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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1455183852

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 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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[Turn over

1 **(a)** **(i)** Write 70 as a product of its prime factors.

..... [2]

(ii) Find the highest common factor (HCF) of 70 and 112.

..... [2]

(iii) Find the lowest common multiple (LCM) of $70x^4y^2$ and $112x^3y^5$.

..... [2]

(b) Simplify.

(i) $a^{12} \div a^4$

..... [1]

(ii) $\frac{5}{2b} \times \frac{bc}{20}$

..... [2]

(c) Solve.

$4 + 2x = 15$

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

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(d) Solve. $\frac{34+2x}{5} = 4-x$

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

(e) $P = d + \sqrt[3]{m^2}$

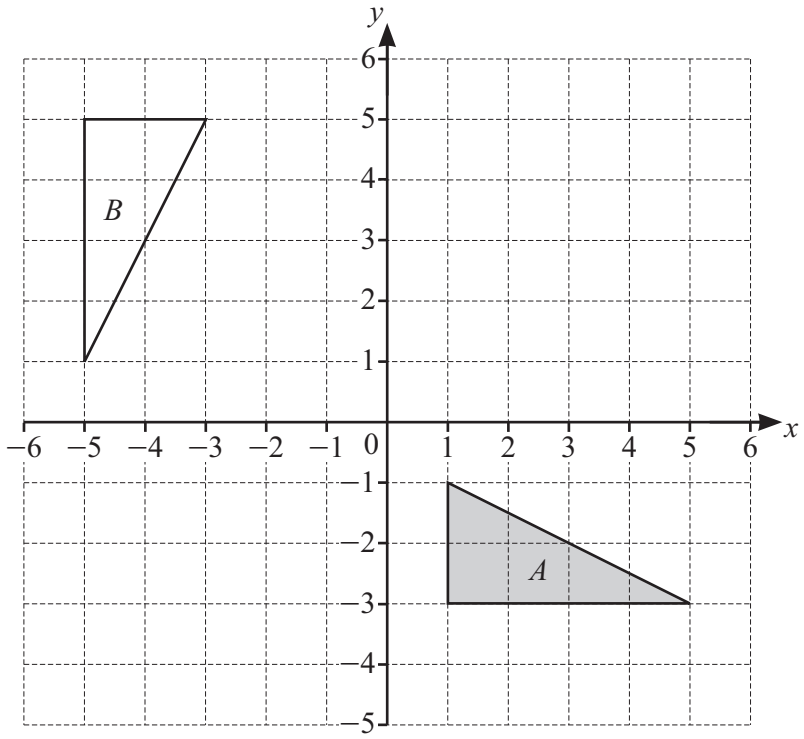
(i) Find P when $d = 7$ and $m = -8$.

$P =$ ..... [2]

(ii) Rearrange the formula to make m the subject.

$m =$ ..... [3]

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(a) On the grid, draw

(i) the image of triangle A after a reflection in the line $x = 1$ [2]

(ii) the image of triangle A after an enlargement by scale factor $\frac{1}{2}$ with centre (5, 1). [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(c) The point (a, b) is reflected in the line $y = k$ where k is an integer and $b < k$.

Write the coordinates of the image of point (a, b) in terms of a, b and k.

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

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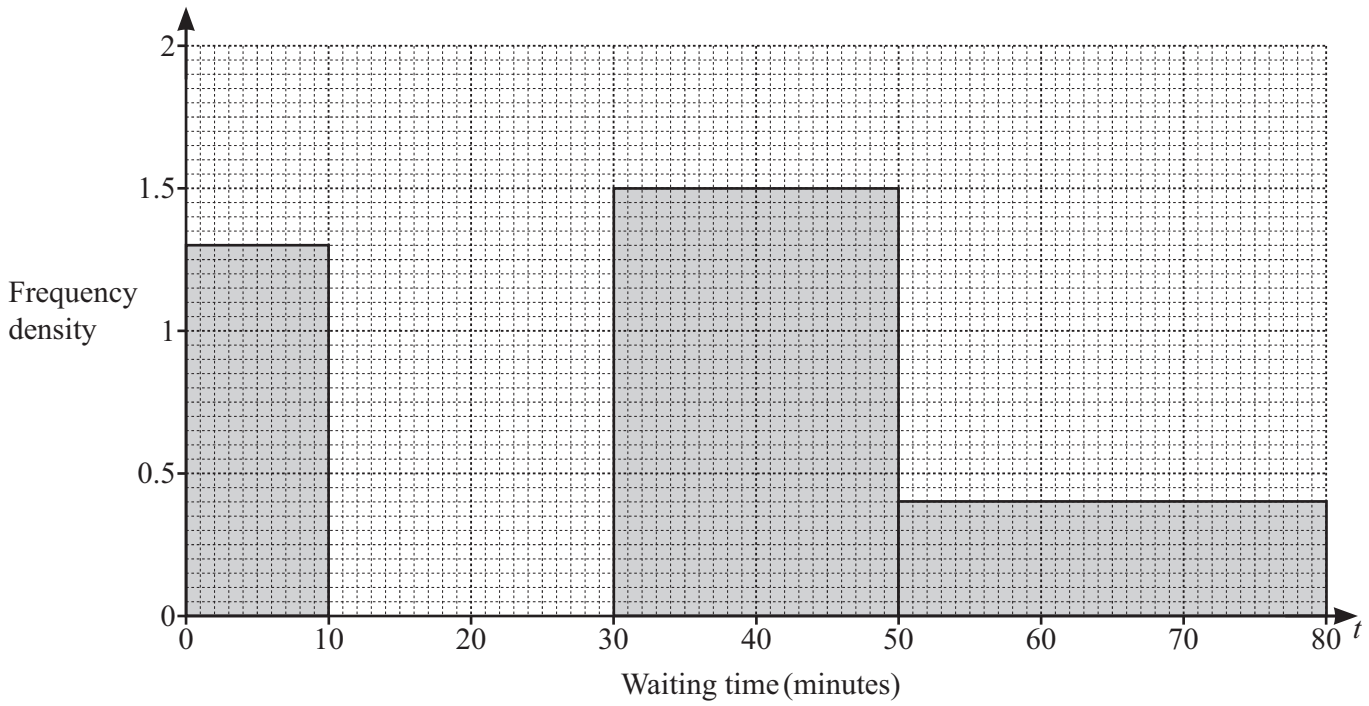
3 **(a)** The table shows the waiting times for 120 patients at a medical centre.

Waiting time (t minutes)	$0 < t \leqslant 10$	$10 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 50$	$50 < t \leqslant 80$
Frequency	2	46	33	26	13

Calculate an estimate of the mean waiting time.

..... min [4]

(b) The histogram shows some information about the waiting times at a different medical centre.



The total number of patients is 90 and no patient waits for more than 80 minutes.

Complete the histogram for the patients that have a waiting time between 10 and 30 minutes.

[4]

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4 **(a)** Enzo, Rashid and Blessy each swim as many lengths of a swimming pool as they can in 15 minutes. The results are shown in the table.

Name	Number of lengths
Enzo	11.25
Rashid	18.75
Blessy	20

(i) Find the number of lengths Enzo swims **as a percentage** of the total number of lengths all three people swim.

..... % [2]

(ii) Write the ratio of the number of lengths each person swims in the form

Enzo : Rashid : Blessy.

Give your answer in its simplest form.

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

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(iii) Each length of the pool is 25 m.

(a) Work out Blessy's average swimming speed for the 15 minutes.
Give your answer in metres per second.

..... m/s [3]

(b) Rashid continues to swim at the same rate.

Calculate the time it takes Rashid to swim a total distance of 5 km.
Give your answer in hours and minutes.

..... h ..... min [4]

(iv) Blessy swims for one hour.
The number of lengths she swims decreases by 5% every 15 minutes.

Calculate the number of lengths she swims in the final 15 minutes.

..... [3]

(b) Another swimmer, Adam, swims 450 m, correct to the nearest 25 metres.
This takes 10 minutes, correct to the nearest minute.

Calculate the minimum distance Adam swims in one hour at this rate.

..... m [3]

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5 A box contains 3 blue pens and 5 red pens.

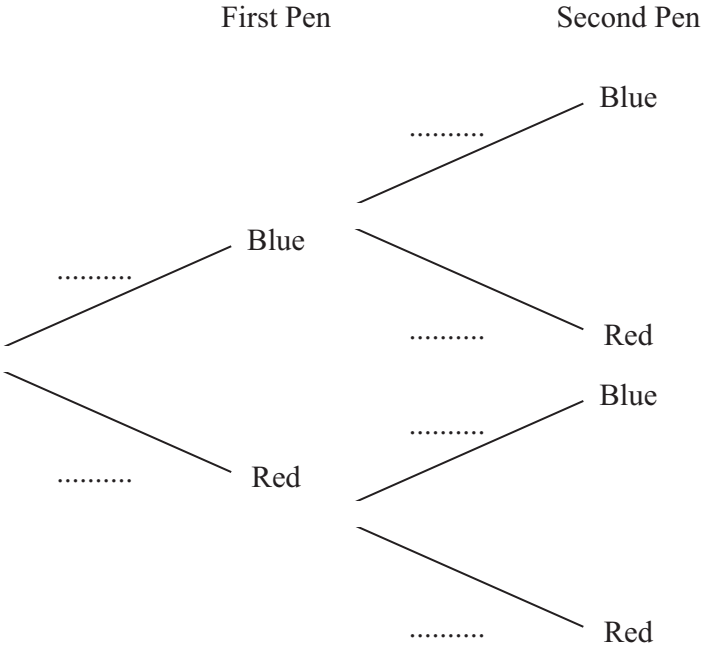
(a) Mia picks a pen from the box at random.

Find the probability that she picks a red pen.

..... [1]

(b) Mia puts the pen back into the box.
She then picks a pen at random and replaces it.
She then picks a second pen at random.

(i) Complete the tree diagram.



[2]

(ii) Find the probability that Mia picks two pens that have the same colour.

..... [3]

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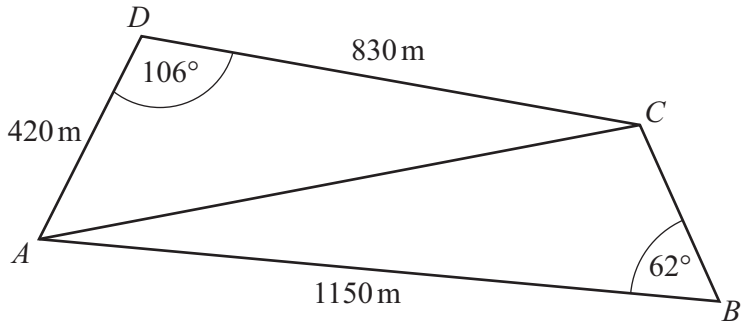
(c) Mia now picks 3 of the 8 pens in the box at random **without** replacement.

Find the probability that she picks 2 blue pens and 1 red pen.

..... [3]

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6 The diagram shows a field $ABCD$.
A straight path AC goes across the field.



NOT TO SCALE

(a) Show that $AC = 1028$ m, correct to the nearest metre.

[3]

(b) Angle ACB is obtuse.

Calculate angle ACB.

Angle $ACB =$ ..... [4]

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(c) Part of the field, triangle ACD, is sold for \$41 500.

Calculate the cost of 1 hectare of this part of the field.
Give your answer correct to the nearest dollar.
[1 hectare = 10 000 m^2]

\$ ..... [4]

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7 A company makes scientific calculators and graphic calculators.
Each day they make x scientific calculators and y graphic calculators.

These inequalities describe the number of scientific and graphic calculators they make each day.

$x < 180$ $y \leqslant 90$ $x + y \leqslant 240$

(a) Complete these two statements.

The company makes fewer than ..... scientific calculators each day.

The company can make a maximum of ..... calculators each day. [2]

(b) Scientific calculators cost \$12 to make.
Graphic calculators cost \$18 to make.
Each day the company spends at least \$2700 making calculators.

Show that $2x + 3y \geqslant 450$.

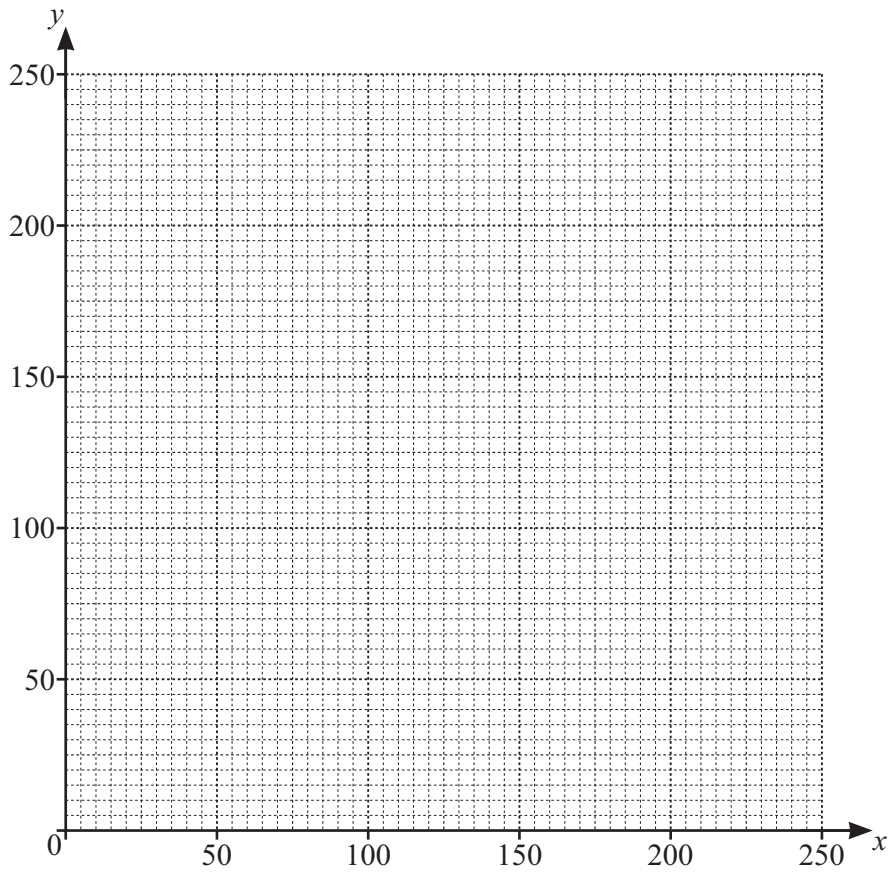
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(c) The region R satisfies these four inequalities.

$x < 180$ $y \leqslant 90$ $x + y \leqslant 240$ $2x + 3y \geqslant 450$

By drawing four suitable lines and shading unwanted regions, find and label the region R.



[7]

(d) Scientific calculators are sold for a profit of \$10.
Graphic calculators are sold for a profit of \$30.

Calculate the maximum profit made by the company in one day.

\$ ..... [2]

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8 **(a)** $f(x) = 7 - 3x$ $g(x) = x^2 - 16$

(i) Find the values of x when $g(x) = 20$.

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

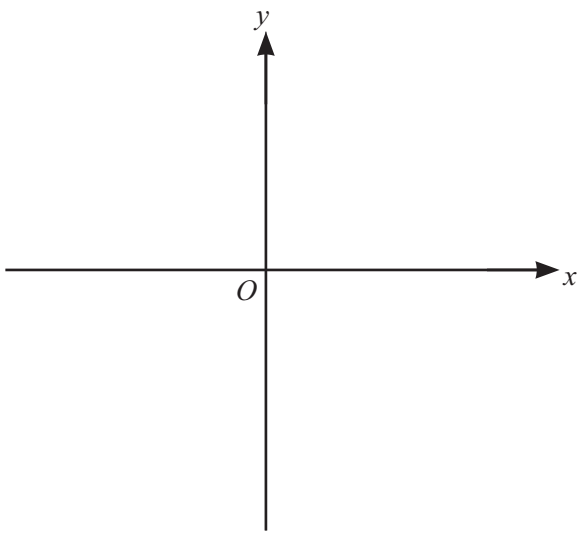
(ii) Find $f^{-1}(x)$.

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

(iii) Find $gf(x) + 1$, giving your answer in its simplest form.

..... [3]

(iv) On the axes, sketch the graph of $y = g(x)$.
On your sketch, indicate the values where the graph crosses the axes.



[4]

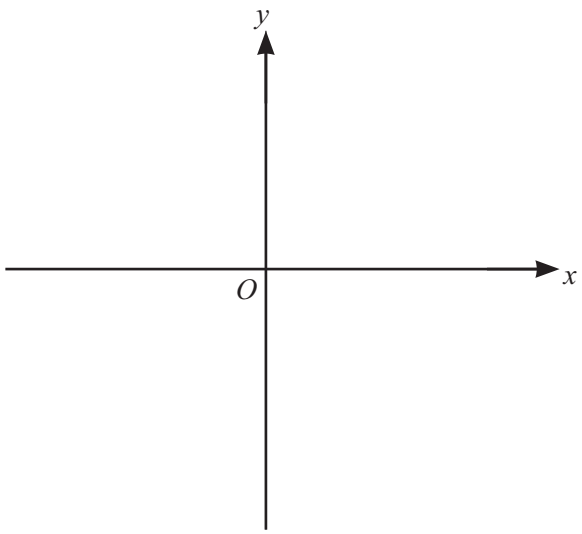
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(v) Find the equation of the tangent to the graph of $y = g(x)$ when $x = -3$.
Give your answer in the form $y = mx + c$.

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

(b) $h(x) = 3^x$

(i) On the axes, sketch the graph of $y = h(x)$.



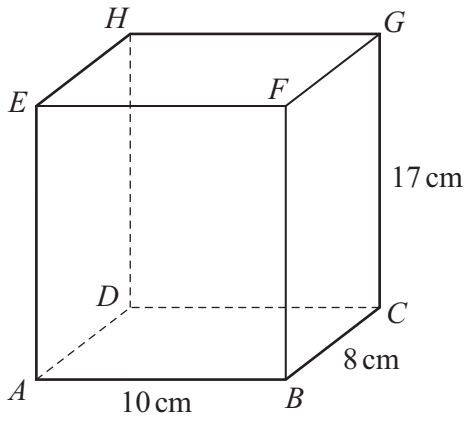
[2]

(ii) Write down the equation of the asymptote to the graph of $y = h(x)$.

..... [1]

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9



NOT TO SCALE

ABCDEFGH is a solid cuboid.
$AB = 10$ cm, $BC = 8$ cm and $CG = 17$ cm.

(a) Work out the volume of the cuboid.

..... cm^3 [1]

(b) Work out the total surface area of the cuboid.

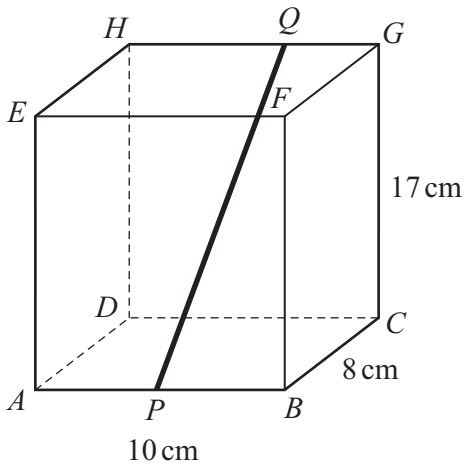
..... cm^2 [3]

(c) Calculate the angle between *GA* and the base *ABCD*.

..... [4]

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(d) A straight rod PQ is placed inside the cuboid.
One end of the rod, P, is placed at the midpoint of AB.
The other end of the rod, Q, rests on GH.
$HQ : QG = 4 : 1$.



NOT TO SCALE

Calculate the length of the rod PQ.

..... cm [4]

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10 (a)



NOT TO SCALE

This rectangle has area 190 cm^2.

(i) By forming and solving an equation, show that $x = 8.5$.

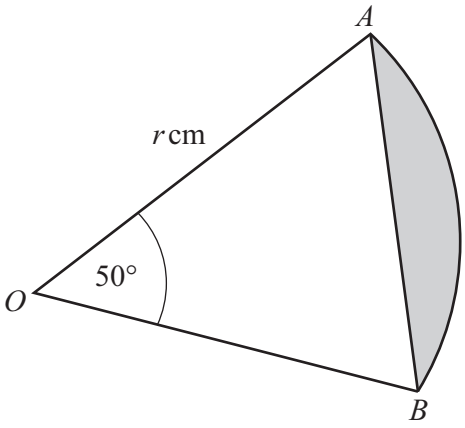
[4]

(ii) Work out the perimeter of the rectangle.

..... cm [2]

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(b)



NOT TO SCALE

The diagram shows a sector OAB of a circle, with centre O, and a chord AB.
The shaded segment has area 30 cm^2.

(i) Show that $r = 23.7$ cm, correct to 1 decimal place.

[4]

(ii) Calculate the perimeter of the shaded segment.

..... cm [4]

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