



# Cambridge IGCSE™

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## MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2023

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

## INSTRUCTIONS

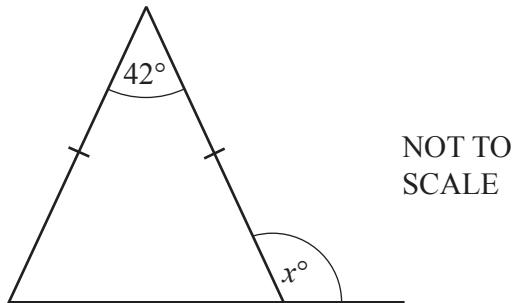
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working 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  $\pi$ , 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 brackets [ ].

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

1 (a)



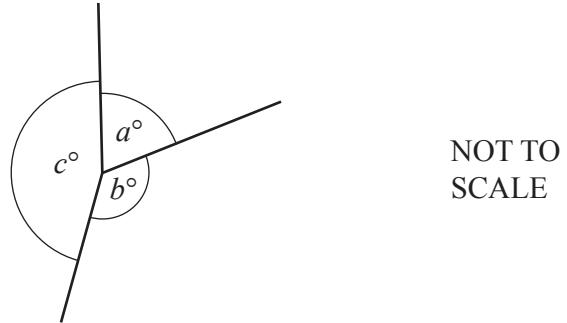
The diagram shows an isosceles triangle with the base extended.

Find the value of  $x$ .

$$x = \dots \quad [3]$$

(b) The diagram shows three lines meeting at a point.  
The ratio  $a : b : c = 3 : 4 : 5$ .

Find the value of  $c$ .



$$c = \dots \quad [3]$$

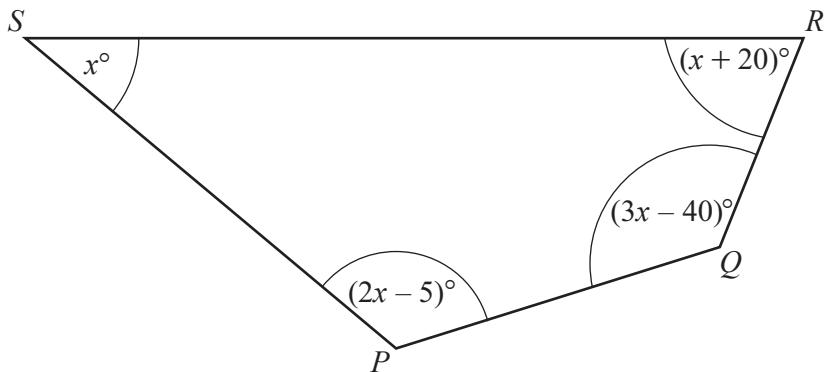
(c) A regular pentagon has an exterior angle,  $d$ .  
A regular hexagon has an interior angle,  $h$ .

Find the fraction  $\frac{d}{h}$ .

Give your answer in its simplest form.

$$\dots \quad [4]$$

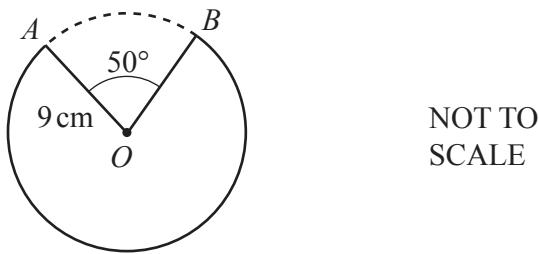
(d)

NOT TO  
SCALE

Show that  $PQRS$  is a cyclic quadrilateral.

[5]

(e)

NOT TO  
SCALE

The diagram shows a circle of radius 9 cm, centre  $O$ .

The minor sector  $AOB$ , with sector angle  $50^\circ$ , is removed from the circle.

Calculate the length of the major arc  $AB$ .

..... cm [3]

2 (a) Anil changes \$830 into euros when the exchange rate is 1 euro = \$1.16 .  
He spends 500 euros.  
He then changes the remaining money back into dollars at the same exchange rate.

Work out how much, in dollars, Anil receives.

\$ ..... [3]

(b) In 2021, Anil earns \$37 000.

(i) He spends \$12 400 on bills in 2021.

Calculate the percentage of his earnings he spends on bills.

..... % [2]

(ii) His earnings of \$37 000 increase by 3.2% in 2022.

Calculate his earnings in 2022.

\$ ..... [2]

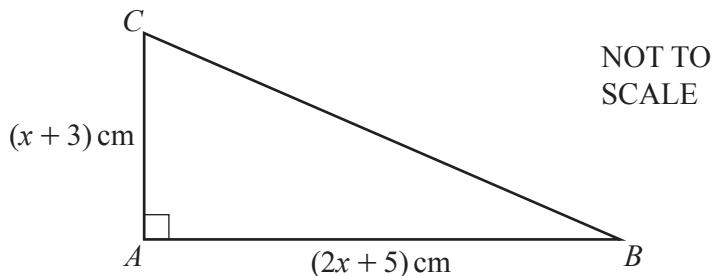
(c) Anil invests \$3500 in an account that pays a rate of 2.4% per year compound interest.

(i) Calculate the total interest earned at the end of 5 years.

\$ ..... [3]

(ii) Find the number of complete years before Anil has at least \$5000 in this account.

..... years [3]



The diagram shows a right-angled triangle  $ABC$ .

**(a) (i)** The area of the triangle is  $60 \text{ cm}^2$ .

Show that  $2x^2 + 11x - 105 = 0$ .

[3]

**(ii)** Solve by factorisation.

$$2x^2 + 11x - 105 = 0$$

$x = \dots$  or  $x = \dots$  [3]

**(iii)** Calculate angle  $ACB$ .

$\dots$  [3]

**(b)** Triangle  $ABC$  is similar to triangle  $DEF$ .  
Triangle  $DEF$  has an area of  $93.75 \text{ cm}^2$ .

**(i)** Find the size of the smallest angle of triangle  $DEF$ .

..... [1]

**(ii)** Find the length of the shortest side of triangle  $DEF$ .

..... cm [3]

4 The table shows information about the heights of 80 children.

Height ( $h$ metres)	$1.2 < h \leq 1.4$	$1.4 < h \leq 1.5$	$1.5 < h \leq 1.65$	$1.65 < h \leq 1.8$	$1.8 < h \leq 1.9$
Frequency	2	13	24	32	9

(a) (i) Write down the interval containing the median.

$$\dots < h \leq \dots [1]$$

(ii) Calculate an estimate of the mean height.

$$\dots \text{ m} [4]$$

(b) (i) One of these children is chosen at random.

Calculate the probability that they have a height of 1.4 m or less.

$$\dots [1]$$

(ii) Two of these children are chosen at random.

Calculate the probability that both children are taller than 1.5 m but only one of them is taller than 1.8 m.

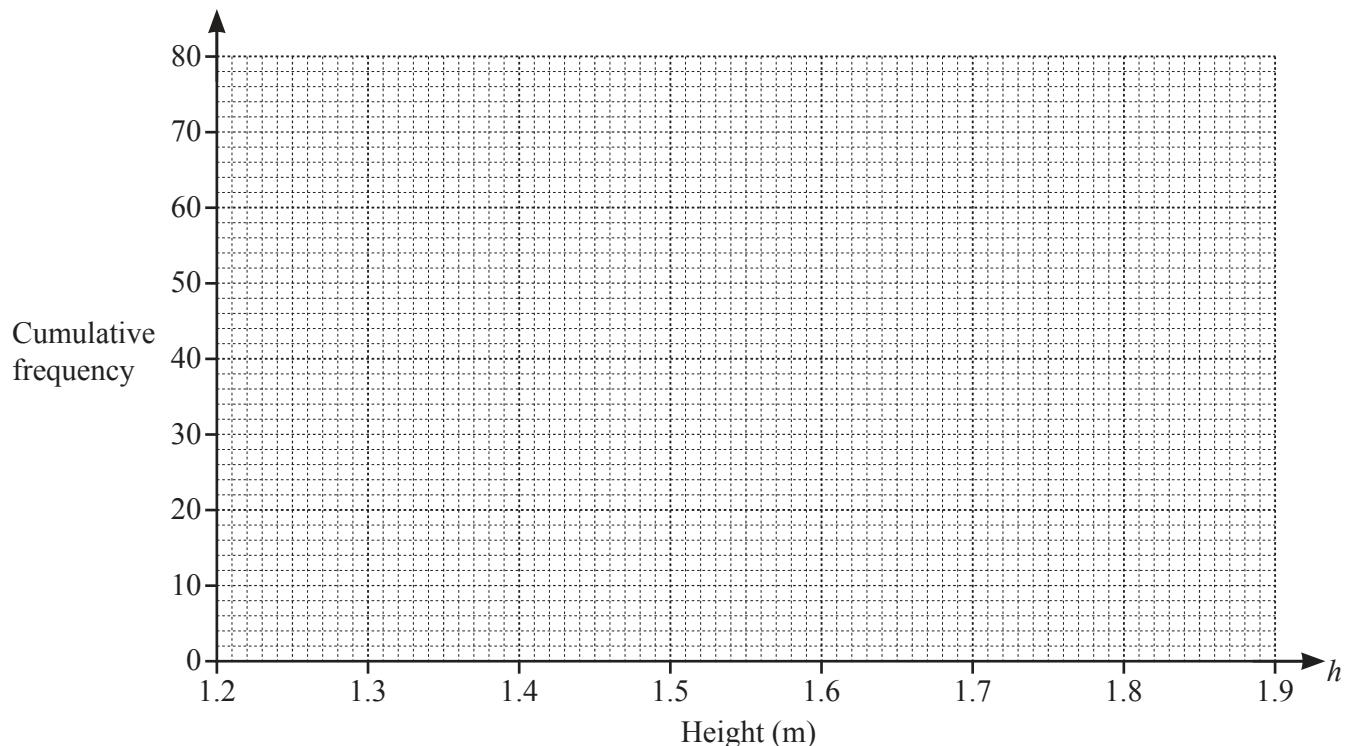
$$\dots [3]$$

(c) (i) Complete the cumulative frequency table for the heights.

Height ( $h$ metres)	$h \leq 1.4$	$h \leq 1.5$	$h \leq 1.65$	$h \leq 1.8$	$h \leq 1.9$
Cumulative frequency	2				

[2]

(ii) On the grid, draw the cumulative frequency diagram.



[3]

(d) Use your diagram to find an estimate of

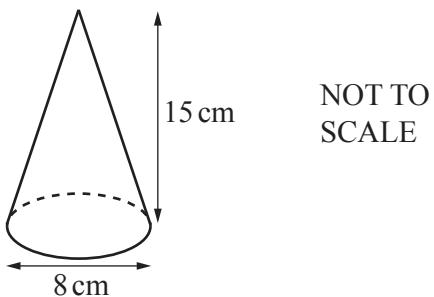
(i) the interquartile range

..... m [2]

(ii) the 60th percentile.

..... m [2]

5 (a)



A cone has base diameter 8 cm and perpendicular height 15 cm.

(i) Calculate the volume of the cone.

[The volume,  $V$ , of a cone with radius  $r$  and height  $h$  is  $V = \frac{1}{3}\pi r^2 h$ .]

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

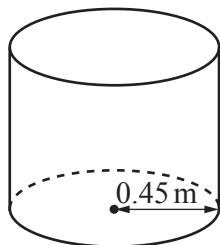
(ii) A label completely covers the curved surface area of the cone.

Calculate the area of the label as a percentage of the **total** surface area of the cone.

[The curved surface area,  $A$ , of a cone with radius  $r$  and slant height  $l$  is  $A = \pi r l$ .]

..... % [5]

(b)

NOT TO  
SCALE

An empty cylindrical container has radius 0.45 m.

300 litres of water is poured into the container at a rate of 375 ml per second.

(i) Find the time taken, in minutes and seconds, for all the water to be poured into the container.

..... min ..... s [3]

(ii) Calculate the height of the water in the container.

..... m [3]

6 (a) A sequence has  $n$ th term  $\frac{n}{2n+3}$ .

(i) Find the first three terms of this sequence.

Give your answers as fractions.

....., ....., ..... [2]

(ii) The  $k$ th term of this sequence is  $\frac{12}{25}$ .

Find the value of  $k$ .

$k =$  ..... [2]

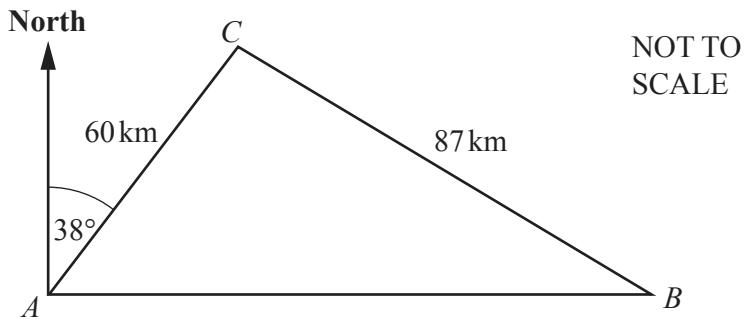
(b) Find the  $n$ th term of each sequence.

(i) 6, 13, 32, 69, 130, ...

..... [2]

(ii) 100, 50, 25, 12.5, 6.25, ...

..... [2]



The diagram shows the straight roads between town  $A$ , town  $B$  and town  $C$ .

$AC = 60$  km,  $CB = 87$  km and  $B$  is due east of  $A$ .

The bearing of  $C$  from  $A$  is  $038^\circ$ .

(a) Show that angle  $ACB = 95.1^\circ$ , correct to 1 decimal place.

[5]

(b) Without stopping, a car travels from town  $A$  to town  $C$  then to town  $B$ , before returning directly to town  $A$ .

The total time taken for the journey is 3 hours 20 minutes.

Calculate the average speed of the car for this journey.

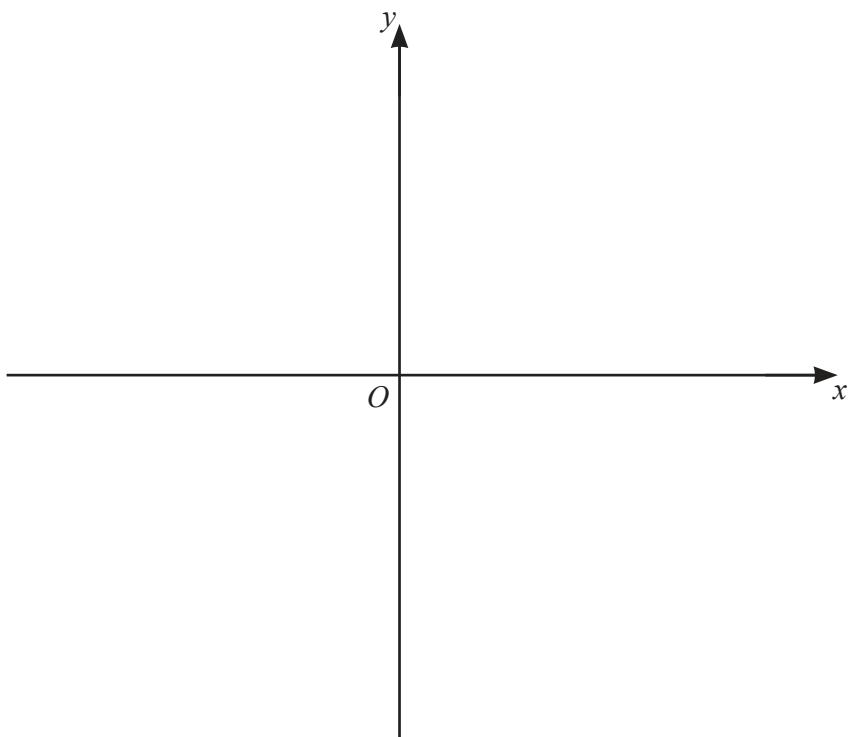
Give your answer in kilometres per hour.

..... km/h [6]

8 (a) (i) Show that the equation  $y = (x-4)(x+1)(x-2)$  can be written as  $y = x^3 - 5x^2 + 2x + 8$ .

[2]

(ii) On the diagram, sketch the graph of  $y = x^3 - 5x^2 + 2x + 8$ , indicating the values where the graph crosses the axes.



[4]

(b) The graph of  $y = x^3 - 5x^2 + 2x + 8$  has two tangents with a gradient of 10.

Find the equations of these two tangents.

You must show all your working and give your answers in the form  $y = mx + c$ .

$$y = \dots$$

$$y = \dots [7]$$

9 (a) Simplify.

(i)  $(3x^2y^4)^3$

..... [2]

(ii)  $\left(\frac{16}{x^{16}y^8}\right)^{-\frac{3}{2}}$

..... [3]

(b) (i) Factorise.

$x^2 - 9$

..... [1]

(ii) Simplify.

$$\frac{x^2 - 9}{2xy - 6y + 5x - 15}$$

..... [3]

(c) Solve the simultaneous equations.

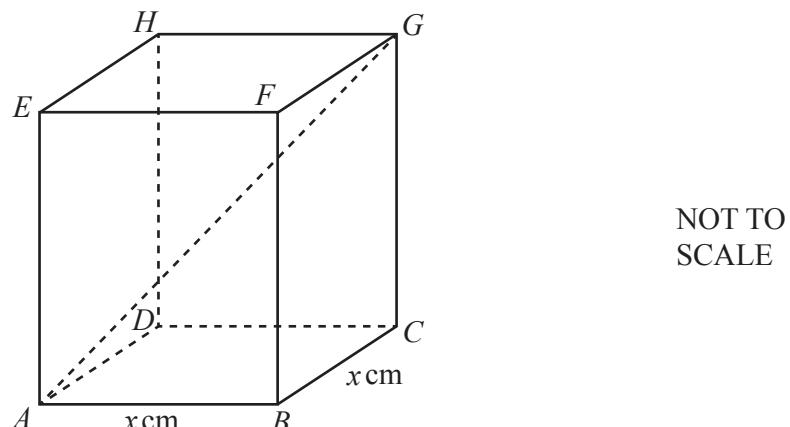
You must show all your working and give your answers correct to 2 decimal places.

$$\begin{aligned}2x + y &= 7 \\y &= 5x^2 + 2x - 13\end{aligned}$$

$$x = \dots, y = \dots$$

$$x = \dots, y = \dots \quad [6]$$

10 (a)

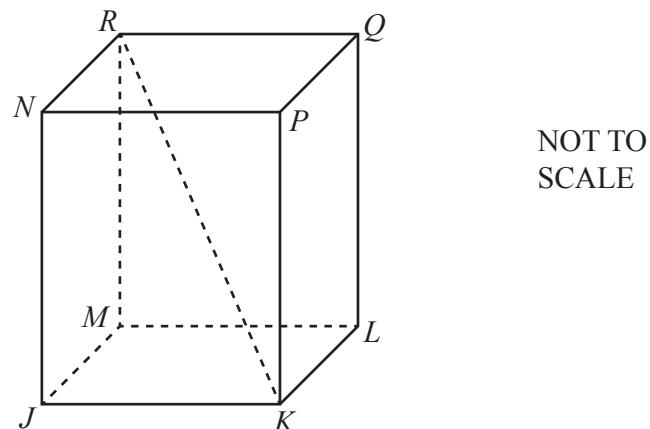


$ABCDEFGH$  is a cuboid with a square base of side  $x$  cm.  $CG = 20$  cm and  $AG = 28$  cm.

Calculate the value of  $x$ .

$$x = \dots [4]$$

(b)



The diagram shows a different cuboid  $JKLMNPQR$ .

$MR = 30$  cm correct to the nearest centimetre.

$KR = 37$  cm correct to the nearest centimetre.

Calculate the lower bound of the angle between  $KR$  and the base  $JKLM$  of the cuboid.

..... [4]

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