

## A “Theorem” by George Pólya

If you know how to prove things by induction, then here is an amazing fact:



**Theorem.** *All horses are the same color.*

**Proof.** We'll induct on the number of horses. Base case: 1 horse. Clearly with just 1 horse, all horses have the same color.

Now, for the inductive step: we'll show that if it is true for any group of  $N$  horses, that all have the same color, then it is true for any group of  $N+1$  horses.

Well, given any set of  $N+1$  horses, if you exclude the last horse, you get a set of  $N$  horses. By the inductive step these  $N$  horses all have the same color. But by excluding the *first* horse in the pack of  $N+1$  horses, you can conclude that the last  $N$  horses also have the same color. Therefore all  $N+1$  horses have the same color.

An excerpt from: Su, Francis E., et al. "All Horses are the Same Color." *Math Fun Facts*. <<http://www.math.hmc.edu/funfacts>>.