






NAME 

SCHOOL 

TEACHER 

Pre-Leaving Certificate Examination, 2016

Mathematics

Paper 1

Ordinary Level

Time: 2 hours, 30 minutes

300 marks

School stamp

Running total	
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For examiner	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

Grade

Instructions

There are **two** sections in this examination paper:

Section A	Concepts and Skills	150 marks	6 questions
Section B	Contexts and Applications	150 marks	3 questions

Answer all nine questions.

Write your answers in the spaces provided in this booklet. You may lose marks if you do not do so. You may also ask the superintendent for more paper. Label any extra work clearly with the question number and part.

The superintendent will give you a copy of the *Formulae and Tables* booklet. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

You will lose marks if all necessary work is not clearly shown.

You may lose marks if the appropriate units of measurement are not included, where relevant.

You may lose marks if your answers are not given in simplest form, where relevant.

Write the make and model of your calculator(s) here:

Question 3

(25 marks)

- (a) A teacher needs to replace 7 jerseys and 3 balls in the sports kit for the Under-16 team in a school. The total cost of replacing this kit is €495. Let $\text{€}x$ be the cost of a jersey and $\text{€}y$ be the cost of a ball.



- (i) Write down an equation in x and y to represent the cost of this kit.

- (ii) The teacher later finds out he needs to replace 3 of the same-sized jerseys and 2 balls for the Under-14 team at a cost of €255. Write down an equation in x and y to represent the cost of this kit.

- (iii) Solve these simultaneous equations to find the cost of a jersey and the cost of a ball.

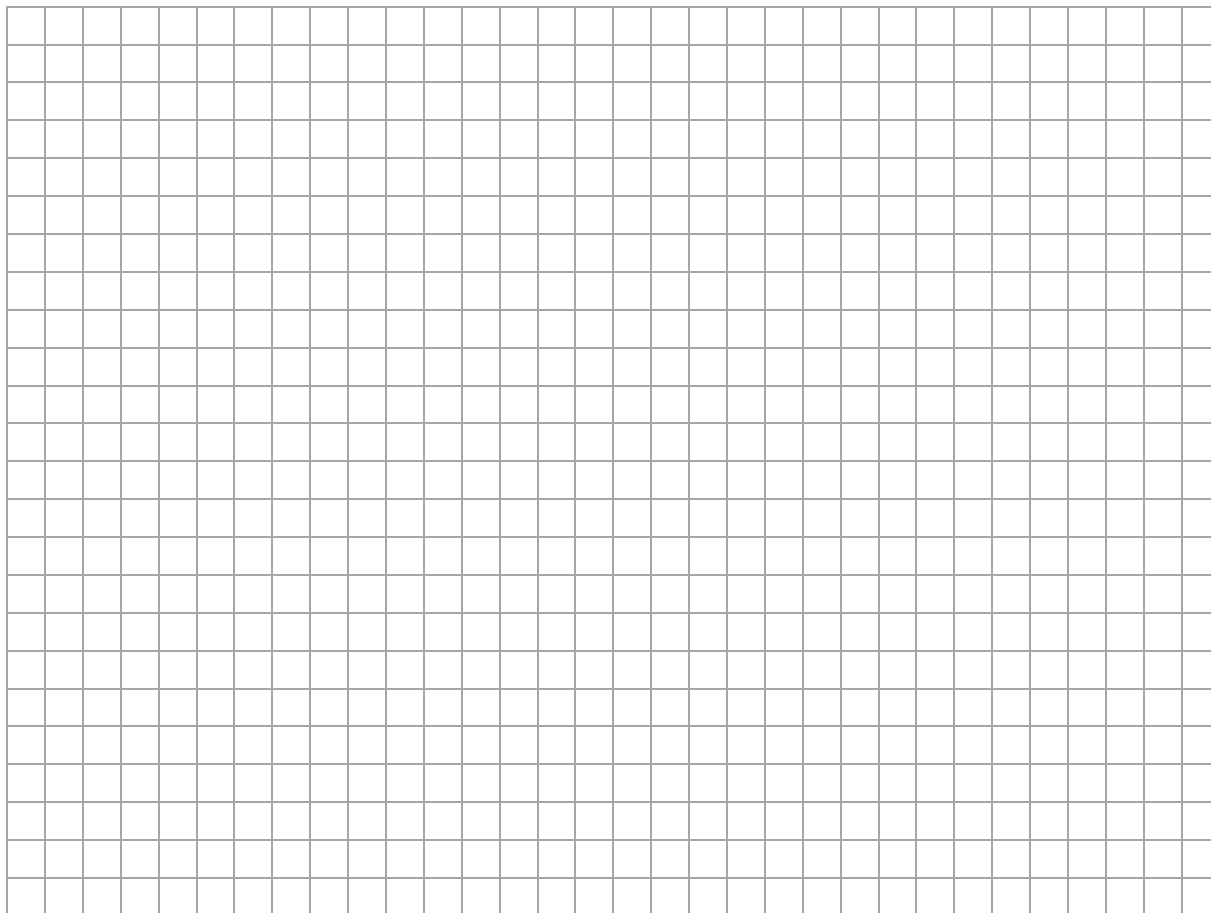
- (b) If the teacher orders everything at the same time, he will receive a discount of 12·5% on all the jerseys. Find the overall percentage discount he will receive on his entire order.

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Question 4

(25 marks)

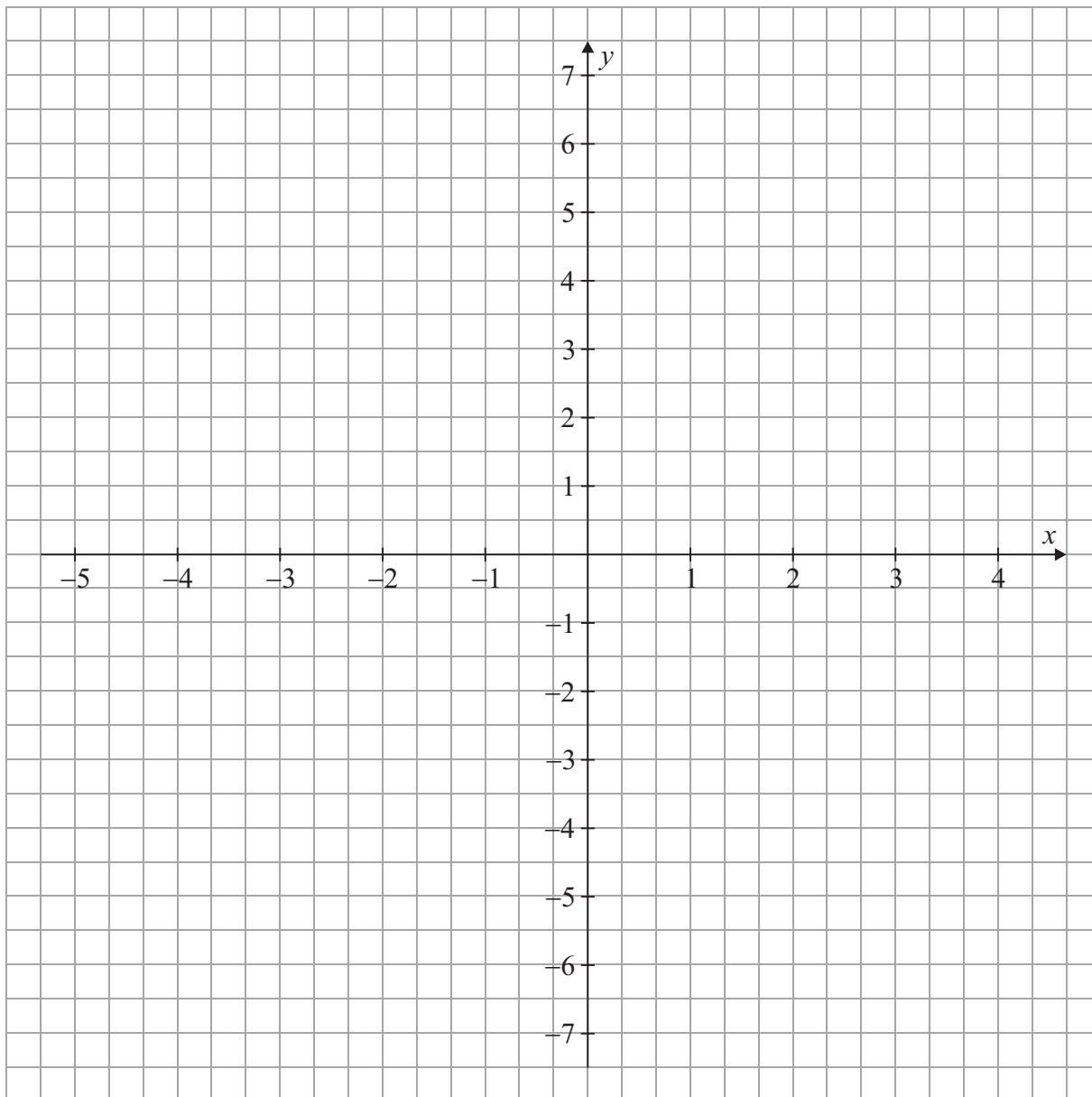
- (a) Solve the equation $x^2 + 2x - 4 = 0$ and give your answers correct to two decimal places.



- (b) Show that the co-ordinates of the turning point of the function $f(x) = x^2 + 2x - 4$, $x \in \mathbb{R}$, are $(-1, -5)$.



- (c) Use your answers to parts (a) and (b) above to sketch the graph of $f(x)$. Show your scale on both axes.

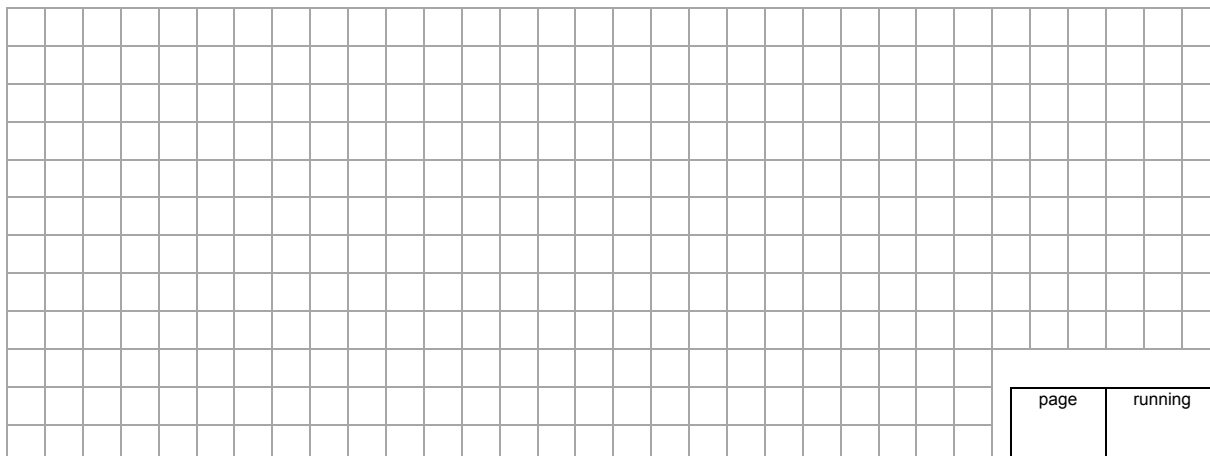


- (d) On the same axes above, sketch the graph of each of the functions:

$$g(x) = f(x) - 2,$$

$$h(x) = f(x - 2).$$

Label each graph clearly.



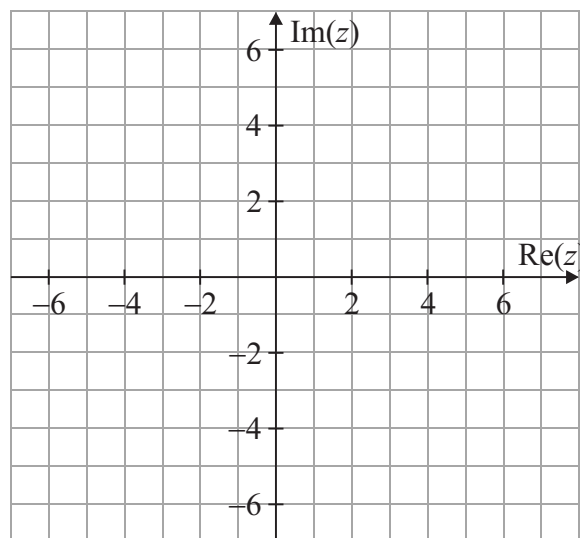
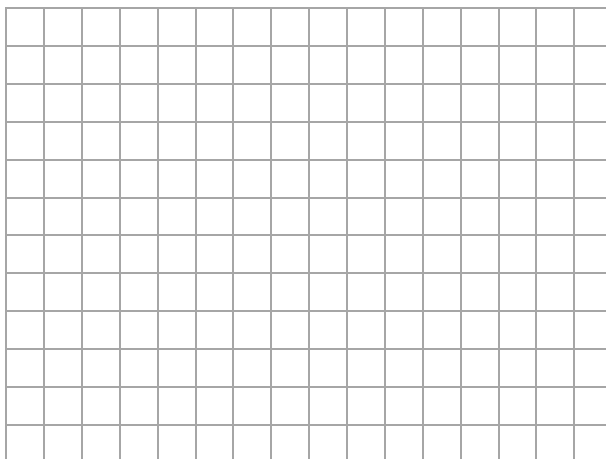
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Question 5

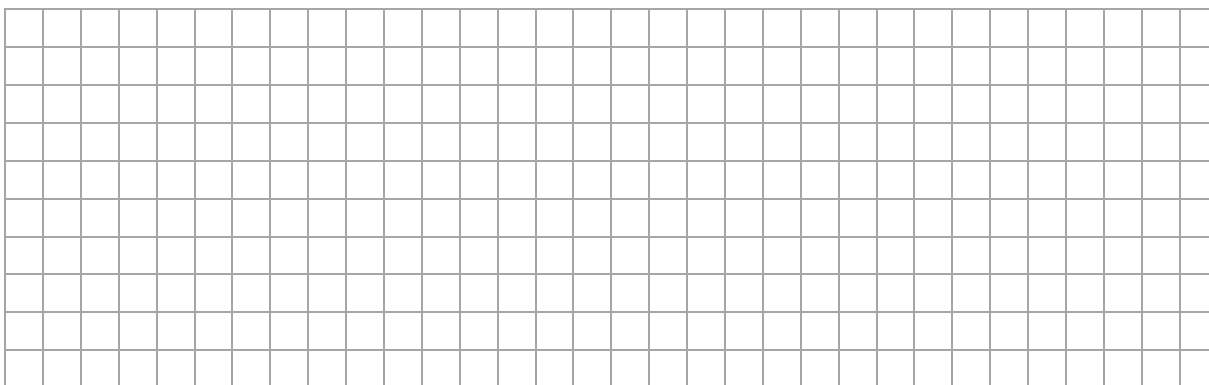
(25 marks)

$z = 2 + 5i$ is a complex number, where $i^2 = -1$.

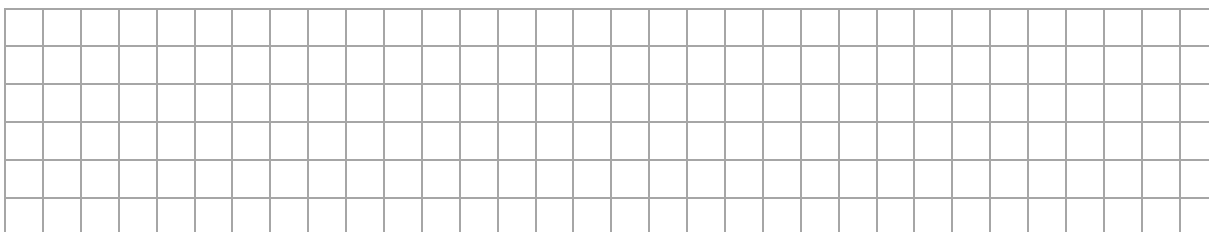
(a) Plot z and iz on the Argand diagram.



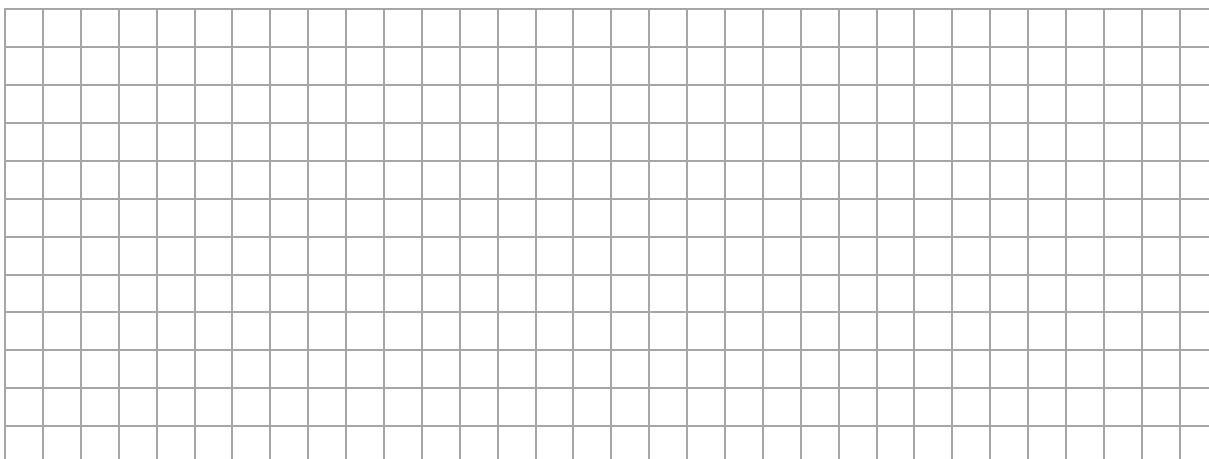
(b) (i) Verify algebraically that $|z| = |iz|$.



(ii) Give a reason why $|z| = |iz|$ will always be true for any complex number z .



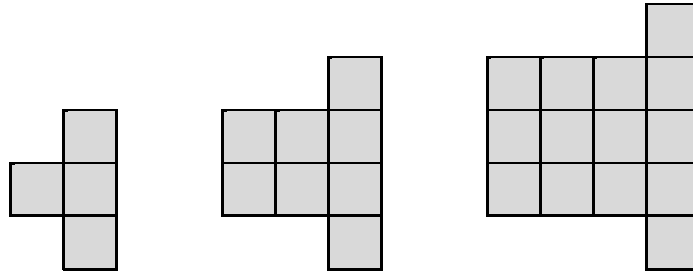
(c) Show that z is a root of the equation $z^2 - 4z + 29 = 0$ and find the other root of the equation.



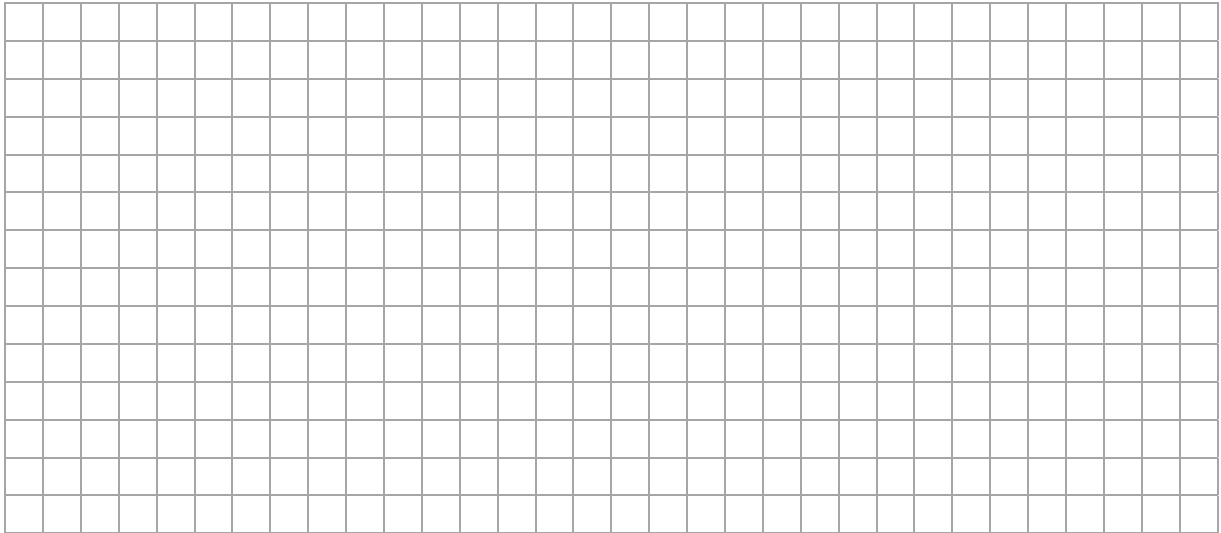
Question 9

(50 marks)

The first three patterns in a sequence of patterns formed by arranging square tiles are shown below.



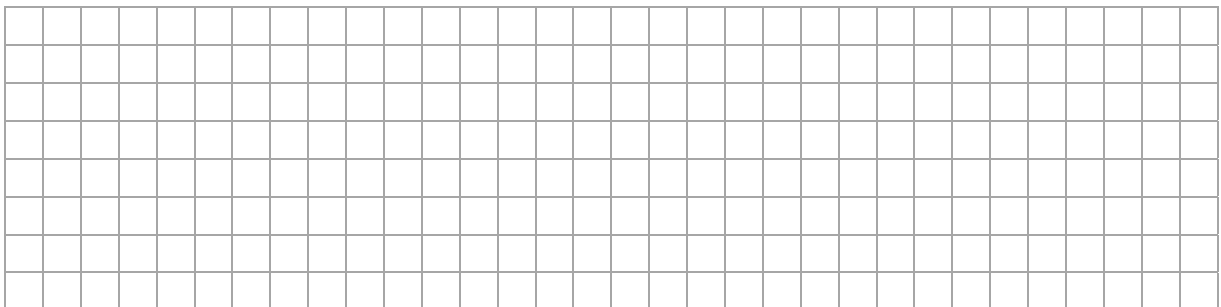
(a) Draw the fourth pattern in the sequence.



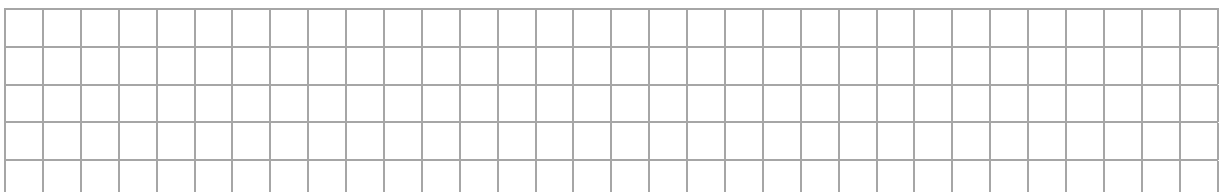
(b) (i) Complete the table below.

Pattern Number	1	2	3	4	5	6	7
Number of Tiles	4	8	14				

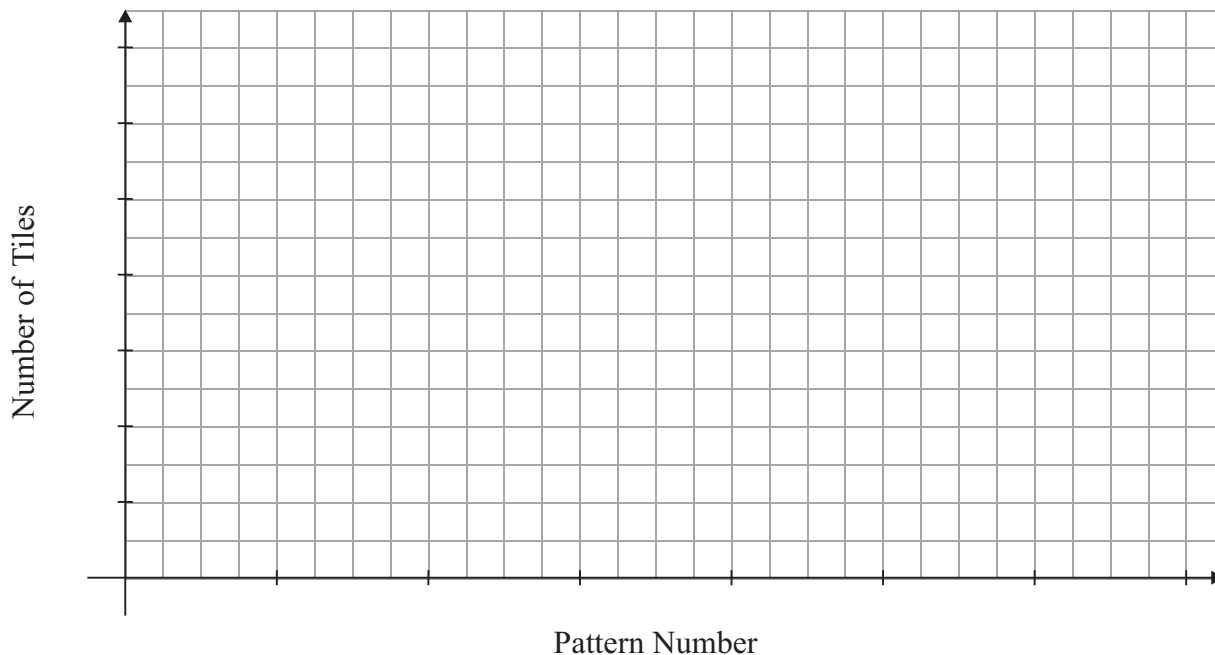
(ii) Show that the number of tiles in each pattern forms a quadratic sequence.



(iii) Write an expression in n for the number of tiles needed to turn the n th pattern into the $(n + 1)$ th pattern.



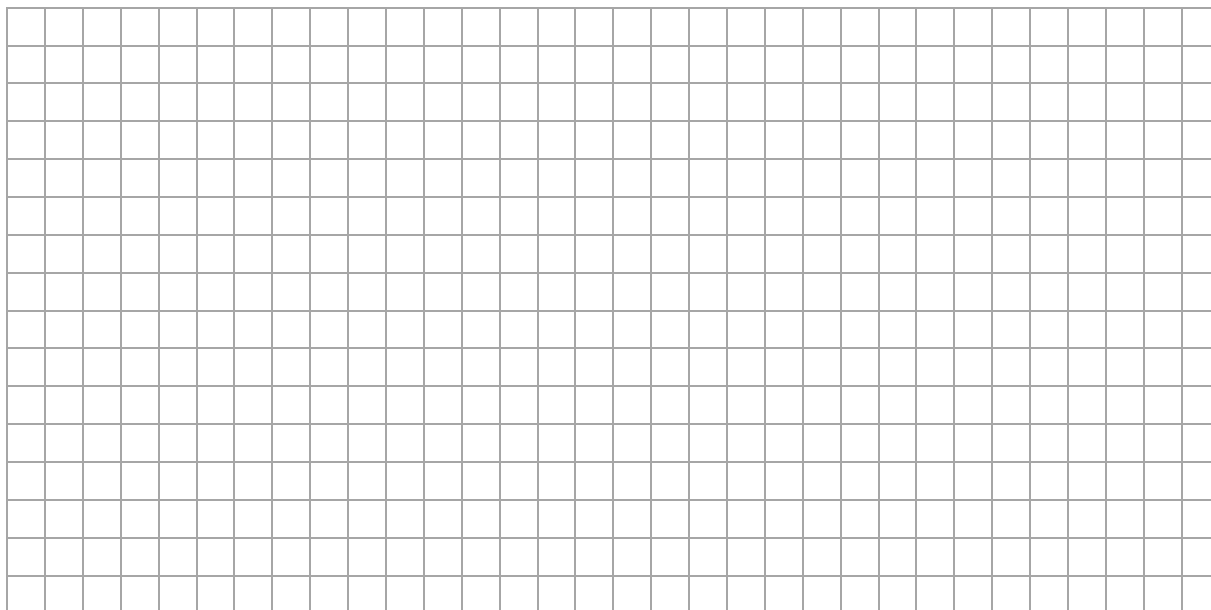
- (c) Draw a graph to represent the number of tiles needed for each of the first seven patterns on the axes below.



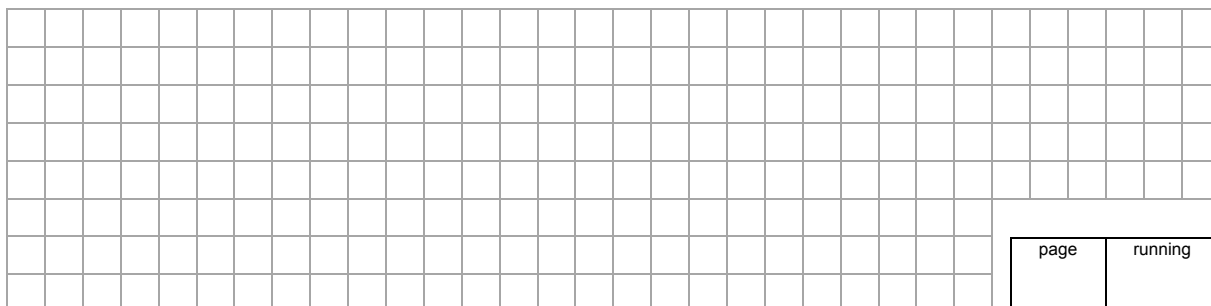
- (d) The number of tiles in the n th pattern is given by the formula

$$T_n = n^2 + bn + c, \quad \text{where } b, c \in \mathbb{Q} \text{ and } n \in \mathbb{N}.$$

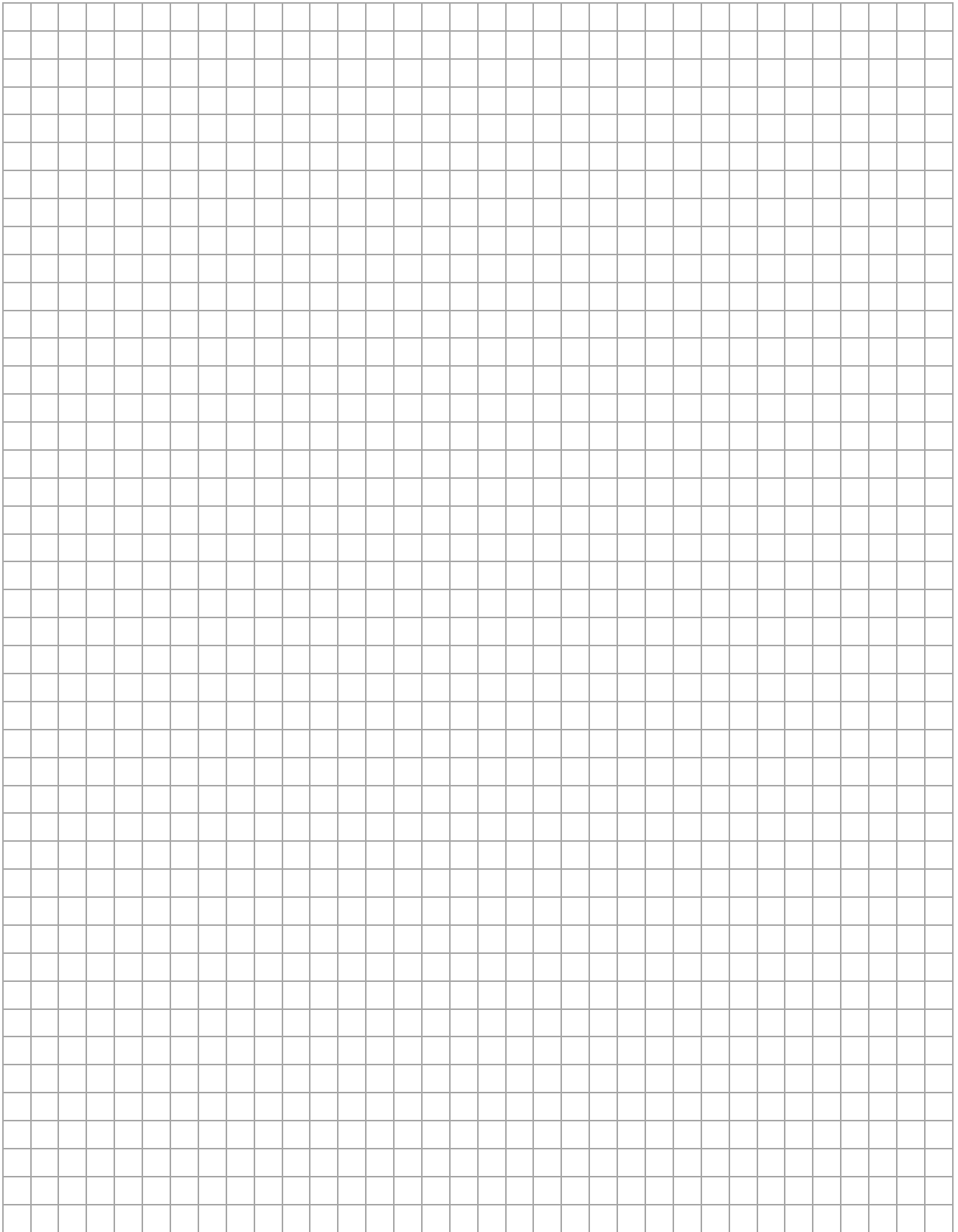
- (i) Find the value of b and the value of c .



- (ii) How many tiles are needed for the 30th pattern in the sequence?



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