



# Cambridge IGCSE™

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**CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/41**

Paper 4 (Extended)

**May/June 2023**

**2 hours 15 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, centre 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 graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
- 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  $\pi$ , use your calculator value.

## INFORMATION

- The total mark for this paper is 120.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

## Formula List

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

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

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

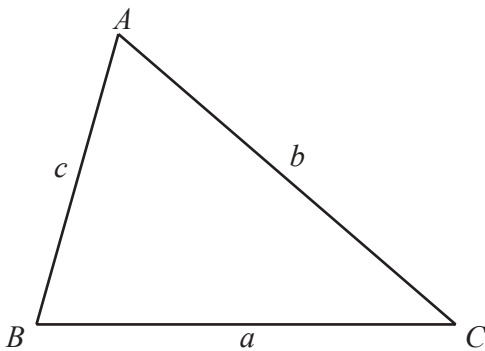
Curved surface area,  $A$ , of sphere of radius  $r$ .  $A = 4\pi r^2$

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

Volume,  $V$ , of cylinder of radius  $r$ , height  $h$ .  $V = \pi r^2 h$

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

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



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

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

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

Answer **all** the questions.

- 1 25 students each record the number of logic problems they solve in one hour. The table shows the results.

Number of logic problems solved	3	4	5	6	7	8
Frequency	1	3	8	7	5	1

(a) Find

(i) the range

..... [1]

(ii) the mode

..... [1]

(iii) the median

..... [1]

(iv) the interquartile range

..... [2]

(v) the mean.

..... [2]

(b) Nabile draws a pie chart.

Calculate the angle that represents 7 logic problems solved.

..... [2]

(c) Shabana draws a bar chart using these results.

The bar that represents 4 logic problems solved has a height of 4.5 cm.

Calculate the height of the bar that represents 5 logic problems solved.

..... cm [2]

2 (a) Calculate the volume of each shape.

(i) A cuboid with a square base of side 5 cm and height 3 cm.

..... cm<sup>3</sup> [2]

(ii) A sphere with radius 4 cm.

..... cm<sup>3</sup> [2]

(b) A cylinder has volume 120 cm<sup>3</sup> and height 6 cm.

Calculate its radius.

..... cm [2]

(c) A cone has volume 120 cm<sup>3</sup> and height 6 cm.

Calculate the length of its sloping edge.

..... cm [3]

3



$f(x) = |\cos x^\circ|$  for  $0 \leq x \leq 360$

(a) On the diagram, sketch the graph of  $y = f(x)$ . [2]

(b) Find the zeros of  $f(x)$ .  
 ..... [2]

(c) (i) Solve the equation  $f(x) = 0.5$  .  
 ..... [2]

(ii) Solve the inequality  $f(x) < 0.5$  .  
 ..... [2]

(iii) On the diagram, shade the regions that satisfy the inequalities  $y < 0.5$  and  $y > f(x)$ . [1]

(d) The equation  $f(x) = k$  has four solutions.

Complete the statement to show the range of possible values of  $k$ .

.....  $< k <$  ..... [1]

4 (a) Alex invests \$650 at a rate of 2% per year compound interest.

(i) Calculate the value of this investment at the end of 10 years.

\$ ..... [2]

(ii) Calculate the number of complete years it takes for the value of this investment of \$650 to be first greater than \$1000.

..... [4]

- (b) 2 years ago Chris invested  $\$x$  at a rate of 3% per year compound interest. The value of this investment is now  $\$607.90$  correct to the nearest cent.

Calculate the value of  $x$ .

$$x = \dots\dots\dots [2]$$

- (c) Sam invested  $\$200$  at a rate of  $r\%$  per year compound interest. At the end of 18 years, the value of this investment is  $\$247.90$  correct to the nearest cent.

Find the value of  $r$ .

$$r = \dots\dots\dots [3]$$

5 (a) The equation of line  $L$  is  $y = 4x + 7$ .

(i) Write down the gradient of line  $L$ .

..... [1]

(ii) Write down the coordinates of the point where line  $L$  cuts the  $y$ -axis.

(....., .....) [1]

(b)  $A$  is the point  $(3, 1)$  and  $B$  is the point  $(11, 5)$ .

(i) Calculate the length of  $AB$ .

..... [3]

(ii) Find the equation of the perpendicular bisector of the line  $AB$ .  
Give your answer in the form  $y = mx + c$ .

$y =$  ..... [5]



6       $f(x) = 3 - 2x$        $g(x) = x + 1$        $h(x) = (x + 1)^2$        $j(x) = \tan x^\circ$  for  $0 < x < 180$

(a) Find  $f(-1.5)$ .

..... [1]

(b) Find  $h(h(2))$ .

..... [2]

(c) Find  $g(f(x))$ , giving your answer in its simplest form.

..... [2]

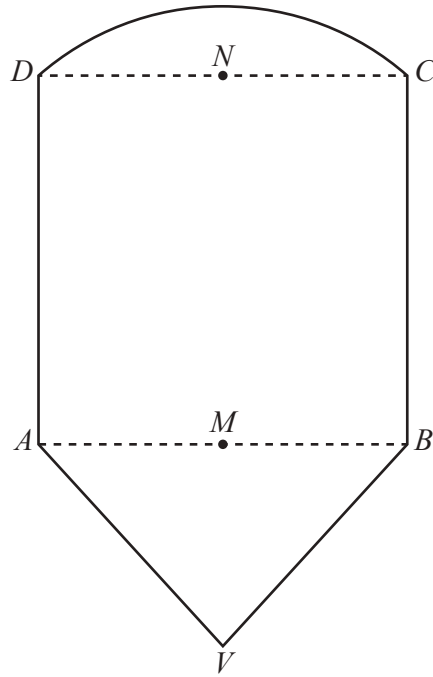
(d) Find  $f^{-1}(x)$ .

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

(e) Find  $x$  when  $j^{-1}(x) = 75$ .

..... [2]

7 (a)



NOT TO  
SCALE

The diagram shows a shape  $AVBCD$ .  
 $ABCD$  is a square of side 12 cm.  
 $M$  is the mid-point of  $AB$  and  $N$  is the mid-point of  $DC$ .  
 Triangle  $AVB$  is isosceles with  $AV = VB = 10$  cm.  
 The arc  $CD$  is part of a circle with centre  $M$ .

(i) Calculate angle  $CMN$ .

Angle  $CMN = \dots\dots\dots$  [2]

(ii) Calculate the length of  $CM$ .

$CM = \dots\dots\dots$  cm [2]

(iii) Calculate the perimeter of the shape  $AVBCD$ .

$\dots\dots\dots$  cm [3]

(iv) Calculate the area of the shape  $AVBCD$ .

.....  $\text{cm}^2$  [5]

- (b) Two solids are mathematically similar with volumes  $240 \text{ cm}^3$  and  $810 \text{ cm}^3$ .  
The surface area of the larger solid is  $558 \text{ cm}^2$ .

Calculate the surface area of the smaller solid.

.....  $\text{cm}^2$  [3]

- 8 (a) The cost of a television is  $\$t$  and the cost of a computer is  $\$c$ .  
The total cost of 2 televisions and 1 computer is  $\$1470$ .  
The total cost of 3 televisions and 2 computers is  $\$2480$ .

Use simultaneous equations to find the cost of a television.  
You must show all your working.

\$ ..... [4]

- (b) Jono spends  $\$9.69$  on bags of potatoes.  
When the cost of a bag is  $x$  cents he can buy 2 more bags than when the cost of a bag is  $(x + 6)$  cents.

- (i) Show that  $x^2 + 6x - 2907 = 0$ .

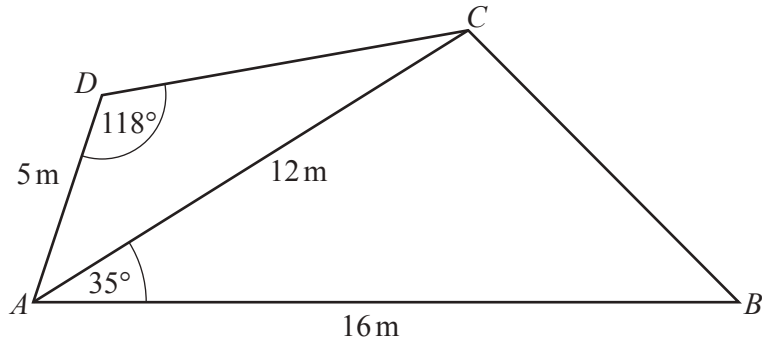
[3]

(ii) Solve the equation  $x^2 + 6x - 2907 = 0$ .

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [2]

(iii) Find the number of bags Jono can buy for \$9.69 when the cost of one bag is  $x$  cents.

$\dots\dots\dots$  [1]



NOT TO SCALE

(a) *B* is due east of *A*.

Find the bearing of *A* from *C*.

..... [2]

(b) Calculate the area of triangle *ABC*.

..... m<sup>2</sup> [2]

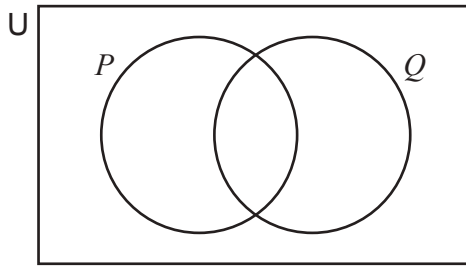
(c) Calculate angle *CAD*.

Angle *CAD* = ..... [4]

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

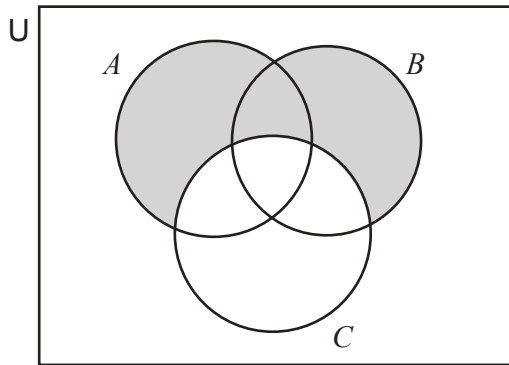
..... m [3]

10 (a) (i) In the Venn diagram, shade the region  $P \cup Q'$ .



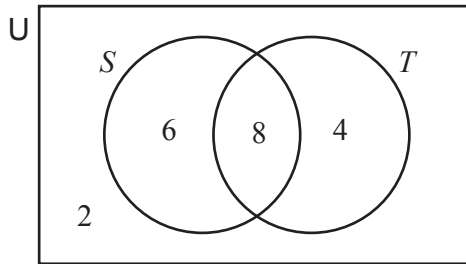
[1]

(ii) Use set notation to describe the shaded region in the Venn diagram.



..... [1]

(b) 20 students are asked if they like swimming ( $S$ ) and if they like tennis ( $T$ ).  
The Venn diagram shows the results.



(i) How many students like swimming or tennis but not both?

..... [1]

(ii) Find  $n(S \cup T)$ .

..... [1]



(iii) One of the 20 students is chosen at random.

Find the probability that this student likes swimming and tennis.

..... [1]

(iv) Two of the 20 students are chosen at random.

Find the probability that they both like tennis.

..... [2]

(v) Two of the students who like swimming are chosen at random.

Find the probability that

(a) they both like tennis

..... [2]

(b) one likes swimming only and one likes swimming and tennis.

..... [3]

11 (a) (i) Write 0.000 021 in standard form.

..... [1]

(ii) Calculate  $(7.3 \times 10^{-11}) \times (4.7 \times 10^{-7})$ , giving your answer in standard form.

..... [1]

(iii) Calculate  $(3.2 \times 10^{-200}) \div (4 \times 10^{-100})$ , giving your answer in standard form.

..... [2]

(iv) Simplify  $(5 \times 10^p)^2$ , giving your answer in standard form.

..... [2]

(b)  $y = 10^x$

Write  $x$  in terms of  $y$ .

$x = \dots\dots\dots$  [1]

(c) Solve  $7^x = 14$ .

$x = \dots\dots\dots$  [1]

(d)  $\log y = 1 + 3 \log x - \frac{1}{2} \log w$

Find  $y$  in terms of  $x$  and  $w$ .

$y = \dots\dots\dots$  [4]

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