

X7.3 Let $n: \text{nat}+1$ be a positive natural constant. Let $S: n*\text{int}$ be an implementer's variable, a string of n integers. It is being reimplemented by $R: n*\text{int}$, which is a different implementer's variable, also a string of n integers such that each item of R is the difference between the previous and current item of S . For example, if $n=5$ and $S = 3; 5; 2; 7; 5$, then $R = 3; 2; -3; 5; -2$. The first item of R is the first item of S . The next item of S is 2 greater than the previous item, so the next item of R is 2. And so on.

(a) What is the data transformer?

(b) Let x and i be user's variables. Use your transformer to transform $x := S_i$.

After trying the question, scroll down to the solution.

(a) What is the data transformer?

$$\S \quad R_0 = S_0 \wedge \forall i: 1..n \cdot R_i = S_i - S_{i-1}$$

(b) Let x and i be user's variables. Use your transformer to transform $x := S_i$.

$$\S \quad \forall S \cdot R_0 = S_0 \wedge (\forall i: 1..n \cdot R_i = S_i - S_{i-1}) \\ \Rightarrow \exists S' \cdot R'_0 = S'_0 \wedge (\forall i: 1..n \cdot R'_i = S'_i - S'_{i-1}) \wedge (x := S_i)$$

= UNFINISHED

= $x := \sum j: 0..i+1 \cdot R_j$