237 (heads and tails) Let L be a list of positive integers. Write a program to find the number of pairs of indexes i and j such that

$$\Sigma L\,[0;..i] \;=\; \Sigma L\,[j;..\#L]$$

After trying the question, scroll down to the solution.

§ Let $D\ a\ b\ =\ (\Sigma\ L\ [0;..a]) - (\Sigma\ L\ [b;..\#L])$. Now we can express the number of pairs of indexes i: 0,..a and j: b,..$\#L$ such that $\Sigma\ L\ [0;..i]\ =\ \Sigma\ L\ [j;..\#L]$ as

$N\ a\ b\ =\ \Sigma i$: 0,..$a\cdot\ \Sigma j$: b,..$\#L\cdot$ **if** $D\ i\ j = 0$ **then** 1 **else** 0 **fi**

$n'=N(\#L)0\ \Longleftarrow\ a:= 0.\ b:= \#L.\ n:= 0.\ d:= 0.\ d = D\ a\ b \wedge n = N\ a\ b \Rightarrow n'=N(\#L)0$

$d = D\ a\ b \wedge n = N\ a\ b \Rightarrow n'=N(\#L)0\ \Longleftarrow$
if $d<0$ **then** $d:= d + L\ a.\ a:= a+1.\ d = D\ a\ b \wedge n = N\ a\ b \Rightarrow n'=N(\#L)0$
else if $d>0$ **then** $b:= b-1.\ d:= d - L\ b.\ d = D\ a\ b \wedge n = N\ a\ b \Rightarrow n'=N(\#L)0$
else if $j=0$ **then** *ok*
else $n:= n+1.\ b:= b-1.\ d:= d + L\ a - L\ b.\ a:= a+1.$
$d = D\ a\ b \wedge n = N\ a\ b \Rightarrow n'=N(\#L)0$ **fi fi fi**

Proofs not done.