UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

8778931706

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/06**

Paper 6 (Extended) **October/November 2013**

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**.

For Examiner's Use

A INVESTIGATION SUMS OF SEQUENCES (20 marks)

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

Here is the method to construct a sequence for this investigation.

Method	Example
Write down any two numbers for the first two terms.	3 and 7
Add these two terms to make the third term.	3 + 7 = 10
Add the second and third terms to make the fourth term.	7 + 10 = 17
Add the third and fourth terms to make the fifth term.	10 + 17 = 27
Continue in this way to construct the sequence.	

This example makes the sequence: 3, 7, 10, 17, 27, 44, ...

1 Show that the sum of the first six terms in this sequence, divided by the fifth term, is 4.

For Examiner's Use

2 **(a)** The first two terms of another sequence are 4.52 and 16.9 .

(i) Use the method to write down the next four terms in this sequence.
Do not round any of your numbers.

4.52, 16.9, ... , ... , ... , ...

(ii) Work out the sum of the first six terms in this sequence and divide it by the fifth term.

.....

(b) **(i)** Choose two negative numbers to be the first two terms of a sequence.

Use the method to work out the next four terms in this sequence.
Write down the first six terms in your sequence.

..... , ... , ... , ... , ... , ...

(ii) Work out the sum of the first six terms in your sequence and divide it by the fifth term.

.....

3 The first two terms of a new sequence are p and q.
The table shows the working for the first five terms.

Working	Term
p	p
q	q
$p \quad + \quad q$	$p + q$
$q \quad + \quad p + q$	$p + 2q$
$p + q \quad + \quad p + 2q$	$2p + 3q$

(a) Complete the table.

(b) Find an expression for the sum of these first six terms.
Simplify your answer.

.....

(c) Find an equation to connect the fifth term and the sum of the first six terms.

.....

For Examiner's Use

4 **(a)** Find the next four terms in the sequence in **question 3**.

7^{th} term .....

8^{th} term .....

9^{th} term .....

10^{th} term .....

(b) Find an expression for the sum of the first ten terms in this sequence.
Simplify your answer.

.....

(c) Find an equation to connect the seventh term and the sum of the first ten terms.

.....

For Examiner's Use

5 **(a)** Find the next four terms in the sequence in **question 4**.

11^{th} term .....

12^{th} term .....

13^{th} term .....

14^{th} term .....

(b) Find an expression for the sum of the first fourteen terms.
Simplify your answer.

.....

(c) This sum is a multiple of one of the terms in **question 4(a)**.
Find this multiple.

.....

(d) Prove this connection.

For Examiner's Use

6 In **question 2** the connection between the sum of the six terms and the fifth term is

sum of the first 6 terms = **4** times 5th term

Complete the following statements.

sum of the first 10 terms = ...

sum of the first 14 terms = ...

sum of the first 18 terms = ...

[Turn over

B MODELLING THE EARTH'S TEMPERATURE (20 marks)

For Examiner's Use

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

Logarithms to base 10 are written as log.

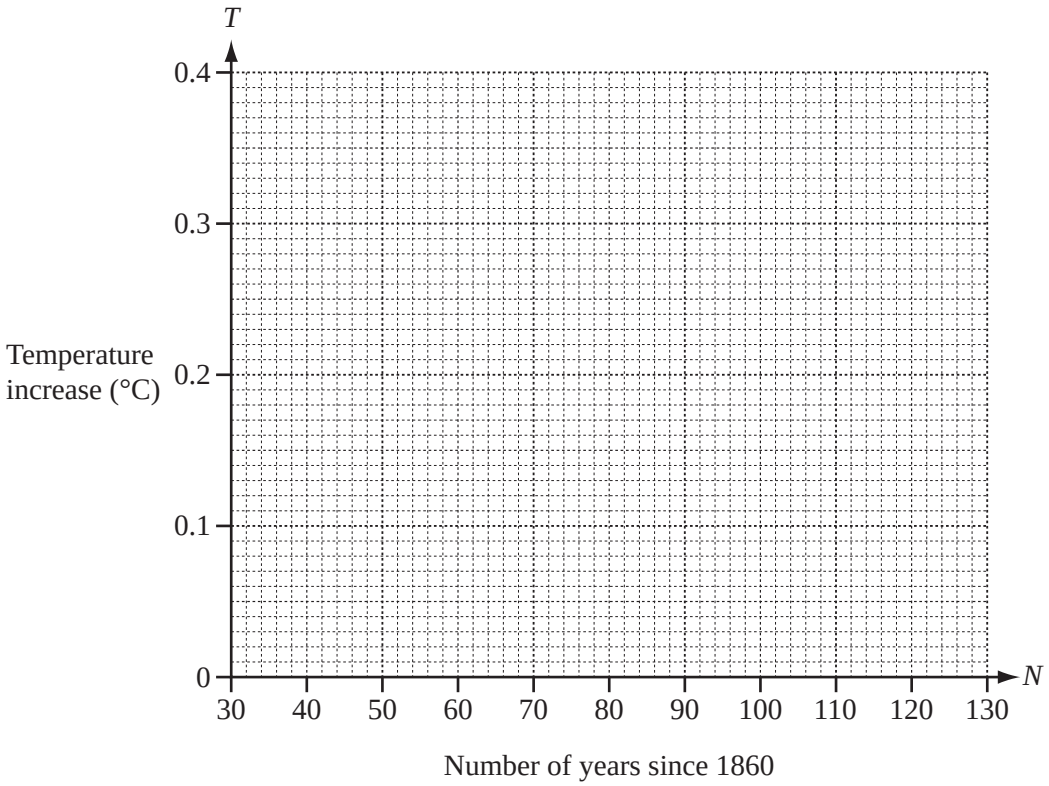
Scientists have been measuring the temperature of the earth since 1860.

The table shows the increase in Earth's temperature since 1860.
The increases are averages for each decade (10 years) correct to 2 decimal places.

Final year of each decade	Number of years since 1860 (N)	Temperature increase since 1860 in °C (T)
1890	30	0.02
1900	40	0.03
1910	50	0.04
1920	60	0.06
1930	70	0.08
1940	80	0.10
1950	90	0.13
1960	100	0.18
1970	110	0.24
1980	120	0.32

1 (a) On the grid, plot the temperature increase (T) against the number of years since 1860 (N), for $30 \leqslant N \leqslant 120$.

Draw a smooth curve that shows the increase in temperature.



For Examiner's Use

(b) (i) Which of the following models best fits this graph?

$T = aN + b$ $\quad T = a\sin bN$ $\quad T = aN^b$ $\quad T = |aN + b|$

.....

(ii) Use the values of N and T for 1900 and 1940 in your model to write down two equations in a and b.

.....

.....

(iii) Use your equations to show that $0.3 = 0.5^b$.

(iv) Find the value of b and show that it rounds to 1.74, correct to 3 significant figures.

(v) Find the value of a. Give your answer correct to 2 significant figures.

$a =$ .....

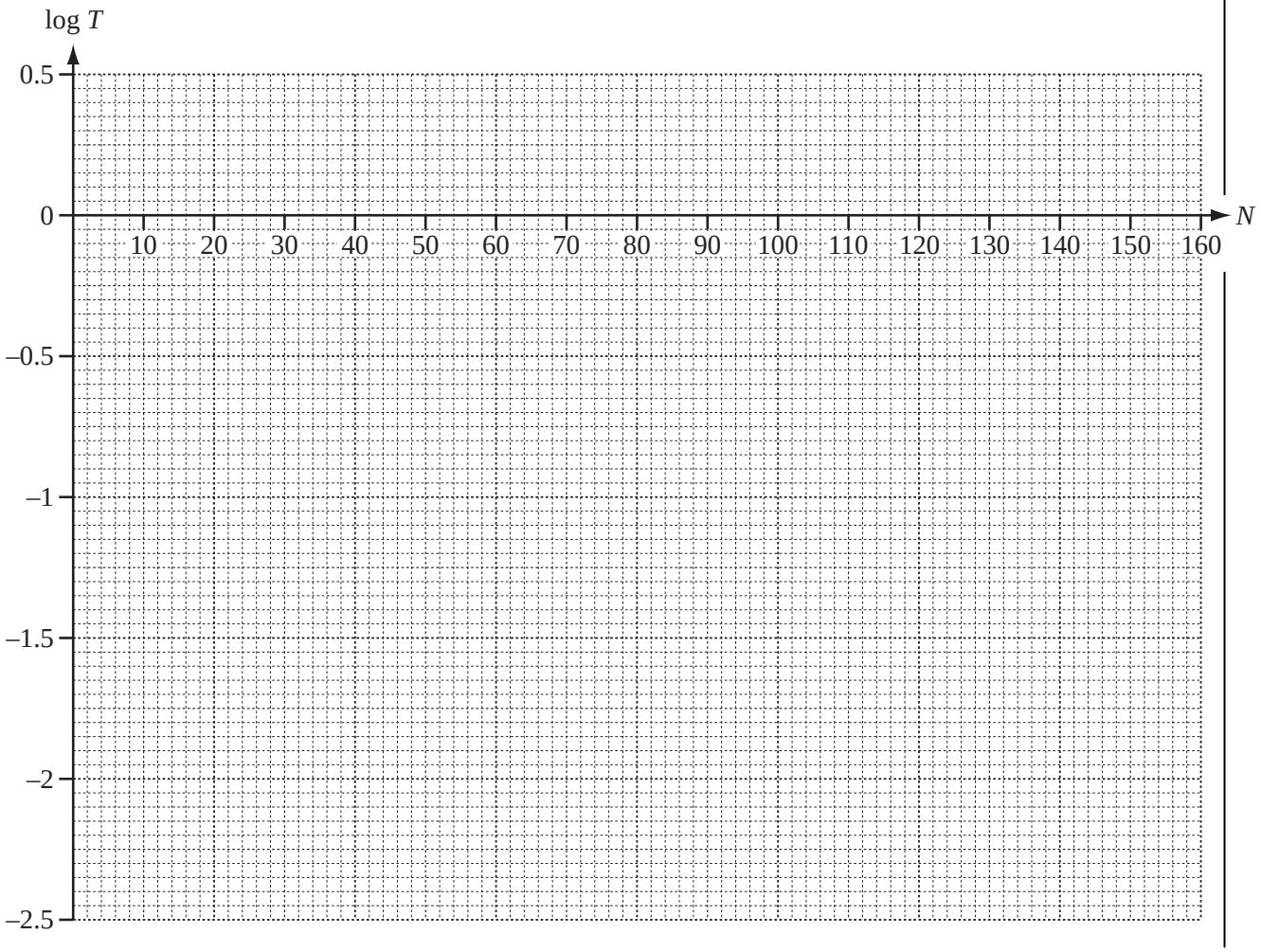
(vi) Show that your model gives a suitable value of T for 1920.

2 **(a)** **(i)** Complete the table to give the value of log T for each value of N.
Give each answer correct to 2 decimal places.

For Examiner's Use

Final year of each decade	Number of years since 1860 (N)	Temperature increase since 1860 in °C (T)	log T
1890	30	0.02	–1.70
1900	40	0.03	
1910	50	0.04	
1920	60	0.06	–1.22
1930	70	0.08	
1940	80	0.10	
1950	90	0.13	–0.89
1960	100	0.18	
1970	110	0.24	–0.62
1980	120	0.32	–0.49

(ii) On the grid plot log T against N, for $30 \leqslant N \leqslant 120$.



(iii) The mean point is (75, –1.07).
On the grid, draw the line of best fit.

(iv) Use your line of best fit to predict the temperature increase by 2020 (160 years since 1860).

.....

(b) (i) A model for the line of best fit is $\log T = mN + c$.

Find the values of m and c.
Give your answers correct to 2 significant figures.

$m =$ ..... $c =$ .....

(ii) Use this model to predict the temperature increase by 2020.

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(iii) Comment on your two predictions for the temperature increase by 2020.

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