Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2743470414

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2024**

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 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 brackets [ ].

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

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1 **(a)** The table shows the areas, in km^2, of the four largest rainforests in the world.

Rainforest	Area (km^2)
Amazon	5 500 000
Congo	2 000 000
Atlantic	1 315 000
Valdivian	250 000

(i) Find the area of the Valdivian rainforest as a percentage of the area of the Amazon rainforest.

..... % [1]

(ii) Write, in its simplest form, the ratio of the areas of the rainforests Valdivian : Atlantic : Congo.

..... : ..... : ..... [2]

(iii) The Amazon rainforest has 60% of its area in Brazil and 10% of its area in Colombia.
$43\frac{1}{3}$% of the **remaining area** of the rainforest is in Peru.

Find the percentage of the Amazon rainforest that is in Brazil, Colombia and Peru.

..... % [3]

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(iv) The area of the Amazon rainforest represents $\frac{27}{50}$ of the total area of rainforest in the world.

Calculate the total area of rainforest in the world.
Give your answer correct to the nearest 100 000 km^2.

..... km^2 [3]

(v) In the world, 60.7 hectares of rainforest are lost every minute.

Calculate the total area, in hectares, of rainforest that is lost in 365 days.
Give your answer in standard form.

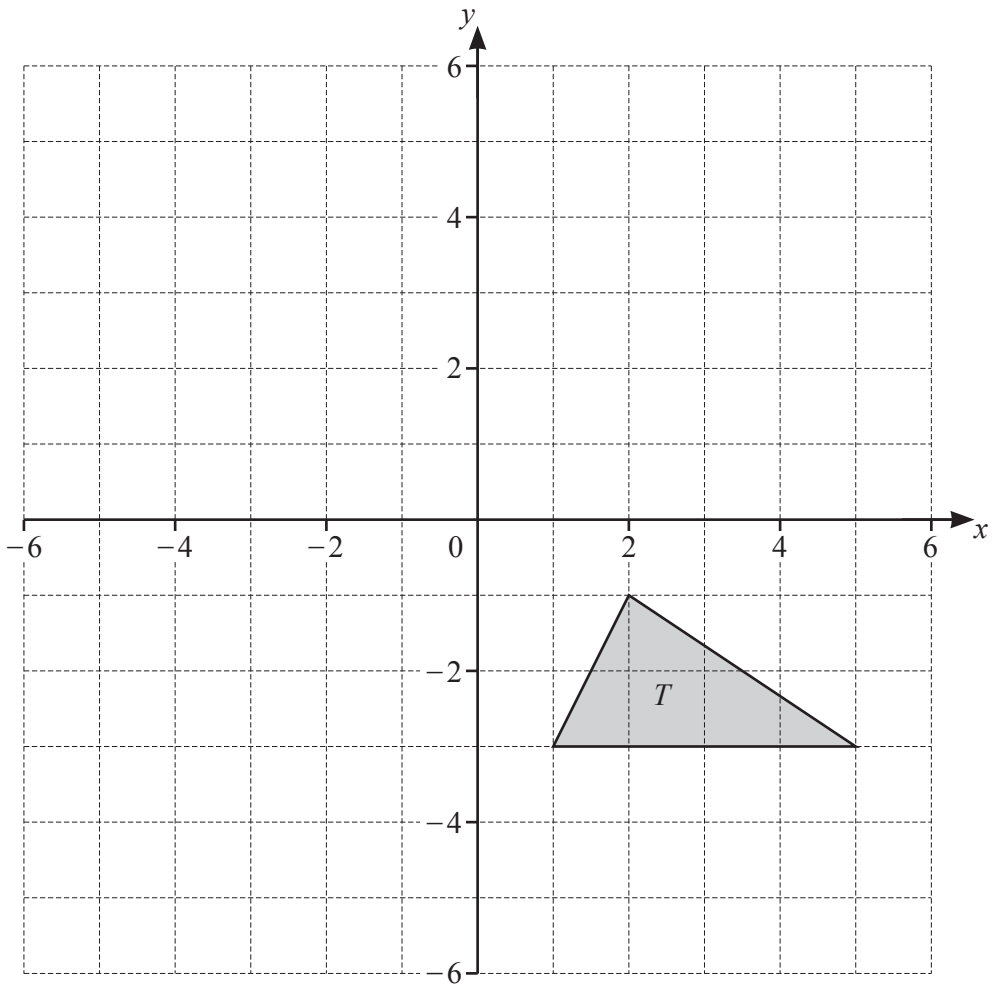
..... hectares [3]

(b) The Amazon river has a length of 6440 km, correct to the nearest 10 km.
The Congo river has a length of 4400 km, correct to the nearest 100 km.

Calculate the upper bound of the difference between the lengths of the Amazon river and the Congo river.

..... km [3]

2 (a)



On the grid, draw the image of

(i) triangle T after a reflection in the x-axis [1]

(ii) triangle T after a translation by the vector $\begin{pmatrix}-5\\-2\end{pmatrix}$ [2]

(iii) triangle T after an enlargement by scale factor $-\frac{1}{2}$ with centre $(-1, 1)$. [2]

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(b) A shape P is enlarged by scale factor 3 to give shape Q.
Shape Q is then enlarged by scale factor $\frac{2}{5}$ to give shape R.

The area of shape P is $10\,\text{cm}^2$.

Calculate the area of shape R.

..... cm^2 [3]

3 **(a)** $C = \frac{1}{4}xy^2$

(i) Find C when $x = 5$ and $y = 8$.

$C =$ ..... [2]

(ii) Find the positive value of y when $C = 15$ and $x = 2.4$.

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

(b) Write as a single fraction in its simplest form.

$$\frac{4}{x-1} - \frac{3}{2x+5}$$

..... [3]

(c) Expand and simplify.

$$(2x+3)(4-x)^2$$

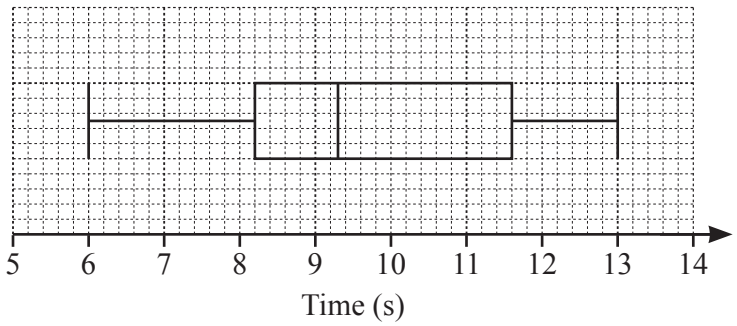
..... [3]

(d) Simplify.

$$\left(\frac{y^8}{16x^{16}}\right)^{-\frac{3}{4}}$$

..... [3]

4 **(a)** Jianyu records the time, in seconds, that some cars take to travel 195 m.
The box and whisker plot shows this information.



(i) Find the median time.

..... s [1]

(ii) Find the interquartile range.

..... s [1]

(iii) Find the difference between the average speed of the fastest car and the average speed of the slowest car.
Give your answer in **kilometres per hour**.

..... km/h [5]

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(b) Matilda records the distances that 80 different cars can travel with a full tank of fuel. The table shows this information.

Distance (d km)	$250 < d \leqslant 300$	$300 < d \leqslant 400$	$400 < d \leqslant 420$	$420 < d \leqslant 450$	$450 < d \leqslant 500$
Frequency	7	13	19	21	20

(i) Write down the class interval that contains the median.

..... $< d \leqslant$ ..... [1]

(ii) Calculate an estimate of the mean.

..... km [4]

(iii) A histogram is drawn to show the information in the table.
The height of the bar for the interval $250 < d \leqslant 300$ is 2.8 cm.

Calculate the height of the bar for each of the following intervals.

$300 < d \leqslant 400$ ..... cm

$400 < d \leqslant 420$ ..... cm

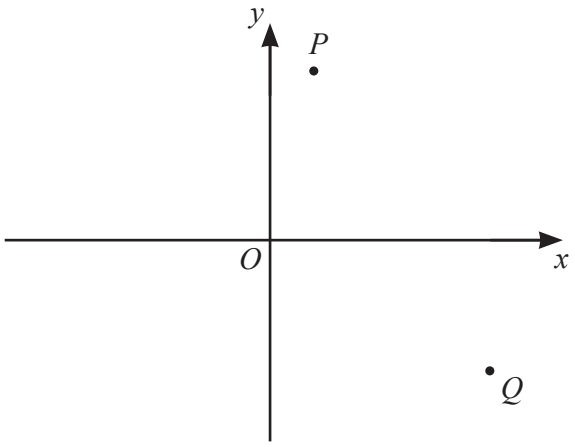
$420 < d \leqslant 450$ ..... cm [3]

(iv) Two of the 80 cars are chosen at random.

Find the probability that, with a full tank of fuel, one of the cars can travel more than 450 km and the other car can travel **not** more than 300 km.

..... [3]

5 **(a)** P is the point (1, 7).
Q is the point (5, –5).



NOT TO SCALE

(i) Find $\overrightarrow{PQ}$.

$\overrightarrow{PQ} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(ii) Show that $|\overrightarrow{OP}| = |\overrightarrow{OQ}|$.

[3]

(iii) PQ is a chord of a circle with centre O.

Calculate the circumference of this circle.

..... [2]

(iv) PQ is the diameter of a different circle with centre R.

Find the coordinates of R.

(..... , ...) [2]

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

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

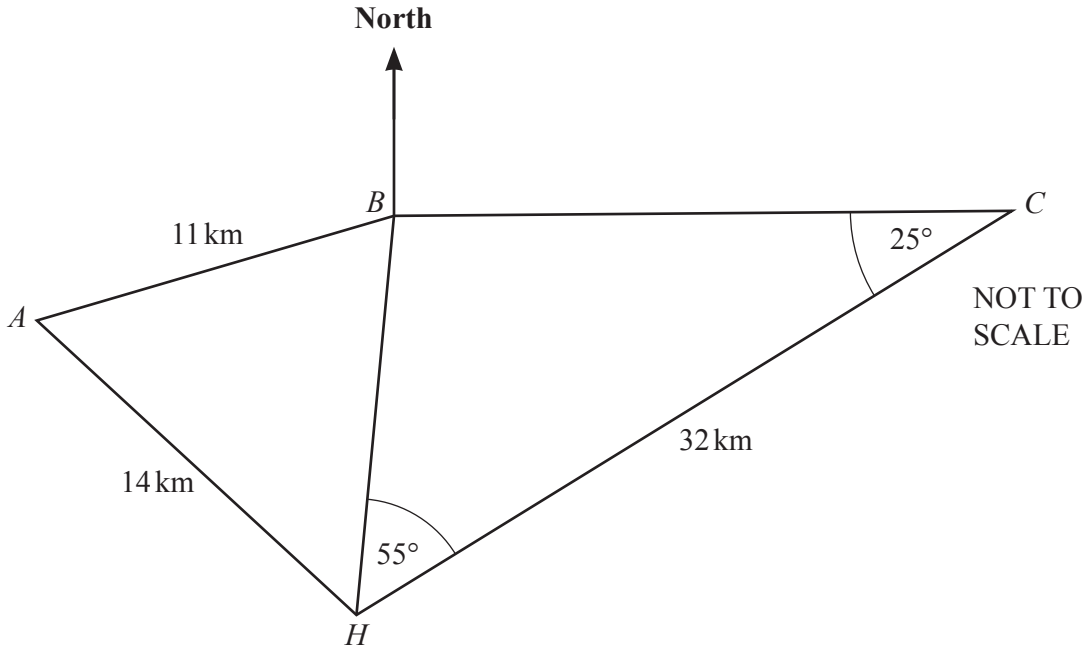
(b) The position vector of A is **a**.
The position vector of B is **b**.

M is a point on AB such that $AM : MB = 2 : 3$.

Find, in terms of **a** and **b**, the position vector of M.
Give your answer in its simplest form.

..... [4]

6



The diagram shows the positions of two lighthouses A and B, a boat C and a harbour H.
C is due east of B.

(a) Find the bearing of the harbour from boat C.

..... [1]

(b) **(i)** Show that angle $CBH = 100°$.

[1]

(ii) Show that $BH = 13.7$ km, correct to 1 decimal place.

[3]

(c) Calculate the bearing of A from B.

..... [5]

(d) At 1 pm boat C sails 32 km directly to the harbour at a speed of 10 knots.

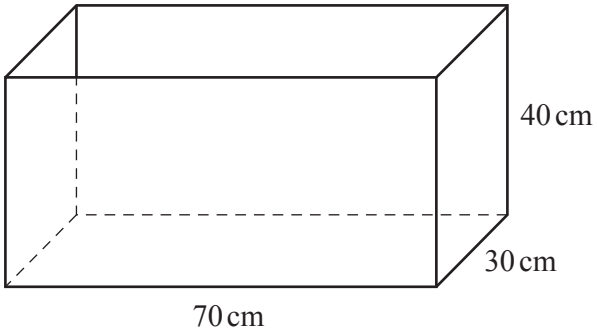
(i) Calculate the time when boat C arrives at the harbour.
Give this time correct to the nearest minute.
[1 knot = 1.852 km/h]

..... [4]

(ii) Calculate the distance of boat C to the harbour when boat C is at the shortest distance from lighthouse B.

..... km [3]

7 (a)



NOT TO SCALE

The diagram shows a box in the shape of a cuboid.
The box is open at the top.

(i) Work out the surface area of the inside of the open box.

..... cm^2 [3]

(ii) Cylinders with height 20 cm and diameter 15 cm are placed in the box.

Work out the maximum number of these cylinders that can completely fit inside the box.

..... [3]

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(b) A solid bronze cone has a mass 750 g.
The density of the bronze is 8.9 g/cm^3.

The ratio radius of cone : height of cone = 1 : 3.

(i) Show that the radius of the cone is 2.99 cm, correct to 3 significant figures.
[Density = mass ÷ volume]

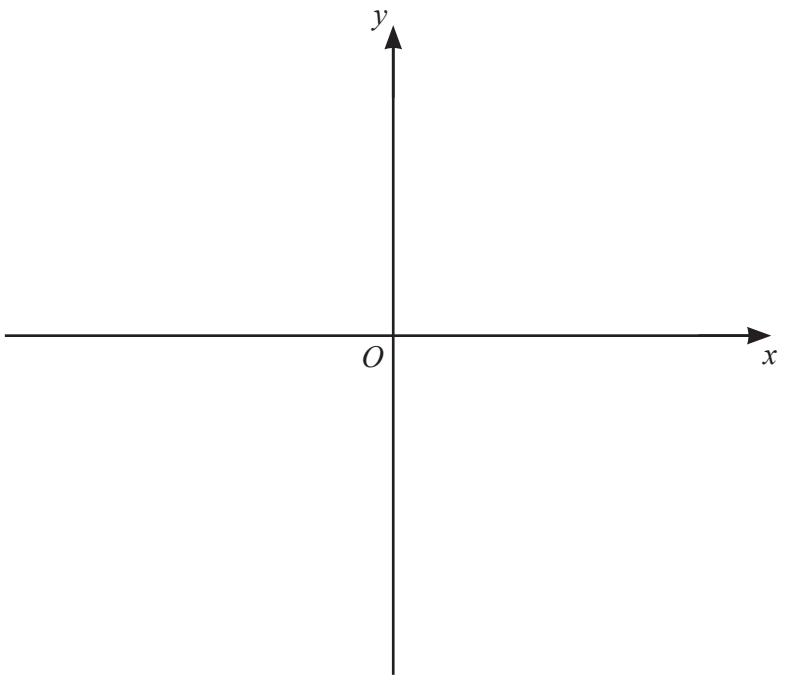
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[4]

(ii) Calculate the total surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm^2 [5]

8 **(a)** On the axes, sketch the graph of $y = x^2 + 7x - 18$.
On your sketch, write the values where the graph meets the x-axis and the y-axis.



[4]

(b) **(i)** Find the derivative of $y = x^2 - 3x - 28$.

..... [2]

(ii) Find the coordinates of the turning point of $y = x^2 - 3x - 28$.

(..... , ...) [3]

(c) The line $y = 5 - 2x$ intersects the graph of $y = x^2 - 3x - 28$ at point P and point Q.

Find the coordinates of P and Q.
You must show all your working and give your answers correct to 2 decimal places.

(..... , ...)

(..... , ...) [6]

9 $f(x) = 4x + 1$ $g(x) = 6 - 2x$ $h(x) = 3^{x-2}$

(a) Find

(i) $f(3)$

..... [1]

(ii) $gf(3)$.

..... [1]

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

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

(c) Find x when $f(x) = g(2x - 7)$.

$x =$ ..... [4]

(d) Find the value of hh(2).

..... [2]

(e) Find x when $h^{-1}(x) = 10$.

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

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