UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9387816354

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2011**

2 hours 30 minutes

Candidates answer on the Question Paper.

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

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 a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, 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 π 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.

This document consists of **15** printed pages and **1** blank page.

For Examiner's Use

1 **(a)** Work out the following.

(i) $\dfrac{1}{0.2^2}$

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

(ii) $\sqrt{5.1^2 + 4 \times 7.3^2}$

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

(iii) $25^{\frac{1}{2}} \times 1000^{-\frac{2}{3}}$

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

(b) Mia invests \$7500 at 3.5% per year **simple** interest.
Calculate the total amount she has after 5 years.

Answer(b) \$ ..... [3]

(c) Written as the product of prime factors $48 = 2^4 \times 3$.

(i) Write 60 as the product of prime factors.

Answer(c)(i) ..... [2]

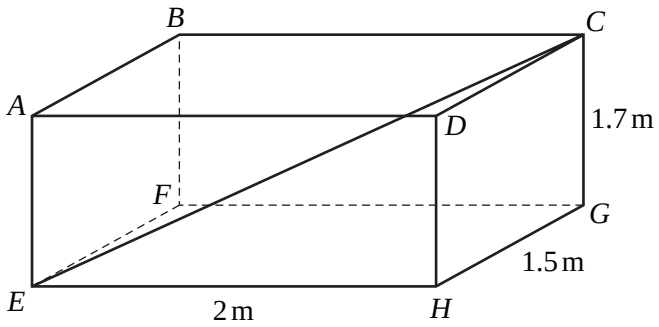
(ii) Work out the highest common factor (HCF) of 48 and 60.

Answer(c)(ii) ..... [2]

(iii) Work out the lowest common multiple (LCM) of 48 and 60.

Answer(c)(iii) ..... [2]

2



NOT TO SCALE

The diagram shows a box *ABCDEFGH* in the shape of a cuboid measuring 2 m by 1.5 m by 1.7 m.

(a) Calculate the length of the diagonal *EC*.

Answer(a) EC = ... m [4]

(b) Calculate the angle between *EC* and the base *EFGH*.

Answer(b) ..... [3]

(c) (i) A rod has length 2.9 m, correct to 1 decimal place.

What is the upper bound for the length of the rod?

Answer(c)(i) ..... m [1]

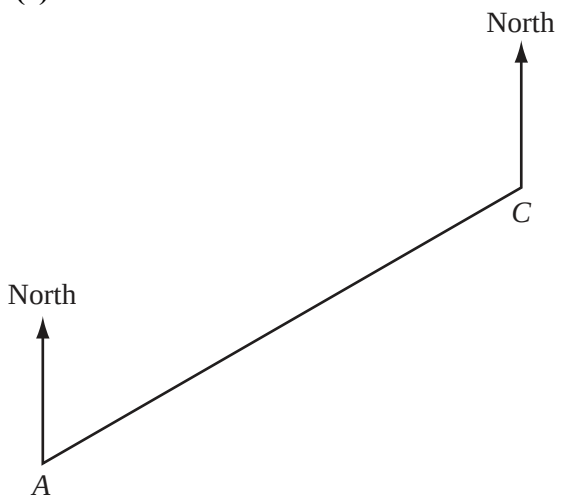
(ii) Will the rod fit completely in the box?

Give a reason for your answer.

Answer(c)(ii) ..... [1]

For Examiner's Use

3 (a)



The scale drawing shows the positions of two towns *A* and *C* on a map.
On the map, 1 centimetre represents 20 kilometres.

(i) Find the distance in kilometres from town *A* to town *C*.

Answer(a)(i) ..... km [2]

(ii) Measure and write down the bearing of town *C* from town *A*.

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

(iii) Town *B* is 140 km from town *C* on a bearing of 150°.

Mark accurately the position of town *B* on the scale drawing. [2]

(iv) Find the bearing of town *C* from town *B*.

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

(v) A lake on the map has an area of 0.15 cm^2.

Work out the actual area of the lake.

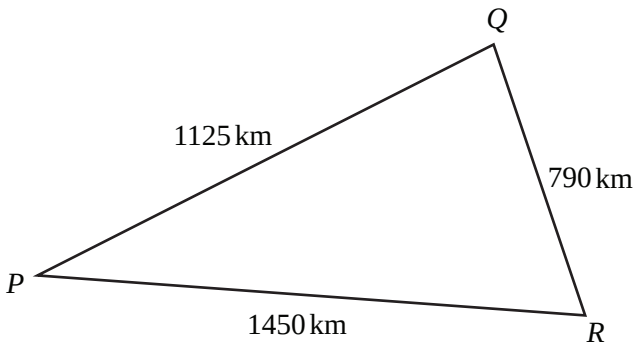
Answer(a)(v) ..... km^2 [2]

(b) A plane leaves town C at 11 57 and flies 1500 km to another town, landing at 14 12.

Calculate the average speed of the plane.

Answer(b) ..... km/h [3]

(c)



NOT TO SCALE

The diagram shows the distances between three towns P, Q and R.

Calculate angle PQR.

Answer(c) Angle PQR = ... [4]

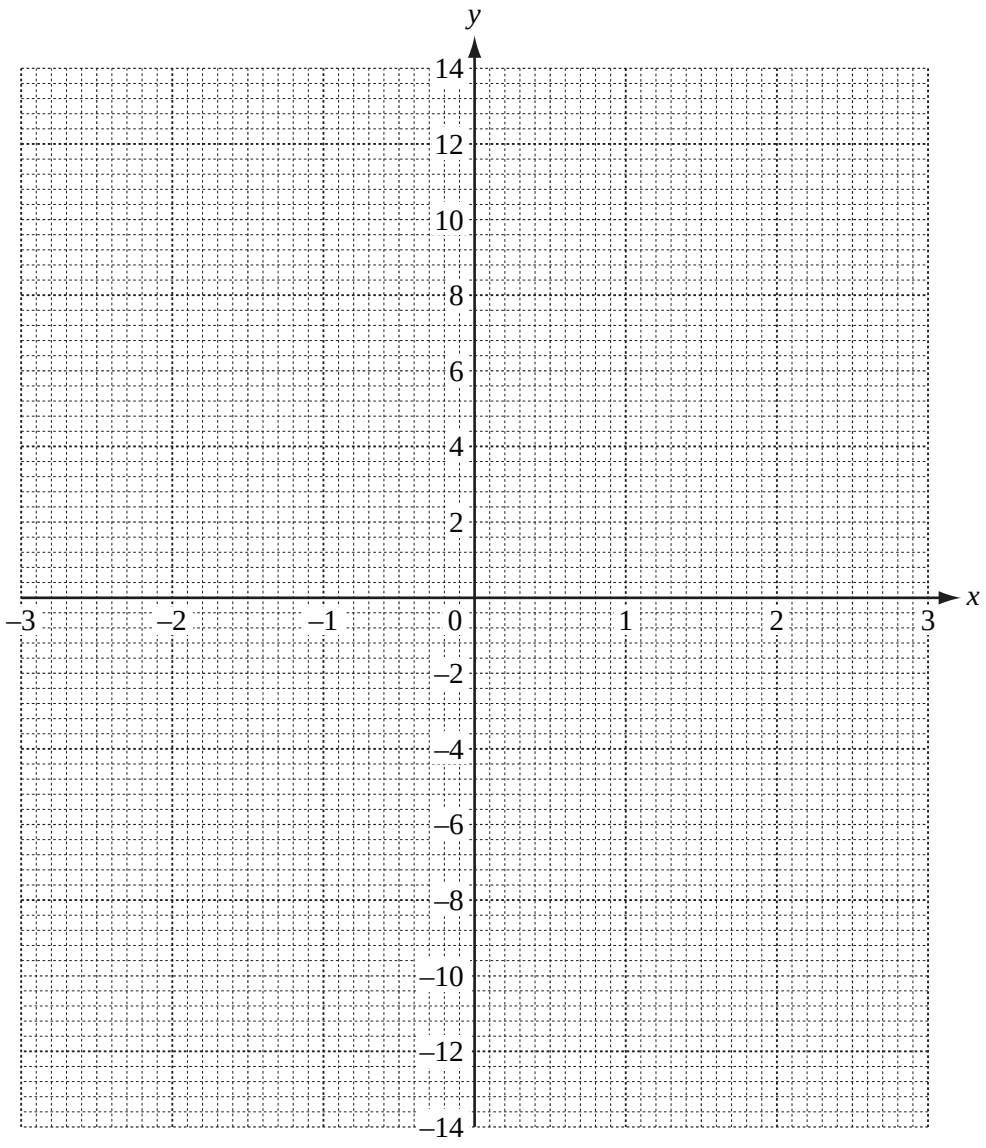
For Examiner's Use

4 **(a)** Complete the table of values for the function $y = x^2 - \frac{3}{x}$, $x \neq 0$.

x	-3	-2	-1	-0.5	-0.25		0.25	0.5	1	2	3
y	10	5.5		6.3	12.1		-11.9			2.5	8

[3]

(b) Draw the graph of $y = x^2 - \frac{3}{x}$ for $-3 \leqslant x \leqslant -0.25$ and $0.25 \leqslant x \leqslant 3$.



[5]

For Examiner's Use

(c) Use your graph to solve $x^2 - \frac{3}{x} = 7$.

Answer(c) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(d) Draw the tangent to the curve where $x = -2$.
Use the tangent to calculate an estimate of the gradient of the curve where $x = -2$.

Answer(d) ..... [3]

For Examiner's Use

5 **(a)** Solve $9 < 3n + 6 \leqslant 21$ for integer values of n.

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

(b) Factorise completely.

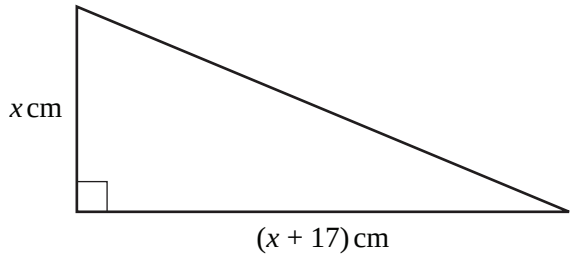
(i) $2x^2 + 10xy$

Answer(b)(i) ..... [2]

(ii) $3a^2 - 12b^2$

Answer(b)(ii) ..... [3]

(c)



NOT TO SCALE

The area of this triangle is $84\,\text{cm}^2$.

(i) Show that $x^2 + 17x - 168 = 0$.

Answer (c)(i)

[2]

(ii) Factorise $x^2 + 17x - 168$.

Answer(c)(ii) ..... [2]

(iii) Solve $x^2 + 17x - 168 = 0$.

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

(d) Solve

$$\frac{15 - x}{2} = 3 - 2x.$$

For Examiner's Use

Answer(d) $x =$ ..... [3]

(e) Solve $2x^2 - 5x - 6 = 0$.

Show all your working and give your answers correct to 2 decimal places.

Answer(e) $x =$ ..... or $x =$ ..... [4]

6

For Examiner's Use

Time (t mins)	$0 < t \leqslant 20$	$20 < t \leqslant 35$	$35 < t \leqslant 45$	$45 < t \leqslant 55$	$55 < t \leqslant 70$	$70 < t \leqslant 80$
Frequency	6	15	19	37	53	20

The table shows the times taken, in minutes, by 150 students to complete their homework on one day.

(a) (i) In which interval is the median time?

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

(ii) Using the mid-interval values 10, 27.5, ……..calculate an estimate of the mean time.

Answer(a)(ii) ..... min [3]

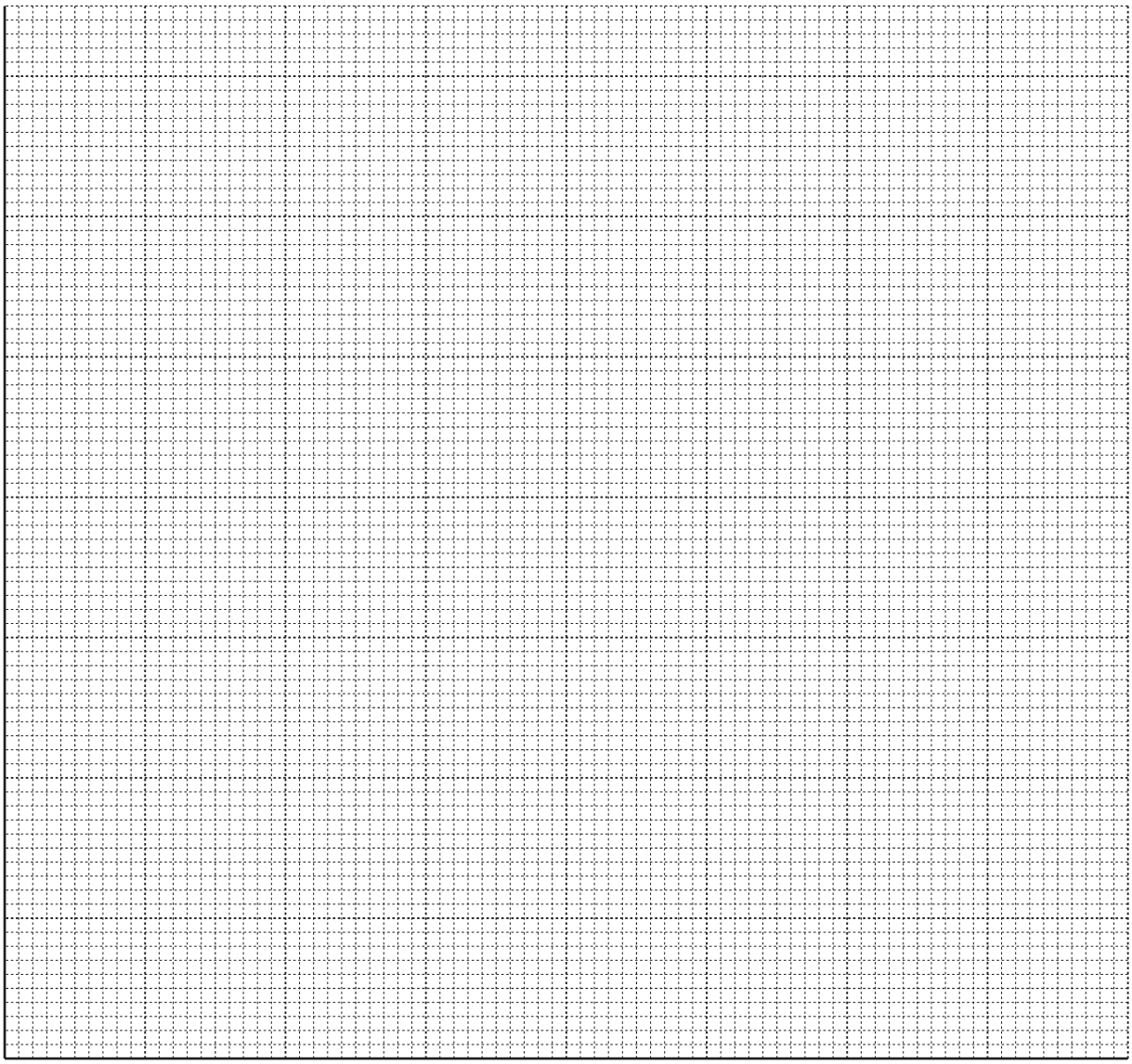
(b) (i) Complete the table of cumulative frequencies.

Time (t mins)	$t \leqslant 20$	$t \leqslant 35$	$t \leqslant 45$	$t \leqslant 55$	$t \leqslant 70$	$t \leqslant 80$
Cumulative frequency	6	21				

[2]

(ii) On the grid, label the horizontal axis from 0 to 80, using the scale 1 cm represents 5 minutes and the vertical axis from 0 to 150, using the scale 1 cm represents 10 students.

Draw a cumulative frequency diagram to show this information. [5]



For Examiner's Use

(c) Use your graph to estimate

(i) the median time, *Answer(c)*(i) ..... min [1]

(ii) the inter-quartile range, *Answer(c)*(ii) ..... min [2]

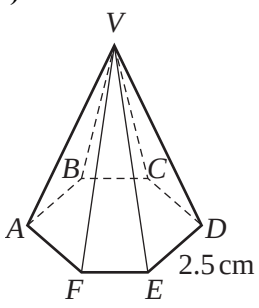
(iii) the number of students whose time was in the range $50 < t \leqslant 60$, *Answer(c)*(iii) ..... [1]

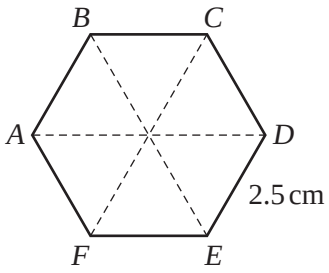
(iv) the probability, as a fraction, that a student, chosen at random, took longer than 50 minutes, *Answer(c)*(iv) ..... [2]

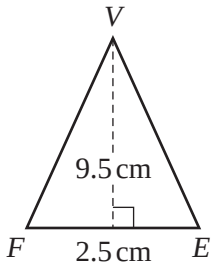
(v) the probability, as a fraction, that two students, chosen at random, both took longer than 50 minutes. *Answer(c)*(v) ..... [2]

For Examiner's Use

7 (a)







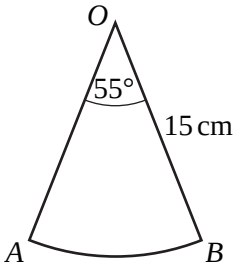
NOT TO SCALE

A solid pyramid has a **regular hexagon** of side 2.5 cm as its base.
Each sloping face is an isosceles triangle with base 2.5 cm and height 9.5 cm.

Calculate the **total** surface area of the pyramid.

Answer(a) ..... cm^2 [4]

(b)



NOT TO SCALE

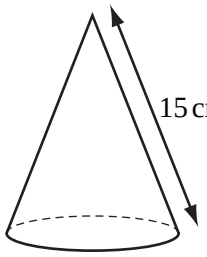
A sector *OAB* has an angle of 55° and a radius of 15 cm.

Calculate the area of the sector and show that it rounds to 108 cm^2, correct to 3 significant figures.

Answer (b)

[3]

(c)



NOT TO SCALE

The sector radii *OA* and *OB* in **part (b)** are joined to form a cone.

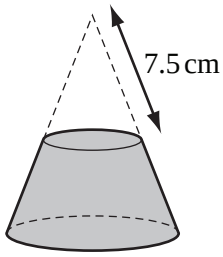
(i) Calculate the base radius of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

Answer(c)(i) ..... cm [2]

(ii) Calculate the perpendicular height of the cone.

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

(d)



NOT TO SCALE

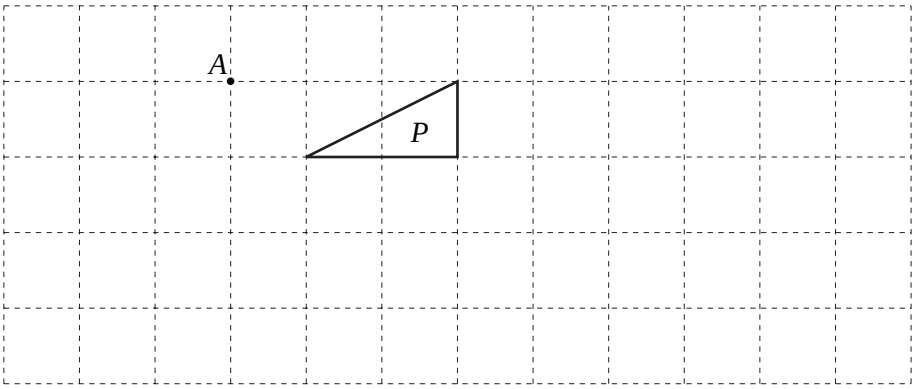
A solid cone has the same dimensions as the cone in **part (c)**.
A small cone with slant height 7.5 cm is removed by cutting parallel to the base.

Calculate the volume of the remaining solid.

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

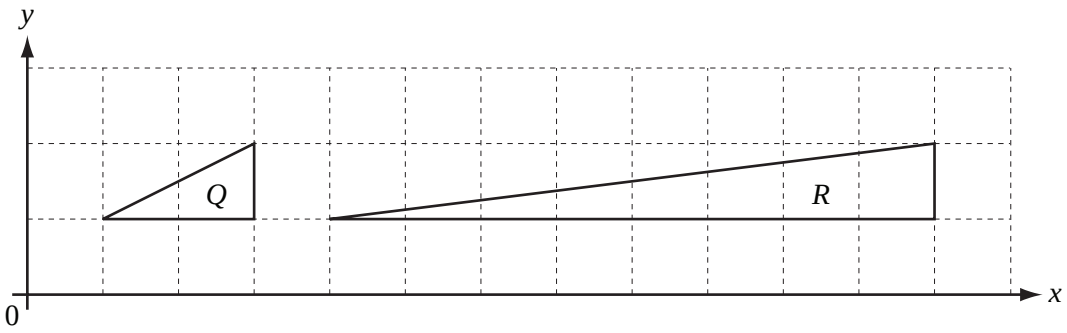
Answer(d) ..... cm^3 [3]

8 **(a)**



Draw the enlargement of triangle P with centre A and scale factor 2. [2]

(b)



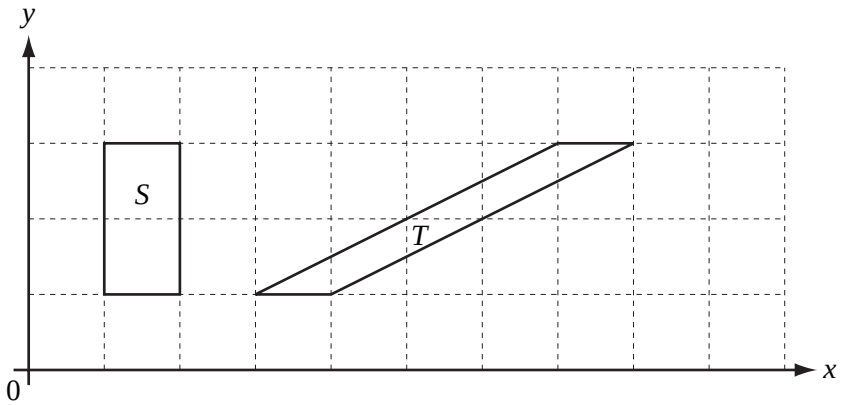
(i) Describe fully the **single** transformation which maps shape Q onto shape R.

Answer(b)(i) ..... [3]

(ii) Find the matrix which represents this transformation.

Answer(b)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(c)



Describe fully the **single** transformation which maps shape S onto shape T.

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

For Examiner's Use

9 **(a)** **(i)** Work out the first 3 terms of the sequence whose nth term is $n(n + 2)$.

Answer(a)(i) ..... , ... , ... [2]

(ii) Which term in this sequence is equal to 168?

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

(b) Find a formula for the nth term of the following sequences.

(i) 5 8 11 14 17 ……

Answer(b)(i) ..... [2]

(ii) 1 2 4 8 16 ……

Answer(b)(ii) ..... [2]

(c)

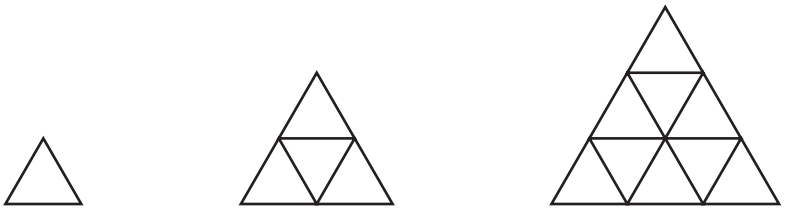


Diagram 1 Diagram 2 Diagram 3

A sequence of diagrams is formed by drawing equilateral triangles each of side one centimetre.
Diagram 1 has 3 one centimetre lines.
Diagram 2 has 9 one centimetre lines.

The formula for the **total** number of one centimetre lines needed to draw **all of the first *n* diagrams** is

$$an^3 + bn^2 + n.$$

Find the values of a and b.

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

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

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