UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/31**

Paper 3 (Core) **May/June 2011**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
Geometrical instruments
Tracing paper (optional)

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.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

This document consists of **16** printed pages.

For Examiner's Use

1 Mr and Mrs Clark and their three children live in the USA and take a holiday in Europe.

(a) Mr Clark changes $500 into euros (€) when the exchange rate is €1 = $1.4593.

Calculate how much he receives.
Give your answer correct to 2 decimal places.

Answer(a) € ..... [2]

(b) Tickets for an amusement park cost €62 for an adult and €52 for a child.

Work out the cost for Mr and Mrs Clark and their three children to visit the park.

Answer(b) € ..... [3]

(c) Mr Clark sees a notice:

SPECIAL OFFER!

Family ticket €200

Work out €200 as a percentage of your answer to **part (b)**.

Answer(c) ..... % [1]

(d) Mrs Clark buys 6 postcards at €0.98 each.
She pays with a €10 note.

Calculate how much change she will receive.

For Examiner's Use

Answer(d) € ..... [2]

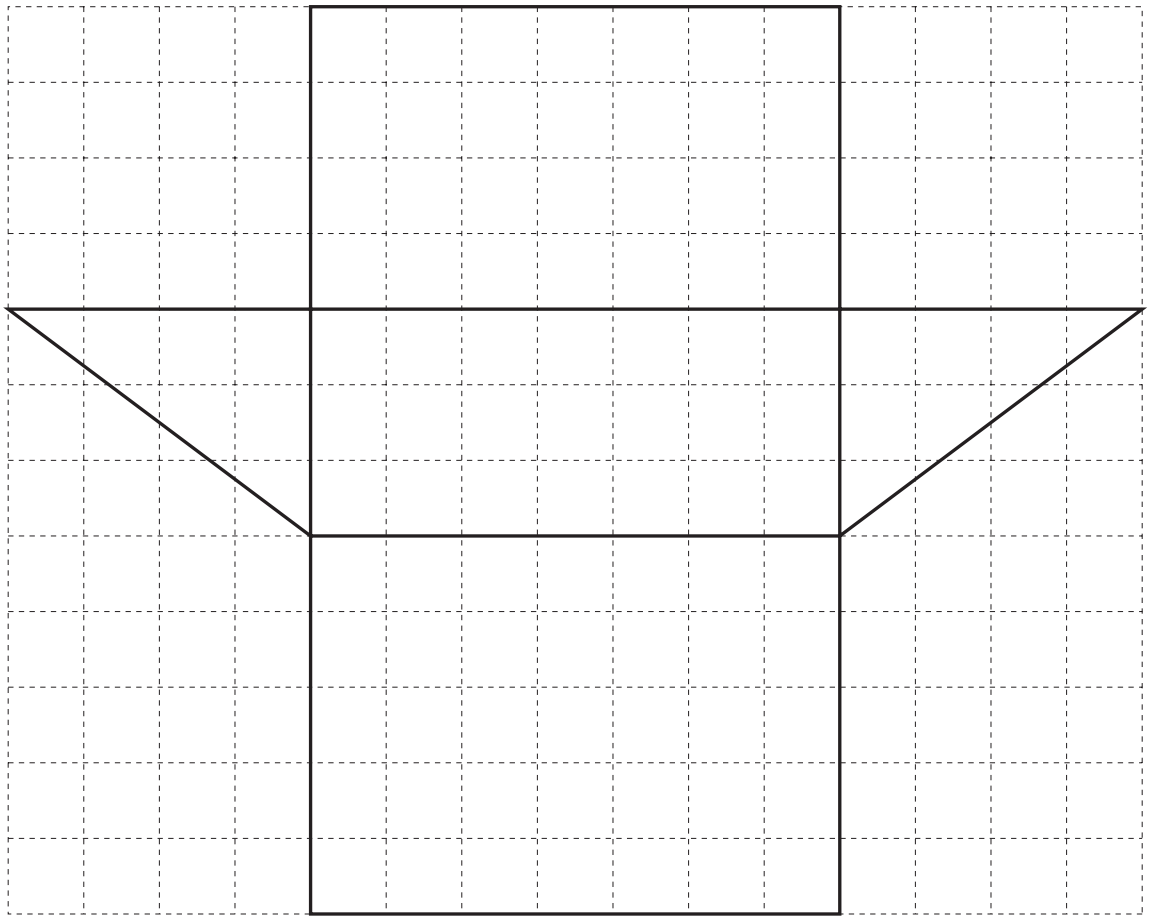
(e) Children under a height of 130 cm are not allowed on one of the rides in the park.
Helen Clark is 50 inches tall.

Use 1 inch = 2.54 cm to show that she will not be allowed on this ride.

Answer(e)

[1]

2



The shape above is the net of a solid drawn on a 1 cm square grid.

(a) Write down the geometrical name of the solid.

Answer(a) ..... [1]

(b) Find the perimeter of the net.

Answer(b) ..... cm [1]

For Examiner's Use

For Examiner's Use

(c) Work out

(i) the area of one of the triangles,

Answer(c)(i) ..... cm^2 [2]

(ii) the volume of the solid.

Answer(c)(ii) ..... cm^3 [2]

(d) A cuboid of length 4 cm and width 3 cm has the same volume as the solid.

Calculate the height of the cuboid.

Answer(d) ..... cm [2]

For Examiner's Use

3 **(a)** $x = 3m - k$

Find the value of

(i) x when $m = 2$ and $k = -4$,

Answer(a)(i) ..... [2]

(ii) m when $x = 19$ and $k = 5$.

Answer(a)(ii) ..... [3]

(b) Expand the brackets.

$g(7f - g^2)$

Answer(b) ..... [2]

(c) Factorise completely.

$18h^2 - 12hj$

Answer(c) ..... [2]

(d) Make m the subject of the formula.

$t = 8m + 15$

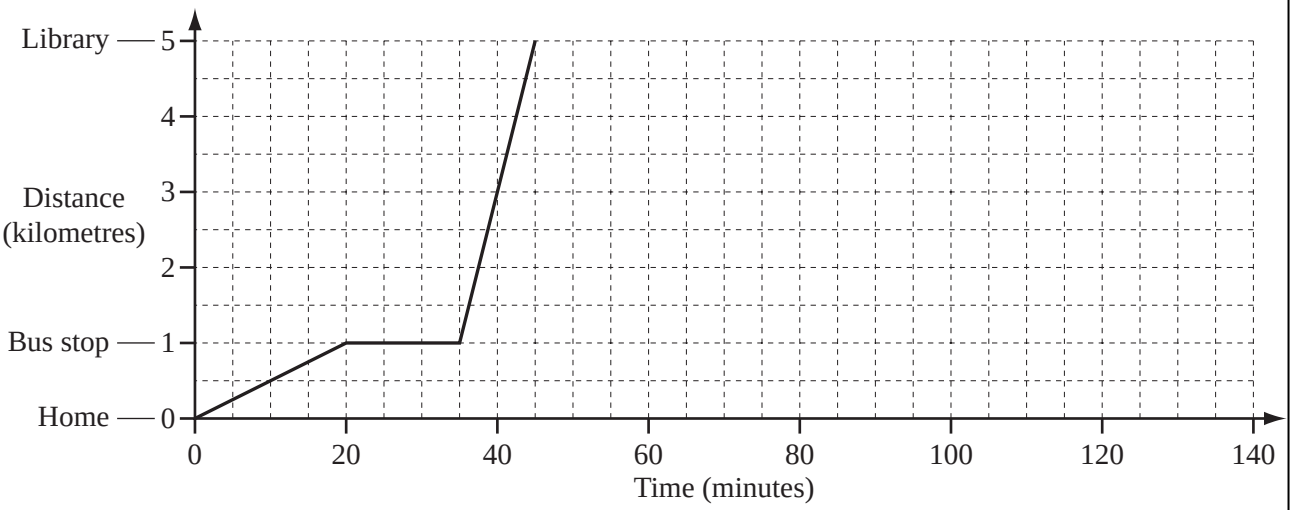
Answer(d) $m =$ ..... [2]

(e) Solve the equation.

$p + 3 = 3(p - 5)$

Answer(e) $p =$ ..... [3]

4



For Examiner's Use

Sonia travels from home to the library.
She walks to the bus stop and waits for a bus to take her to the library.

(a) Write down

(i) the distance to the bus stop,

Answer(a)(i) ..... km [1]

(ii) how many minutes Sonia waits for a bus,

Answer(a)(ii) ..... min [1]

(iii) how many minutes the bus journey takes to the library.

Answer(a)(iii) ..... min [1]

(b) Calculate, in **kilometres per hour**,

(i) Sonia's walking speed,

Answer(b)(i) ..... km/h [1]

(ii) the speed of the bus,

Answer(b)(ii) ..... km/h [2]

(iii) the **average** speed for Sonia's journey from home to the library.

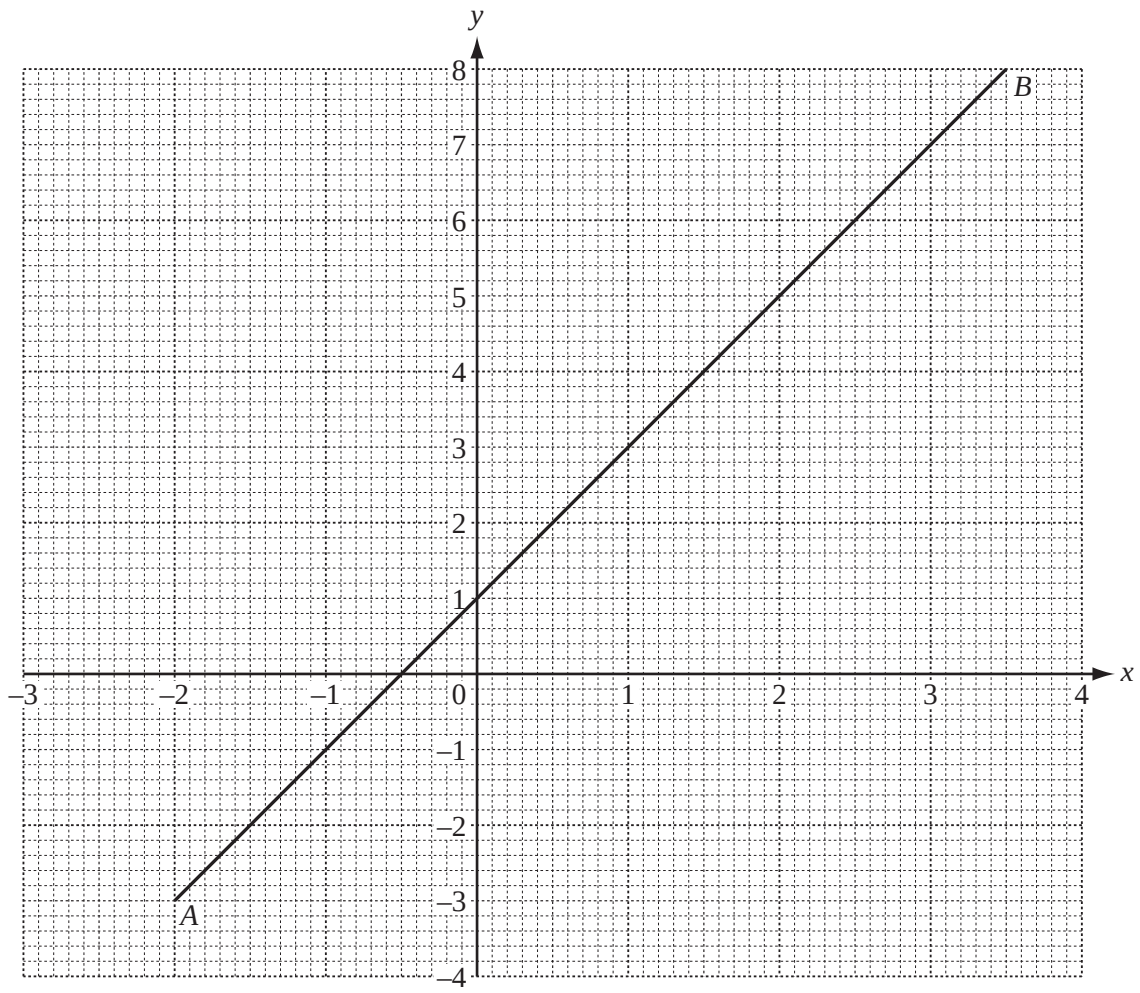
Answer(b)(iii) ..... km/h [3]

(c) Sonia works in the library for one hour.
Then she travels home by car.
The average speed of the car is 30 km/h.

Complete the travel graph. [2]

5

For Examiner's Use



(a) (i) Find the gradient of the line AB.

Answer(a)(i) ..... [2]

(ii) Write down the equation of the line AB in the form $y = mx + c$.

Answer(a)(ii) $y =$ ..... [2]

For Examiner's Use

(b) The table shows some values of the function $y = x^2 - 2$.

x	−3	−2	−1	0	1	2	3
y	7		−1		−1		7

(i) Complete the table. [2]

(ii) On the grid, draw the graph of $y = x^2 - 2$ for $-3 \leqslant x \leqslant 3$. [4]

(iii) Use your graph to solve the equation $x^2 - 2 = 0$.

Answer(b)(iii) $x =$ ..... or $x =$ ..... [2]

(c) Write down the co-ordinates of the points where your graph meets the line AB.

Answer(c)(..... , ...) and (..... , ...) [2]

For Examiner's Use

6 **(a)** 103 112 125 132 144 159 161

From the list above, write down

(i) a square number,

Answer(a)(i) ..... [1]

(ii) a cube number,

Answer(a)(ii) ..... [1]

(iii) a prime number,

Answer(a)(iii) ..... [1]

(iv) an odd number which is a multiple of 3.

Answer(a)(iv) ..... [1]

(b) Write 88 as a product of prime numbers.

Answer(b) ..... [2]

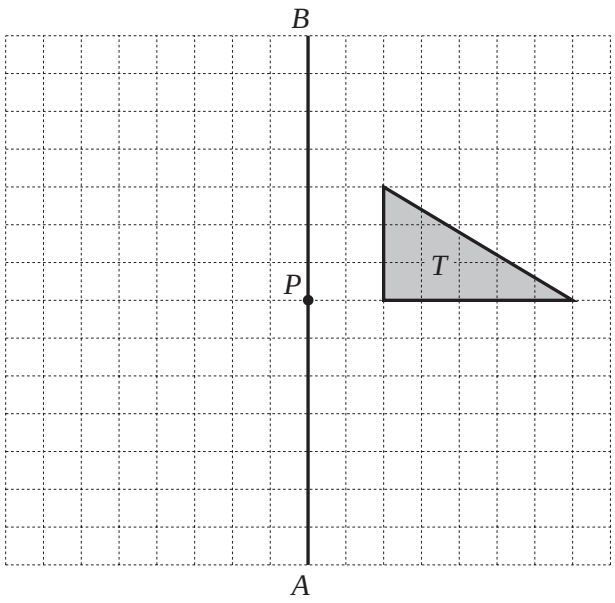
(c) Find the highest common factor of 72 and 96.

Answer(c) ..... [2]

(d) Find the lowest common multiple of 15 and 20.

Answer(d) ..... [2]

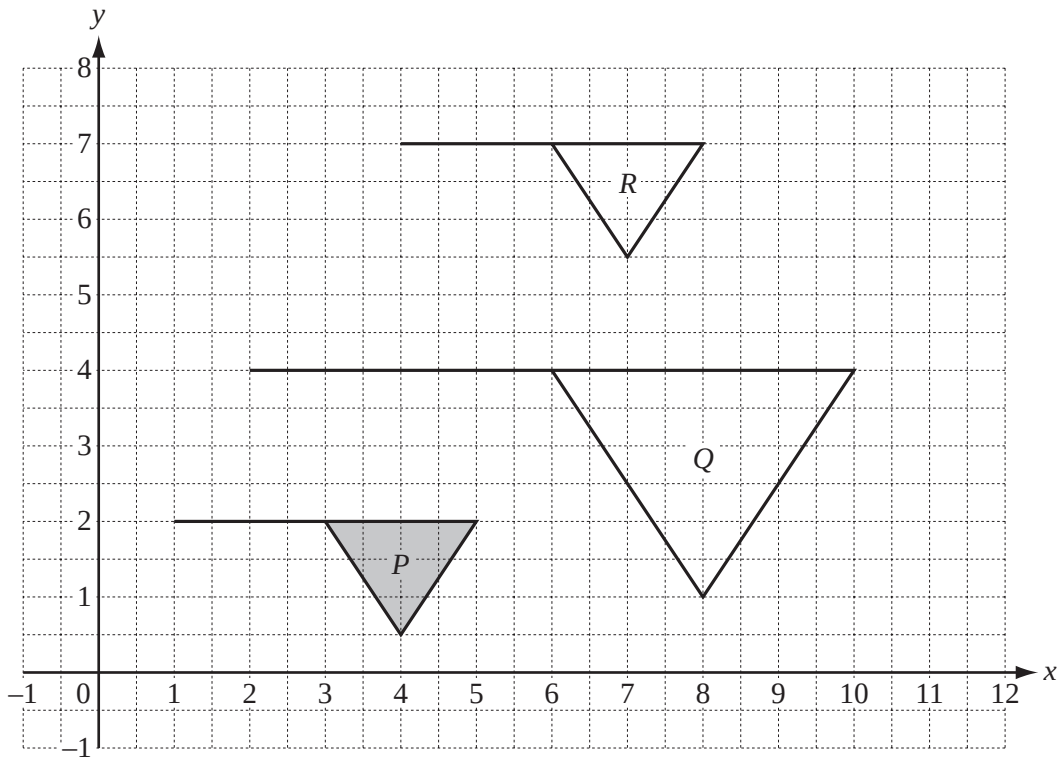
7 (a)



(i) Reflect triangle T in the line AB.
Label your image X. [1]

(ii) Rotate triangle T through 90° clockwise about the point P.
Label your image Y. [2]

(b)



Describe the **single** transformation which maps

(i) flag P onto flag Q,

Answer(b)(i) ..... [3]

(ii) flag P onto flag R.

Answer(b)(ii) ..... [2]

For Examiner's Use

For Examiner's Use

8 30 students took a vocabulary test.
The marks they scored are shown below.

7	8	5	8	3	2
6	6	3	3	6	2
7	1	5	10	2	6
6	5	8	1	2	7
3	1	5	3	10	3

(a) Complete the frequency table below.

The first five frequencies have been completed for you.
You may use the tally column to help you.

Mark	Tally	Frequency
1		3
2		4
3		6
4		0
5		4
6		
7		
8		
9		
10		

[3]

(b) (i) Find the range.

For Examiner's Use

Answer(b)(i) ..... [1]

(ii) Write down the mode.

Answer(b)(ii) ..... [1]

(iii) Find the median.

Answer(b)(iii) ..... [2]

(iv) Calculate the mean.

Answer(b)(iv) ..... [3]

(c) A student is chosen at random.

Find the probability that the student scored

(i) 1 mark,

Answer(c)(i) ..... [1]

(ii) 4 marks,

Answer(c)(ii) ..... [1]

(iii) fewer than 6 marks.

Answer(c)(iii) ..... [1]

9 **(a)** In the space below, construct the triangle ABC with $AB = 10$ cm and $AC = 12$ cm.
Leave in your construction arcs.
The line BC is already drawn.

For Examiner's Use

[2]

For Examiner's Use

(b) Measure angle ABC.

Answer(b) Angle ABC = ... [1]

(c) (i) **Using a straight edge and compasses only**, and leaving in your construction arcs, construct the perpendicular bisector of BC. [2]

(ii) This bisector cuts AC at P.

Mark the position of P on the diagram and measure AP.

Answer(c)(ii) AP = ... cm [1]

(d) Construct the locus of all the points inside the triangle which are 5 cm from A. [1]

(e) Shade the region inside the triangle which is

- nearer to B than to C

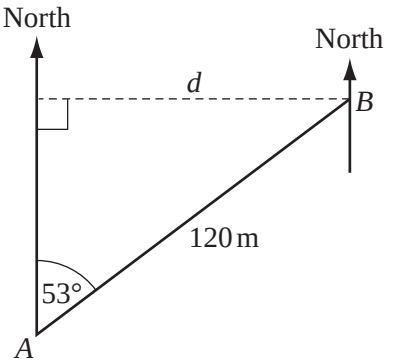
and

- less than 5 cm from A. [2]

Question 10 is printed on the next page.

For Examiner's Use

10 (a)



NOT TO SCALE

B is 120 m from *A* on a bearing of 053°.
Calculate

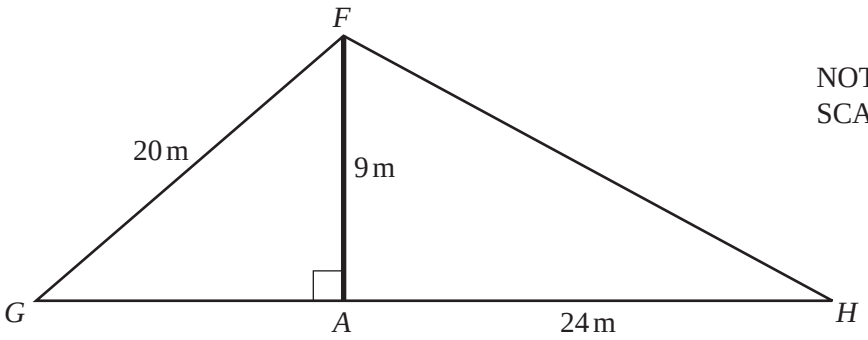
(i) the distance *d*,

Answer(a)(i) *d* = ... m [2]

(ii) the bearing of *A* from *B*.

Answer(a)(ii) ..... [1]

(b)



NOT TO SCALE

A vertical flagpole, *AF*, is 9 m high.
It is held in place by two straight wires *FG* and *FH*.
FG = 20 m and *AH* = 24 m.
G, *A* and *H* lie in a straight line on horizontal ground.
Calculate

(i) angle *FHA*,

Answer(b)(i) Angle *FHA* = ... [2]

(ii) the distance *GA*.

Answer(b)(ii) *GA* = ... m [3]