 Sum of an arithmetic sequence

The activities below lead students to discover the sum of an arithmetic sequence.

Context: At the age of 7, Carl Friedrich Gauss is believed to have amazed his teachers by summing the integers from 1 to 100 almost instantly. How did he do this?

Activity 1: Find the sum of the first 100 integers.

Students to come up with methods of finding the sum of the first 100 integers.

Potential methods include:

1. Pairing the numbers: add 1 to 100, 2 to 99, 3 to 98 etc. to obtain
2. Pairing the numbers: add 1 to 99, 2 to 98, etc. to obtain as the original term of 50 is not paired.

Discuss the first method in terms of , and .

Activity 2: Find the sum of the first 1000 integers.

Students to come up with methods of finding the sum of the first 1000 integers.

Potential methods include:

1. Pairing the numbers: add 1 to 1000, 2 to 999, 3 to 998 etc. to obtain
2. Pairing the numbers: add 1 to 999, 2 to 998, etc. to obtain as the original term of 500 is not paired.

Discuss the first method in terms of , and .

Activity 3: Generalise the result.

Method 1:

* Consider the arithmetic series:
* Consider the arithmetic series in reverse:
* Add the two series together

There are terms of

Method 2:

* Consider the arithmetic series:
* Consider the arithmetic series in reverse:
* Add the two series together

There are n terms of