Cambridge IGCSE

**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

*5339410747*

**MATHEMATICS** **0580/41**

Paper 4 (Extended) **October/November 2015**

**2 hours 30 minutes**

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For $\pi$, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.


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**1** **(a)** Luc is painting the doors in his house.
He uses $\frac{3}{4}$ of a tin of paint for each door.

Work out the least number of tins of paint Luc needs to paint 7 doors.

*Answer(a)* ..... [3]

**(b)** Jan buys tins of paint for \$17.16 each.
He sells the paint at a profit of 25%.

For how much does Jan sell each tin of paint?

*Answer(b)* \$ ..... [2]

**(c)** The cost of \$17.16 for each tin of paint is 4% more than the cost in the previous year.

Work out the cost of each tin of paint in the previous year.

*Answer(c)* \$ ..... [3]

**(d)** In America a tin of paint costs \$17.16 .
In Italy the same tin of paint costs €13.32 .
The exchange rate is \$1 = €0.72 .

Calculate, in dollars, the difference in the cost of the tin of paint.

*Answer(d)* \$ ..... [2]

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**(e)** Paint is sold in cylindrical tins of height 11 cm.
Each tin holds 750 ml of paint.

**(i)** Write 750 ml in $cm^3$.

*Answer(e)*(i) ..... $cm^3$ [1]

**(ii)** Calculate the radius of the tin.
Give your answer correct to 1 decimal place.

*Answer(e)*(ii) ..... cm [3]

**(iii)** A mathematically similar tin has a height of 22 cm.

How many **litres** of paint does this tin hold?

*Answer(e)*(iii) ..... litres [2]

**(f)** The mass of a tin of paint is 890 grams, correct to the nearest 10 grams.

Work out the upper bound of the total mass of 10 tins of paint.

*Answer(f)* ..... g [1]

**(g)** The probability that a tin of paint is dented is 0.07 .

Out of 3000 tins of paint, how many would you expect to be dented?

*Answer(g)* ..... [2]

**(h)** Tins of paint are filled at the rate of 2 $m^3$ per minute.

How many 750 ml tins of paint can be filled in 1 hour?

*Answer(h)* ..... [3]

**2** **(a)** Calculate $2^{0.7}$.

*Answer(a)* ..... [1]

**(b)** Find the value of $x$ in each of the following.

**(i)** $2^x = 128$

*Answer(b)*(i) $x$ = ..... [1]

**(ii)** $2^x \times 2^9 = 2^{13}$

*Answer(b)*(ii) $x$ = ..... [1]

**(iii)** $2^9 \div 2^x = 4$

*Answer(b)*(iii) $x$ = ..... [1]

**(iv)** $2^x = \sqrt[3]{2}$

*Answer(b)*(iv) $x$ = ..... [1]

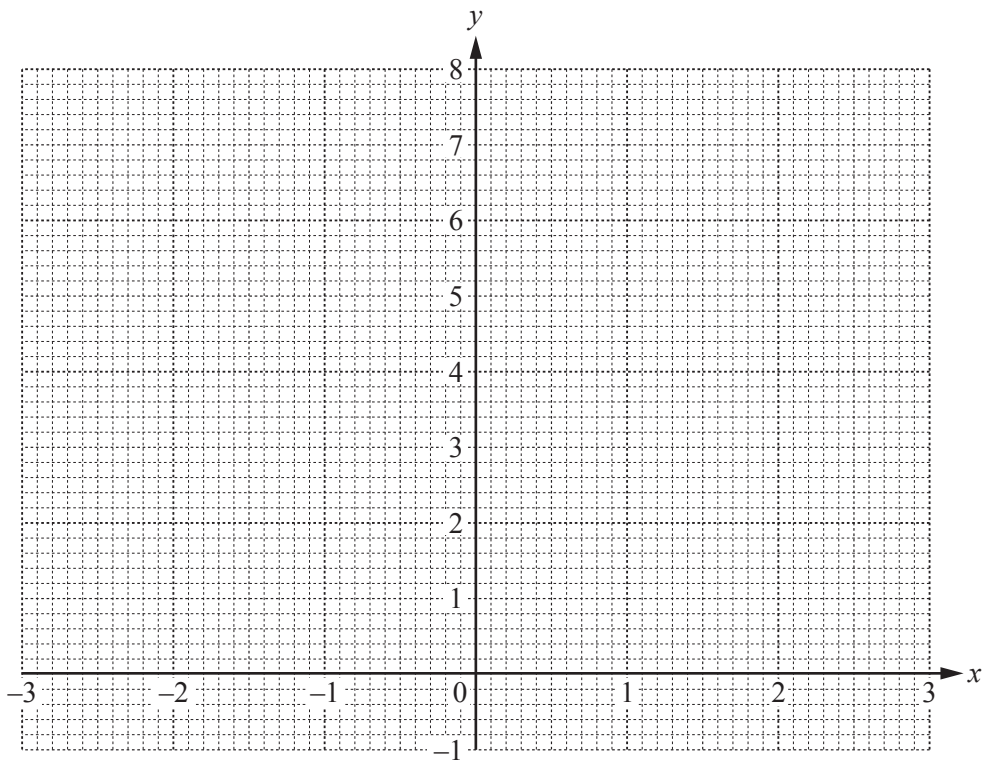
**(c)** **(i)** Complete this table of values for $y = 2^x$.

| $x$ | –3 | –2 | –1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y$ | 0.125 | | 0.5 | | 2 | 4 | 8 |

[2]

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**(ii)** On the grid, draw the graph of $y = 2^x$ for $-3 \leqslant x \leqslant 3$.




[4]

**(iii)** Use your graph to solve $2^x = 5$.

*Answer(c)*(iii) $x$ = ..... [1]

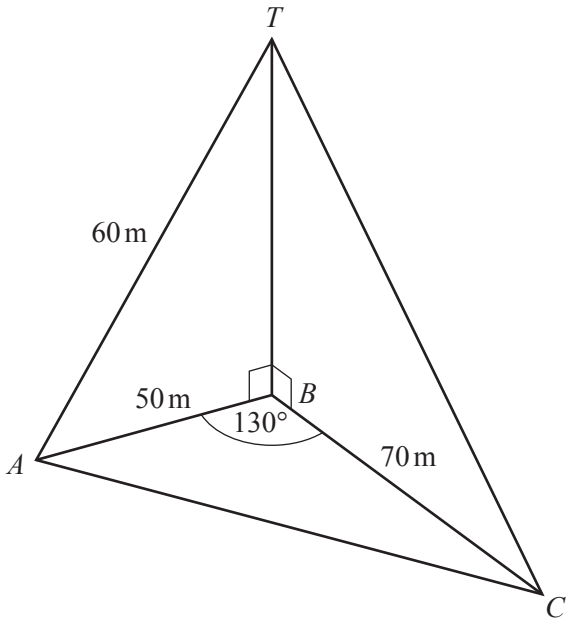
**(iv)** Find the equation of the line joining the points (1, 2) and (3, 8).

*Answer(c)*(iv) ..... [3]

**(v)** By drawing a suitable line on your graph, solve $2^x - 2 - x = 0$.

*Answer(c)*(v) $x$ = ..... or $x$ = ..... [2]

**3 (a)**




NOT TO SCALE

$A$, $B$ and $C$ are points on horizontal ground.
$BT$ is a vertical pole.
$AT = 60$ m, $AB = 50$ m, $BC = 70$ m and angle $ABC = 130°$.

**(i)** Calculate the angle of elevation of $T$ from $C$.

*Answer(a)*(i) ..... [5]

**(ii)** Calculate the length $AC$.

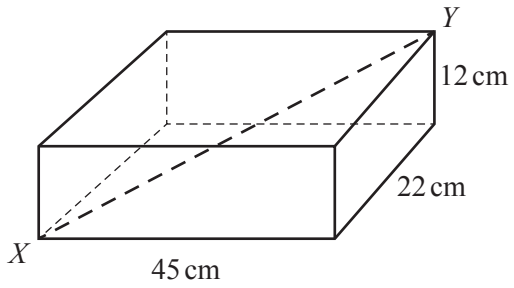
*Answer(a)*(ii) $AC$ = ..... m [4]

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

*Answer(a)*(iii) ..... $m^2$ [2]

**(b)**




NOT TO SCALE

A cuboid has length 45 cm, width 22 cm and height 12 cm.

Calculate the length of the straight line *XY*.

*Answer(b) XY* = ..... cm [4]

**4** Ali buys $x$ rose bushes and $y$ lavender bushes.

He buys:
- at least 5 rose bushes
- at most 8 lavender bushes
- at most 15 bushes in total
- more lavender bushes than rose bushes.

**(a) (i)** Write down four inequalities, in terms of $x$ and/or $y$, to show this information.

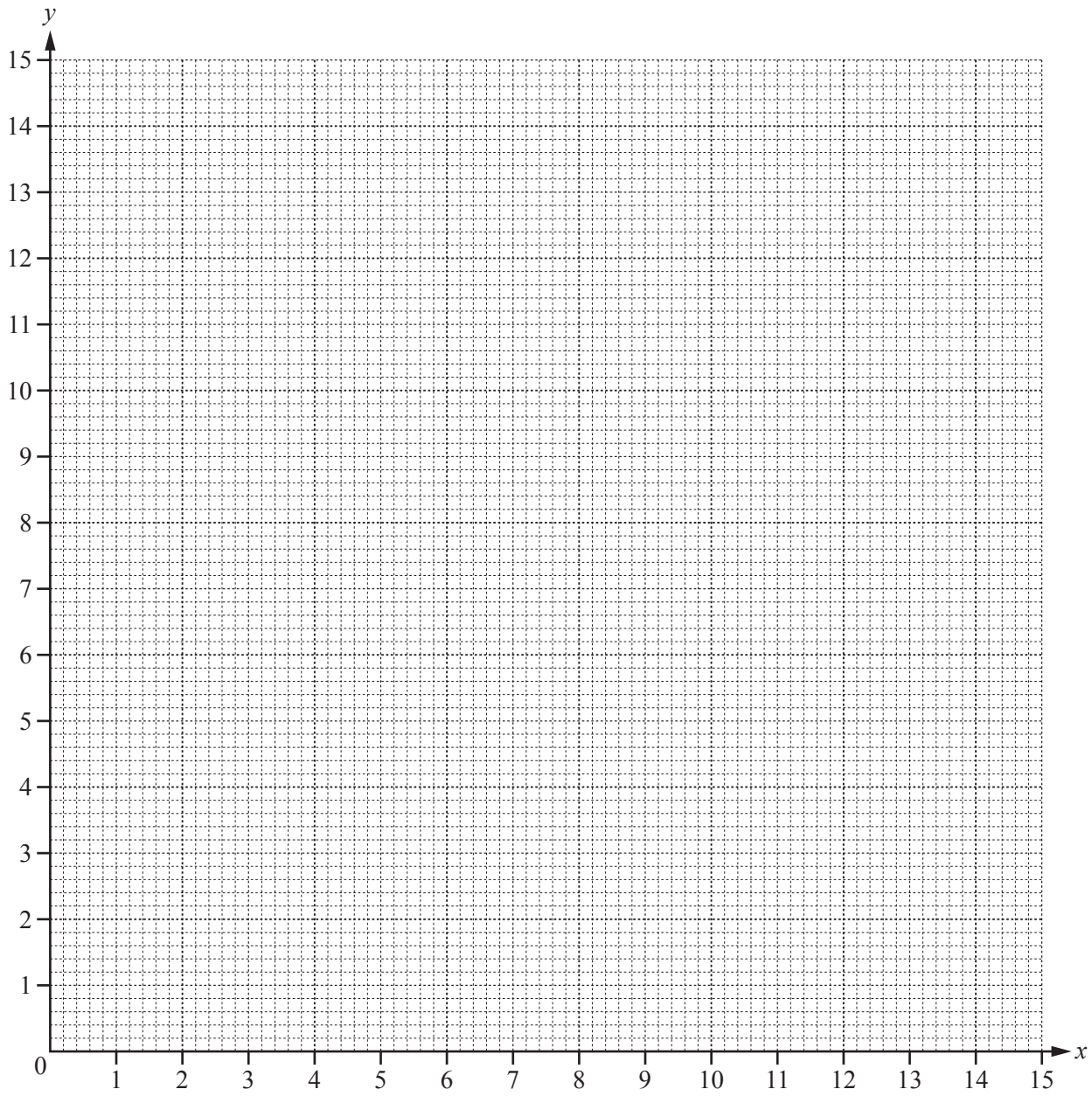
*Answer(a)*(i) .....

.....

.....

..... [4]

**(ii)** On the grid, show the information in **part (a)(i)** by drawing four straight lines.
Label the region R where all four inequalities are true.




[5]

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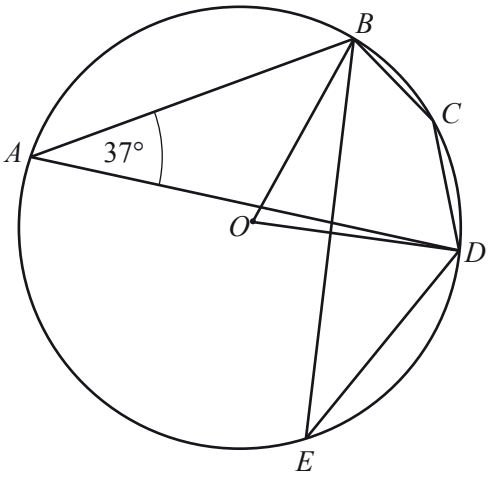
**(b)** Rose bushes cost \$6 each and lavender bushes cost \$4.50 each.

What is the greatest amount of money Ali could spend?

*Answer(b)* \$ ..... [2]

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**5**




NOT TO SCALE

*A*, *B*, *C*, *D* and *E* are points on the circle, centre *O*.
Angle *BAD* = 37°.

Complete the following statements.

**(a)** Angle *BED* = ..... because .....

..... [2]

**(b)** Angle *BOD* = ..... because .....

..... [2]

**(c)** Angle *BCD* = ..... because .....

..... [2]

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**6** 120 students take a mathematics examination.

**(a)** The time taken, $m$ minutes, for each student to answer question 1 is shown in this table.

| Time ($m$ minutes) | $0 < m \leqslant 1$ | $1 < m \leqslant 2$ | $2 < m \leqslant 3$ | $3 < m \leqslant 4$ | $4 < m \leqslant 5$ | $5 < m \leqslant 6$ |
|---|---|---|---|---|---|---|
| Frequency | 72 | 21 | 9 | 11 | 5 | 2 |

Calculate an estimate of the mean time taken.

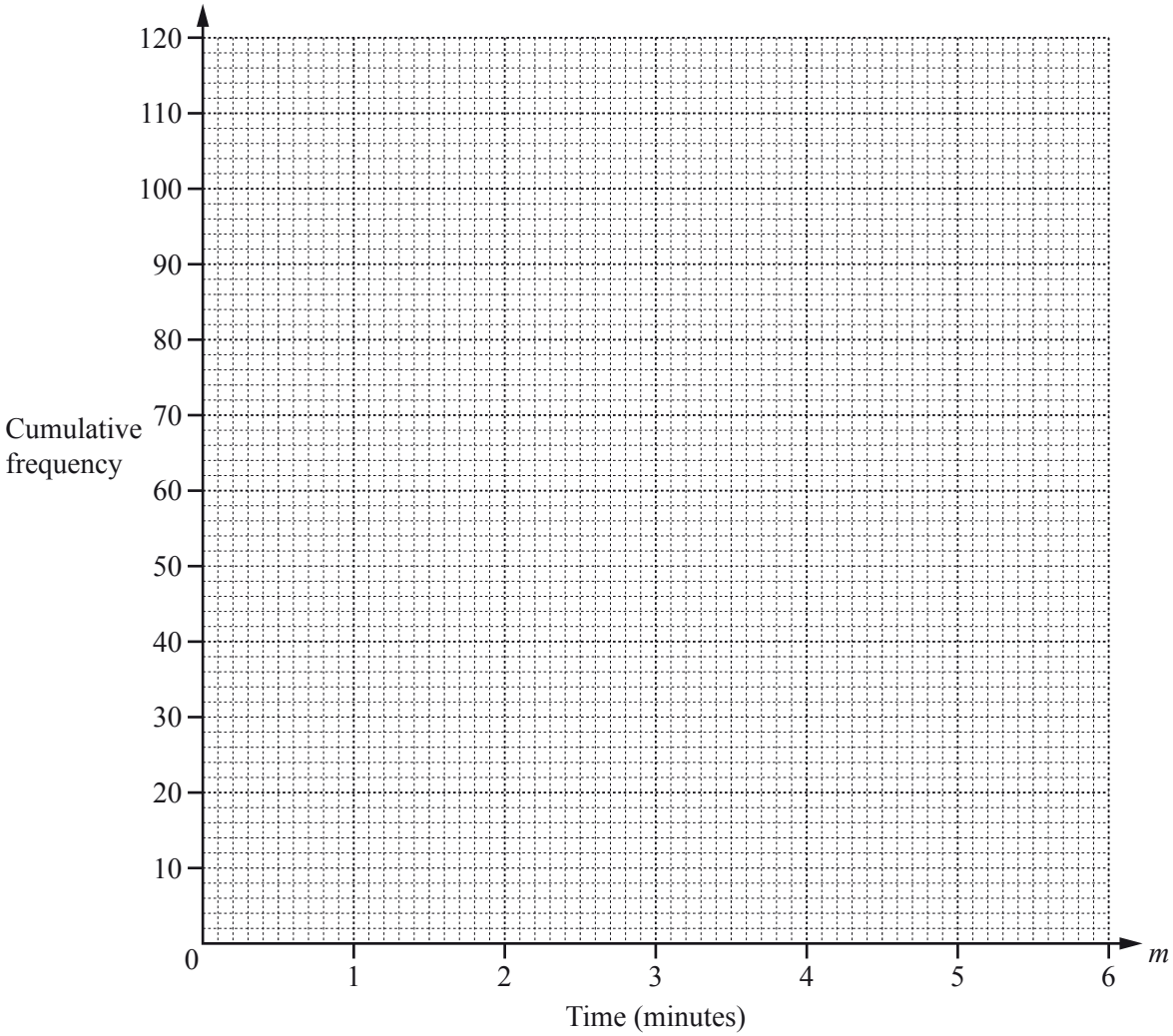
*Answer(a)* .....min [4]

**(b)** **(i)** Using the table in **part (a)**, complete this cumulative frequency table.

| Time ($m$ minutes) | $m \leqslant 1$ | $m \leqslant 2$ | $m \leqslant 3$ | $m \leqslant 4$ | $m \leqslant 5$ | $m \leqslant 6$ |
|---|---|---|---|---|---|---|
| Cumulative frequency | 72 | | | | | 120 |

[2]

**(ii)** Draw a cumulative frequency diagram to show the time taken.




[3]

**(iii)** Use your cumulative frequency diagram to find

**(a)** the median,

*Answer(b)*(iii)(a) ..... min [1]

**(b)** the inter-quartile range,

*Answer(b)*(iii)(b) ..... min [2]

**(c)** the 35th percentile.

*Answer(b)*(iii)(c) ..... min [2]

**(c)** A new frequency table is made from the table shown in **part (a)**.

| Time ($m$ minutes) | $0 < m \leqslant 1$ | $1 < m \leqslant 3$ | $3 < m \leqslant 6$ |
|---|---|---|---|
| Frequency | 72 | | |

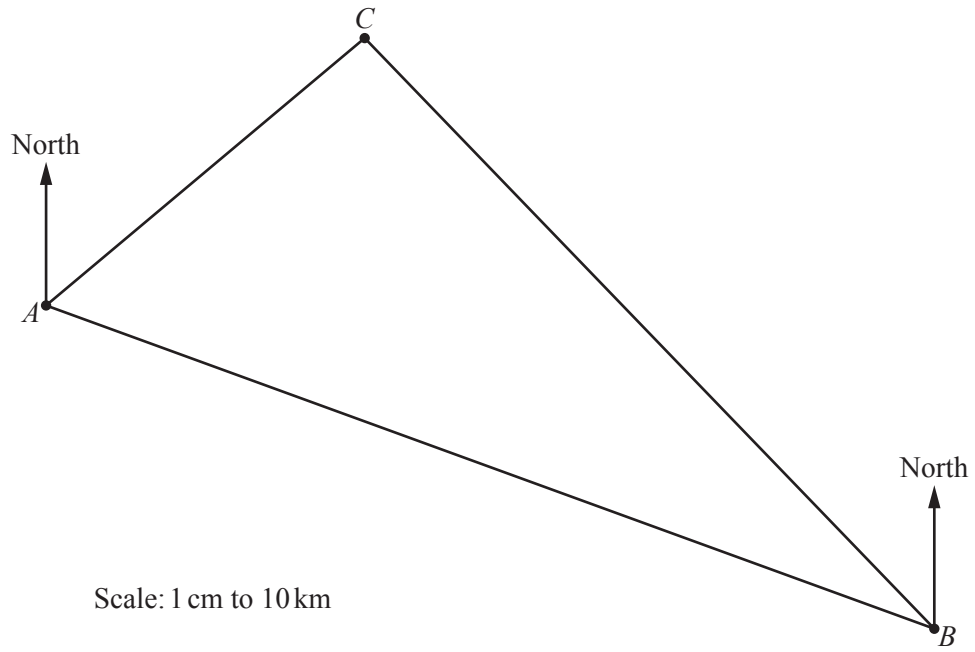
**(i)** Complete the table above. [2]

**(ii)** A histogram was drawn and the height of the first block representing the time $0 < m \leqslant 1$ was 3.6 cm.

Calculate the heights of the other two blocks.

*Answer(c)*(ii) ..... cm and ..... cm [3]

**7** The scale drawing shows the positions of three towns $A$, $B$ and $C$ on a map.
The scale of the map is 1 centimetre represents 10 kilometres.




**(a)** Find the actual distance $AB$.

*Answer(a)* ..... km [1]

**(b)** Measure the bearing of $A$ from $B$.

*Answer(b)* ..... [1]

**(c)** Write the scale 1 cm to 10 km in the form $1 : n$.

*Answer(c)* 1 : ..... [1]

**(d)** A national park lies **inside** the triangle $ABC$.
The four boundaries of the national park are

- equidistant from $C$ and $B$
- equidistant from $AC$ and $CB$
- 15 km from $CB$
- along $AB$.

On the scale drawing, shade the region which represents the national park.
**Leave in your construction arcs.** [7]

**(e)** On the scale drawing, a lake inside the national park has area 0.4 $cm^2$.

Calculate the actual area of the lake.

*Answer(e)* ..... $km^2$ [2]

**8** **(a)** Factorise $x^2 - 3x - 10$.

*Answer(a)* ..... [2]

**(b)** **(i)** Show that $\frac{x+2}{x+1} + \frac{3}{x} = 3$ simplifies to $2x^2 - 2x - 3 = 0$.

*Answer(b)*(i)

[3]

**(ii)** Solve $2x^2 - 2x - 3 = 0$.
Give your answers correct to 3 decimal places.
Show all your working.

*Answer(b)*(ii) $x$ = ..... or $x$ = ..... [4]

**(c)** Simplify $\frac{2x+3}{x+2} - \frac{x}{x+1}$.

*Answer(c)* ..... [4]

**9** The first three diagrams in a sequence are shown below.
The diagrams are made by drawing lines of length 1 cm.

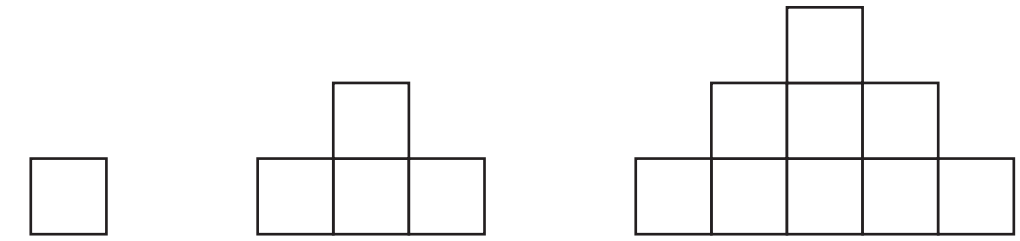


Diagram 1 Diagram 2 Diagram 3

**(a)** The areas of each of the first three diagrams are shown in this table.

| Diagram | 1 | 2 | 3 |
|---|---|---|---|
| Area ($cm^2$) | 1 | 4 | 9 |

**(i)** Find the area of Diagram 4.

*Answer(a)*(i) ..... $cm^2$ [1]

**(ii)** Find, in terms of $n$, the area of Diagram $n$.

*Answer(a)*(ii) ..... $cm^2$ [1]

**(b)** The numbers of 1 cm lines needed to draw each of the first three diagrams are shown in this table.

| Diagram | 1 | 2 | 3 |
|---|---|---|---|
| Number of 1 cm lines | 4 | 13 | 26 |

**(i)** Find the number of 1 cm lines needed to draw Diagram 4.

*Answer(b)*(i) ..... [1]

**(ii)** In which diagram are 118 lines of length 1 cm needed?

*Answer(b)*(ii) ..... [1]

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**(c)** The **total** number of 1 cm lines needed to draw both Diagram 1 and Diagram 2 is 17.
The **total** number of 1 cm lines needed to draw all of the first $n$ diagrams is

$$\frac{2}{3}n^3 + an^2 + bn.$$

Find the value of $a$ and the value of $b$.
Show all your working.

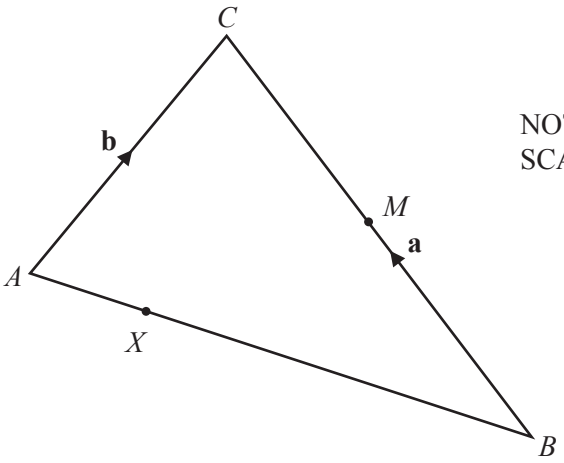
*Answer(c)* $a$ = .....

$b$ = ..... [6]

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**Question 10 is printed on the next page.**

**10**




NOT TO SCALE

$\overrightarrow{BC} = \mathbf{a}$ and $\overrightarrow{AC} = \mathbf{b}$.

**(a)** Find $\overrightarrow{AB}$ in terms of **a** and **b**.

*Answer(a)* $\overrightarrow{AB}$ = ..... [1]

**(b)** $M$ is the midpoint of $BC$.
$X$ divides $AB$ in the ratio 1 : 4.

Find $\overrightarrow{XM}$ in terms of **a** and **b**.
Show all your working and write your answer in its simplest form.

*Answer(b)* $\overrightarrow{XM}$ = ..... [4]

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