Sigma Notation

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$$\sum_{1}^{n} a_i = a_1 + a_2 + a_3 + \ldots + a_n$$
$$i = \text{The index}$$
$$a_i = \text{The } i^{th} \text{ term}$$

1

$$\sum_{1}^{5} i = 1 + 2 + 3 + 4 + 5$$

2

$$\sum_{1}^{4} k^3 = 1^3 + 2^3 + 3^3 + 4^3$$

3

$$\sum_{1}^{4} 3^k = 3^1 + 3^2 + 3^3 + 3^4$$

4

$$\sum_{6}^{8} n^2 = 6^2 + 7^2 + 8^2$$

5

$$\sum_{1}^{4}(-1) = (-1)^1(-1)^2 + (-1)^3 + (-1)^4$$

Useful notation when we have a long sum
$\sum_1^{100} i = 1 + 2 + 3 + \ldots$ or sums of variable length ($\sum_i^n i = 1 + 2 + 3$)

6 Properties

1. $$\sum_{i}^{n} ca_i = c \sum_{i} a_i$$

$$\begin{aligned} \text{EX: } \sum_{i}^{n} 2i &= 2(1) + 2(2) + \ldots + 2(n) \\ &= 2(1 + 2 + \ldots + n) \\ &= 2\sum_{i}^{n} i \end{aligned}$$

2.

$$\sum_{i}^{n} a = i + b_i = \sum_{i}^{n} a_i + \sum_{i}^{b} b_i$$

$$\begin{aligned}\sum_{k=1}^{n}(k + k^2) &= (1 + 1^2) + (2 + 2^2) + \ldots + (n^2 + n^2) \\ &= \sum_{i=1}^{n} i + \sum_{i=1}^{n} i^2\end{aligned}$$