Suppose variable declaration with initialization is defined as
\[
\text{var } x: T := e \cdot P \equiv \text{ var } x: T \cdot x := e \cdot P
\]
In what way does this differ from the definition given in Subsection 5.0.0?

After trying the question, scroll down to the solution.
According to Subsection 5.0.0,
\[
\text{var } x: T := e \cdot P
= \exists x: e \cdot \exists x': T \cdot P
= (\text{for } x \text{ substitute } e \text{ in } \exists x': T \cdot P ) \quad \text{assuming } T \text{ cannot mention } x
\text{ and } e \text{ cannot mention } x'
= \exists x': T: (\text{for } x \text{ substitute } e \text{ in } P ) \quad \text{assuming } e \text{ cannot mention } x
= \exists x, x': T: (x := e. P ) \quad \text{substitution law}
= \text{var } x: T: x := e. P
\]

With the three assumptions, there's no difference. So let's violate those assumptions. First, let \( T = x+1 \).

\[
\text{var } x: x+1 \cdot x := e. P
= \exists x, x': x+1 \cdot (x := e. P )
= \exists \langle x: x+1 \cdot \exists x': x+1 \cdot (x := e. P ) \rangle
\]

Section 3.0 defines a function by saying “Let \( v \) be a name, and let \( D \) be a bunch of items (possibly using previously introduced names but not using \( v \)), ...”. We do not have a definition of \( \langle x: x+1 \cdot ... \rangle \).

Next, suppose \( e = x+1 \).

\[
\text{var } x: T := x+1 \cdot P
= \exists x: x+1 \cdot \exists x': T \cdot P
= \exists \langle x: x+1 \cdot \exists x': T \cdot P \rangle
\]

So again we do not have a definition of \( \langle x: x+1 \cdot ... \rangle \).

Last, suppose \( e = x' + 1 \).

\[
\text{var } x: T := x' + 1 \cdot P
= \exists x: x' + 1 \cdot \exists x': T \cdot P
\]

The \( x' \) appearing first is not the same variable as the \( x' \) appearing second.