Number Investigations

1) What numbers can you make by adding just threes and fives together?

Can you make all the numbers between 10 and 20?

Are there any numbers you cannot make?

Does allowing subtraction alter this?

2) The number 3 can be split up in four different ways:

1+1+1 1 + 2 2+1 3

How many ways can the number 4 be split up? Here are some of them:

1+1+1+1 4 2+2

How many others can you find?

What about the number of ways of splitting 5?

What about the number of ways of splitting 6?

Investigate further and see if you can spot and patterns.

3) Using the figure 4 four times and the four operations we can make lots of numbers:

$4 + 4 + 4 + 4 = 16$

$\frac{44}{4} + 4 = 11 + 4 = 15$

Using just the figure 4 four times can you make all the numbers from 0 to 10

4) Copy and complete this table from 1 to 10:

Number	Odd	Total
1	1	1
2	1+3	4
3	1+3+5	9
4	1+3+5+7	16
…		
10	1+3+5+7+…	

Do you observe any pattern?

If so, explain how you can use this pattern to find the sum of:

a) The first 15 odd numbers

b) The first 20 odd numbers

c) The first n odd numbers

d) What about the sum of the odd numbers between 20 and 40?

5) Stamps. You only have 1p and 2p stamps, though you have as many of these as you need. To make 3 pence there are three ways because you could either use:

1p2p or 2p1p or 1p1p1p

How many different ways are there of making: 1p, 2p, 3p, 4p, 5p, 6p.

Copy and complete this table with your results:

Total	Number of ways
1	
2	
3	3 ways
4	
5	
6	

Can you describe the pattern?
How many ways are there of making:

a) 10p b) 20p c)30p d) n pence?

Longer Investigations:

6) Sums and Products:

Observe how: 1 + 2 + 3 = 1x2x3

Can you find another three numbers which have their sum equal to their product?
If not, can you explain why?

Find sets of two and three numbers such that their product is TWICE their sum

Extension ideas:

Rather than twice, try three times, four times, five times, etc.

What about including negative numbers or decimals?

7) Postage stamps:

You have a supply of 1p, 2p, 3p, 4p, 5p, 6p stamps. If you are only allowed to use at most two stamps on an envelope can you achieve all values between 1p and 12p?

Can you achieve a higher maximum value by having a different set of 5 stamps?

Investigate how altering the number of stamp values or allowing more stamps to be allowed on the envelope affects the problem.

8) Quadruples:

(1,2,2,3) is a quadruple that satisfies $1^2+2^2+2^2=3^3$.

Find some more quadruples which satisfies this property.

Can you establish any pattern in your results?

What happens if you have five numbers instead?

What about if you cube the numbers rather than square them?