

Proof by induction

Peter Rowlett

Suppose we want to show that some statement p is true for all non-negative integers $0, 1, 2, \dots$.

Let $p(n)$ be a proposition involving $n \in \mathbb{Z}$ for $n \geq 0$. (Note, importantly, that $p(n)$ is *not* a function.)

To prove a statement of the form $\forall n (p(n))$:

1. First prove $p(0)$ (base case).
2. Then prove $\forall n (p(n-1) \implies p(n))$ (inductive step).

Form of final proof:

Base case: [Proof of $p(0)$ goes here]

Inductive step: [Proof of $\forall n (p(n-1) \implies p(n))$ goes here]