0[6] Let $S$ be a text state variable (program variable) $S: \text{\texttt{char}}$. Formalize the specification “$S'$ is a permutation of $S$”, or “$S'$ is an anagram of $S$”. In other words, the same characters occur in $S'$ and $S$, the same number of times each, but possibly rearranged.

1[9] Let $a$, $b$, and $c$ be integer variables. What is the exact precondition for $7 \leq c' < 28 \land \text{odd } c'$ to be refined by
   
   $a := b - 1. \ b := a + 3. \ c := a + b$

2[9] Let $x$, $y$, and $n$ be natural variables. Let $f: \text{\texttt{nat}} \rightarrow \text{\texttt{nat}}$ be a function. Simplify
   
   $\text{frame } x \cdot \text{var } y, m: \text{\texttt{nat}}. \ m := n. \ x' = f m \land y' = f (m + 1)$

3[18] Let $p$ and $n$ be natural variables. Prove
   
   $p' = 2^{20} \iff p := 1. \ n := 0. \ \text{while } n + 20 \text{ do } p := p \times 2. \ n := n + 1 \text{ od}$

end of test