1. Formalize the following sentences. Suppose an array $X[0..N]$ is given, where $N \geq 1$.

   (a) Array $X$ is increasing.
   (b) All values in $X$ are distinct.
   (c) All values in $X$ are equal.
   (d) $X$ contains a 1, then $X$ contains a 0 as well.
   (e) No two neighbors in $X$ are equal.
   (f) The maximum of $X$ occurs only once in $X$.
   (g) $r$ is the length of a longest constant section of $X$.
   (h) All elements of $X$ are prime numbers.
   (i) The number of odd-valued elements in $X$ equals the number of even-valued elements.
   (j) $r$ is the product of the positive elements of $X$.
   (k) $r$ is the maximum of the sums of the sections of $X$.
   (l) $X$ contains a square.

2. Specify a program that:

   (a) Determines the sum of the elements in a given integer array.
   (b) Given boolean array $b$ contains a true, sets integer $x$ to the smallest $z$ such that $b.z$ holds.
   (c) Determines the number of distinct values in a given integer array.
   (d) Given that there is one, determines the second largest value in a given integer array.

3. Specify a program that:

   (a) Determines the length of the longest ascending section in a given integer array.
   (b) Determines the length of the longest section containing at most two distinct values in a given array.
   (c) Determines the length of the longest smooth section in a given integer array. A smooth section is a section in which no two elements differ in value by more than 1.