Exercise 161 asks for a program to compute cumulative sums (running total). Write a program that can be transformed from sequential to concurrent 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

\[
R_i k \quad \equiv \quad \#L' = \#L \land \forall j: i .. k \cdot L'j = \sum L[i;..j+1]
\]

We refine it as follows.

\[
R_i k \quad \Leftarrow \quad \text{if } k - i \leq 1 \text{ then } ok \\
\quad \text{else } \quad \text{var } m := \text{div} (k+i) 2. \\
\quad \quad (R i m \parallel R m k).
\]

\[
\text{for } j := m;..k \ \text{do } L_j := L_j + L (m-1) \quad \text{od fi}
\]

The final \texttt{for}-loop can be concurrent, so that it takes no time. The computation then takes \( \log (\#L) \) time.