First Variant Question Paper

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7432117807

MATHEMATICS **0580/21, 0581/21**

Paper 2 (Extended) **May/June 2009**

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.

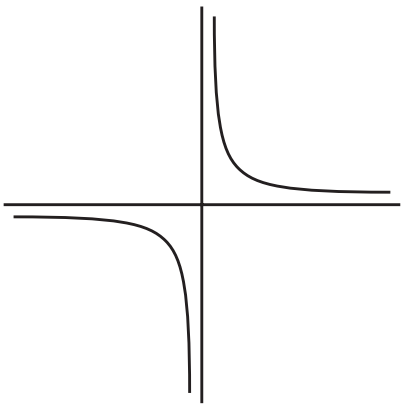
Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees 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.

For Examiner's Use

1



(a) Write down the order of rotational symmetry of the diagram.

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

(b) Draw all the lines of symmetry on the diagram. [1]

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2 Write the following in order of size, smallest first.

$\sqrt{\frac{9}{17}}$ $\frac{5}{7}$ 72% $\left(\frac{4}{3}\right)^{-1}$

Answer ..... < ..... < ..... < ..... [2]

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3 At 05 06 Mr Ho bought 850 fish at a fish market for \$2.62 each.
95 minutes later he sold them all to a supermarket for \$2.86 each.

(a) What was the time when he sold the fish?

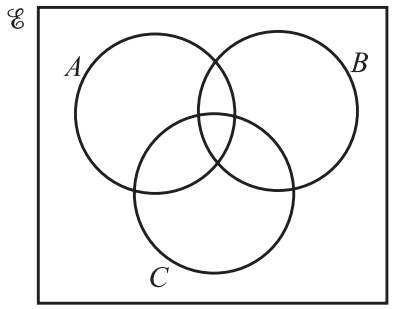
Answer(a) ..... [1]

(b) Calculate his total profit.

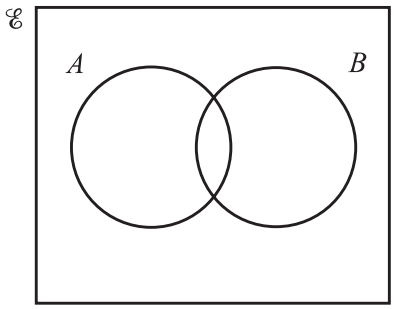
Answer(b) \$ ..... [1]

For Examiner's Use

4 Shade the region required in each Venn Diagram.



$A \cap B \cap C$



$A \cup B'$ [2]

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5 $\mathbf{A} = \begin{pmatrix} -2 & 3 \\ -4 & 5 \end{pmatrix}$

Find $\mathbf{A}^{-1}$, the inverse of the matrix **A**.

Answer ( ) [2]

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6 In 2005 there were 9 million bicycles in Beijing, correct to the nearest million.
The average distance travelled by each bicycle in one day was 6.5 km correct to one decimal place.
Work out the upper bound for the **total** distance travelled by all the bicycles in one day.

Answer ..... km [2]

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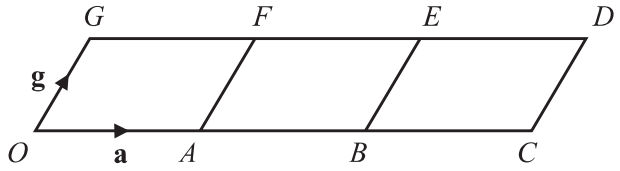
7 Find the co-ordinates of the mid-point of the line joining the points $A(2, -5)$ and $B(6, 9)$.

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

8



The diagram is made from three identical parallelograms.

O is the origin. $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OG} = \mathbf{g}$.

Write down in terms of **a** and **g**

(a) $\overrightarrow{GB}$,

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

(b) the position vector of the centre of the parallelogram $BCDE$.

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

---

9 Rearrange the formula to make y the subject.

$$x + \frac{\sqrt{y}}{9} = 1$$

Answer $y =$ ..... [3]

---

10 Write $\frac{1}{c} + \frac{1}{d} - \frac{c-d}{cd}$ as a single fraction in its simplest form.

Answer ..... [3]

For Examiner's Use

For Examiner's Use

11 In January Sunanda changed £25 000 into dollars when the exchange rate was \$1.96 = £1.
In June she changed the dollars back into pounds when the exchange rate was \$1.75 = £1.
Calculate the profit she made, giving your answer in pounds (£).

Answer £ ..... [3]

---

12 Solve the simultaneous equations

$$2y + 3x = 6,$$
$$x = 4y + 16.$$

Answer x = ...

y = ... [3]

---

13 A spray can is used to paint a wall.
The thickness of the paint on the wall is t. The distance of the spray can from the wall is d.
t is inversely proportional to the square of d.

$t = 0.2$ when $d = 8$.
Find t when $d = 10$.

Answer t = ... [3]

For Examiner's Use

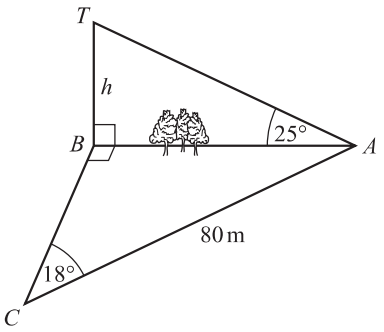
14 **(a)** There are 10^9 nanoseconds in 1 second.
Find the number of nanoseconds in 5 minutes, giving your answer in standard form.

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

(b) Solve the equation $5(x + 3\times10^6) = 4\times10^7$.

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

15



NOT TO SCALE

Mahmoud is working out the height, h metres, of a tower BT which stands on level ground.
He measures the angle TAB as 25°.
He cannot measure the distance AB and so he walks 80 m from A to C, where angle ACB = 18° and angle ABC = 90°.

Calculate

(a) the distance AB,

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

(b) the height of the tower, BT.

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

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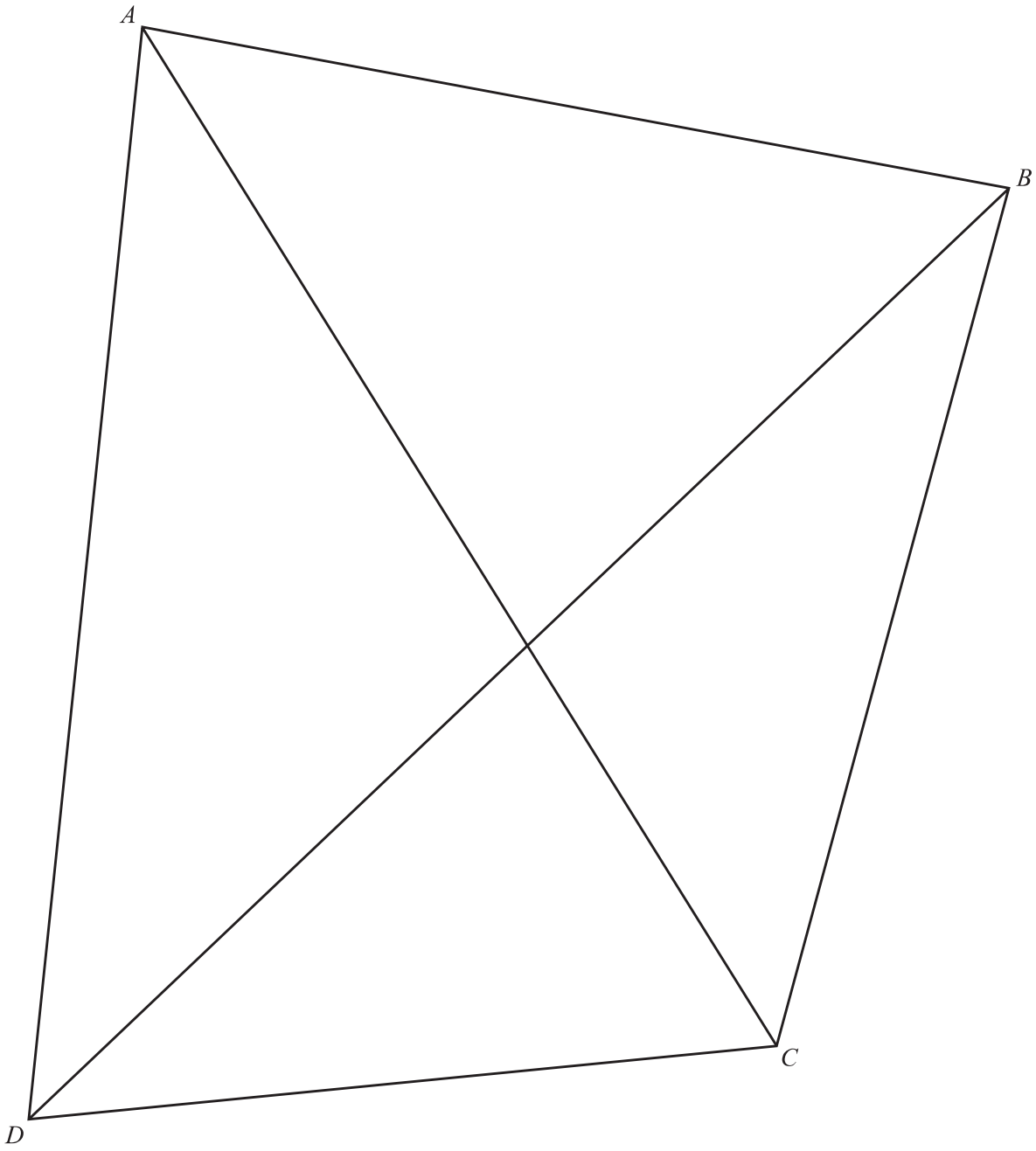
16 **Using a straight edge and compasses only,** draw the locus of all points inside the quadrilateral *ABCD* which are equidistant from the lines *AC* and *BD*.

Show clearly all your construction arcs.

For Examiner's Use



[4]

17

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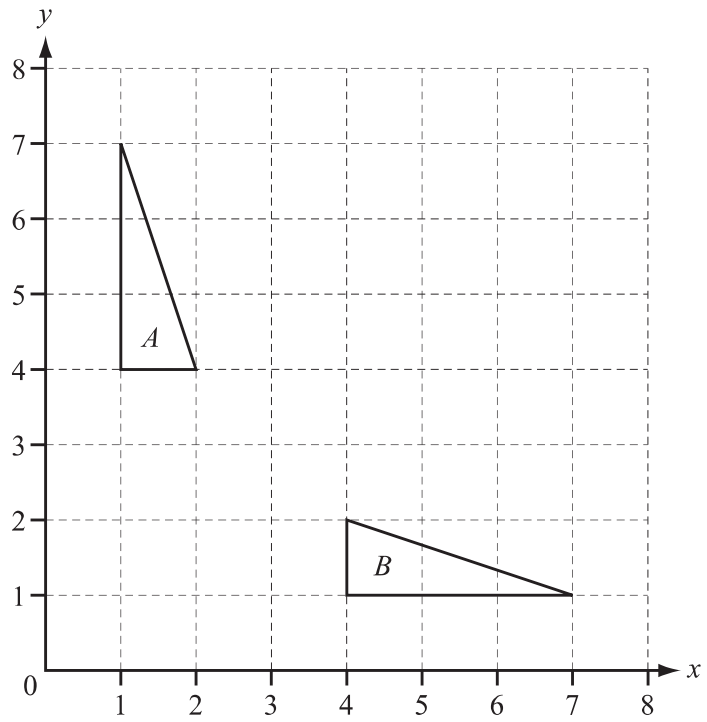


(a) Describe fully the **single** transformation which maps triangle *A* onto triangle *B*.

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

(b) On the grid, draw the image of triangle *A* after rotation by 90° clockwise about the point (4, 4). [2]

---

18 Two similar vases have heights which are in the ratio 3 : 2.

(a) The volume of the larger vase is 1080 cm^3.
Calculate the volume of the smaller vase.

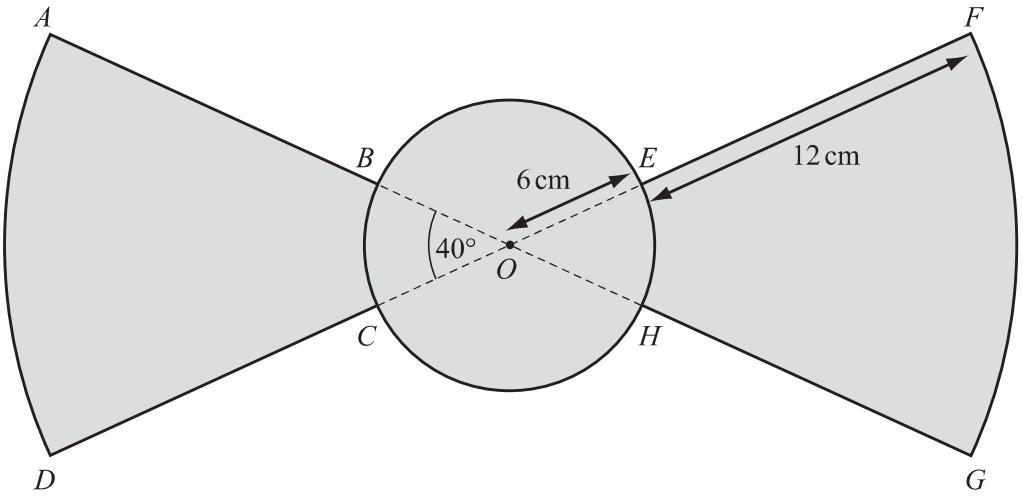
Answer(a) ..... cm^3 [2]

(b) The surface area of the smaller vase is 252 cm^2.
Calculate the surface area of the larger vase.

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

19

For Examiner's Use



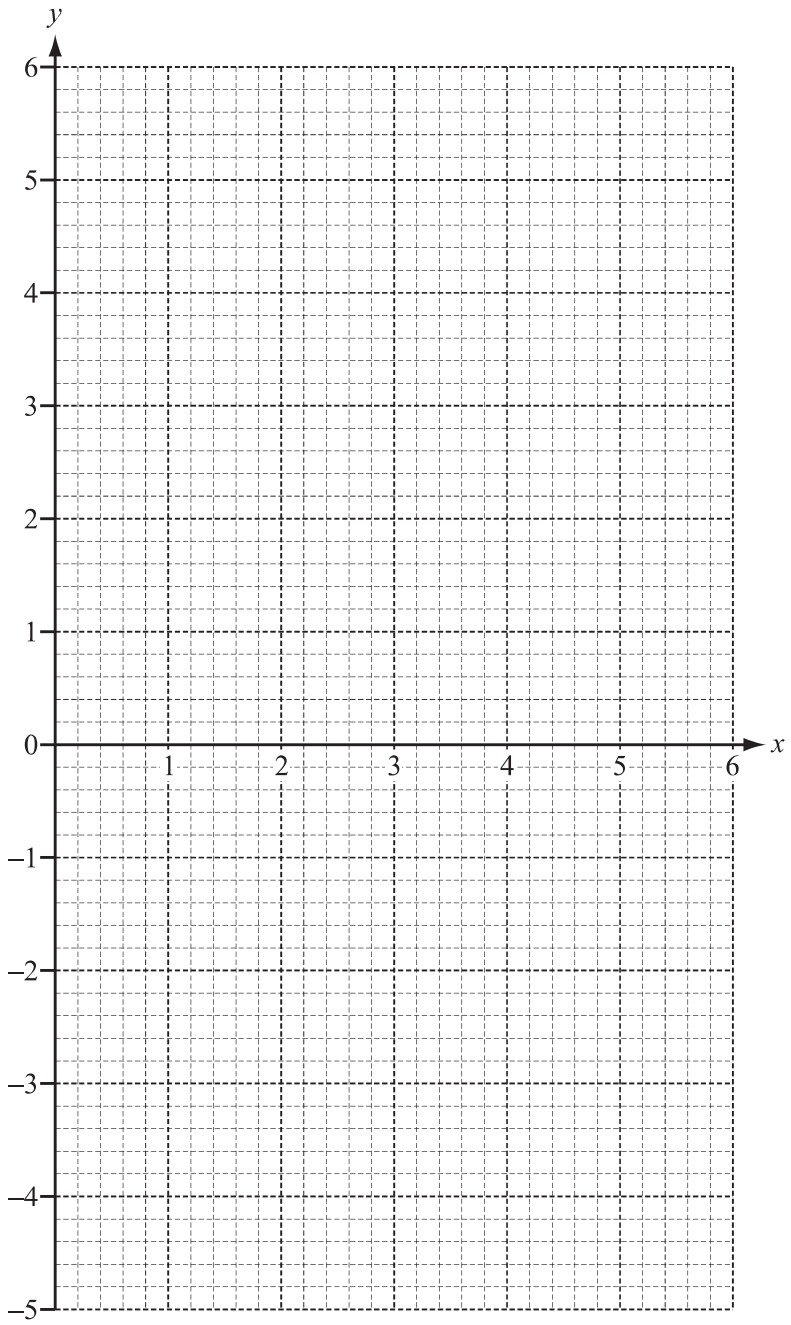
NOT TO SCALE

The diagram shows part of a fan.
OFG and *OAD* are sectors, centre *O*, with radius 18 cm and sector angle 40°.
B, *C*, *H* and *E* lie on a circle, centre *O* and radius 6 cm.
Calculate the shaded area.

Answer ..... cm^2 [4]

20

For Examiner's Use



(a) Draw the three lines $y = 4$, $2x - y = 4$ and $x + y = 6$ on the grid above. [4]

(b) Write the letter R in the region defined by the three inequalities below.

$y \leqslant 4$ $2x - y \geqslant 4$ $x + y \geqslant 6$ [1]

21

For Examiner's Use

$\mathbf{A} = \begin{pmatrix} x & 6 \\ 4 & 3 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 2 & 3 \\ 2 & 1 \end{pmatrix}$

(a) Find **AB**.

Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

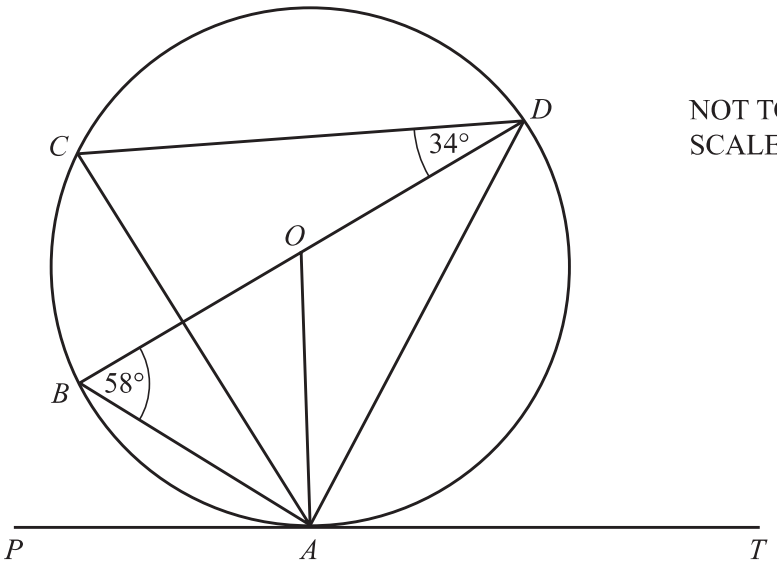
(b) When **AB** = **BA,** find the value of x.

Answer(b) $x =$ ..... [3]

Question 22 is on the next page

22

For Examiner's Use



NOT TO SCALE

A, B, C and *D* lie on the circle, centre *O*.
BD is a diameter and *PAT* is the tangent at *A*.
Angle *ABD* = 58° and angle *CDB* = 34°.

Find

(a) angle *ACD*,

Answer(a) Angle *ACD* = ... [1]

(b) angle *ADB*,

Answer(b) Angle *ADB* = ... [1]

(c) angle *DAT*,

Answer(c) Angle *DAT* = ... [1]

(d) angle *CAO*.

Answer(d) Angle *CAO* = ... [2]