



# Cambridge IGCSE™

CANDIDATE NAME



CENTRE NUMBER

--	--	--	--	--

CANDIDATE NUMBER

--	--	--	--



**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  $\pi$ , 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) (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]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN





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

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

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

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

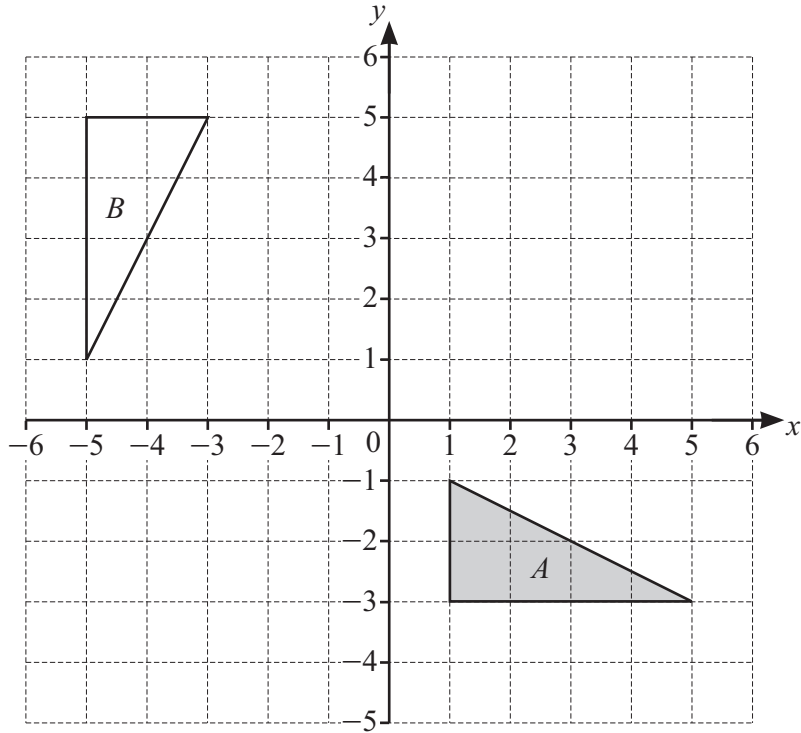
$P = \dots\dots\dots [2]$

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

$m = \dots\dots\dots [3]$

DO NOT WRITE IN THIS MARGIN





- (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]





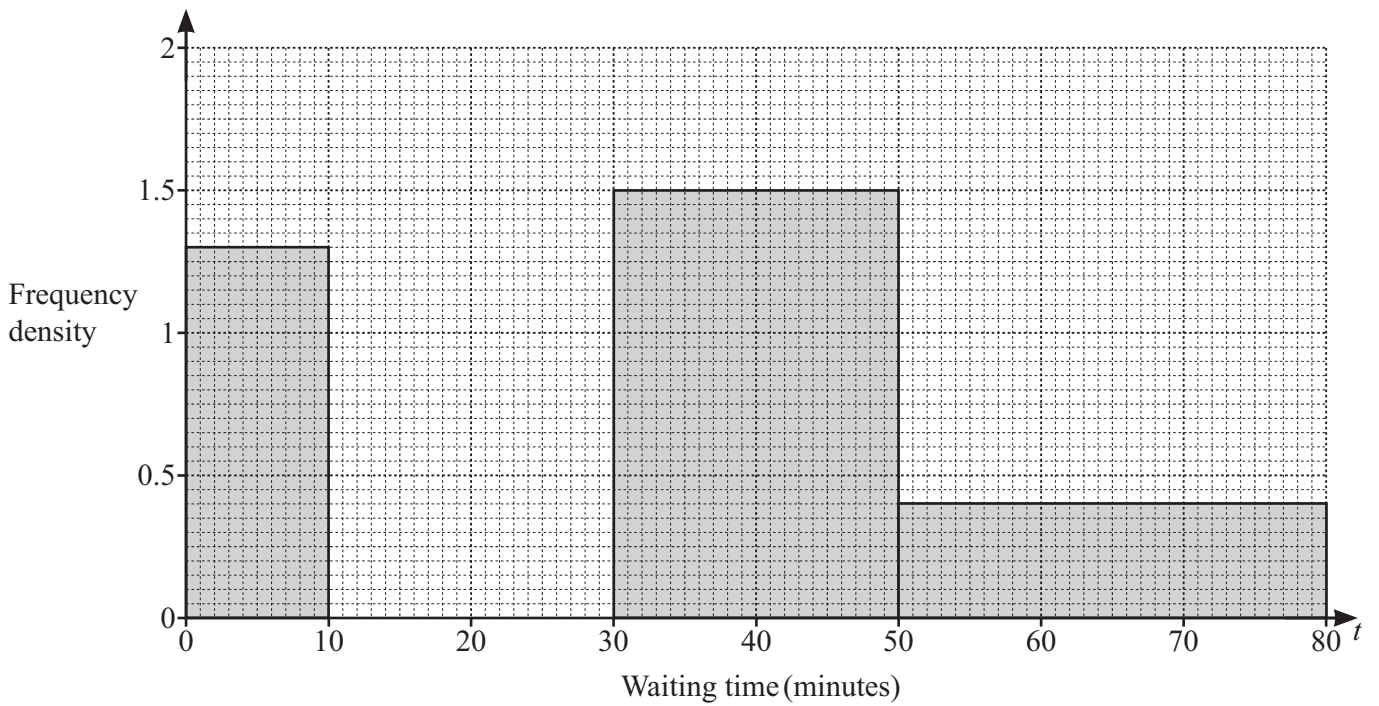
3 (a) The table shows the waiting times for 120 patients at a medical centre.

Waiting time ( $t$ minutes)	$0 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 40$	$40 < t \leq 50$	$50 < t \leq 80$
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]



DO NOT WRITE IN THIS MARGIN



- 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]

DO NOT WRITE IN THIS MARGIN





(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]

DO NOT WRITE IN THIS MARGIN





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

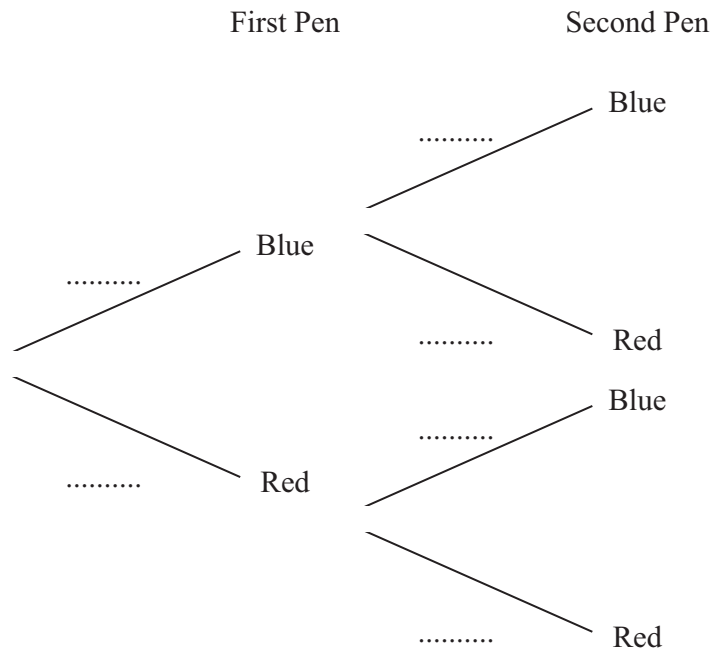
(a) Mia picks a pen from the box at random.

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]







(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.

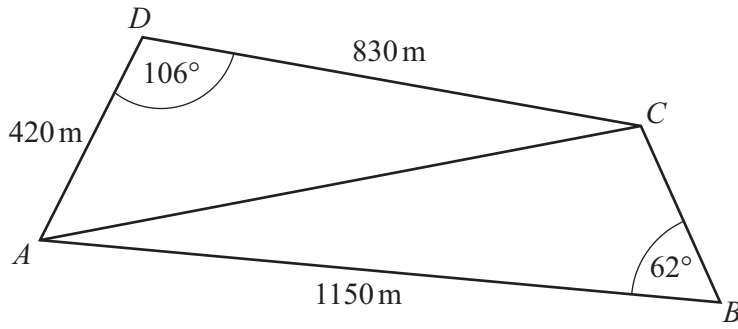
..... [3]



DO NOT WRITE IN THIS MARGIN



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



NOT TO SCALE

- (a) Show that  $AC = 1028\text{ m}$ , correct to the nearest metre.

[3]

- (b) Angle  $ACB$  is obtuse.

Calculate angle  $ACB$ .

Angle  $ACB = \dots\dots\dots$  [4]

DO NOT WRITE IN THIS MARGIN





(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<sup>2</sup>]

\$ ..... [4]

DO NOT WRITE IN THIS MARGIN





- 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.

$$x < 180 \qquad y \leq 90 \qquad x + y \leq 240$$

- (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  $2x + 3y \geq 450$ .

[1]

DO NOT WRITE IN THIS MARGIN





(c) The region  $R$  satisfies these four inequalities.

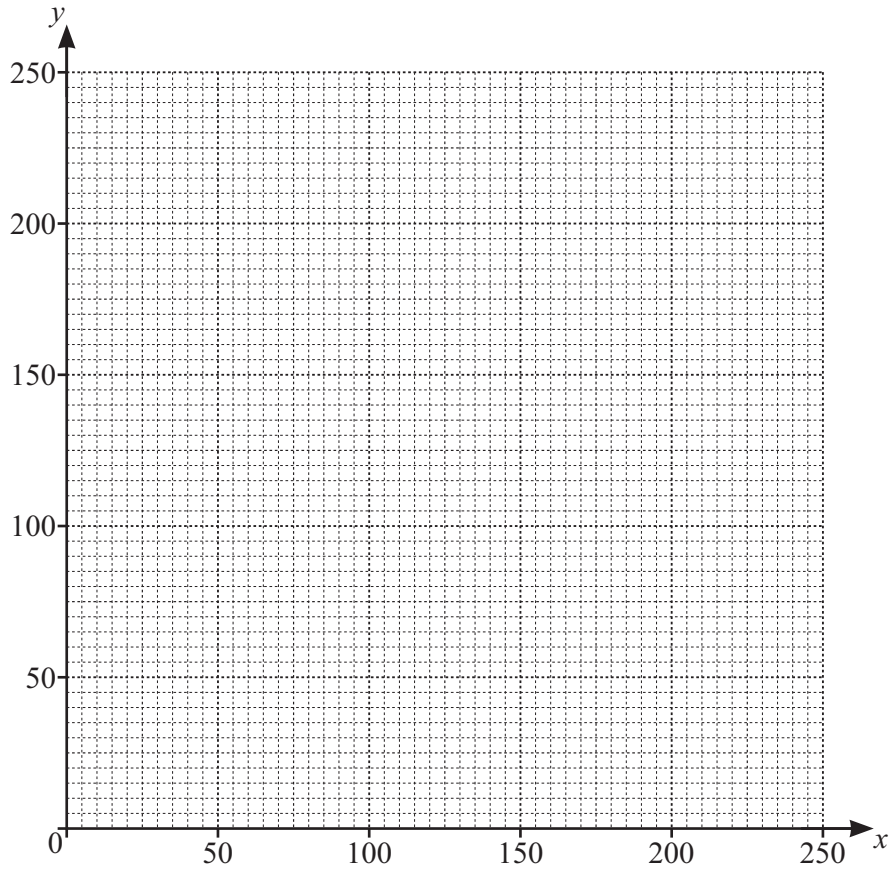
$x < 180$

$y \leq 90$

$x + y \leq 240$

$2x + 3y \geq 450$

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]



DO NOT WRITE IN THIS MARGIN



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

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

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

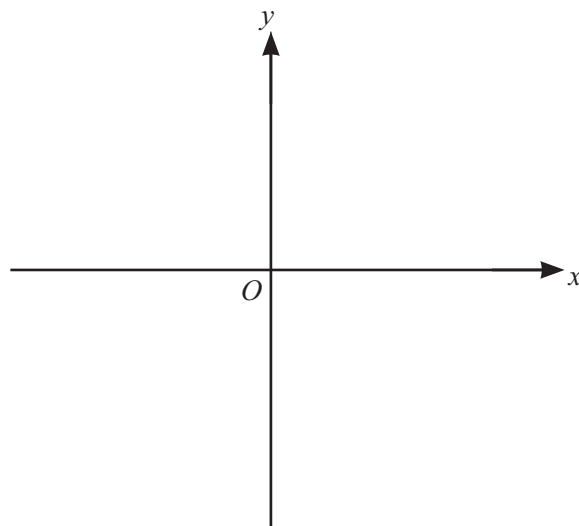
(ii) Find  $f^{-1}(x)$ .

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

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

$\dots\dots\dots$  [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]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN



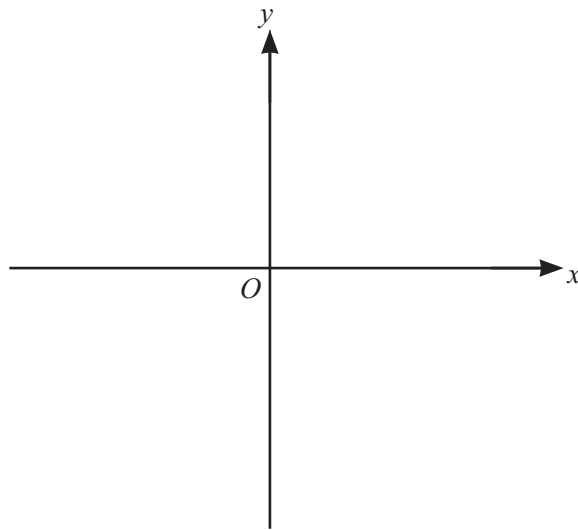


- (v) Find the equation of the tangent to the graph of  $y = g(x)$  when  $x = -3$ .  
Give your answer in the form  $y = mx + c$ .

$y = \dots\dots\dots$  [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  $y = h(x)$ .

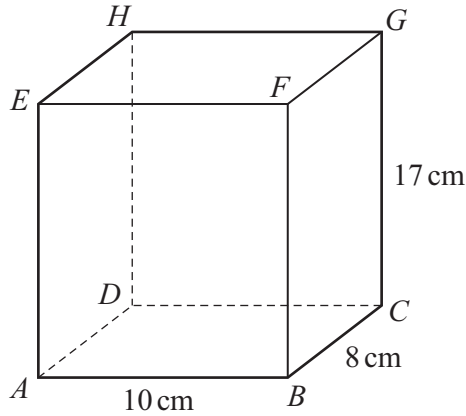
$\dots\dots\dots$  [1]

DO NOT WRITE IN THIS MARGIN





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.

.....  $\text{cm}^3$  [1]

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

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

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

..... [4]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

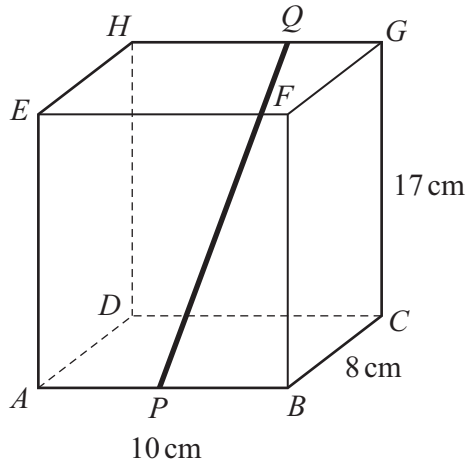
DO NOT WRITE IN THIS MARGIN







- (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  $PQ$ .

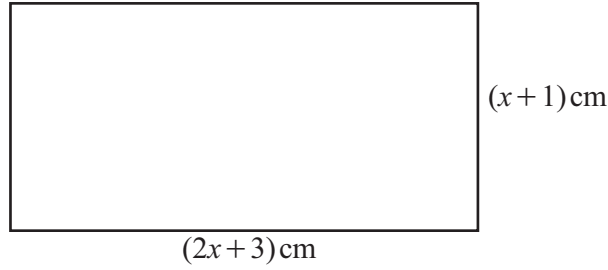
..... cm [4]

DO NOT WRITE IN THIS MARGIN





10 (a)



NOT TO SCALE

This rectangle has area  $190 \text{ cm}^2$ .

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

[4]

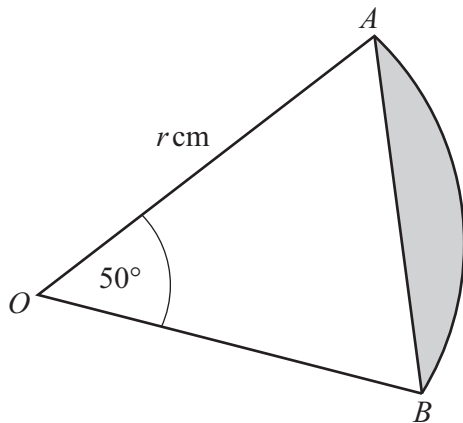
(ii) Work out the perimeter of the rectangle.

..... cm [2]





(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  $30 \text{ cm}^2$ .

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

[4]

(ii) Calculate the perimeter of the shaded segment.

..... cm [4]



DO NOT WRITE IN THIS MARGIN



**BLANK PAGE**

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

