Theorem

Let A, B be finite sets. Then the following are all equivalent (TFAE):

1. *$|A| \leq |B|$;*
2. *there is an $f : A \to B$ injective;*
3. *there is a $g : B \to A$ surjective.*

TFAE means all are true or all are false — i.e. if we know the truth value of any of these, we know it for all!

Also, this theorem can be stated as saying:

- "Injective means domain is smaller than (or equal to) the codomain"
- "Surjective means domain is larger than (or equal to) the codomain"

However!![1,000,000,000]

We have assumed that A, B are finite. This is crucial.