Cambridge International Examinations
Cambridge International General Certificate of Secondary Education (9–1)

MATHEMATICS **0626/06**

Paper 6 (Extended)

October/November 2017

2 hours

Candidates answer on the Question Paper.

Additional Materials: 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 an HB pencil for any diagrams and graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators should be used.
If working is required for any question it must be shown below that question.
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 96.

CAMBRIDGE
International Examinations

[Turn over

1 The Newbold family are going on holiday to Switzerland.
They travel by ferry from Dover in England to Calais in France.

(a) The bearing of Calais from Dover is 118°.

Work out the bearing of Dover from Calais.

....° [2]

(b) (i) The shop on the ferry sells different sized bottles of the same perfume.
The bottles are priced in euros (€).

€5.80 for 18 ml   €9.10 for 29 ml   €12.25 for 37 ml

Which bottle is the best buy?
Show your working.

.... [3]

(ii) A gold watch costs €1000 on the ferry.
The same watch can be bought in Switzerland for 1040 Swiss francs (CHF).

The exchange rate on the ferry is £1 = €1.358.
The exchange rate in Switzerland is 1 CHF = £0.679.

Calculate the difference in the cost of the watch on the ferry and in Switzerland.
Give your answer in pounds, correct to the nearest penny.

£ .... [4]

(c) The ratio of the number of

child passengers : adult passengers : crew members = 11 : 16 : 3.

(i) There are 340 **more** adult passengers than child passengers.

Work out the number of crew members.

.... [2]

(ii) Write down the ratio of   total passengers : crew   in its simplest form.

.... : .... [1]

(d) The ferry has a mass of 47 600 tonnes, correct to the nearest 50 tonnes.

(i) Write down the **lower** bound for the mass of the ferry.

.... tonnes [1]

(ii) Write 47 600 in standard form.

.... [1]

       [Turn over

2 **(a)**
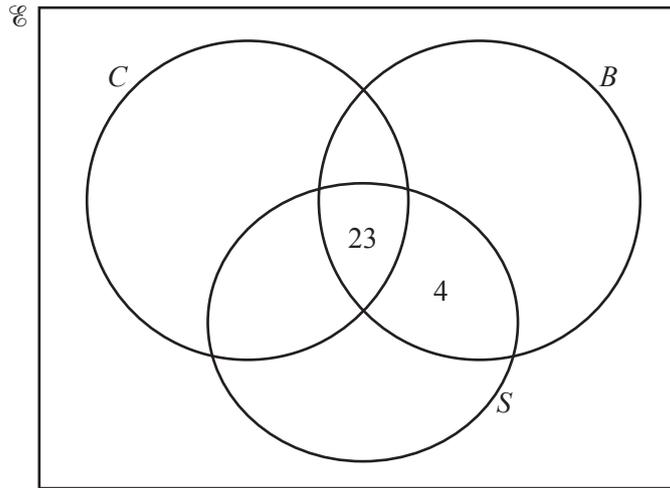
60 pupils are asked which activities they like from Swimming (*S*), Bowling (*B*) and the Cinema (*C*).

- 5 pupils do not like any of the activities
- 3 pupils only like Swimming
- 13 pupils like Swimming but not Bowling
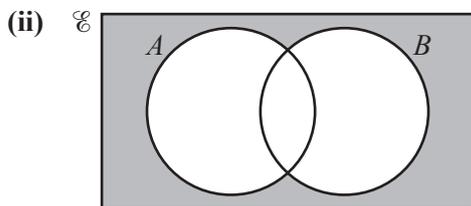- 7 pupils like Cinema and Bowling but not Swimming
- 40 pupils like Bowling

(i) Complete the Venn diagram. [3]

(ii) Work out the number of pupils who like at least 2 of the activities.

.... [1]

(b) Use set notation to describe the shaded regions in each Venn diagram.

(i)

.... [1]

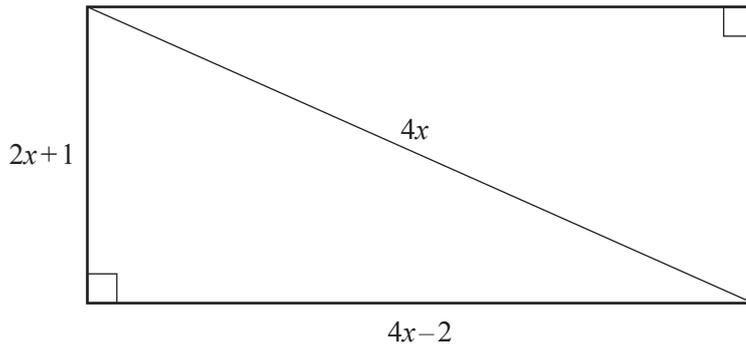**(ii)**
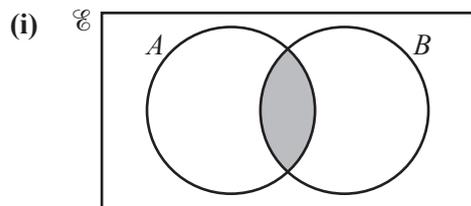
.... [1]

3 In this question, all lengths are in centimetres.

NOT TO
SCALE

The diagram shows a rectangle.
The diagonal has length $4x$.

(a) Write down an expression for the perimeter of the rectangle.
Give your answer in its simplest form.

.... [2]

(b) **(i)** Show that $4x^2 - 12x + 5 = 0$.

[3]

(ii) Find the length of the diagonal.

.... cm [4]

4 **(a)** Sammy invests £6000.
The value of his investment **decreases** exponentially by 4% each year.

    (i) Work out the value of his investment after 2 years.

£.. [2]

    (ii) Write down an expression for the value of his investment after k years.

.... [1]

(b) Teresa invests £3000 at the same time as Sammy invests his money.
The value of Teresa's investment **increases** exponentially by 4% each year.

Write down an expression for the value of Teresa's investment after k years.

.... [1]

(c) **(i)** After n years, the value of Sammy's investment is equal to the value of Teresa's investment.
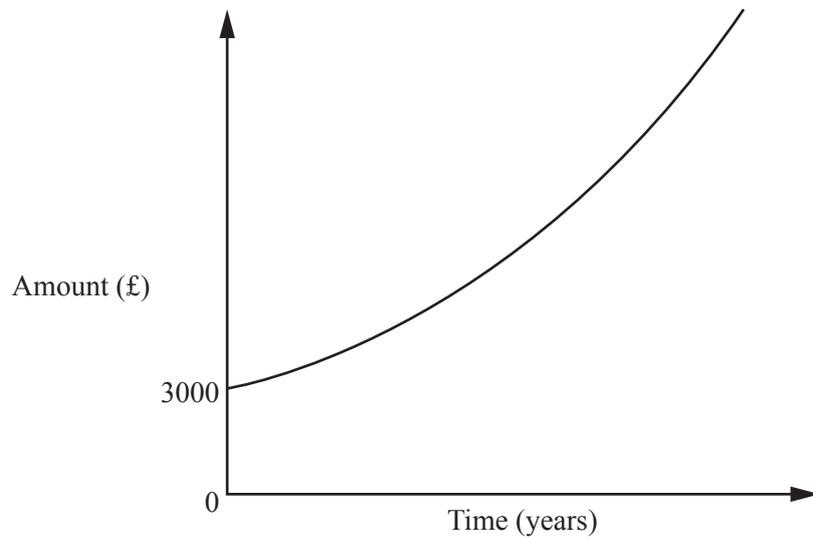
Show that $\left(\frac{13}{12}\right)^n = 2$.

[2]

(ii) Find the number of complete years it takes for the value of Teresa's investment first to be greater than the value of Sammy's investment.

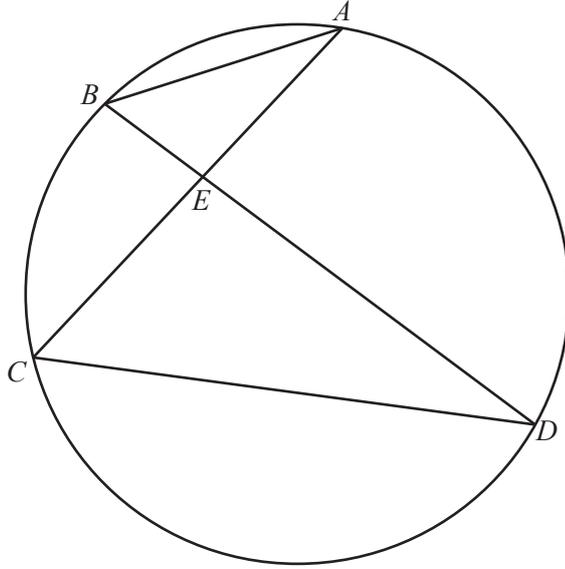.. years [2]

(d) The sketch graph below shows how Teresa's investment changes with time.

On the same graph, show how Sammy's investment changes with time.

[2]

5 (a)

NOT TO SCALE

A, *B*, *C* and *D* are points on the circumference of a circle.
The chords *AC* and *BD* meet at *E*.

(i) Show that triangle *ABE* is similar to triangle *DCE*.
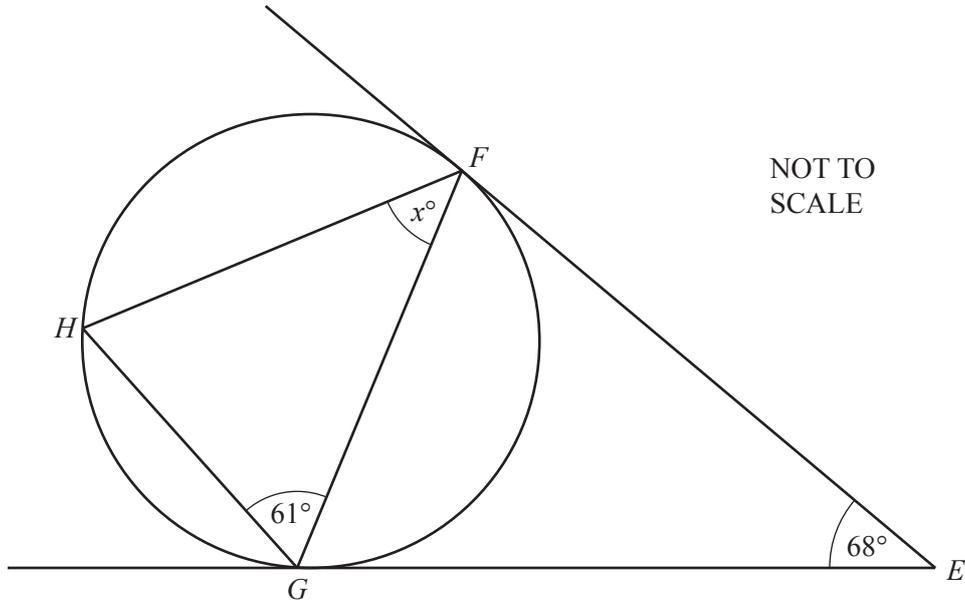Give a reason for each step of your working.

[3]

(ii) *AB* = 7.2 cm, *BE* = 4.8 cm and *CD* = 12 cm.

Work out the length of *CE*.

CE = ... cm [2]

(b)

NOT TO SCALE

F, *G* and *H* are points on the circumference of another circle.
EF and *EG* are tangents to the circle at *F* and *G*.

Work out the value of *x*.
Give a reason for each step of your working.

$x =$ .... [4]

6 **(a)** Rhona asked each of 50 pupils to guess the mass, m grams, of a marble.
The results are recorded in the table.

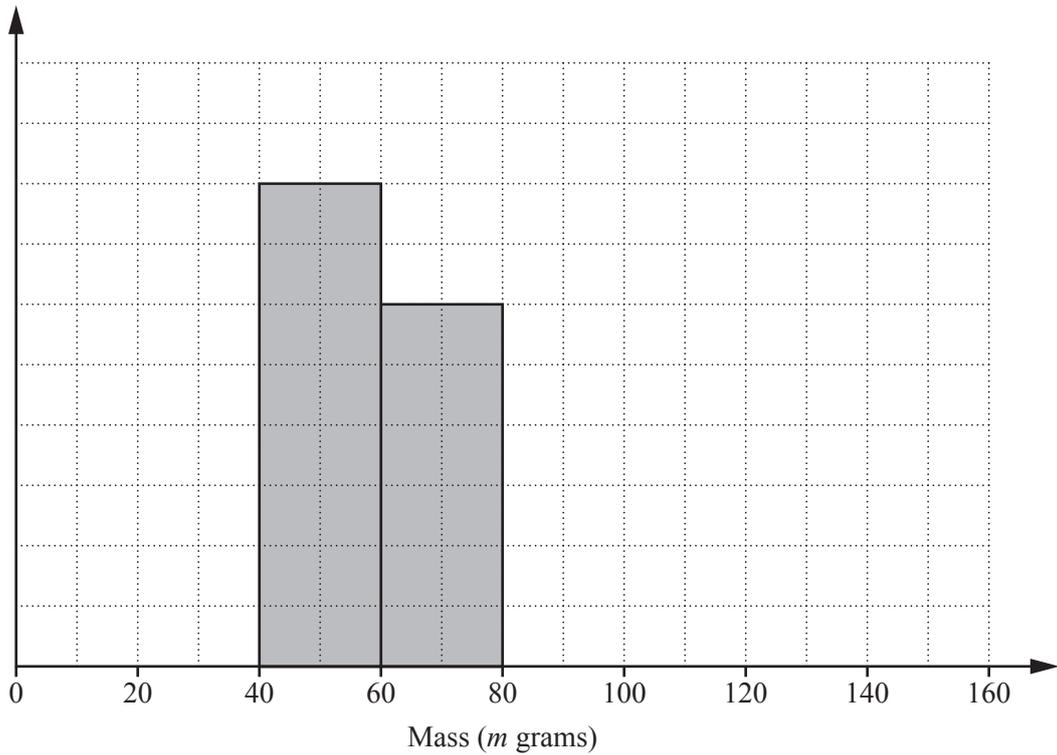| Mass of marble (m grams)	Frequency
$20 \leqslant m < 30$	5
$30 \leqslant m < 40$	7
$40 \leqslant m < 60$	16
$60 \leqslant m < 80$	12
$80 \leqslant m < k$	10

(i) Using mid-interval values, Rhona worked out an estimate of the mean as 61.2 grams.

Work out the value of k which gives this estimate of the mean.

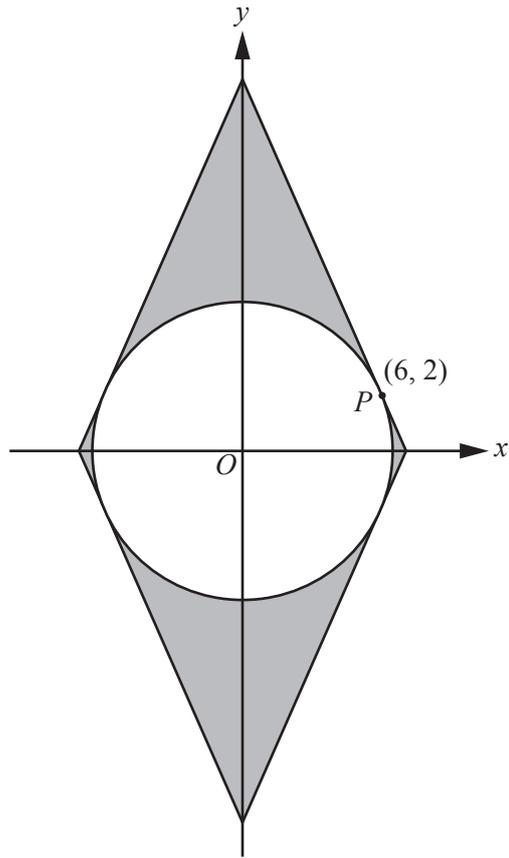$k =$ .... [5]

(ii) Complete the histogram to show the information in the table.

Mass (*m* grams)

[4]

(b) A bag contains *n* marbles.
There are 4 yellow marbles, the rest are green.
Two marbles are taken out of the bag, at random, without replacement.

The probability that both marbles are yellow is $\frac{1}{6}$.

Work out the probability that both marbles are green.

.... [6]

7

NOT TO
SCALE

(6, 2)

P

O

y

x

The diagram shows a circle, centre *O*, inside a rhombus.
Each side of the rhombus is a tangent to the circle.
Point *P* has co-ordinates (6, 2) and lies on the circle and on the rhombus.

(a) Calculate *OP*.
Give your answer as a surd.

OP = ... [2]

(b) Write down the equation of the circle.

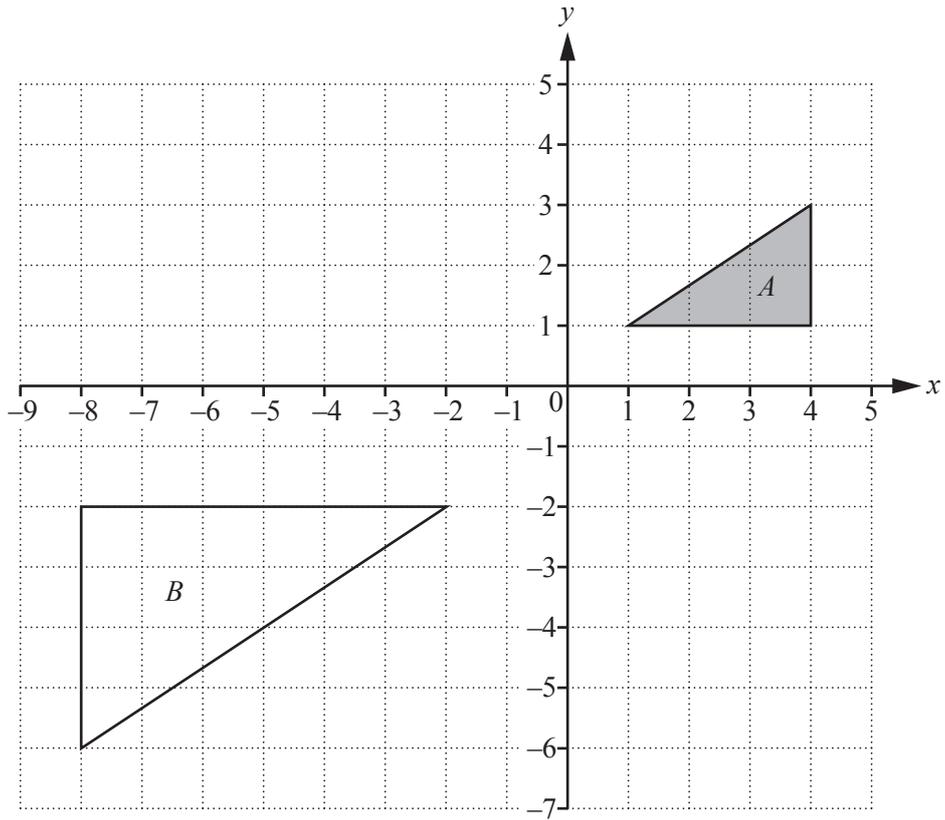.. [2]

(c) Show that the tangent to the circle at *P* has the equation $y = -3x + 20$.

[3]

(d) Work out the total area shaded on the diagram.

.... [6]

8 **(a)**

(i) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

....

.... [3]

(ii) Write down the matrix that maps triangle *A* onto triangle *B*.

$$\begin{pmatrix} & \\ & \end{pmatrix}$$ [2]

(b) (i) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$.

....

.... [2]

(ii) Work out $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [1]

(iii) Give a geometrical explanation of the result in **part (b)(ii)**.

....

.... [1]

Question 9 is printed on the next page.

9   A curve has equation $y = x^3 - 6x^2 + 9x$.

   (a)   Find $\dfrac{dy}{dx}$.

$$\frac{dy}{dx} = \text{...} \quad [2]$$

   (b)   Find the gradient of the curve when $x = 2$.

   .... [2]

   (c)   **(i)**   Find the co-ordinates of the two turning points of the curve.

   (............ , ...) and (............ , ...) [4]

   (ii)   Determine whether each turning point is a maximum or a minimum.
   Show clearly how you decide.

[3]