UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

1208111882

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/06**

Paper 6 (Extended) **October/November 2012**

1 hour 30 minutes

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 both parts **A** and **B**.
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 40.

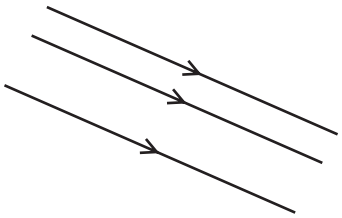
This document consists of **11** printed pages and **1** blank page.

Answer **both** parts **A** and **B**.

A INVESTIGATION STRAIGHT LINES (20 marks)

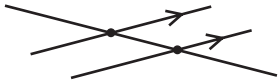
You are advised to spend no more than 45 minutes on this part.

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

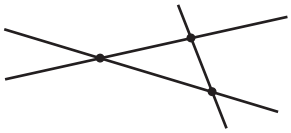


These lines are called ..... lines.

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 maximu number of crossing points.

.....

.....

(b) **(i)** Draw this diagram.

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

.....

4 **(a)** 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	

(b) The maximum number of crossing points follows this pattern

0, odd, odd, even, even, odd, odd, and so on.

Explain why this pattern occurs.

.....

.....

.....

5 The maximum number of crossing points forms a sequence.

(a) Find a formula for the nth term of this sequence.

.....

(b) Use your formula to show that when 10 lines cross, the maximum number of crossing points is 45.

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

.....

(d) Is it possible for the maximum number of crossing points to be 590?
Show how you get your answer.

B MODELLING A SWING (20 marks)

You are advised to spend no more than 45 minutes on this part.

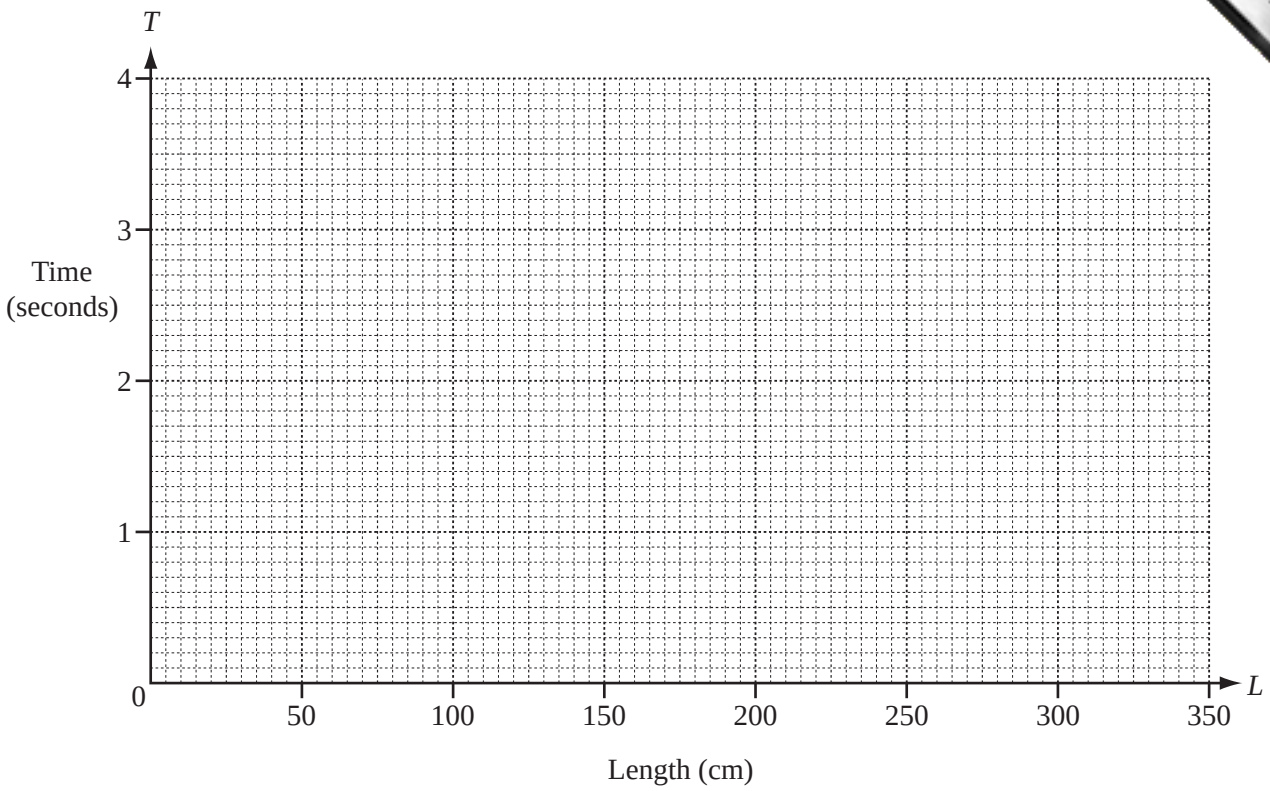
The diagram shows a swing that is free to move backwards and forwards.
The seat is attached to the top bar by two ropes of equal length.

The length, L cm, of the ropes is changed.
The time taken, T seconds, for the seat to swing backwards and forwards once is measured.

The results are shown in the table.

Length L cm	0	50	100	150	200	250	300	350
Time T seconds	0	1.4	2.3	2.4	2.8	3.2	3.5	3.8

1 **(a)** On the grid below, plot the points for T against L, for $0 \leqslant L \leqslant 350$.



(b) One of the times in the table is incorrect.
Write down this time.

..... seconds

(c) **(i)** On the grid in **part (a)**, draw the graph of T against L using the seven correct points.

(ii) Estimate the correct time for your answer to **part (b)**.

..... seconds

2 The relationship between T and L can be represented by a model.

(a) Which of the following models best fits this relationship?

$T = aL + b$ $\quad$ $T = aL^2 + b$ $\quad$ $T = aL^b$

.....

(b) **(i)** Use lengths of 50 cm and 200 cm to show that the value of b is $\frac{1}{2}$.

(ii) Find the value of a in your model.
Give your answer correct to 1 decimal place.

.....

(iii) Rewrite your model substituting your values for a and b.
Show that your model works when $L = 250$ cm.

(c) Use your model to find

(i) the length of the rope when the time taken is 4 seconds,

..... cm

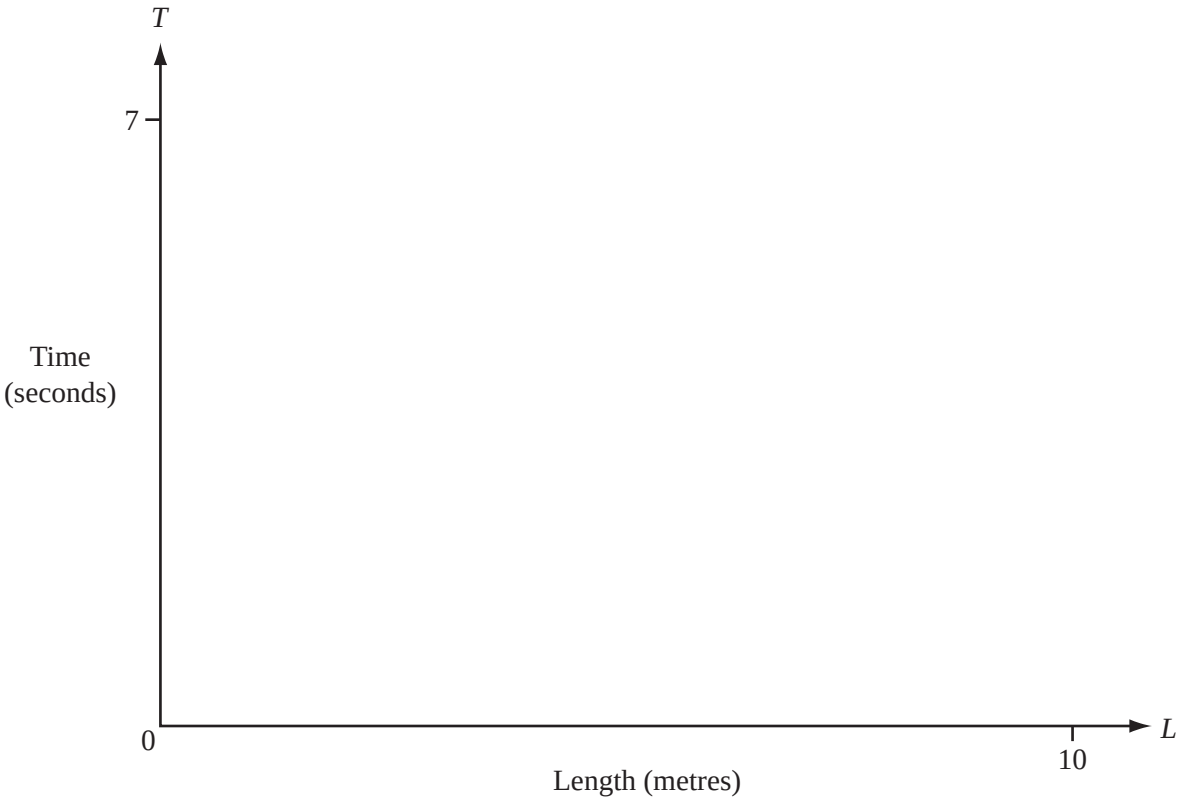
(ii) an estimate of the correct time for your answer in **Question 1 (b)**.

..... seconds

3 The model for the time, T seconds, that a pendulum of length L **metres** takes for one swing is

$$T = 2\pi\sqrt{\frac{L}{9.8}} \ .$$

(a) Sketch the graph of T against L for $0 \leqslant L \leqslant 10$.



(b) **(i)** Show how this model becomes $T = \frac{\pi}{5}\sqrt{\frac{L}{9.8}}$ when L is measured in **centimetres**.

(ii) Compare this model with your model in **Question 2 (b) (iii)**.

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