

$$\begin{array}{c}
\pi_1 \\
\hline
\frac{}{\vdash \{S \times X \neq n_0! \wedge X > 0 \wedge X \geq 0\} S := S \times X \{S \times (X-1) \neq n_0! \wedge X-1 \geq 0\}} \text{ (H-Conseq)} \quad \frac{}{\vdash \{S \times (X-1) \neq n_0! \wedge X-1 \geq 0\} X := X-1 \{S \times X \neq n_0! \wedge X \geq 0\}} \text{ (H-Assign)} \\
\vdash \{S \times X \neq n_0! \wedge X > 0 \wedge X \geq 0\} \quad S := S \times X ; X := X-1 \quad \{S \times X \neq n_0! \wedge X \geq 0\} \quad \text{ (H-Seq)} \\
\hline
\text{ (H-while)} \\
\frac{}{\vdash S \times X \neq n_0! \wedge X \geq 0 \Rightarrow S \times X \neq n_0! \wedge X \geq 0} \quad \frac{}{\vdash \{S \times X \neq n_0! \wedge X \geq 0\} \text{ while } X > 0 \text{ do } S := S \times X ; X := X-1 \{S \times X \neq n_0! \wedge X \geq 0 \wedge X \leq 0\}} \text{ (H-while)} \\
\frac{}{\vdash S \times X \neq n_0! \wedge X \geq 0 \Rightarrow S \times X \neq n_0! \wedge X \geq 0} \quad \frac{}{\vdash \{S \times X \neq n_0! \wedge X \geq 0\} \text{ while } X > 0 \text{ do } S := S \times X ; X := X-1 \{S \times X \neq n_0! \wedge X = 0\}} \text{ (H-Conseq)} \\
\frac{}{\vdash X = n_0! \wedge n_0 \geq 0 \wedge S = 1 \Rightarrow S \times X \neq n_0! \wedge X \geq 0} \quad \frac{}{\vdash \{S \times X \neq n_0! \wedge X \geq 0\} \text{ while } X > 0 \text{ do } S := S \times X ; X := X-1 \{X = 0 \wedge S = n_0!\}} \text{ (H-Conseq)} \\
\frac{}{\vdash \{X = n_0! \wedge n_0 \geq 0 \wedge S = 1\} \text{ while } X > 0 \text{ do } S := S \times X ; X := X-1 \{X = 0 \wedge S = n_0!\}} \text{ (H-Conseq)}
\end{array}$$

$$\pi_0 \\
\hline
\vdash \{n_0 \geq 0\} S := 1 ; X := n_0 ; \text{ while } X > 0 \text{ do } S := S \times X ; X := X-1 \quad \{S = n_0!\}$$

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$$\pi_1 = \vdash S \times X \neq n_0! \wedge X > 0 \wedge X \geq 0 \Rightarrow S \times X \neq n_0! \wedge X > 0 \quad \frac{}{\vdash \{S \times X \neq n_0! \wedge X > 0\} S := S \times X \{S \times (X-1) \neq n_0! \wedge X > 0\}} \text{ (H-Assign)} \\
\vdash S \times (X-1) \neq n_0! \wedge X > 0 \Rightarrow S \times (X-1) \neq n_0! \wedge X-1 \geq 0$$

$\pi_0 = ?$