287 (fast string searching)

(a) Given list P, find list L such that for every index n of list P, Ln is the length of the longest list that is both a proper prefix and a proper suffix of $P[0;..n+1]$. Here is a program to find L.

$A \Leftarrow i{:=}\ 0.\ L{:=}\ [\#P*0].\ j{:=}\ 1.\ B$

$B \Leftarrow$ **if** $j{\ge}\#P$ **then** ok **else** $C.\ L{:=}\ j{\to}i \mid L.\ j{:=}\ j{+}1.\ B$ **fi**

$C \Leftarrow$ **if** $P\,i = P\,j$ **then** $i{:=}\ i{+}1$
  else **if** $i{=}0$ **then** ok
    else $i{:=}\ L\,(i{-}1).\ C$ **fi fi**

Find specifications A, B, and C so that A is the problem and the three refinements are theorems.

(b) Given list S (subject), list P (pattern), and list L (as in part (a)), determine if P is a segment of S, and if so, where it occurs. Here is a program.

$D \Leftarrow m{:=}\ 0.\ n{:=}\ 0.\ E$

$E \Leftarrow$ **if** $m{=}\#P$ **then** $h{:=}\ n{-}\#P$ **else** F **fi**

$F \Leftarrow$ **if** $n{=}\#S$ **then** $h{:=}\ \infty$
  else **if** $P\,m = S\,n$ **then** $m{:=}\ m{+}1.\ n{:=}\ n{+}1.\ E$
    else G **fi fi**

$G \Leftarrow$ **if** $m{=}0$ **then** $n{:=}\ n{+}1.\ F$ **else** $m{:=}\ L\,(m{-}1).\ G$ **fi**

Find specifications D, E, F, and G so that D is the problem and the four refinements are theorems.

no solution given