You are given a nonempty sorted list of numbers. A plateau is a segment (sublist of consecutive items) of equal items. Write a program to find
(a) the length of a longest plateau.
(b) the number of longest plateaus.

After trying the question, scroll down to the solution.
(a) the length of a longest plateau.

Let the list be \( L \). Let \( P_{i,j} \) mean that \( L[i..j] \) is a plateau in \( L[0..k] \). Formally,

\[
P = \langle i, j \rightarrow 0 \leq i \leq j \leq k \land \forall l : i..j \cdot L[i] = L[j] \rangle
\]

Let \( Q \) say that \( p = (\text{the length of a longest plateau in } L[0..k]) \). Formally,

\[
Q = (\exists i, j : P_{i,j} \land p = j - i) \land (\forall i, j : P_{i,j} \Rightarrow p \geq j - i)
\]

The desired result is that \( p' = (\text{the length of a longest plateau in } L) \). Let

\[
R = Q' \land k = \#L
\]

Then \( R \) implies the desired result. Now we can refine.

\[
R \iff p := 1. \; k := 1. \; Q \Rightarrow R
\]

\[
Q \Rightarrow R \iff \text{if } k = \#L \text{ then ok else } Q \land k < \#L \Rightarrow R \text{ fi}
\]

\[
Q \land k < \#L \Rightarrow R \iff \text{if } L(k-p) = L[k] \text{ then } Q \land k < \#L \land L(k-p) = L[k] \Rightarrow R
\]

\[
\text{else } Q \land k < \#L \land L(k-p) \neq L[k] \Rightarrow R \text{ fi}
\]

\[
Q \land k < \#L \land L(k-p) = L[k] \Rightarrow R \iff p := p+1. \; k := k+1. \; Q \Rightarrow R
\]

\[
Q \land k < \#L \land L(k-p) \neq L[k] \Rightarrow R \iff k := k+1. \; Q \Rightarrow R
\]

We are finished, but we can do better. We re-refine one specification.

\[
Q \land k < \#L \land L(k-p) = L[k] \Rightarrow R \iff p := p+1. \; k := k+1. \; Q \land L(k-p) = L(k-1) \Rightarrow R
\]

\[
Q \land L(k-p) = L(k-1) \Rightarrow R \iff \text{if } k = \#L \text{ then ok else } Q \land k < \#L \land L(k-p) = L(k-1) \Rightarrow R \text{ fi}
\]

\[
Q \land k < \#L \land L(k-p) = L(k-1) \Rightarrow R \iff \text{if } L(k-p) = L[k] \text{ then } Q \land k < \#L \land L(k-p) = L[k] \Rightarrow R
\]

\[
\text{else } Q \land k < \#L \land L(k-p) = L(k-1) \neq L[k] \Rightarrow R \text{ fi}
\]

\[
Q \land k < \#L \land L(k-p) = L(k-1) \neq L[k] \Rightarrow R \iff \text{if } k + p \geq \#L \text{ then ok}
\]

\[
\text{else } k := k+p. \; Q \land k < \#L \Rightarrow R \text{ fi}
\]

We can step ahead \( p \) places because in a sorted list, there cannot be two separate plateaus of the same item.

(b) the number of longest plateaus.

no solution given