Here is a procedure applied to an argument.

\[ \langle x: \text{int} \cdot a := x. \ b := x \rangle \ (a+1) \]

Suppose, by mistake, we replace both occurrences of \( x \) in the body with the argument. What do we get? What should we get? (This mistake is known as “call-by-name”.)

\[ \langle \text{int} \cdot a := x. \ b := x \rangle \ (a+1) \]

As directed, replace both occurrences of \( x \)

\[ a := a+1. \ b := a+1 \]

\[ a' = a+1 \land b' = a+2 \]

On page 39, Exercise 110(k) says that it is a mistake to replace the \( x \) after the composition. Here’s what we should get.

\[ \langle \text{int} \cdot a' = a \land b' = b. \ a' = a \land b' = x \rangle \ (a+1) \]

Definition of sequential composition

\[ \langle \text{int} \cdot a'' = a \land b'' = b \land a'' = a' \land b'' = x \rangle \ (a+1) \]

Apply

\[ a' = b' = a+1 \]

OR

\[ \langle x: \text{int} \cdot a := x. \ b := x \rangle \ (a+1) \]

Expand the last assignment

\[ a' = b' = a+1 \]

Expand the two assignments

\[ a := a+1. \ b := a+1 \]

OR

\[ \langle x: \text{int} \cdot a' = x \land b' = x \rangle \ (a+1) \]

Substitution law

\[ a' = b' = a+1 \]