Name:_____ **Date:**_____

Fibonacci Puzzles

Fibonacci numbers and Brick Wall Patterns

If we want to build a brick wall out of the usual size of brick which has a length twice as long as its height, and if our wall is to be **two units tall**, we can make our wall in a number of patterns, depending on how long we want it:

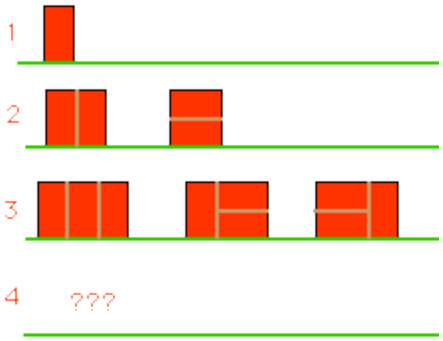
There's just one wall pattern which is 1 unit wide - made by putting the brick on its end.

There are 2 patterns for a wall of length 2: two side-ways bricks laid on top of each other and two bricks long-ways up put next to each other.

There are three patterns for walls of length 3.

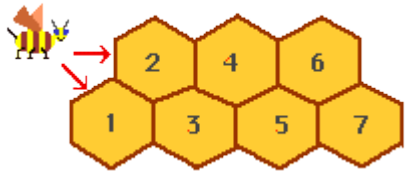
How many patterns can you find for a wall of length 4?

How may different patterns are there for a wall of length 5?



Making a bee-line with Fibonacci numbers

Here is a picture of a bee starting at the end of some cells in its hive. It can **start at either cell 1 or cell 2** and **moves only to the right** (that is, only to a cell with a higher number in it).



There is only one path to cell 1, but

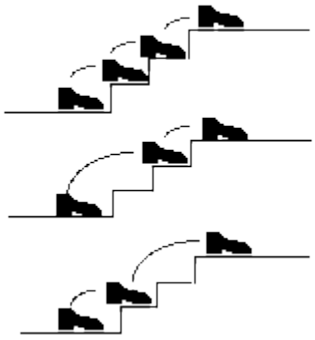
two ways to reach cell 2: directly or via cell 1.

For cell 3, it can go 123, 13, or 23, that is, there are three different paths.

How many paths are there from the start to cell number n?

Leonardo's Leaps

I try and take the stairs rather than the elevator whenever I can so that I get a little more exercise these days. If I'm in a hurry, I can leap two stairs at once otherwise it's the usual one stair at a time. If I mix these two kinds of action - **step** onto the next or else **leap** over the next onto the following one - then in how many different ways can I get up a flight of n steps?



For example, for 3 stairs, I can go

1: **step-step-step**
or else
2: **leap-step**
or finally
3: **step-leap**

...a total of 3 ways to climb 3 steps.

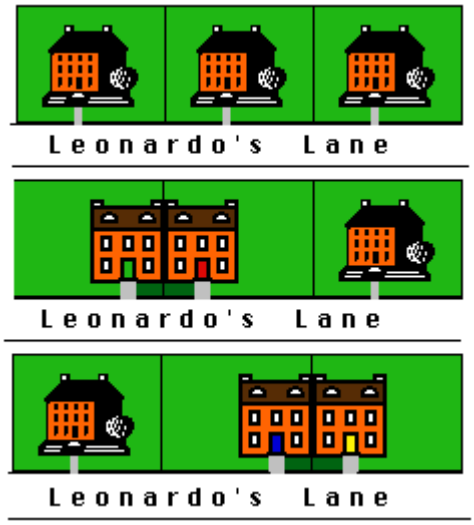
How many ways are there to climb a set of 4 stairs? 5 stairs? n stairs? Why?

Mr. Baldus

Name:_____ **Fibonacci Puzzles**

Leonardo's Lane

This puzzle was suggested by Paul Dixon, a mathematics teacher at Coulby Newham School, Middlesbrough.
A new estate of houses is to be built on one side of a street - let's call it **Leonardo's Lane**. The houses are to be of two types: a single house (a detached house) or two houses joined by a common wall (called "a pair of semi-detached houses" in the UK) which take up twice the frontage on the lane as a single house.
For instance, if just 3 houses could be fitted on to the plot of land in a row, we could suggest:



DDD: Three detached houses

SD: a pair of semi's first followed by a detached house

DS: a detached house followed by a pair of semi's

If you were the architect and there was space for just n dwellings on the Lane of just the two kinds mentioned above, what combinations could you use along the lane?

From Ron Knott's Fibonacci Numbers and the Golden Section web site.