



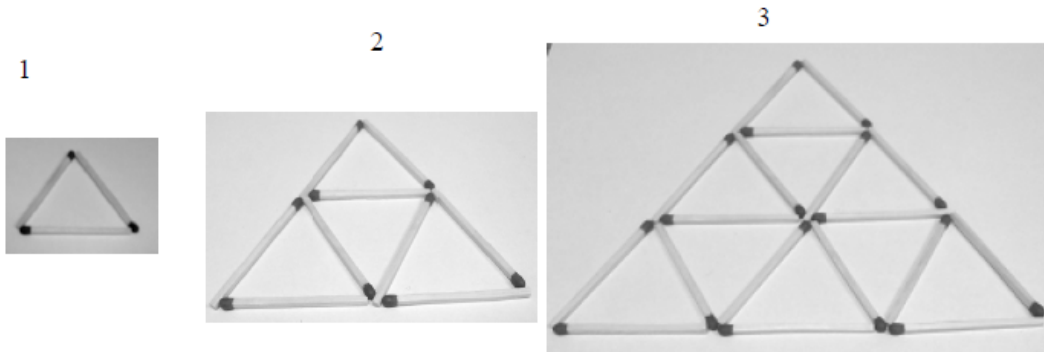
Sequences and Series
Maths Past Exam Questions
Higher Level

Paper 1 – Project Maths – Section B Q9

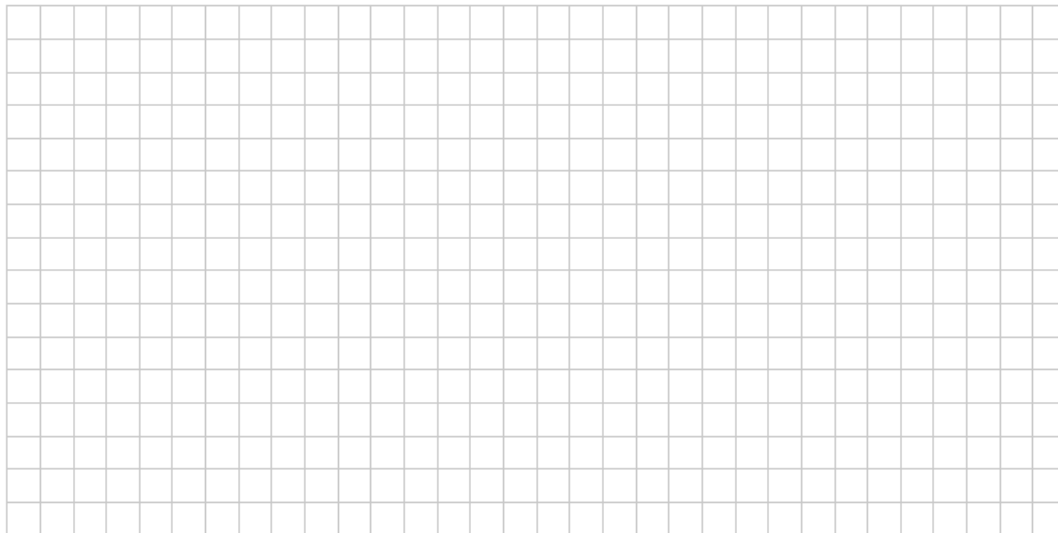
Question 9

(50 marks)

Shapes in the form of small equilateral triangles can be made using matchsticks of equal length. These shapes can be put together into patterns. The beginning of a sequence of these patterns is shown below.



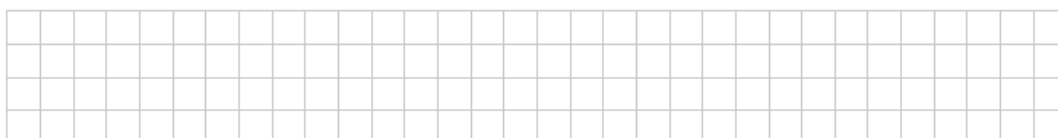
(a) (i) Draw the fourth pattern in the sequence.



(ii) The table below shows the number of small triangles in each pattern and the number of matchsticks needed to create each pattern. Complete the table.

Pattern	1 st	2 nd	3 rd	4 th
Number of small triangles	1		9	
Number of matchsticks	3	9		

(b) Write an expression in n for the number of triangles in the n^{th} pattern in the sequence.



- (c) Find an expression, in n , for the number of matchsticks needed to turn the $(n-1)^{\text{th}}$ pattern into the n^{th} pattern.



- (d) The number of matchsticks in the n^{th} pattern in the sequence can be represented by the function $u_n = an^2 + bn$ where $a, b \in \mathbb{Q}$ and $n \in \mathbb{N}$. Find the value of a and the value of b .



- (e) One of the patterns in the sequence has 4134 matchsticks. How many small triangles are in that pattern?

