (LK/SW) 1592389138 72510/1

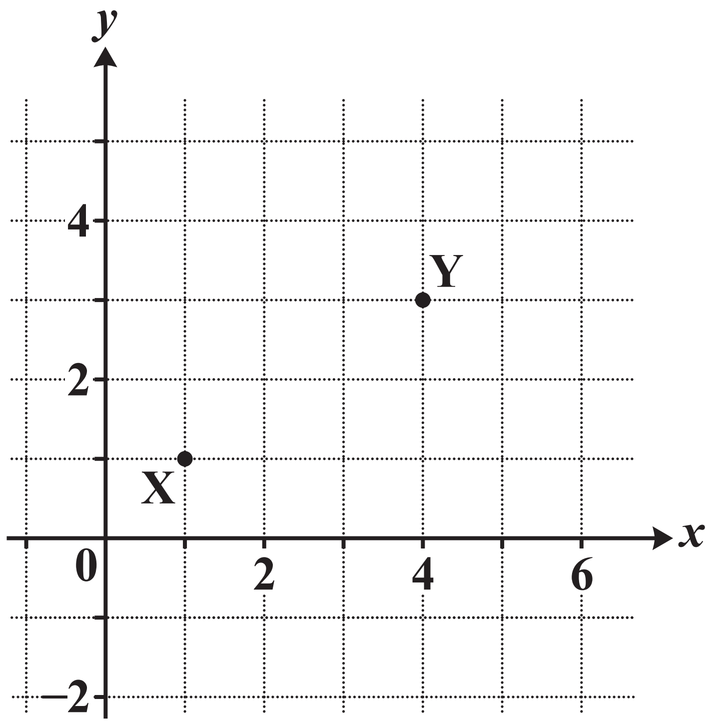
INSTRUCTIONS TO CANDIDATES

- The insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes on the first page. 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).
- 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

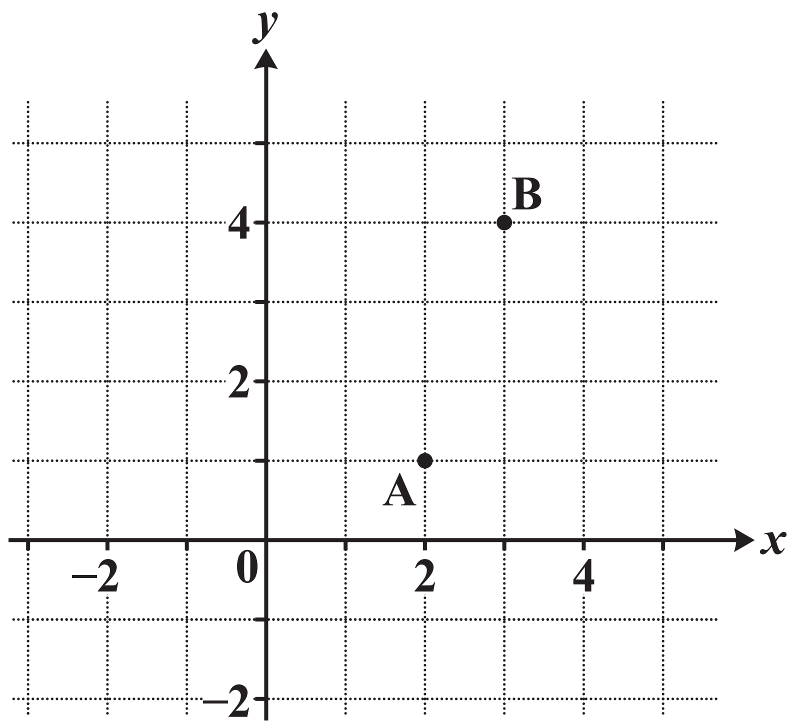
- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **You may find it helpful to make notes and do some calculations as you read the passage.**
- **You are NOT required to hand in these notes with your question paper.**
- **You are advised that an answer 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.**

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]

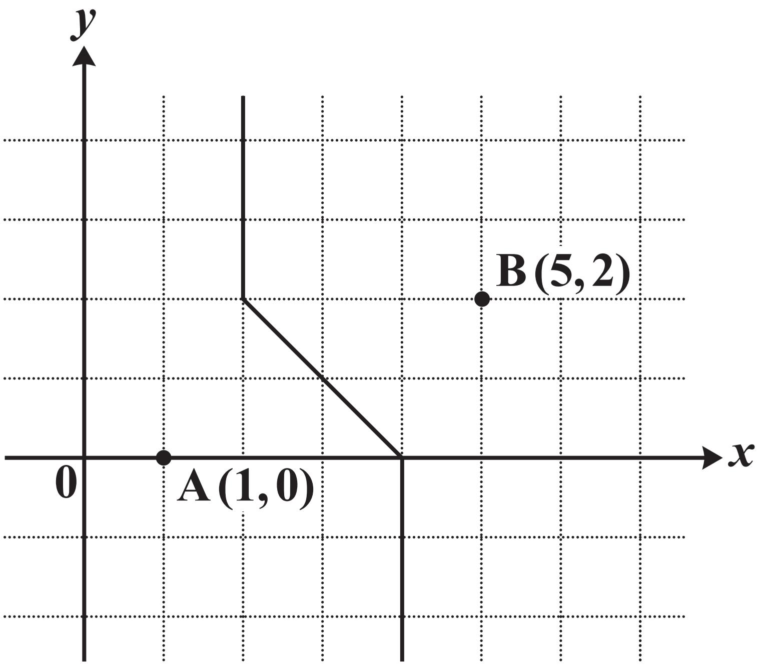
1	

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	

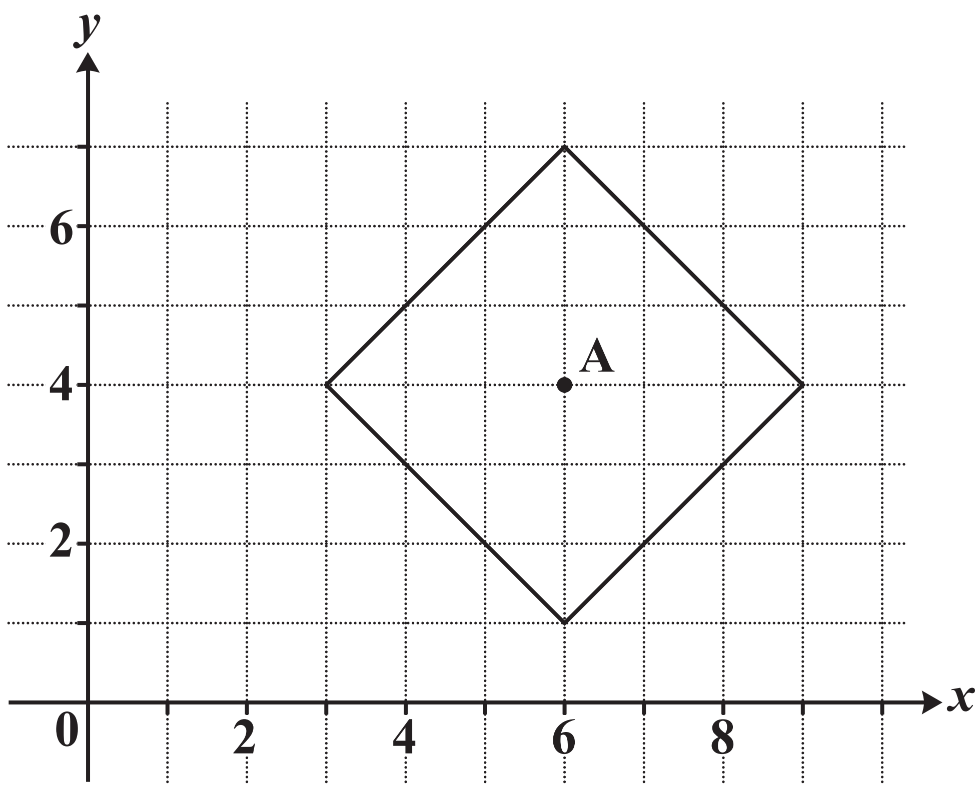
3 (i) Describe the following locus of a point P, using the notation $t(P, A)$ and $t(P, B)$ as appropriate.



[1]

3 (i)	

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



[1]

3 (ii)	

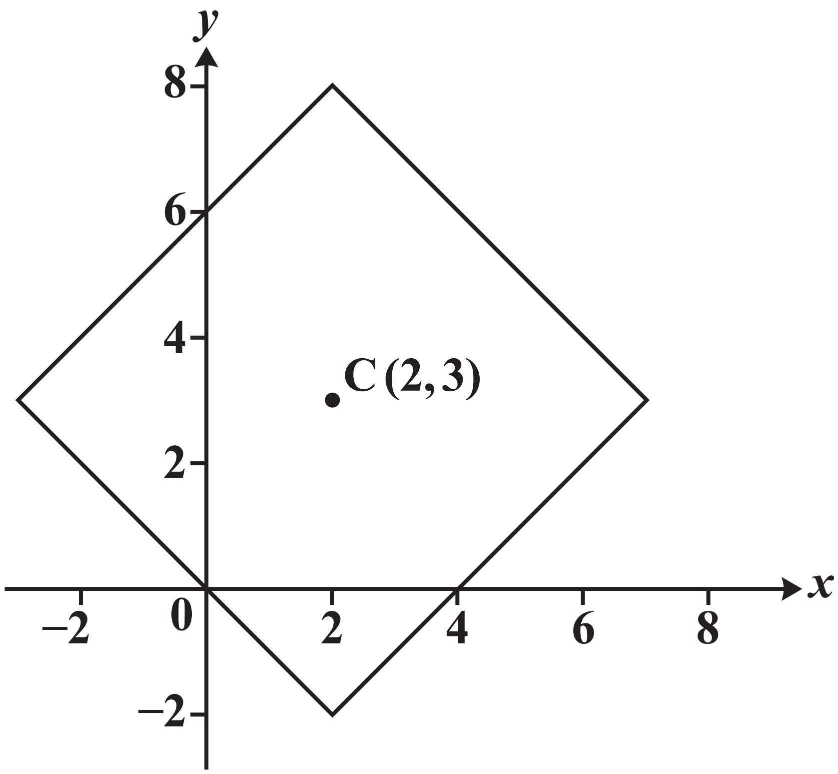
4 **Referring to Fig. 5, or otherwise, find the value of n$\left(4,4\right)$. [2]**

4	

5 **In lines 85 and 86 it says there are 35 minimum distance routes from A $\left(0,0\right)$ to B $\left(4,3\right)$. Determine how many of these routes pass through the point with coordinates $\left(3,2\right)$, explaining your reasoning. [2]**

5	

6 **Fig. 7 is reproduced below.**

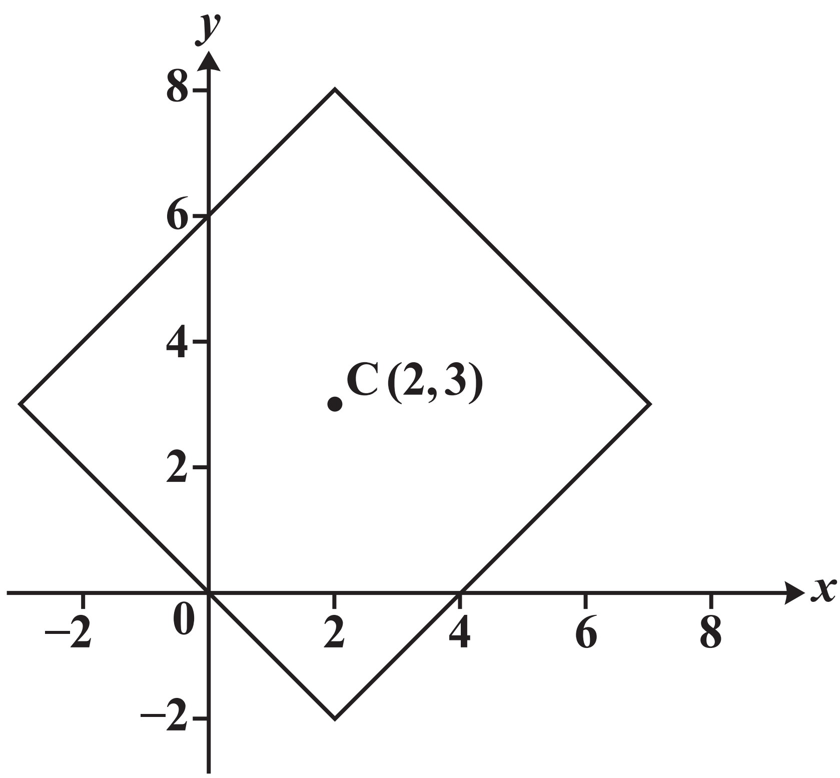


(i) **Two points on this locus have x-coordinate -0.7.**
Write down the coordinates of each of these points. **[2]**

6 (i)	

(ii) **In lines 121 to 124 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 (ii)	

7 **In lines 37 to 39 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]**

7 (i)	

(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 (ii)	