



Stage 4 ★
Mixed Selection 1

1. Below 400

If the pattern below is continued, what number will appear directly below 400?

1
2 3 4
5 6 7 8 9
10 11 12 13 14 15 16

2. Big Fibonacci

In a sequence of positive integers, every term after the first two terms is the sum of the two previous terms in the sequence.

If the fifth term is 2004, what is the maximum possible value of the first term?

3. What a coincidence!

Consider the arithmetic sequences:

1998, 2005, 2012... and

1996, 2005, 2014...

Which is the next number after 2005 that appears in both sequences?

4. Alternating sum

Given that the number 2008 is the correct answer to the calculation: $1 - 2 + 3 - 4 + 5 - 6 + \dots + (n - 2) - (n - 1) + n$ where n is an odd positive whole number. What is n ?

5. Collatz-ish

The first term of a sequence of positive integers is 6. The other terms in the sequence follow these rules:

if a term is even then divide it by 2 to obtain the next term;

if a term is odd then multiply it by 5 and subtract 1 to obtain the next term.

For which values of n is the n th term equal to n ?

These problems are adapted from UKMT Mathematical Challenge problems (ukmt.org.uk)