UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5208945727

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2011**

1 hour 30 minutes

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 70.

This document consists of **12** printed pages.

UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

1 A bus leaves a port every 15 minutes, starting at 09 00.
The last bus leaves at 17 30.

How many times does a bus leave the port during one day?

Answer ..... [2]

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2 Factorise completely $ax + bx + ay + by$.

Answer ..... [2]

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3 Use your calculator to find the value of

(a) $3^0 \times 2.5^2$,

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

(b) 2.5^{-2}.

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

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4 The cost of making a chair is \$28 correct to the nearest dollar.

Calculate the lower and upper bounds for the cost of making 450 chairs.

Answer lower bound \$ .....

upper bound \$ ..... [2]

For Examiner's Use

5 Jiwan incorrectly wrote $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} = 1\frac{3}{9}$.

Show the correct working and write down the answer as a mixed number.

Answer ..... [3]

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6 The force, F, between two magnets varies **inversely** as the **square** of the distance, d, between them.

$F = 150$ when $d = 2$.

Calculate F when $d = 4$.

Answer $F =$ ..... [3]

For Examiner's Use

7 $\begin{pmatrix} 0 & 2 \\ -3 & 4 \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} 8 \\ 25 \end{pmatrix}$

Find the value of a and the value of b.

Answer $a =$ .....

$b =$ ..... [3]

---

8 A cruise ship travels at 22 knots.

[1 knot is 1.852 kilometres per hour.]

Convert this speed into metres per second.

Answer ..... m/s [3]

For Examiner's Use

9 A sequence is given by $u_1 = \sqrt{1}$, $u_2 = \sqrt{3}$, $u_3 = \sqrt{5}$, $u_4 = \sqrt{7}$, …

(a) Find a formula for u_n, the nth term.

Answer(a) $u_n =$ ..... [2]

(b) Find u_{29}.

Answer(b) $u_{29} =$ ..... [1]

---

10 Write as a single fraction in its simplest form.

$$\frac{3}{x+10} - \frac{1}{x+4}$$

Answer ..... [3]

---

11 Find the values of m and n.

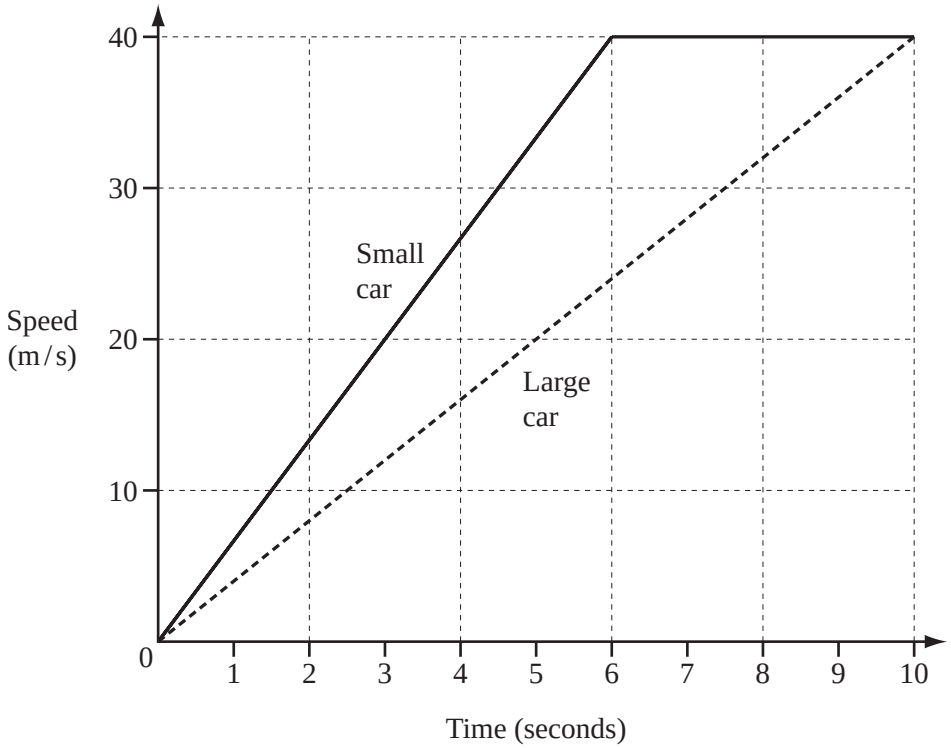
(a) $2^m = 0.125$

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

(b) $2^{4n} \times 2^{2n} = 512$

Answer(b) $n =$ ..... [2]

12

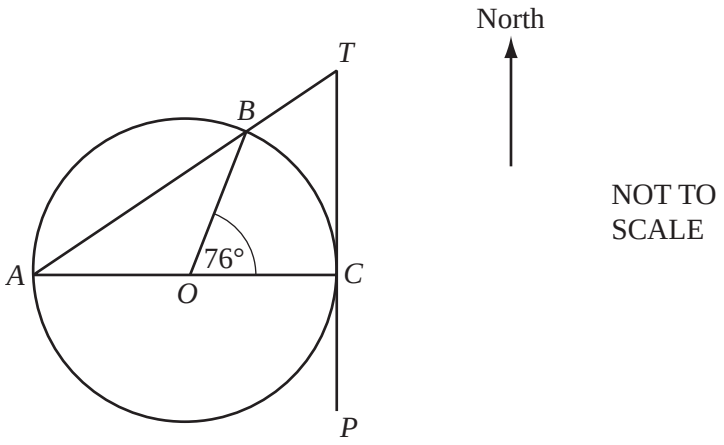


A small car accelerates from 0 m/s to 40 m/s in 6 seconds and then travels at this constant speed.
A large car accelerates from 0 m/s to 40 m/s in 10 seconds.

Calculate how much further the small car travels in the first 10 seconds.

Answer ..... m [4]

13



AOC is a diameter of the circle, centre *O*.
AT is a straight line that cuts the circle at *B*.
PT is the tangent to the circle at *C*.
Angle *COB* = 76°.

(a) Calculate angle *ATC*.

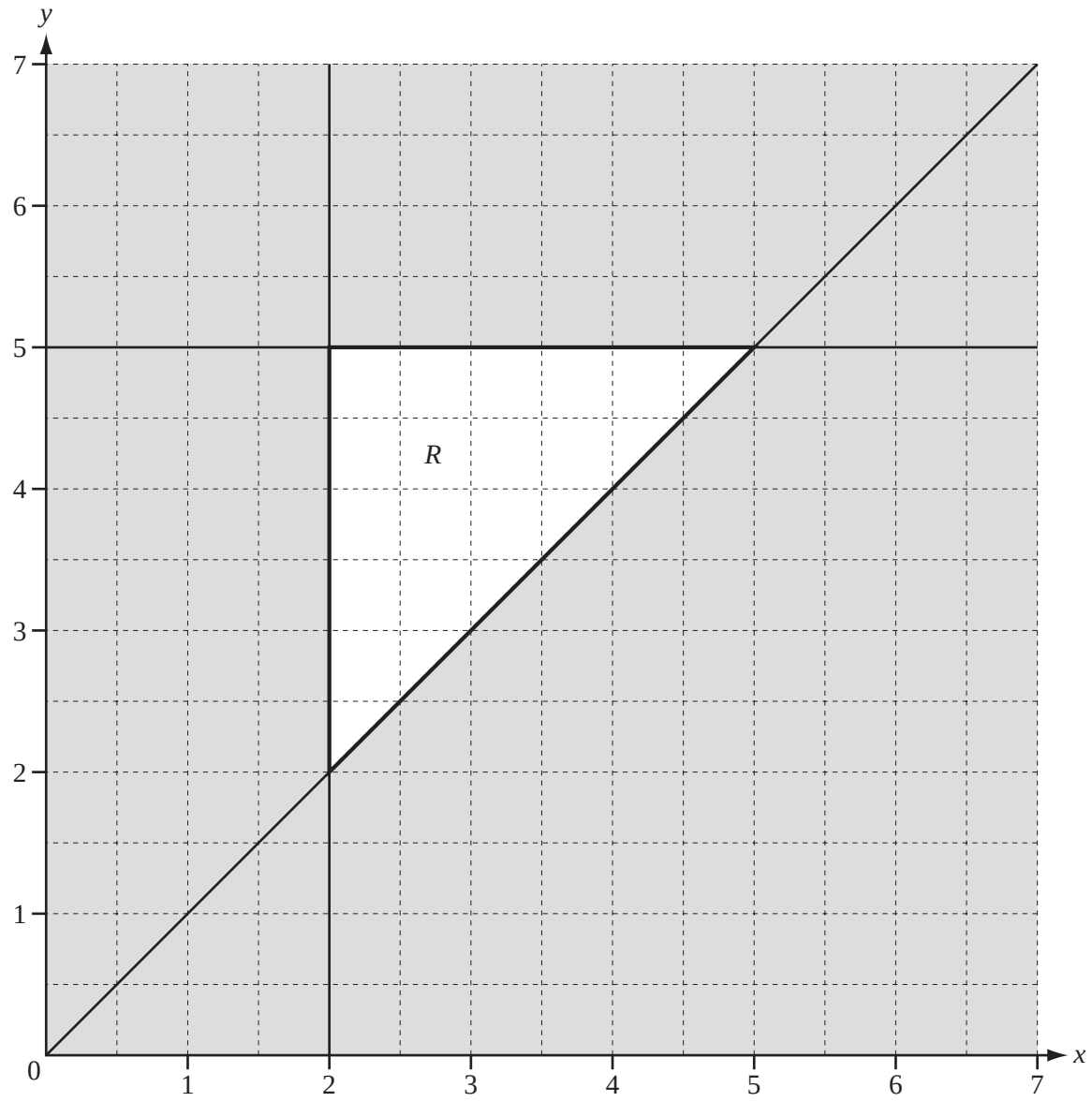
Answer(a) Angle *ATC* = ... [2]

(b) *T* is due north of *C*.

Calculate the bearing of *B* from *C*.

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

14



The region R is bounded by three lines.

Write down the three inequalities which define the region R.

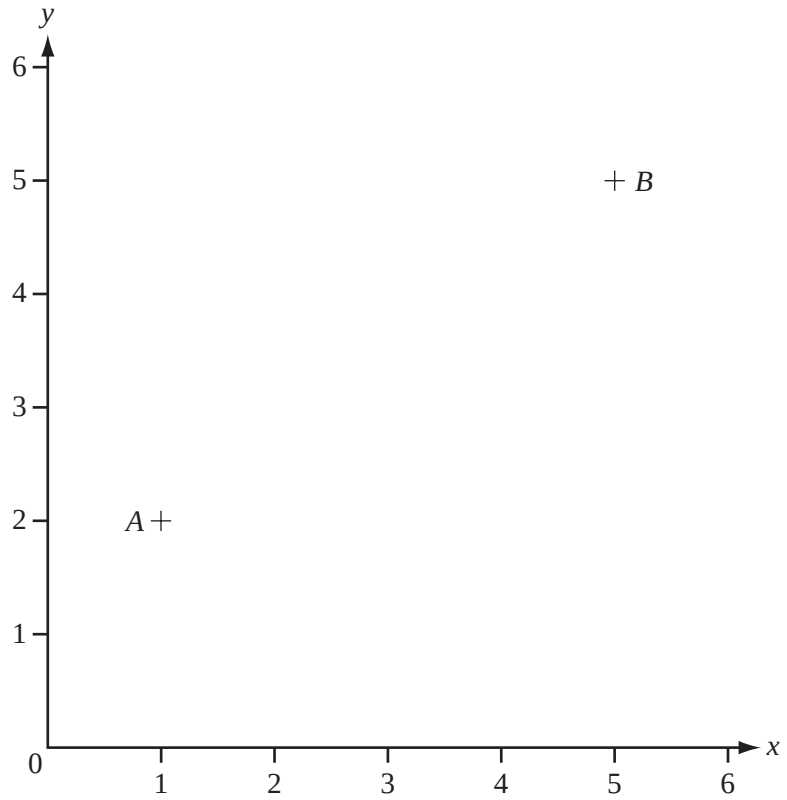
Answer .....

.....

..... [4]

15

For Examiner's Use



The points $A(1, 2)$ and $B(5, 5)$ are shown on the diagram .

(a) Work out the co-ordinates of the midpoint of AB.

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

(b) Write down the column vector $\overrightarrow{AB}$.

Answer(b) $\overrightarrow{AB} = \begin{pmatrix} \\ \\ \end{pmatrix}$ [1]

(c) **Using a straight edge and compasses only,** draw the locus of points which are equidistant from A and from B. [2]

For Examiner's Use

16 In a survey of 60 cars, the type of fuel that they use is recorded in the table below.

Each car only uses one type of fuel.

Petrol	Diesel	Liquid Hydrogen	Electricity
40	12	2	6

(a) Write down the mode.

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

(b) Olav drew a pie chart to illustrate these figures.

Calculate the angle of the sector for Diesel.

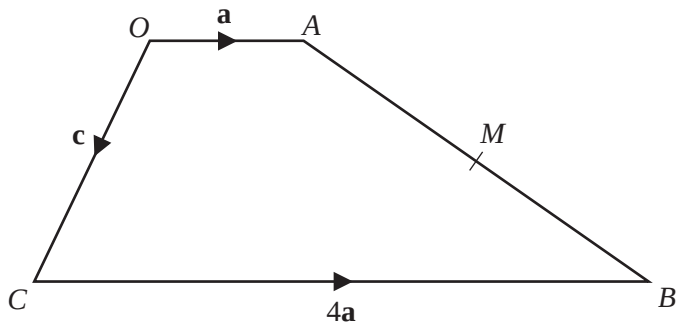
Answer(b) ..... [2]

(c) Calculate the probability that a car chosen at random uses Electricity.

Write your answer as a fraction in its simplest form.

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

17



O is the origin, $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{CB} = 4\mathbf{a}$.
M is the midpoint of AB.

(a) Find, in terms of **a** and **c**, in their simplest form

(i) the vector $\overrightarrow{AB}$,

Answer(a)(i) $\overrightarrow{AB}$ = ... [2]

(ii) the position vector of M.

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

(b) Mark the point D on the diagram where $\overrightarrow{OD} = 3\mathbf{a} + \mathbf{c}$. [2]

18

$$w = \frac{1}{\sqrt{LC}}$$

(a) Find w when $L = 8 \times 10^{-3}$ and $C = 2 \times 10^{-9}$.
Give your answer in standard form.

Answer(a) w = ... [3]

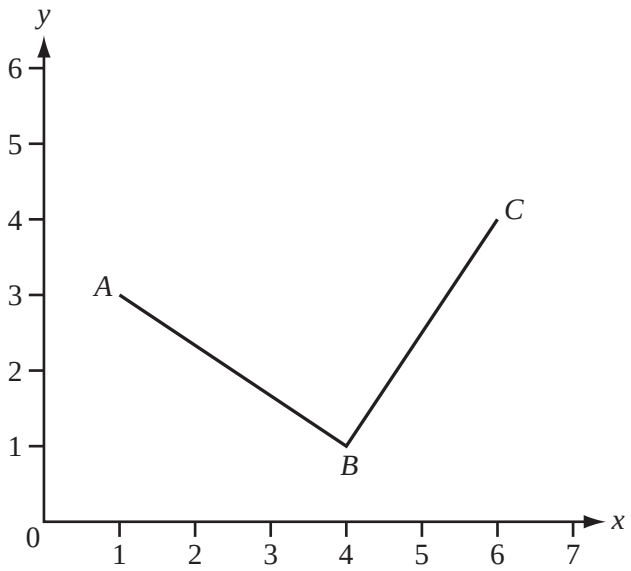
(b) Rearrange the formula to make C the subject.

Answer(b) C = ... [3]

Question 19 is printed on the next page.

19

For Examiner's Use



$A(1, 3)$, $B(4, 1)$ and $C(6, 4)$ are shown on the diagram.

(a) Using a straight edge and compasses only, construct the angle bisector of angle ABC. [2]

(b) Work out the equation of the line BC.

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

(c) ABC forms a **right-angled isosceles** triangle of area 6.5 cm^2.

Calculate the length of AB.

Answer(c) $AB =$ ..... cm [2]