

In this post, we explain the concept of mathematical induction through a well-known example, that is the sum of the first n natural numbers.

Mathematical induction is very useful and is employed quite frequently in top-level mathematics.

Let us consider the sum

$$\sum_{j=1}^n j \tag{1}$$

We want to prove that it is equal to $\frac{n(n+1)}{2}$ for all $n \in \mathbb{N}$. It is trivial to see that the equality holds in the case $n = 1$. Suppose now that it holds for $n \in \mathbb{N}$ and let us prove that it also holds $n + 1$.

$$\begin{aligned} \sum_{j=1}^{n+1} j &= \sum_{j=1}^n j + n + 1 \\ &= \frac{n(n+1)}{2} + (n+1) \\ &= \frac{(n+1)(n+2)}{2} \end{aligned}$$