Exercise 157 asks for a program to compute cumulative sums (running total). Write a program that can be transformed from sequential to parallel execution with $\log n$ time where $n$ is the length of the list.

§ Let $L$ be a list variable. The result we want is $R_0 (\#L)$ where

$$R_{i,k} = \#L' = \#L \land \forall j: i \ldots k \cdot L'j = \sum L[i..j+1]$$

That is the right form for a for-loop, but it will not be $\log$ time, and it will not be parallelizable. So we refine it as follows.

$$R_{i,k} \iff \text{if } k-i \leq 1 \text{ then } \text{ok}$$
$$\quad \text{else } \text{var } m := \text{div} (k+i) 2.$$
$$\quad (R_{i,m} || R_{m,k}).$$
$$\quad \text{for } j := m \ldots k \text{ do } Lj := Lj + L(m-1) \text{ od fi}$$

The final for-loop can be parallelized, so that it takes no time. The computation then takes $\log (\#L)$ time.