# Assignment 2

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## Math 300 – Spring 2019

The second homework assignment has two parts:

1. Revise the Theorem and Proof activity, "Day 1: Sets of Ages", posted on the main web page. You will need to fill in details and clarify the exposition. In particular:

   - Introduce names for the objects (sets, etc.) you consider. Here you might employ LaTeX notation for a function $f : A \to B$, or for an indexed sum $\sum_{i \in I} a_i$. A separately displayed line of math looks like:

   $$\sum_{i \in I} a_i \leq N.$$

   - Use the `theorem` environment to organize your assignment as definitions/examples/theorems/proofs, separated by exposition where appropriate (see below for examples).
   - Cite the pigeonhole principle in your proof, and say what function you are applying it to;
   - Say why the sets you obtain in the conclusion of the proof are disjoint.

2. Consider variants of the theorem where the number of people is some $n < 10$ (but the age range is still from 0 to 100). Is it true with $n = 9$? $n = 8$? Figure out the largest $n$ for which it fails, and give a counterexample.

   Optional (extra credit): Find a more general theorem that allows the age range to be variable (i.e. from 0 to $a$ for some integer $a$) and prove it.

You are required to use the `theorem` environment in this assignment. Look online, or see the examples below in the `.tex` source file for this document, for help.

**Theorem 1.** *A theorem is a hopefully interesting mathematical statement.*

*Proof.* Its proof would look like this. □

An example showing the theorem does not generalize:

**Example 1.** Might look like this.

Note these were typeset differently (italics vs. not); this was because we used different `theoremstyle`s in the preamble of this document (see lines 7-12 above).