

Σ Summation notation, a way to shrink sums Σ

Daniel Rui

1 Σ The notation

Summation notation is a compact way of writing sums. For example, $1 + 2 + \dots + 10$ can be written as

$$\sum_{k=1}^{10} k$$

k starts at one, increases by one, adds that to the sum, until it reaches 10. (k starts at one, increases to become two, adds that to one, increases by one to become three, adds that to $1+2$, on and on)

What if we want $2 + 3 + 4 + \dots + 10$? Then instead of $k = 1$, we use $k = 2$.

$$\sum_{k=2}^{10} k$$

What if we want $1 + 3 + 5 + \dots + 39$?

$$\sum_{k=1}^{20} 2k - 1$$

Verify that this is true.

What if we want $1 + 2 + 3 + \dots$? (This means make k go from one, all the way to infinity)

$$\sum_{k=1}^{\infty} k$$

2 Σ Practice

$$\Sigma \Rightarrow 1 + 2 \dots$$

2.1

$$\sum_{k=-4}^{15} k^2$$

2.2

$$\sum_{k=10}^{20} \frac{1}{n}$$

2.3

$$\sum_{k=0}^{\infty} \frac{(-1)^k}{k+1}$$

3 Σ Practice

$$1 + 2 + \dots \Rightarrow \Sigma$$

3.1

$$5 + 9 + 13 + 17 + \dots + 101$$

3.2

$$1 + \frac{1}{2} + \frac{1}{3} + \dots$$

3.3

$$1 + 4 + 9 + \dots + n$$