



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

CENTER
NUMBER

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MATHEMATICS (US)

0444/31

Paper 3 (Core)

October/November 2013

2 hours

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments
 Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your Center 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 work is needed for any question it must be shown in the space provided.
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 digits.
Give answers in degrees to one decimal place.
For π , use either your calculator value or 3.142.

The number of points is given in parentheses [] at the end of each question or part question.
The total of the points for this paper is 104.

Write your calculator model in the box below.

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

Formula List

Area, A , of triangle, base b , height h .

$$A = \frac{1}{2}bh$$

Area, A , of circle, radius r .

$$A = \pi r^2$$

Circumference, C , of circle, radius r .

$$C = 2\pi r$$

Lateral surface area, A , of cylinder of radius r , height h .

$$A = 2\pi rh$$

Surface area, A , of sphere of radius r .

$$A = 4\pi r^2$$

Volume, V , of prism, cross-sectional area A , length l .

$$V = Al$$

Volume, V , of cylinder of radius r , height h .

$$V = \pi r^2 h$$

Volume, V , of sphere of radius r .

$$V = \frac{4}{3}\pi r^3$$

1 (a) (i) 1 and 120 are factors of 120.

Write down another factor of 120.

Answer(a)(i) [1]

(ii) Find the greatest common factor of 120 and 900.

Answer(a)(ii) [2]

(b) 2 5 15 24 49 60 258 512

From the list, write down

(i) a multiple of 30,

Answer(b)(i) [1]

(ii) a perfect square,

Answer(b)(ii) [1]

(iii) the cube root of 8.

Answer(b)(iii) [1]

(c) Give an example to show that the following statements are **not** true.

(i) An odd number multiplied by an even number gives an odd number.

Answer(c)(i) [1]

(ii) The cube of a negative number is positive.

Answer(c)(ii) [1]

(d) Use $<$, $>$, or $=$ to complete the following statements.
Each symbol may be used more than once.

(i) $0.5 \dots\dots\dots \frac{3}{8}$ [1]

(ii) $1.5 \dots\dots\dots 105\%$ [1]

(iii) $0.78 \dots\dots\dots \frac{11}{14}$ [1]

- 2 Pedro is on a cruise ship.
- (a) Pedro left the ship in Cadiz at 08 45.
He returned to the ship at 16 10.
Find how long Pedro was in Cadiz.

Answer(a) hours minutes [1]

(b)

| |
|--|
| Exchange Rate \$1 = €0.769 |
|--|

- (i) Pedro changed \$167 into euros (€).

Calculate how many euros Pedro received.
Give your answer correct to 2 decimal places.

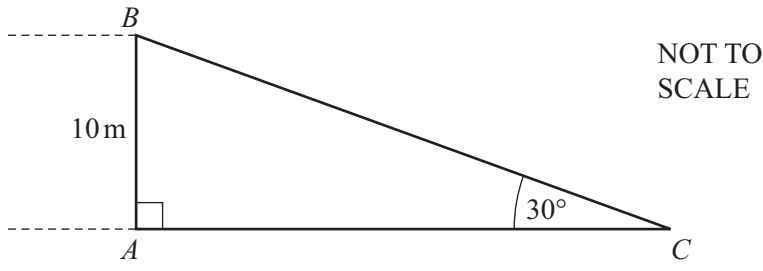
Answer(b)(i) € [2]

- (ii) Later, Pedro changed €61.52 back into dollars (\$) using the same exchange rate.

Calculate how many dollars Pedro received.

Answer(b)(ii) \$ [2]

(c)



Pedro can either enter the ship through door *A* or walk up the gangway, *CB*, and enter through door *B*.

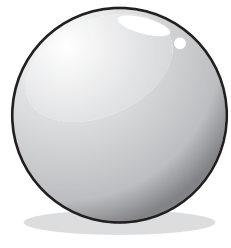
Door *B* is 10 meters directly above door *A*.

The gangway is at an angle of 30° to the horizontal.

Use trigonometry to calculate *CB*, the length of the gangway.

Answer(c) m [3]

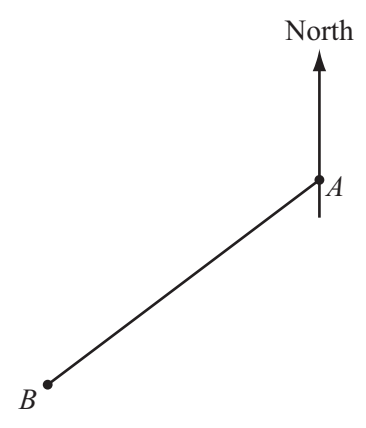
(d) Pedro uses an exercise ball in the ship's gym. When inflated, the exercise ball is spherical. The ball is filled with 73.6 liters of air.



Calculate the diameter of the exercise ball. Give your answer in centimeters.

Answer(d) cm [4]

3 (a) The diagram shows the position of town A and town B, on a map.



(i) Measure the length, in millimeters, of the line AB.

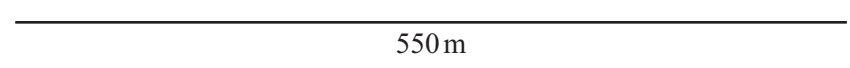
Answer(a)(i) mm [1]

(ii) Measure the bearing of town B from town A.

Answer(a)(ii) [1]

(b) A triangular field has sides of length 550 m, 300 m and 400 m.

(i) Construct the triangle, **using a ruler and compass only**.
Use a scale of 1 cm to represent 50 m.
The side of length 550 m has been drawn for you.

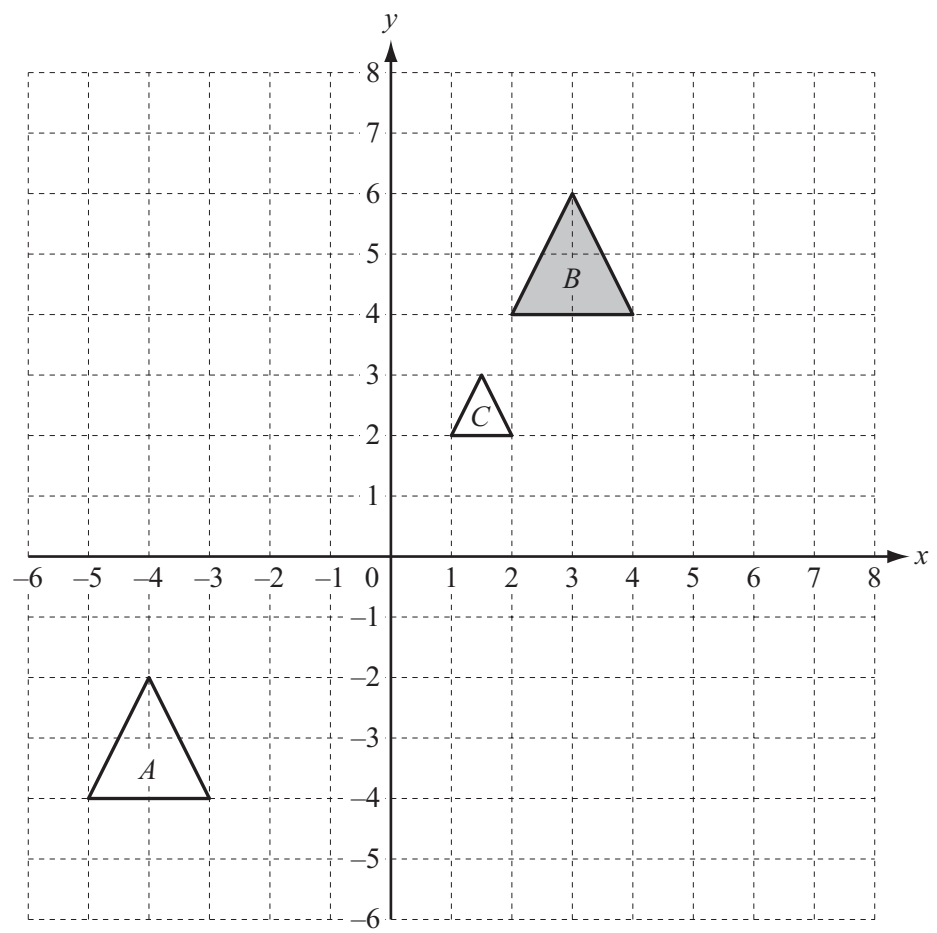


550 m

[3]

(ii) By making a suitable measurement on your diagram, calculate the area of the field.
Give your answer in square meters.

Answer(b)(ii) m² [3]



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

Answer(a)(i)
 [2]

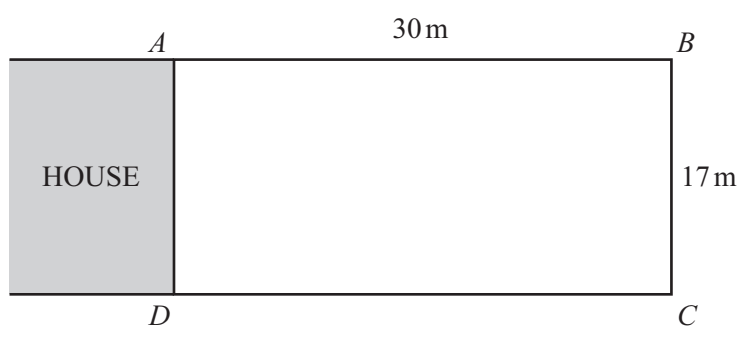
(ii) Describe fully the **single** transformation which maps shape *B* onto shape *C*.

Answer(a)(ii)
 [3]

(b) (i) Reflect shape *B* in the *y*-axis. Label the image *D*. [1]

(ii) Rotate shape *B* through 90° anticlockwise about the origin. Label the image *E*. [2]

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SCALE

The rectangle $ABCD$ shows Mr Liu's garden.

- (a) Mr Liu puts a fence around three sides of his garden, AB , BC and CD .
The fence costs \$3.28 per meter.

Calculate the cost of the fence.

Answer(a) \$ [2]

- (b) (i) Calculate the area of Mr Liu's garden.

Answer(b)(i) m^2 [2]

- (ii) Mr Liu uses an area of $408 m^2$ in his garden for a lawn, flowers and vegetables.
He divides this area into three parts, in the ratio

$$\text{lawn} : \text{flowers} : \text{vegetables} = 5 : 3 : 4.$$

Calculate the area used for each part.

Answer(b)(ii) Lawn m^2

Flowers m^2

Vegetables m^2 [3]

(c) Mr Liu walks in a straight line across his garden from A to C .
Calculate the distance Mr Liu walks.

Answer(c) m [3]

(d) Mr Liu has a circular pond, radius 4.5 m, in his garden.

(i) Calculate the area of the pond.

Answer(d)(i) m^2 [2]

(ii) The pond is filled with water to a depth of 2 meters.

Calculate the volume of water in the pond.

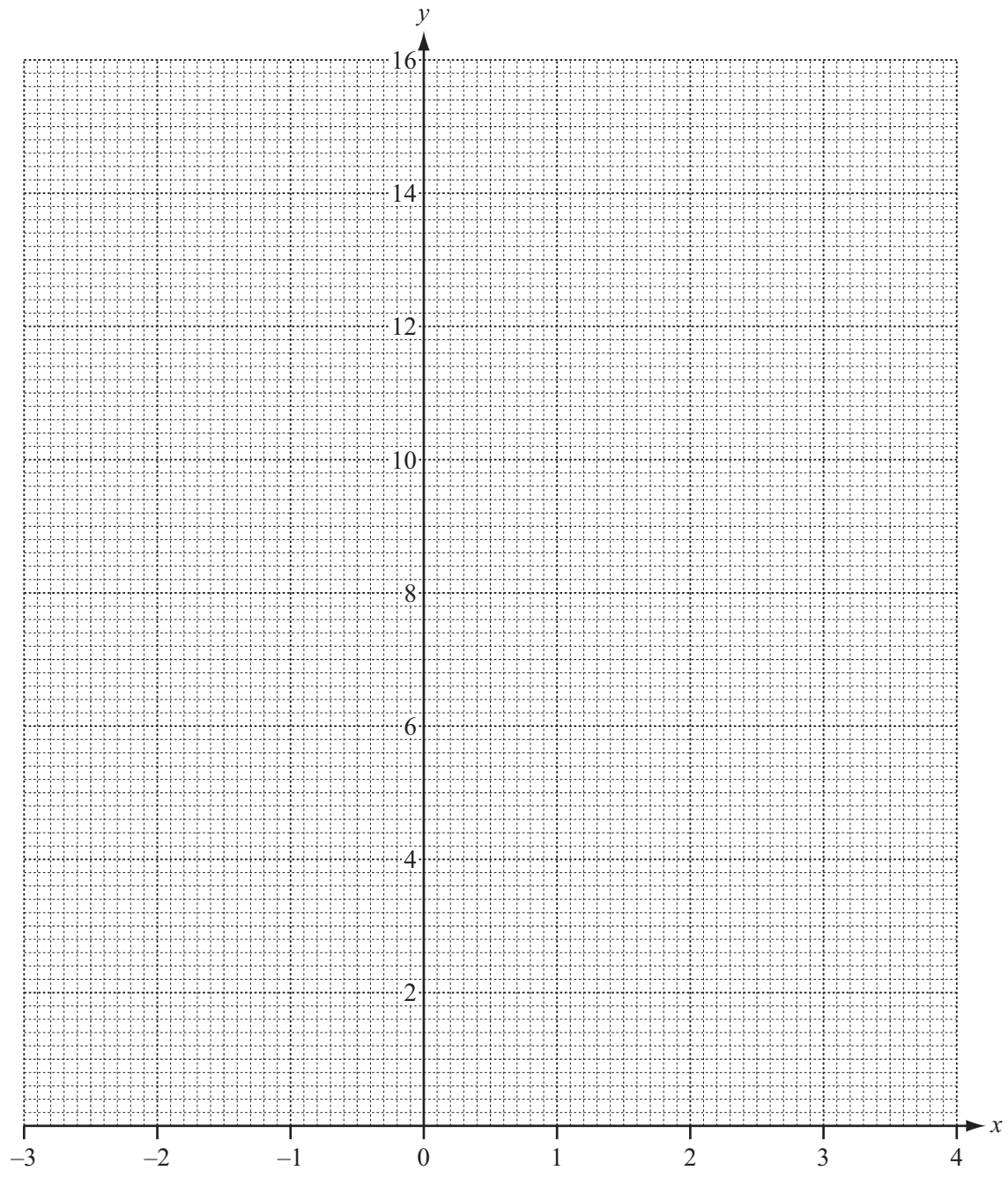
Answer(d)(ii) m^3 [1]

6 (a) Complete the table of values for $y = x^2 - x + 2$.

| | | | | | | | | |
|-----|----|----|----|---|---|---|---|---|
| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y | | 8 | | 2 | | 4 | | |

[3]

(b) On the grid, draw the graph of $y = x^2 - x + 2$ for $-3 \leq x \leq 4$.



[4]

(c) Write down the equation of the axis of symmetry of the graph.

Answer(c) [1]

(d) (i) On the grid, draw the line $y = 9$. [1]

(ii) Solve the equation $x^2 - x + 2 = 9$.

Answer(d)(ii) $x =$ or $x =$ [2]

7

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---------------------------|------|------|------|-----|-----|-----|------|------|-----|-----|------|------|
| Average temperature in °C | -4.4 | -4.2 | -2.7 | 0.3 | 4.8 | 9.1 | 11.8 | 10.8 | 6.7 | 2.7 | -1.1 | -3.3 |

The table shows the average temperature for Tromso, Norway each month.

(a) (i) Write down the month which had the highest average temperature.

Answer(a)(i) [1]

(ii) How much warmer was it in September than in February?

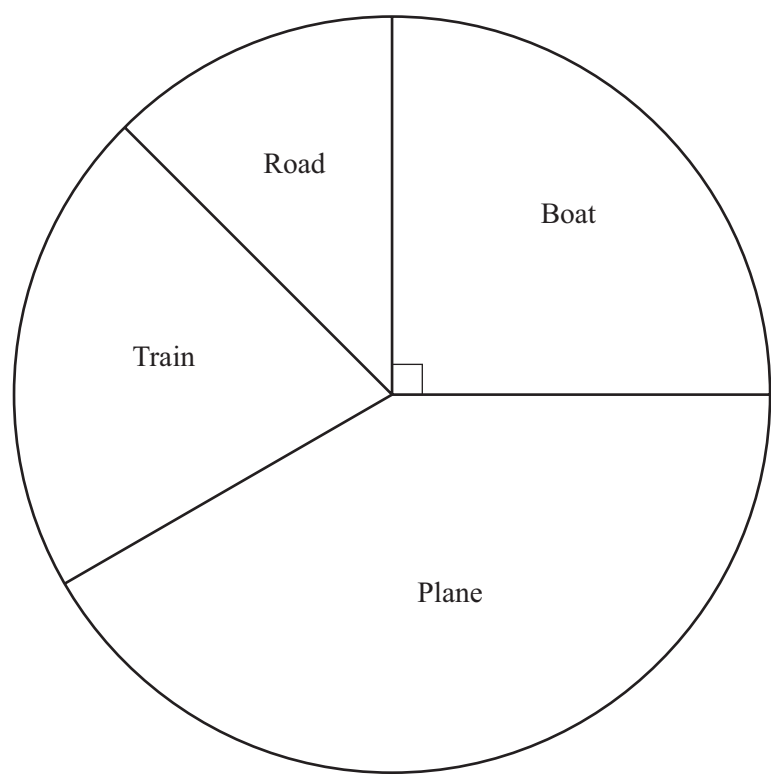
Answer(a)(ii) °C [1]

(iii) The lowest temperature in October was 12.3°C below the average temperature for that month.

Work out the lowest temperature in October.

Answer(a)(iii) °C [1]

(b) In a survey, some tourists were asked how they had traveled to Norway. The pie chart shows the results.



(i) 150 of these tourists traveled by boat.

Show that 600 tourists took part in the survey.

Answer(b)(i)

[1]

(ii) Calculate the number of these tourists who traveled by plane.

Answer (b)(ii) [3]

(c) A train ticket from Oslo to Stavanger costs 885 krone.
There is a discount of 12% on the total cost of the tickets for a group of 10 or more people.

Calculate the cost of tickets for a group of 15 people.

Answer(c) krone [3]

(d) On 1 January 2000, the population of Norway was 4 480 000, correct to 3 significant digits.

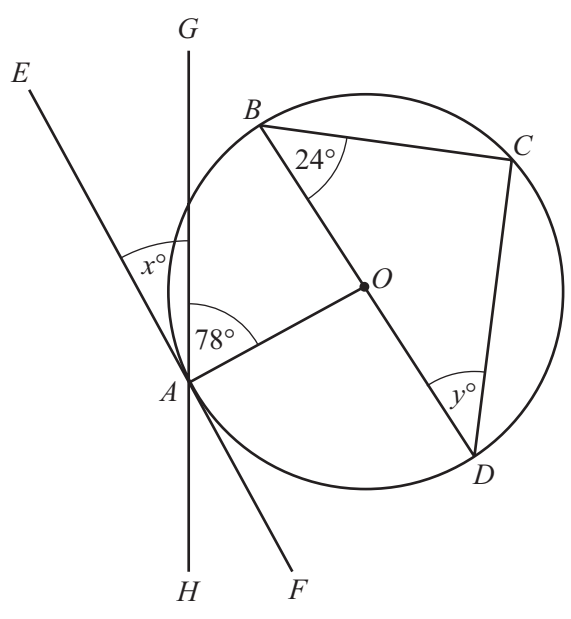
(i) Write this number in standard form.

Answer(d)(i) [1]

(ii) On 1 January 2011, the population of Norway was 4 920 000, correct to 3 significant digits.

Calculate the percentage increase in the population.

Answer(d)(ii) % [3]



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A, B, C and D are points on the circumference of a circle, center O .
 EF is a tangent to the circle at A .
 GH is a straight line through the point A .
 Angle $CBD = 24^\circ$ and angle $OAG = 78^\circ$.

(a) (i) Write down the mathematical names of lines BC and OA .

Answer(a)(i) BC is a

OA is a [2]

(ii) Find the value of x , giving a reason for your answer.

Answer(a)(ii) $x = \dots\dots\dots$ because

..... [2]

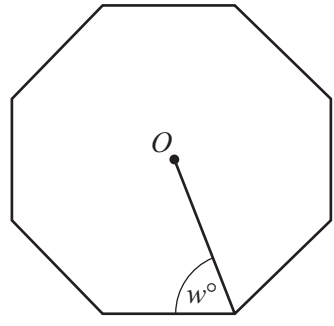
(iii) Find the value of y , giving reasons for your answer.

Answer(a)(iii) $y = \dots\dots\dots$ because

.....

..... [3]

(b) The diagram shows a regular polygon, center O .



NOT TO
SCALE

(i) Write down the name of this polygon.

Answer(b)(i) [1]

(ii) Find the value of w .
Show all your working.

Answer(b)(ii) $w =$ [3]

(c) The exterior angle of another regular polygon is 24° .

Calculate the number of sides this polygon has.

Answer(c) [2]

Question 9 is printed on the next page.

9 (a) The cost, \$C, of a party for n people is calculated using the following formula.

$$C = 130 + 4n$$

(i) Calculate C when n = 25.

Answer(a)(i) [2]

(ii) Eurdley has a party which costs \$1138.
How many people is this party for?

Answer(a)(ii) [2]

(b) Solve the following equations.

(i) 3x = 27

Answer(b)(i) x = [1]

(ii) 8y - 4 = 24

Answer(b)(ii) y = [2]

(iii) 4(5q - 2) = 72

Answer(b)(iii) q = [3]

(c) Solve the system of linear equations.

$$\begin{aligned} 6x + 8y &= -31 \\ 14x - 5y &= 46 \end{aligned}$$

Answer(c) x =

y = [4]

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