FIBONACCI NUMBERS AND PASCAL'S TRIANGLE

You won't have time to do all these! It would be better to choose one, and really get into it, than to do a lot of superficial work on more.

1. Fibonacci Numbers in Pascal's Triangle

- Start by completing this grid of Pascal's Triangle up to the 10th row.
- Then complete shading the diagonals and find the sums of the numbers on the diagonals (count blank spaces as 0).
- What do you notice?

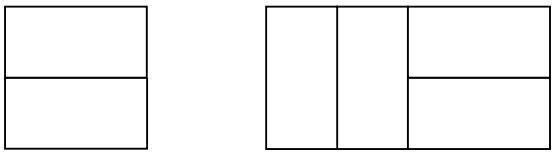
Row number, *n*										Diagonal colour	Diagonal sum
0	1										
1	1	1									
2	1	2	1								
	1	3	3	1							

2. Coin Combinations

If you only have 1p and 2p coins available, how many ways can you make 1p, 2p, 3p, 4p, … ? Note: 1p + 2p is a DIFFERENT combination of coins from 2p + 1p, so there are 3 ways to make 3p: 1p + 2p, 2p + 1p and 1p + 1p + 1p.

- Start by tabulating the number of ways you can make each total up to, say, 5p. You might find it helpful to use two colours of multi-link cubes for 1p and 2p coins.
- Then instead tabulate which totals you can make with 1 coin, 2 coins, 3 coins, 4 coins, …
- What do you notice about your answers?

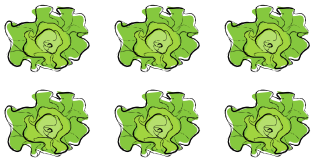
3. Brick Wall



You have a load of bricks with which to build a low wall. The bricks are all 2 units long and 1 unit wide. They can be put together either vertically or horizontally, as in the diagrams on the right to build a wall which is 2 units high.

- Using squared paper or multi-link cubes, find out how many DIFFERENT wall patterns you can build of width 1, 2, 3, 4, … units
- Look at the numbers of different patterns for each length of wall – what do you notice?
- What do you notice about your answers?

4. Back to the Rabbits …



All those rabbits would eat a lot of lettuce (as you'll know if you've ever read any of the Peter Rabbit books).

- A rabbit approaches the lettuce patch from the top left.
- The lettuce patch has two rows of lettuces.
- The rabbit eats the first lettuce it comes to, then goes onto the next.
- It always moves to the nearest lettuce (right, up or down), and doesn't bother going back on itself (there's probably another rabbit behind eating anything the first one missed!).

How many paths are there through the lettuce field are there, if the rabbit eats 1, 2, 3, 4, … lettuce?

- You could use squared paper to help you, or multi-link cubes.
- What do you notice about your answers?

If you would like to try more problems like this, go to http://www.maths.surrey.ac.uk/hosted-sites/R.Knott/Fibonacci/fibpuzzles.html where some of these problems originated.