

Mathematical Induction

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Harmonic numbers H_j , $j=1,2,3,\dots$ are defined by
 $H_j=1+1/2+1/3+\dots+1/j$.

Prove $H_{2n} \geq 1+n/2$ for $n \in \mathbb{N}$

Proof by induction: in the book

Prove that $n^3 - n$ is divisible by 3 whenever n is a positive integer.

Proof by induction: in the book

A wrong proof, WHY?

Show that all horses are the same color.

Proof: We do induction on the size of sets of horses of the same color.

Basis step: Obviously all sets of 0 horses (and all sets with 1 horse) are the same color

Inductive step: Assume all horses are the same color for k horses

Now show it must be true for all sets of $k+1$ horses

Every set of $k+1$ horses has an overlap of horses which are the same color.

So $k+1$ horses have the same color.



Therefore all horses have the same color.

Reading and Notes

- Master the technique of mathematical induction
- Recommended exercises: 4.1:3,7,21,31,43