This miniproject asks you about the "3x + 1 Conjecture described in the book (see Example 23).

- (a) Do #37 in Section 1.7.
- (b) Do #38 in Section 1.7.
- (c) Prove the following:

If every positive integer $k \leq M$ for some integer M has the property that some number of repetitions of the transformation T, applied to k, will reach the integer 1, then some number of repetions of T applied to 2M will also reach the integer 1.

(d) Prove the following:

If every positive integer $k \leq M$ for some integer M has the property that some number of repetitions of the transformation T, applied to k, will reach the integer 1, then some number of repetions of T applied to 4M will also reach the integer 1.

(e) Prove the following:

If every positive integer $k \leq M$ for some integer M has the property that some number of repetitions of the transformation T, applied to k, will reach the integer 1, then some number of repetions of Tapplied to $2^n M$, for every positive integer n, will also reach the integer 1.