Structure of an induction proof

February 10, 2009

To prove: [*write out statement here*]

We'll prove this by induction. Let $P(n)$ be the statement that [*fill in predicate here*]

Let S be the set of positive integers k such that $P(k)$ is true.
We'll show first that $1 \in S$, and second, that if $k \in S$, then $k+1 \in S$. Together, these imply that all positive integers are in S, and we will be done.

Base case: To show that $1 \in S$, we'll write out $P(1)$: [*write out P(1) here, and give an explanation of why it's true.*]

So $P(1)$ is true, and $1 \in S$.

Inductive step: For some fixed but unknown positive integer k, we'll assume $P(k)$ is true, i.e., we'll assume that [*write out $P(k)$ here*]

We'll then use this to prove $P(k+1)$, i.e., to prove [*write out $P(k+1)$ here*]

[*Start from $P(k)$ and argue the truth of $P(k+1)$*]

which is exactly the statement $P(k+1)$, which we promised to prove.

We conclude, by induction, that S contains all positive integers, so $P(n)$ is true for every positive integer n.