Let $n$ be natural and let $s$ be a natural variable. Using a for-loop, without using multiplication or exponentiation, write a program for $s'=n^2$.

§ I'll use the invariant form of for-loop.

$s'=n^2 \iff s:=0. \ A 0 \Rightarrow A'n$

$A 0 \Rightarrow A'n \iff \text{for } k:=0;..n \text{ do } k:0;..n \wedge A k \Rightarrow A'(k+1) \text{ od}$

$k:0;..n \wedge A k \Rightarrow A'(k+1) \iff s:=s+$

To complete the final refinement, we need to define $A k$. Here's one way.

$A k \iff s=k\times n$

Now to change $k\times n$ into $(k+1)\times n$ we need to add

$(k+1)\times n - k\times n = n$

So we complete the solution:

$k:0;..n \wedge A k \Rightarrow A'(k+1) \iff s:=s+n$

Here's another way to define $A k$.

$A k \iff s=k^2$

Now to change $k^2$ into $(k+1)^2$ we need to add

$(k+1)^2 - k^2 = k+k+1$

So we complete the solution:

$k:0;..n \wedge A k \Rightarrow A'(k+1) \iff s:=s+k+k+1$