Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTER NUMBER						CANDIDATE NUMBER				

1476822834

MATHEMATICS (US) **0444/41**

Paper 4 (Extended) **May/June 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, center number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary work clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in parentheses [ ].

This document has **20** pages.

DC (CE/SG) 305589/2

[Turn over

Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lateral surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

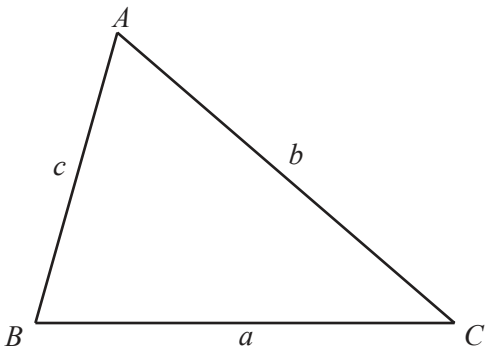
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

Surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\quad V = \frac{1}{3}Ah$

Volume, V, of cone of radius r, height h. $\quad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \frac{4}{3}\pi r^3$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}bc\sin A$$

1 **(a)** Geeta buys x apples, $(x+7)$ oranges and $(2x-1)$ bananas.
The total number of pieces of fruit Geeta buys is 30.

(i) Find the number of apples Geeta buys.

..... [3]

(ii) The cost of one apple is 15 cents.
The cost of one orange is 18 cents.
The total cost of all the fruit is \$5.55 .

Find the cost, in cents, of one banana.

..... cents [3]

(b) **(i)** Solve.

$$\frac{3w}{16} - 1 = \frac{1}{2}$$

$w =$ ..... [2]

(ii) $$\frac{3(2^{-y})}{16} - 1 = \frac{1}{2}$$

Find the value of y.

$y =$ ..... [2]

2 **(a)** Write down an example of continuous data.

..... [1]

(b) A class of 24 students takes a test.
The table shows their marks.

Mark	6	7	8	9	10
Frequency	1	3	8	3	9

(i) Find

(a) the range,

..... [1]

(b) the mode,

..... [1]

(c) the median.

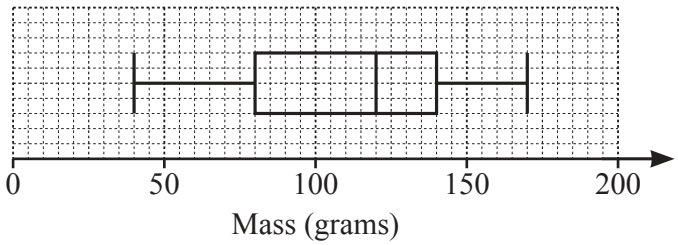
..... [1]

(ii) A pie chart is drawn to show the information in the table.

Calculate the sector angle for the number of students who scored 10 marks.

..... [2]

(c)



The box plot shows information about the masses, in grams, of some apples.

(i) Find the median.

..... g [1]

(ii) Find the range.

..... g [1]

(iii) Find the interquartile range.

..... g [1]

(d) (i) The time, t minutes, spent on homework in one week by each of 200 students is recorded. The table shows the results.

Time (t minutes)	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 90$	$90 < t \leqslant 100$	$100 < t \leqslant 150$
Frequency	6	10	70	84	30

Calculate an estimate of the mean.

..... min [4]

(ii) A new table with different class intervals is completed.

Time (t minutes)	$40 < t \leqslant 90$	$90 < t \leqslant 150$
Frequency	86	114

On a histogram the height of the bar for the $40 < t \leqslant 90$ interval is 17.2 cm.

Calculate the height of the bar for the $90 < t \leqslant 150$ interval.

..... cm [2]

[Turn over

3 **(a)** Alex, Bobbie and Chris share strawberries in the ratio Alex : Bobbie : Chris = 3 : 2 : 2.
Chris receives 12 strawberries.

Calculate the total number of strawberries shared.

..... [2]

(b) In a sale, a shop reduces all prices by 12%.

(i) Dina buys a book which has an original price of $6.50 .

Calculate how much Dina pays for the book.

$ ..... [2]

(ii) Elu pays $11 for a toy.

Calculate the original price of the toy.

$ ..... [2]

(c) Feri invests some money.
The rate of interest for the first year is 2.5%.
At the end of the second year the overall percentage increase of Feri's investment is 6.6%.

Find the rate of interest for the second year.

..... % [2]

(d) Each day the mass of a radioactive substance decays at a rate of 2% of its mass on the previous day.
The initial mass is 80 g.

(i) Find the mass at the end of 5 days.

..... g [2]

(ii) Find how many **more** whole days, after day 5, it takes for the mass to reduce to less than 67 g.

..... [3]

4 $f(x) = 2x - 1$ $g(x) = 3x - 2$ $h(x) = \frac{1}{x},\ x \neq 0$ $j(x) = 5^x$

(a) Find

(i) $f(2)$,

..... [1]

(ii) $gf(2)$.

..... [1]

(b) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(c) Find x when $h(x) = j(-2)$.

$x =$ ..... [2]

(d) Write $f(x) - h(x)$ as a single fraction.

..... [2]

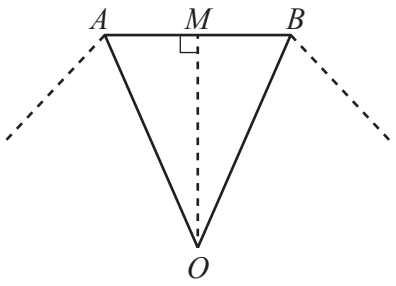
(e) Find the value of $\mathrm{jj}(2)$.

..... [1]

(f) Find x when $\mathrm{j}^{-1}(x) = 4$.

$x =$ ..... [2]

5 **(a)** *ABCDEFGH* is a regular octagon with sides of length 6 cm.
The diagram shows part of the octagon.
O is the center of the octagon and *M* is the midpoint of *AB*.



NOT TO SCALE

(i) **(a)** Show that angle *OAM* is 67.5°.

[2]

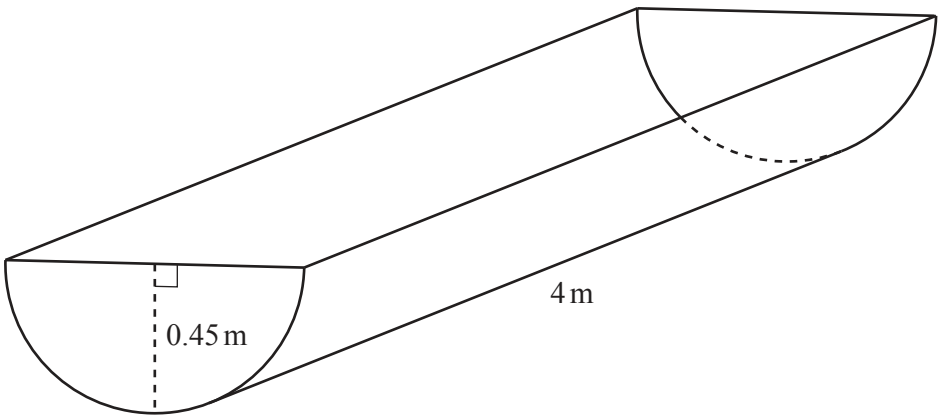
(b) Calculate the area of the octagon.

..... cm^2 [4]

(ii) Find the area of the circle that passes through the vertices of the octagon.

..... cm^2 [3]

(b)



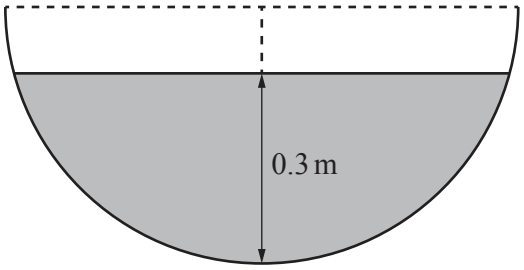
NOT TO SCALE

The diagram shows a horizontal container for water with a uniform cross-section.
The cross-section is a semicircle.
The radius of the semicircle is 0.45 m and the length of the container is 4 m.

(i) Calculate the volume of the container.

..... m^3 [2]

(ii)



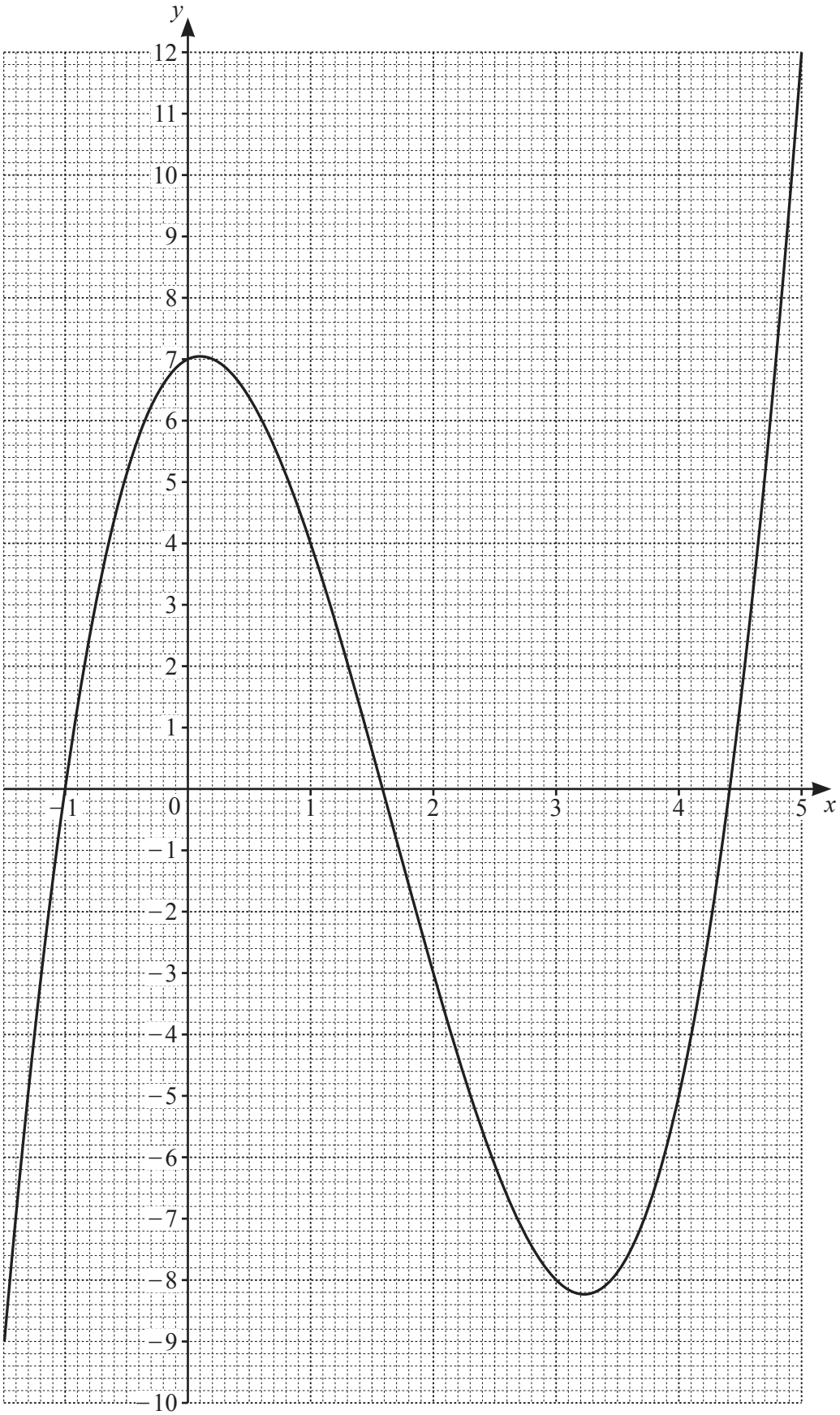
NOT TO SCALE

The greatest depth of the water in the container is 0.3 m.
The diagram shows the cross-section.

Calculate the number of liters of water in the container.
Give your answer correct to the nearest integer.

..... liters [6]

6 (a)



The diagram shows the graph of $y = f(x)$ for $-1.5 \leqslant x \leqslant 5$.

(i) Find $f(2)$.

..... [1]

(ii) Solve the equation $f(x) = 0$ for $-1.5 \leqslant x \leqslant 5$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(iii) $f(x) = k$ has three solutions for $-1.5 \leqslant x \leqslant 5$ where k is an integer.

Find the smallest possible value of k.

$k =$ ..... [1]

(iv) By drawing a suitable straight line solve the equation $f(x) = 10 - 2x$.

$x =$ ..... [3]

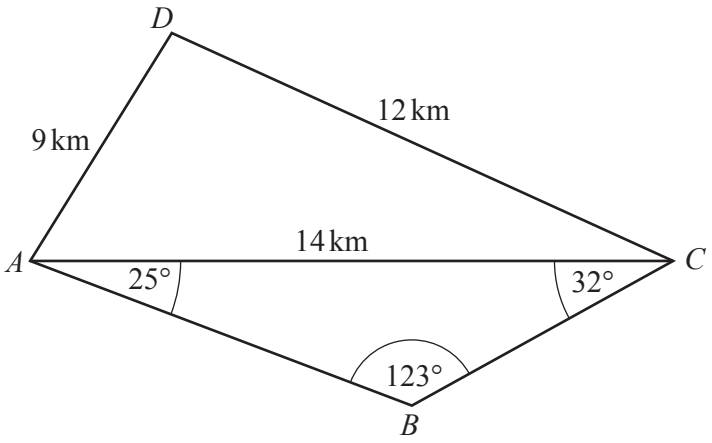
(v) On the grid, draw a line $y = mx$ so that $f(x) = mx$ has exactly one solution for $-1.5 \leqslant x \leqslant 5$. [2]

(b) Line L passes through the point $(4, -1)$ and is perpendicular to the line $y = 2x + 5$.

Work out the equation of line L, giving your answer in the form $y = mx + b$.

$y =$ ..... [4]

7



NOT TO SCALE

(a) Calculate angle ACD.

Angle ACD = ... [4]

(b) Show that $BC = 7.05$ km, correct to 2 decimal places.

[3]

(c) Calculate the shortest distance from B to AC.

..... km [3]

(d) Calculate the length of the straight line BD.

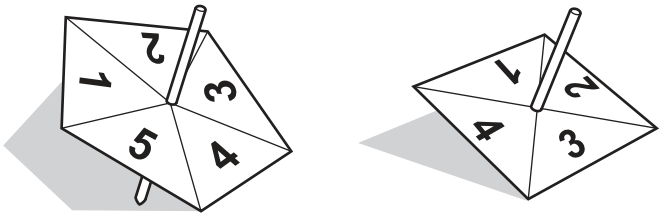
$BD =$ ..... km [4]

(e) C is due east of A.

Find the bearing of D from C.

..... [2]

8 (a)



Spinner A Spinner B

The diagram shows two fair spinners.
Spinner A is numbered 1, 2, 3, 4, 5 and spinner B is numbered 1, 2, 3, 4.
The two spinners are spun and the two scores are added.

(i) Draw a possibility diagram to show all the possible totals.

[2]

(ii) Find the probability that the total of the two numbers is

(a) 7,

..... [1]

(b) a square number,

..... [1]

(c) less than 10.

..... [1]

(iii) The two spinners are spun 60 times.

Calculate the expected number of times the total is 7.

..... [1]

(b) When a coin is tossed it is equally likely to show heads or tails.
When a die is rolled it is equally likely to show a 1, 2, 3, 4, 5 or 6.

(i) The die is rolled.

Find the probability that the die shows 4.

..... [1]

(ii) The coin is tossed and the die is rolled.

(a) Find the probability that the coin shows tails **and** the die shows 4.

..... [2]

(b) Find the probability that the coin shows tails **or** the die shows 4.

..... [2]

(c) When the weather is fine, the probability that Jodie goes swimming is $\frac{4}{5}$.

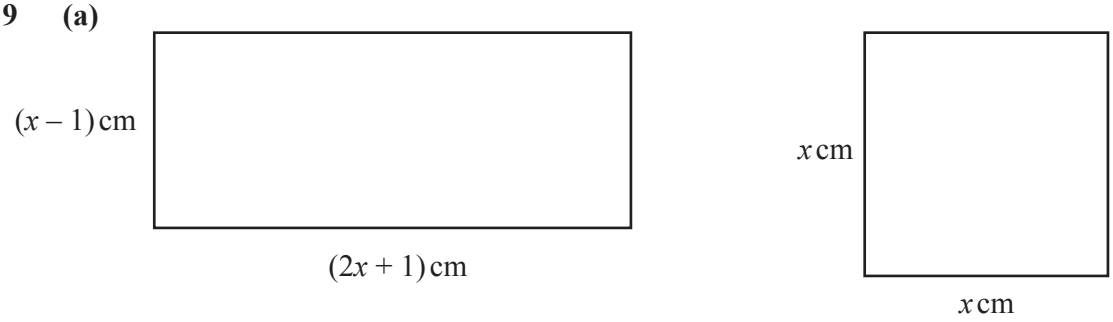
When the weather is not fine, the probability that Jodie goes swimming is $\frac{1}{10}$.

The probability that the weather will be fine tomorrow is $\frac{2}{3}$.

Find the probability that Jodie goes swimming tomorrow.

..... [3]

9 (a)

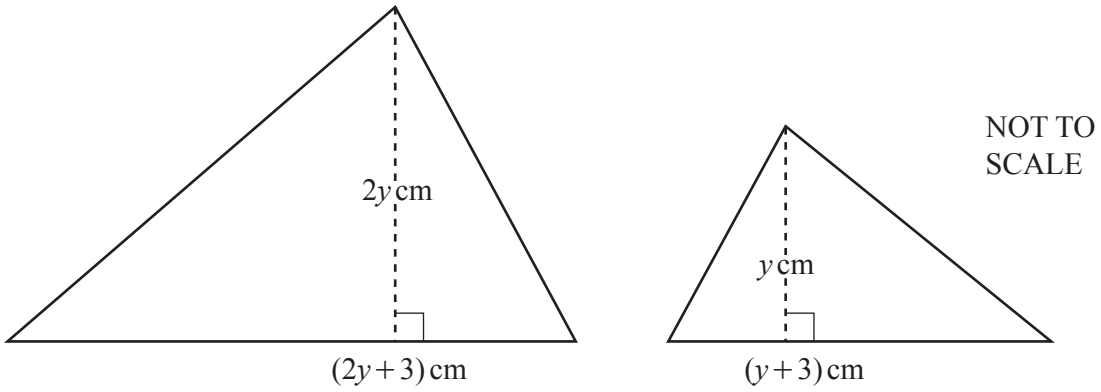


The area of the rectangle is $29\,cm^2$ greater than the area of the square.
The difference between the perimeters of the two shapes is k cm.

Find the value of k.
You must show all your work.

$k =$ ..... [6]

(b)



The area of the larger triangle is $2\,\text{cm}^2$ greater than the area of the smaller triangle.

(i) Show that $3y^2 + 3y - 4 = 0$.

[4]

(ii) Find the area of the smaller triangle.
You must show all your work.

..... cm^2 [4]

Question 10 is printed on the next page.

10 **(a)** Solve the system of linear equations.

$$2p + q = 2$$
$$p - q = -\frac{1}{2}$$

$p =$ .....

$q =$ ..... [2]

(b) Hence, for $0° \leqslant u \leqslant 360°$ and $0° \leqslant v \leqslant 360°$, solve this system of equations.

$$2\sin u + \cos v = 2$$
$$\sin u - \cos v = -\frac{1}{2}$$

$u =$ ..... or $u =$ .....

$v =$ ..... or $v =$ ..... [4]