An artistic **puzzle**

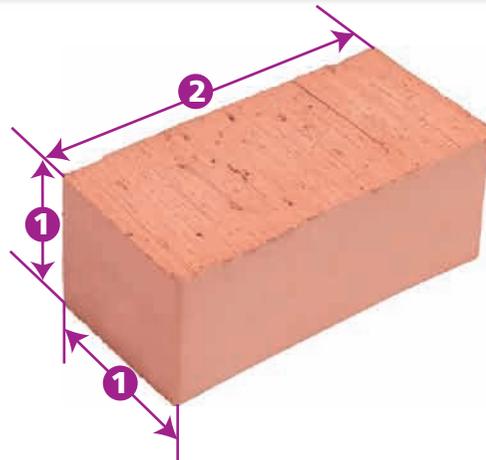Many artists use **mathematical structures** in their work.

Many artworks in the region are free to view in parks, museums, galleries and other public places.

This artwork is in the **Yorkshire Sculpture Park** near Wakefield.

Photograph by Peter Smith – 2007

This sculpture is made entirely from identical blocks measuring 2 units by 1 unit by 1 unit.

How many blocks are there in the whole sculpture?

digital design

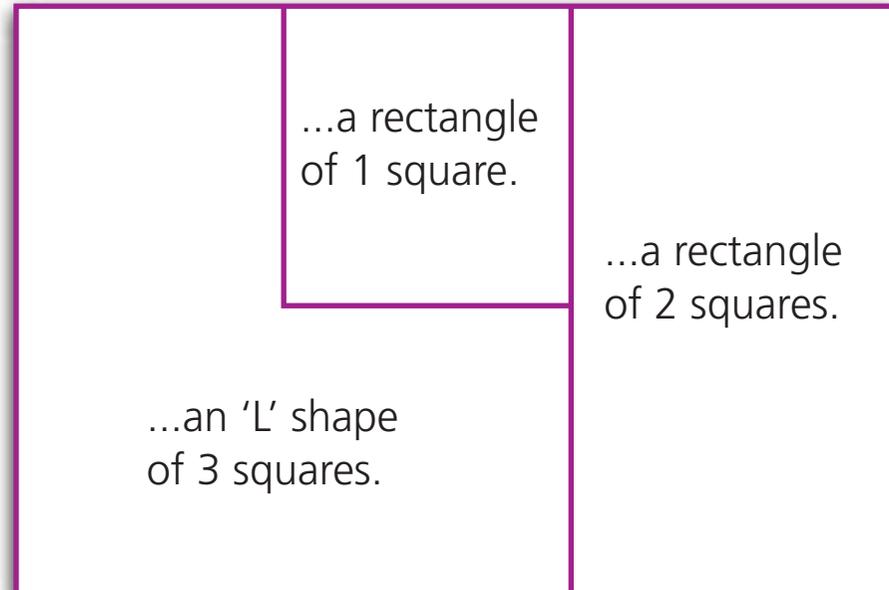The artist **Peter Lowe** got interested in **mathematical spirals.**

It began with a square and by adding a double square and an 'L' shape... I formed a rectangle.

At this point I began to wonder if it were possible to continue the process until I arrived at another complete rectangle or square...

Add rectangles or 'L' shapes of 4, 5, 6 … squares to solve Peter's problem.

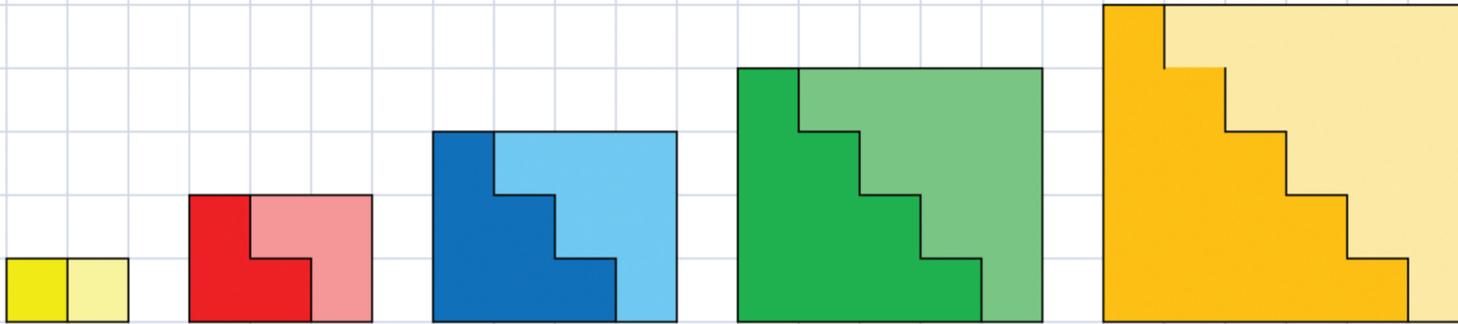What is the size of this **next possible** square? **Why?**

And the one after that... ?

...a rectangle of 1 square.

...a rectangle of 2 squares.

...an 'L' shape of 3 squares.

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maths

Maths in art: Squares and rectangles helpsheet

How big are the rectangles?

What is the connection with the triangle numbers?

Maths in art: Squares and rectangles spreadsheet

counting numbers	square numbers	triangle numbers
1	what's the rule?	what's the rule?
what's the rule?		

Digital design: Maths in art

Description

This topic looks at work from two artists who use mathematics in their artistic productions.

Activity 1: How many blocks?

Activity 2: Squares and rectangles

Both activities have an accessible starting point; both also can be extended to provide a real challenge. An artistic puzzle uses a sculpture by Sol LeWitt entitled '123454321' which is in the Yorkshire Sculpture Park. It is worth giving the pupils the opportunity to grapple with the whole problem to begin with to see if they can devise a sensible line of attack.

Useful prompts are:

- How many blocks in the smallest cube?
- How many blocks in a 1-2-1 pattern?
- What about a 1-2-3-2-1 pattern?

For pupils who have solved the problem, ask them to continue the pattern, using difference tables to search for regularity.

> ### Resources
> *calculators, squared paper*

Peter Lowe's work forms the basis for Squares and rectangles, a multi-stage activity which will need more than one lesson to complete. Statements from the author set out the puzzle which is based on the triangle numbers. Initially, let the pupils explore the problem practically with pencil and paper. Ask them if they could have made a 5 x 5 or a 7 x 7 square as a prompt to their thinking about **why** 6 x 6 is the next possibility.

Finding the next possible solution is a significant challenge: what is the next triangle number which is also a square number? To find this solution, the pupils will need to think algebraically about square and triangle numbers. It will be useful to ask the pupils to discuss in groups – at an appropriate stage, Squares and rectangles helpsheet gives a visual image of the formula for the triangle numbers. Squares and rectangles spreadsheet is designed to be used in a whole class discussion. It provides a template for generating square and triangle numbers for them to compare. Pupils can search visually for a number appearing in both columns – or they may think of generating a fourth column containing the square roots of the triangle numbers to help the search.

Photograph by Peter Smith – 2007

The mathematics

Both activities involve number patterns connected to the triangle numbers. In An artistic puzzle, difference tables are used as an extension. In Squares and rectangles pupils need to think algebraically.

The solution, which also contains the 6 x 6 square, is beautifully illustrated at http://www.portlandgallery.com/pages/exhibitions/151/single/21235.html