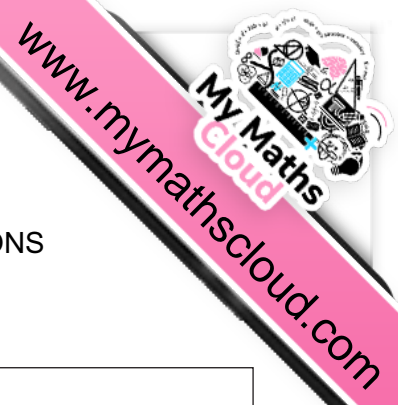




UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education



CANDIDATE  
NAME

CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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**CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/05**

Paper 5 (Core)

**October/November 2012**

**1 hour**

Candidates answer on the Question Paper

Additional Materials: Graphics Calculator

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

Do not use staples, paper clips, highlighters, glue or correction fluid.

You may use a pencil for any diagrams or graphs.

**DO NOT WRITE IN ANY BARCODES.**

Answer **all** the questions.

You must show all relevant working to gain full marks for correct methods, including sketches.

**In this paper you will also be assessed on your ability to provide full reasons and communicate your mathematics clearly and precisely.**

At the end of the examination, fasten all your work securely together.

The total number of marks for this paper is 24.

This document consists of 7 printed pages and 1 blank page.

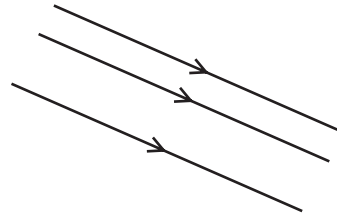


Answer **all** the questions.

## INVESTIGATION

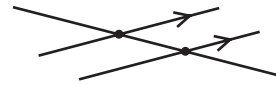
## STRAIGHT LINES

- 1 The straight lines in this diagram **never cross**.  
Complete the statement.

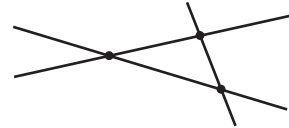


These lines are called ..... lines.

- 2 In this diagram three lines cross at two points.



In this diagram three lines cross at three points.  
This is the **maximum** number of crossing points for three lines.



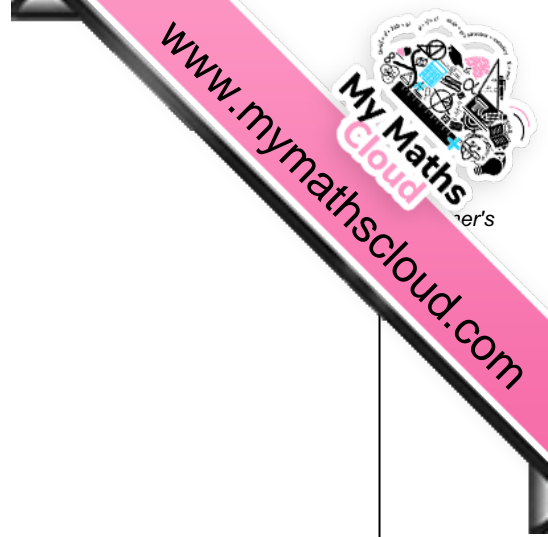
Draw diagrams to show the following numbers of crossing points for **four** lines.  
Put arrow symbols on all the lines that never cross.

- (a) Three crossing points.

(b) Four crossing points.

(c) Five crossing points.

(d) Six crossing points.  
This is the maximum number of crossing points for four lines.



- 3 A diagram for the maximum number of crossing points for five lines is to be drawn.
- (a) Explain how a fifth line must be drawn on your diagram in **part 2 (d)** to give the maximum number of crossing points.

.....

.....

.....

- (b) Draw this diagram.

- (c) Write down the maximum number of crossing points for five lines.

.....

4 Complete this table.

Number of lines	1	2	3	4	5	6	7	8	9
Maximum number of crossing points	0		3	6		15		28	

5 The formula for the maximum number of crossing points is  $\frac{1}{2}n(n-1)$ .

(a) What does the letter  $n$  represent?

.....

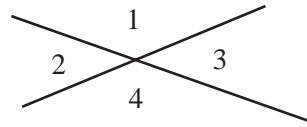
(b) Show that this formula gives the answer in the table when eight lines cross.

(c) Find the number of lines when the maximum number of crossing points is 120.

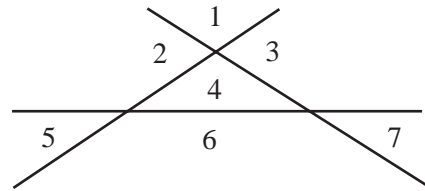
.....

- 6 Straight lines can also form regions.

There are four regions when two lines cross.



The maximum number of regions when three lines cross is seven.



- (a) (i) Draw a diagram to show the **maximum** number of regions when four lines cross. Number the regions.

- (ii) Write down the maximum number of regions when four lines cross.

.....

(b) Complete this table.

Number of lines	1	2	3	4	5	6	7
Maximum number of regions	2	4	7		16	22	

(c) The maximum number of regions forms a sequence.  
 The maximum number of regions when 21 lines cross is 232.  
 Find the maximum number of regions when 22 lines cross.  
 Show how you get your answer.

.....

(d) (i) Find a formula for the maximum number of regions when  $n$  lines cross.  
 You may use the formula in **question 5** to help you.

.....

(ii) Test that your formula gives the answer in the table when six lines cross.

