CANDIDATE
NAME

CENTRE
NUMBER

CANDIDATE
NUMBER

MATHEMATICS

0580/03, 0581/03

Paper 3 (Core)

October/November 2007

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator   Geometrical instruments
                           Mathematical tables (optional)   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 soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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 104.

For Examiner's Use

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

1 Margarita keeps a record of all her marks for science experiments, as shown in the table below.

Mark	5	6	7	8	9	10
Frequency	1	5	10	9	7	3

(a) **(i)** How many science experiments did Margarita do?

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

(ii) Write down the mode.

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

(iii) Find the median.

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

(iv) Calculate the mean.

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

(b) Margarita draws a pie chart to show this information.
The sectors for her marks of 5, 6, 7 and 8 have already been drawn.
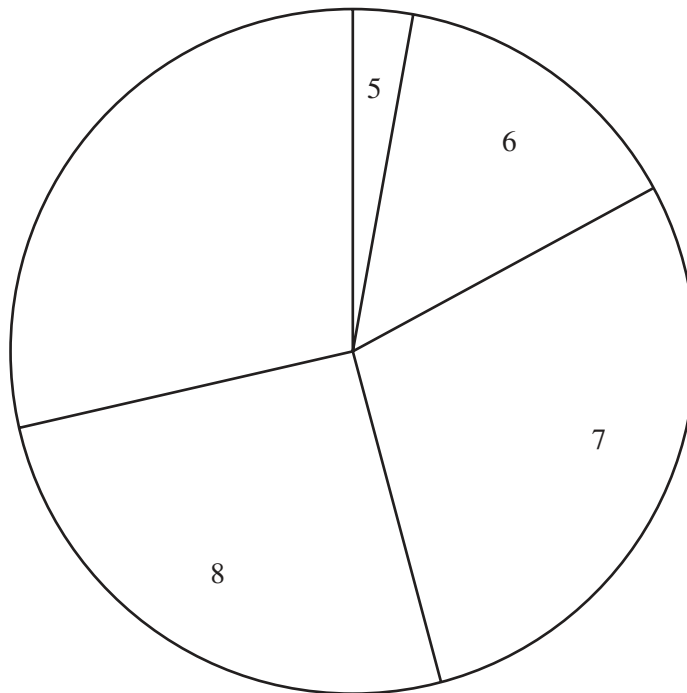
(i) Calculate the angle of the sector for her mark of 9.

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

(ii) Complete the pie chart accurately. [1]

2
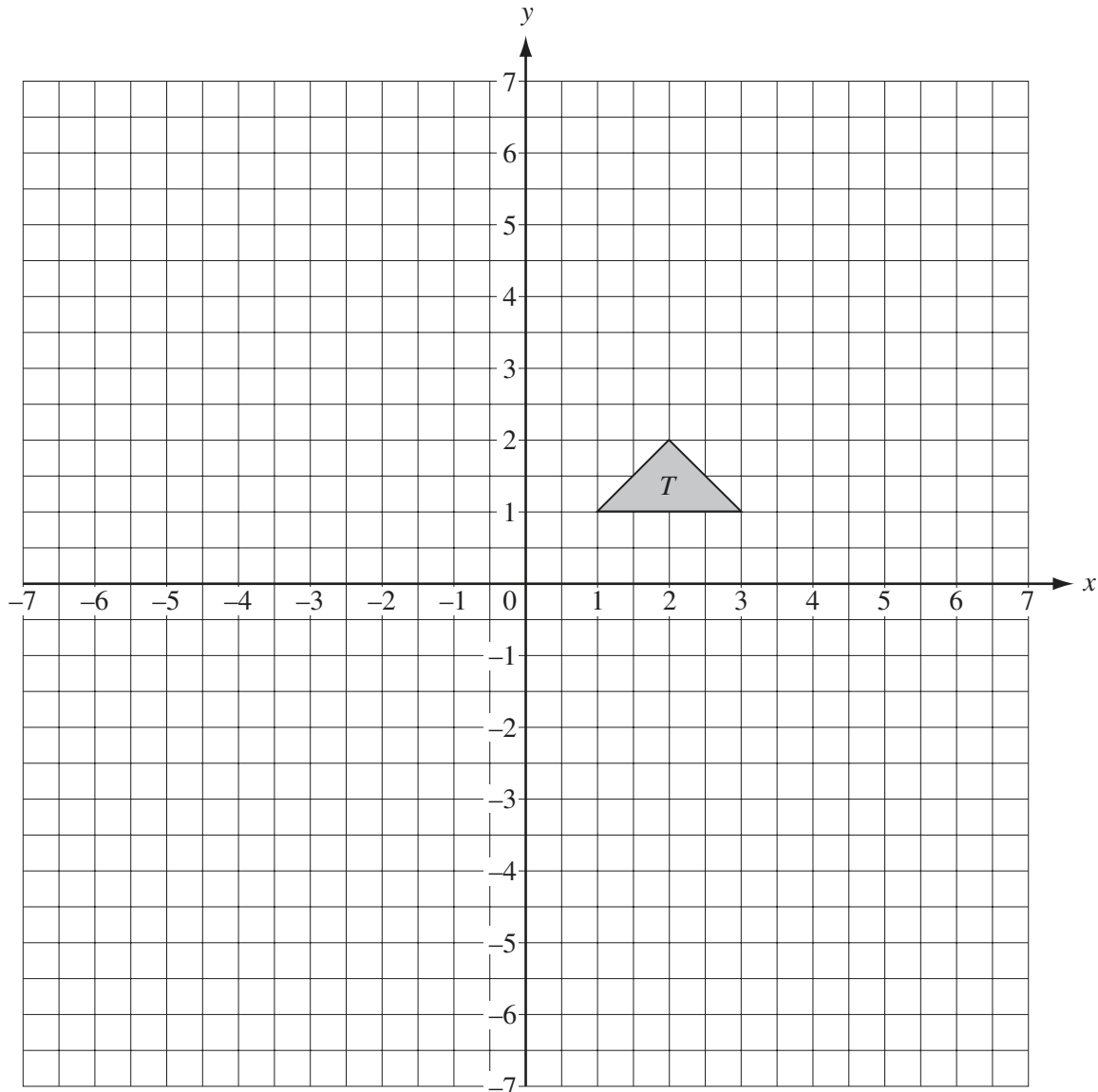
(a) Draw the image of triangle *T* after translation by the vector $\begin{pmatrix} -6 \\ 3 \end{pmatrix}$. Label it *A*.   [2]

(b) Draw the image of triangle *T* after reflection in the line $y = -1$. Label it *B*.   [2]

(c) Draw the image of triangle *T* after rotation through 180° about the point (0, 0). Label it *C*.   [2]

(d) Draw the image of triangle *T* after enlargement, centre (0, 0), scale factor 2. Label it *D*.   [2]

(e) Describe clearly the **single** transformation which maps triangle *D* onto triangle *T*.

Answer(e) ....   [3]

3 **(a)** Complete the table for the function $y = \dfrac{36}{x}$, $(x \neq 0)$.

x	−6	−5	−4	−3	−2	−1		1	2	3	4	5	6
y		−7.2	−9		−18				18		9	7.2	

[3]

(b) On the grid below, draw the graph of $y = \dfrac{36}{x}$ for $-6 \leqslant x \leqslant -1$ and $1 \leqslant x \leqslant 6$.
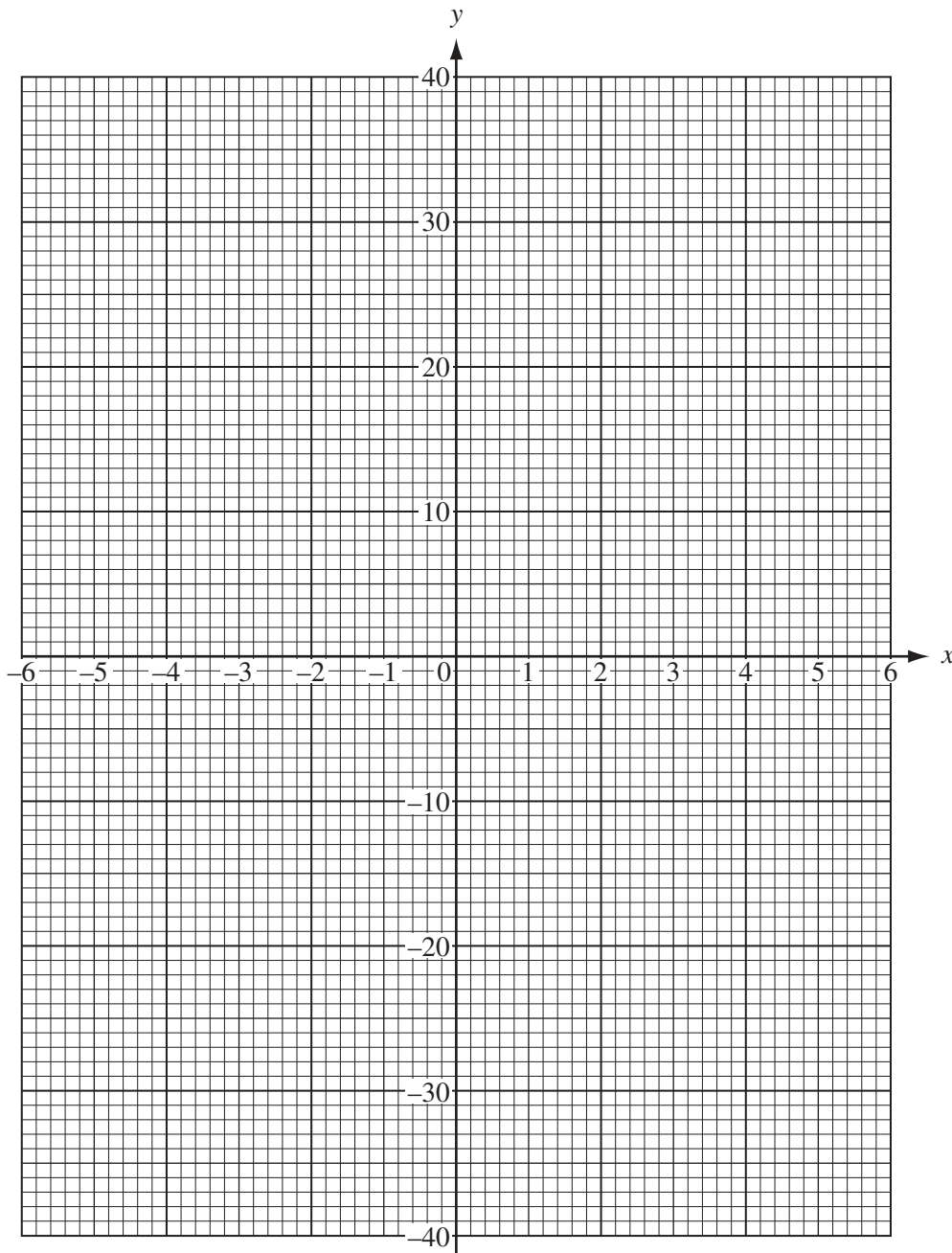
[4]

(c) Use your graph to find x when $y = 21$.

Answer(c) x = ... [1]

(d) Complete the table for the function $y = x^2$.

x	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
y		25	16		4	1		1	4		16	25	

[2]

(e) On the same grid, draw the graph of $y = x^2$ for $-6 \leqslant x \leqslant 6$. [4]

(f) Write down the co-ordinates of the point of intersection of the graphs of $y = \dfrac{36}{x}$ and $y = x^2$.

Answer(f)(............... , ...) [1]

4
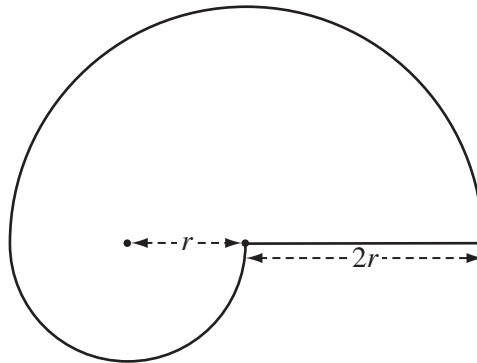
The area of the shape is given by the formula $A = \dfrac{5\pi r^2}{2}$.

(a) Calculate the area when $r = 3$ cm.

Answer(a) A = ... cm^2 [2]

(b) Calculate the value of r when $A = 200$ cm^2.

Answer(b) r = ... cm [3]

(c) Make r the subject of the formula.

Answer(c) .... [3]

5 **(a)** $\qquad$ –4 $\quad$ –16 $\quad$ 0.12 $\quad$ 7 $\quad$ 144 $\quad$ $\sqrt{7}$ $\quad$ $2\frac{2}{3}$

From this list of numbers, write down

(i) the smallest number,

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

(ii) a natural number,

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

(iii) a square number,

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

(iv) an irrational number.

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

(b) Write down 40 as a **product** of prime numbers.
(1 is not a prime number.)

Answer(b) 40 = ... [2]

(c) Three pairs of prime numbers have a **sum** of 40.

One pair is 3 and 37.

Find the other two pairs.

Answer(c) .... and ....

.... and .... [2]

6 **(a)** Pencils cost 5 cents each and erasers cost 4 cents each.

    (i) Work out the **total** cost of 10 pencils and 7 erasers.

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

    (ii) Write down, in terms of p and e, the **total** cost of p pencils and e erasers.

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

(b) The cost of a pen is x cents and the cost of a ruler is y cents.

2 pens and 3 rulers have a total cost of 57 cents.

5 pens and 1 ruler have a total cost of 58 cents.

  (i) Write down two equations in x and y.

Answer(b)(i) ....

....[2]

  (ii) Find the value of x and the value of y.

Answer(b)(ii) $x =$ ....

$y =$ ....[4]

7

NOT TO SCALE
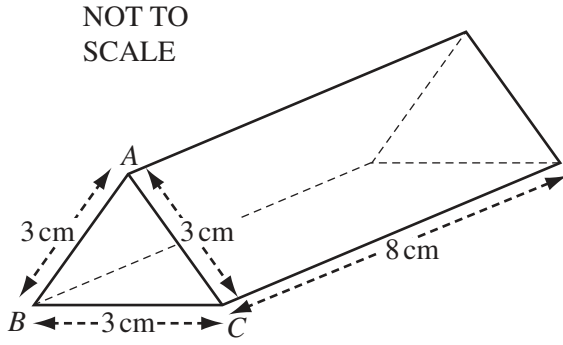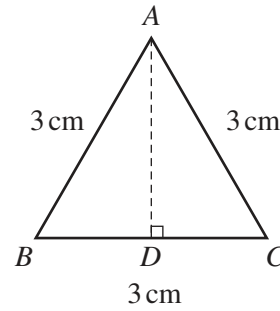
Diagram 1

Diagram 2

A physics teacher uses a set of identical triangular glass prisms in a lesson.
Diagram 1 shows one of the prisms.
Diagram 2 shows the cross-section of one prism.
The triangle ABC is equilateral, with sides of length 3 cm and height AD.

(a) (i) Calculate the length of AD.

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

(ii) Calculate the area of triangle ABC.

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

(iii) The length of the prism is 8 cm. Calculate the volume of the prism.

Answer(a)(iii) .... cm^3 [2]

(b) After the lesson, the glass prisms are put into a box, which is also a triangular prism.
The cross-section is an equilateral triangle, with sides of length 9 cm.
The length of the box is 16 cm.

NOT TO
SCALE

9 cm   9 cm

9 cm   16 cm
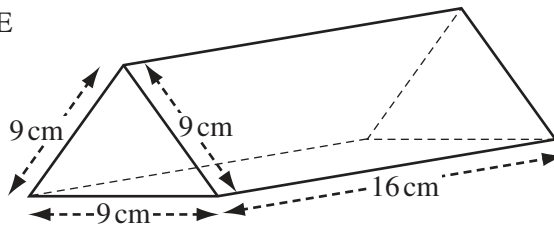
(i) Work out the largest number of glass prisms that can fit into the box.

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

(ii) Sketch a net of the box. (Accurate construction is **not** required.)

[1]

(iii) Calculate the surface area of the box.

Answer(b)(iii)   ....   cm^2 [6]

(iv) The box was made out of plastic, which cost 6 cents per square centimetre.
To make the box, 540 cm^2 of plastic was bought.
Calculate the total cost of the plastic, giving your answer in dollars.

Answer(b)(iv) $ ....   [2]

8 Carlos is in a class of 12 students.
He compares the results of the students in a mathematics test with their results in a history test.
The table shows these results.

Student	A	B	C	D	E	F	G	H	I	J	K	L
Mathematics mark	17	8	11	15	14	19	9	12	19	18	13	15
History mark	10	13	10	8	11	7	14	11	10	11	11	10

(a) A student is chosen at random.
What is the probability that the student scored **more than** 10 marks

(i) in mathematics,

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

(ii) in mathematics and in history,

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

(iii) in at least one subject?

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

(b) The mean mathematics mark is 14.2.
Calculate the mean history mark.

Answer(b) .... [2]

(c)
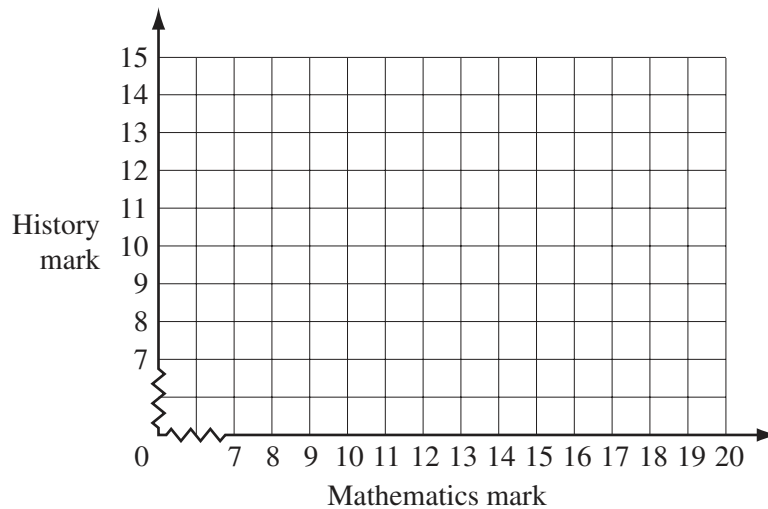
(i) On the grid, plot the points to show the results of the 12 students. [3]

(ii) Draw a line of best fit. [1]

(iii) What type of correlation does this show?

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

9
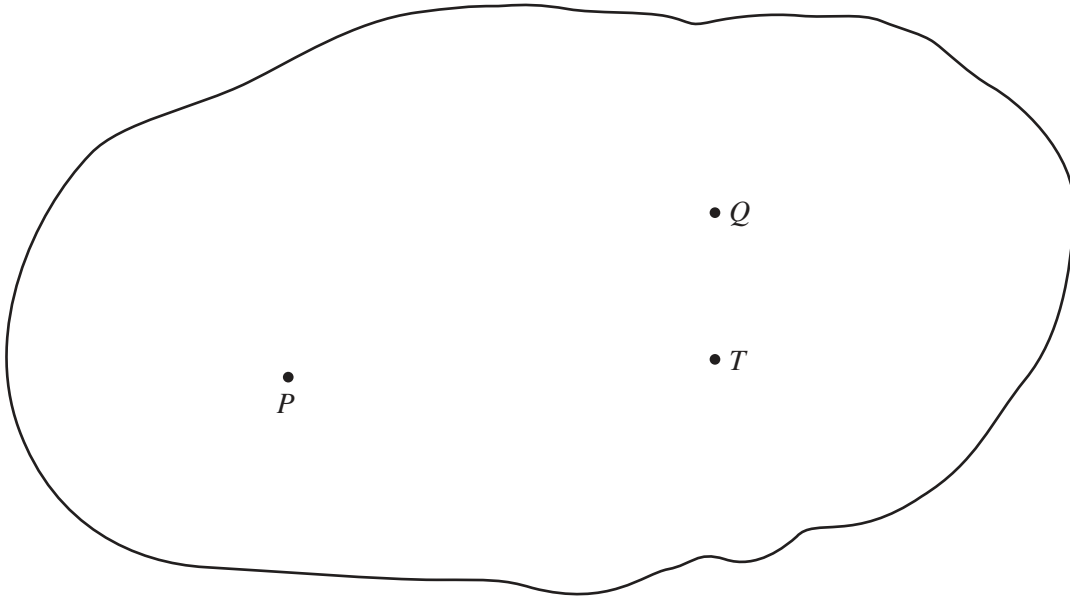
The scale drawing shows a map of a town.
The positions of the town hall, *T*, and two post offices, *P* and *Q*, are marked.
On the scale drawing, 1 centimetre represents 200 metres.

(a) A new post office in the town is to be built so that it is 800 m from *T* **and** equidistant
from *P* and from *Q*.

   (i) On the scale drawing, draw the locus of points which are 800 m from *T*. [1]

   (ii) On the scale drawing, using a straight edge and compasses only, construct the
   locus of points which are equidistant from *P* and from *Q*. [2]

   (iii) Label the position of the new post office *R*. [1]

   (iv) Find the actual distance between post offices *P* and *R*.

   Answer(a)(iv) .... m [2]

(b) On the scale drawing, draw straight lines to make triangle *PQT*.
Using a straight edge and compasses only, construct the locus of points which are
equidistant from *PT* and from *QT*. [2]

(c) On the scale drawing, shade the region inside triangle *PQT*, where points are nearer to *Q*
than to *P* **and** nearer to *PT* than to *QT*. [2]

Question 10 is printed on the next page.

                 [Turn over

10

Diagram 1   Diagram 2   Diagram 3   Diagram 4   Diagram 5
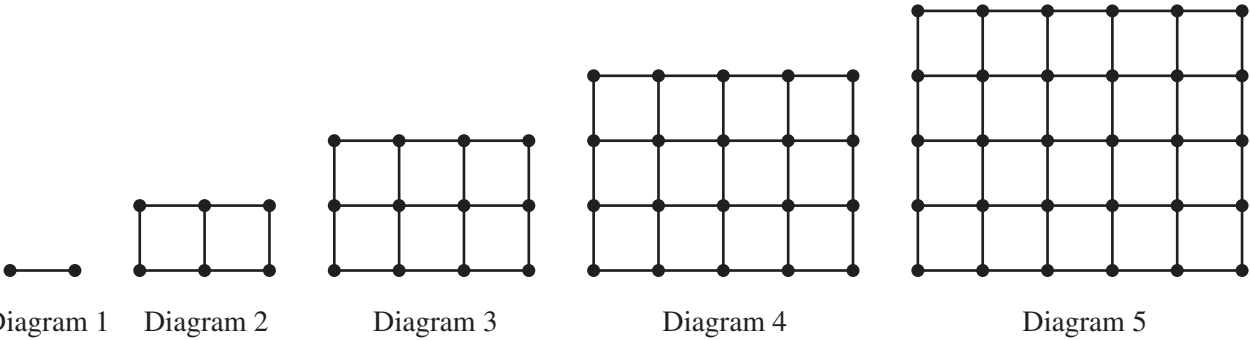
Look at the sequence of five diagrams above.
Diagram 1 has 2 dots and 1 line.
Diagram 2 has 6 dots and 7 lines.

The numbers of dots and lines in each of the diagrams are shown in the table below.

Diagram number	1	2	3	4	5	6	7
Number of dots	2	6	12	20	30		
Number of lines	1	7	17	31	49		

(a) Fill in the empty spaces in the table for Diagrams 6 and 7. [4]

(b) How many dots are there in Diagram n?

Answer(b) .... [2]

(c) The number of lines in Diagram n is $2n^2 - 1$.
Which diagram has 287 lines?

Answer(c) .... [2]