1. (Adapted from textbook problem 2.1-3) Consider the searching problem:
   Input: A sequence of numbers $A = <a_1, a_2, \ldots, a_n>$ and a value $v$.
   Output: An index $i$ such that $v = A[i]$ or the special value NIL if $v$ does not appear in $A$.

   a. Write pseudocode for linear search, which scans through the sequence, looking for $v$.

   b. State precisely a loop invariant for your algorithm, and prove that this loop invariant holds. Recall that proving a loop invariant holds has three components:

   - Initialization: It is true prior to the first iteration of the loop
   - Maintenance: If it is true before an iteration of the loop, it remains true before the next iteration.
   - Termination: When the loop terminates, the invariant gives us a useful property that helps us prove the algorithm is correct.