1. Plain TEXnology

Theorem T. *All things are not necessarily the same*

2. Permutations

TAoCP* 1.2.5 gives two methods to generate all permutations of a given ordered set. Quantites of permutations are considered with relevance to computing efficiencies.

3. The Wide-Awake example Group

We re-think, re-word, and re-start with a set of attributes, elements or objects,
$W = \{woozy, vacuous, sleepy, wide - awake\}$. These elements are used to generate all possible arrangements η which are orderd n-tuples with $1 \leq n \leq 4$. For example, $\eta = (woozy, wide - awake)$ is a 2-tuple. Now the set $Woozy$ is the set of all permutations that jumble such elements like η.

Let $(Woozy, \circ, 0, -)$ be the group with the set $Woozy$, a binary operation $\circ$, a neutral elment 0, and for each element $\pi \in Woozy$ there is an inverse element $-\pi \in Woozy$ such that $\pi \circ -\pi = 0$.

For now, here, we call this group's binary operation *composition*. Given two elements $\pi, \eta \in Woozy$, then $\pi \circ \eta \in Woozy$ and $\eta \circ \pi \in Woozy$.

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* https://www-cs-faculty.stanford.edu/%7Eknuth/taocp.html