

- ① $x=0 \wedge sum=0 \wedge n \geq 0 \Rightarrow sum=x \wedge x \leq n$ because $0+0=0 \wedge n \geq 0 \Rightarrow 0 \leq n$
- ② $sum=x \wedge x \leq n \wedge \text{not}(x < n) \Rightarrow sum=n \wedge n$ because $x \leq n \wedge \text{not}(x < n) = x=n$
- ③ $sum=x \wedge x \leq n \wedge x < n \Rightarrow sum+2 \cdot (x+1)-1 = (x+1) \wedge (x+1) \leq n$
 because $sum+2 \cdot (x+1)-1 = sum+(2 \cdot x)+2-1 = sum+(2 \cdot x)+1$ and since
 $sum=x \wedge x \leq n$, $sum+2 \cdot (x+1)-1 = (x \wedge x)+(2 \cdot x)+1 = (x+1)(x+1)$
 Also $x < n \Rightarrow x+1 \leq n$

Assign

$$\left\{ \begin{array}{l} sum+2 \cdot (x+1)-1 \\ = (x+1) \cdot (x+1) \\ \wedge x+1 \leq n \end{array} \right\} \quad \left\{ \begin{array}{l} x := x+1 \\ sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\}$$

③

Assign

$$\left\{ \begin{array}{l} sum = sum \\ x \leq n \wedge x < n \end{array} \right\} \quad \left\{ \begin{array}{l} x := x+1 \\ sum := sum+2 \cdot x-1 \end{array} \right\} \quad \left\{ \begin{array}{l} sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\} \quad \left\{ \begin{array}{l} sum := sum \\ sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\} \quad \left\{ \begin{array}{l} sum := sum \\ sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\} \quad \left\{ \begin{array}{l} sum := sum \\ sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\}$$

$$\left\{ \begin{array}{l} sum = sum \\ x \leq n \wedge x < n \end{array} \right\} \quad \left\{ \begin{array}{l} x := x+1 \\ sum := sum+2 \cdot x-1 \end{array} \right\} \quad \left\{ \begin{array}{l} sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\} \quad \left\{ \begin{array}{l} sum := sum \\ sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\} \quad \left\{ \begin{array}{l} sum := sum \\ sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\}$$

$$\left\{ \begin{array}{l} sum = sum \\ x \leq n \end{array} \right\} \quad \left\{ \begin{array}{l} sum := sum \\ sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\} \quad \left\{ \begin{array}{l} sum := sum \\ sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\} \quad \left\{ \begin{array}{l} sum := sum \\ sum+2 \cdot x-1 \\ = x \cdot x \\ \wedge x \leq n \end{array} \right\}$$

$$\left\{ \begin{array}{l} x=0 \wedge sum=0 \\ n \geq 0 \end{array} \right\} \quad \text{while } x < n \text{ do } \left\{ \begin{array}{l} x := x+1 \\ sum := sum+2 \cdot x-1 \end{array} \right\}$$

Rule of
Conseq

$$\left\{ \begin{array}{l} x=0 \wedge sum=0 \\ n \geq 0 \end{array} \right\} \quad \text{while } x < n \text{ do } \left\{ \begin{array}{l} x := x+1 \\ sum := sum+2 \cdot x-1 \end{array} \right\} \quad \left\{ \begin{array}{l} sum = n \cdot n \end{array} \right\}$$