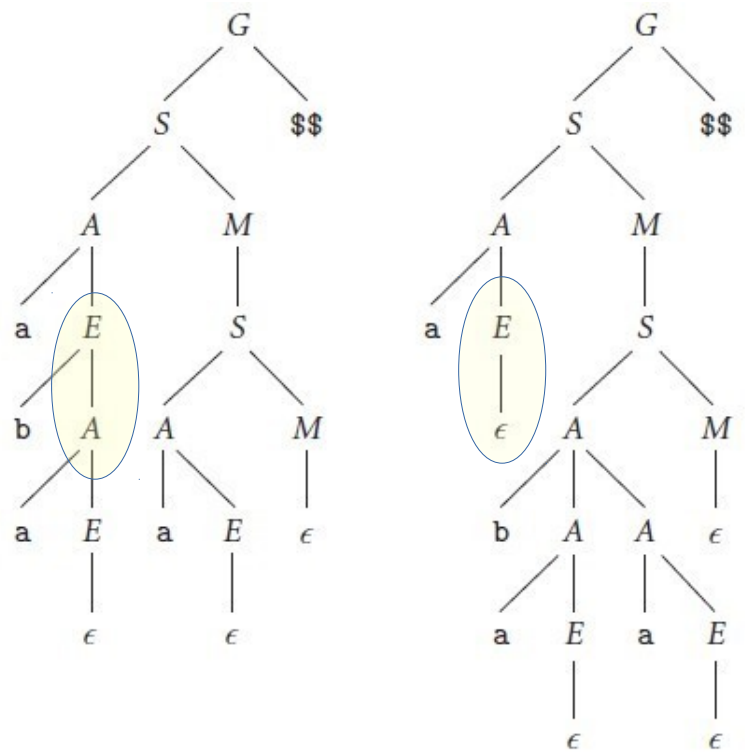
2.12 b&c

Two Different Trees Can be drawn:



"Prediction conflicts" exist any time a different choice can be made in determining how to draw the tree for *any* ***possible*** *input*. Circled above is a conflict where either rule for **E** could be chosen. (The conflicts can be discovered by pure analysis of the grammar, but the exact "mathematics" of this is beyond our scope.)

While, in isolation, the following rule appears to be fine:

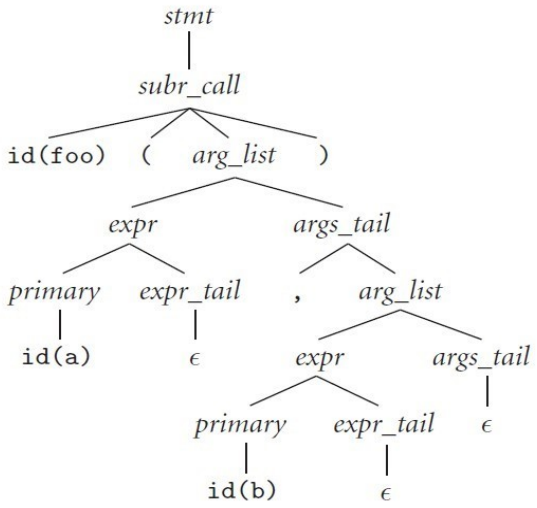
E →a B | b A | ε

It causes "ambiguity" problems when part of the larger grammar in question.

NOTE: An ambiguous grammars will always have prediction conflicts, ***but it is possible*** *for a grammars to have a prediction conflict with respect to a particular grammas class (LL(1), LR(0), etc.) yet* ***not*** *be ambiguous in general. For example, the following has an LL(1) prediction conflict:*

S →a B | a C
A →x
B→ y

2.13a



2.13b

This is just one possible result, but “factoring” is still the key regardless of how you choose to represent the rewritten production rules:

$$
\begin{aligned}
\textit{stmt} &\longrightarrow \texttt{id}\ \textit{stmt\_tail} \\
\textit{stmt\_tail} &\longrightarrow \texttt{(}\ \textit{arg\_list}\ \texttt{)} \\
&\longrightarrow \texttt{:=}\ \textit{expr} \\
\textit{primary} &\longrightarrow \texttt{id}\ \textit{primary\_tail} \\
&\longrightarrow \texttt{(}\ \textit{expr}\ \texttt{)} \\
\textit{primary\_tail} &\longrightarrow \texttt{(}\ \textit{arg\_list}\ \texttt{)} \\
&\longrightarrow \epsilon
\end{aligned}
$$

2.17

Though there are a number of possibilities in how you might interpret the “Conditional Expression”, here is a completely valid interpretation:

$$
\begin{aligned}
\textit{stmt} &\longrightarrow \texttt{if}\ \textit{condition}\ \texttt{then}\ \textit{stmt\_list}\ \texttt{fi} \\
&\longrightarrow \texttt{while}\ \textit{condition}\ \texttt{do}\ \textit{stmt\_list}\ \texttt{od} \\
\textit{condition} &\longrightarrow \textit{expr}\ \textit{relation}\ \textit{expr} \\
\textit{relation} &\longrightarrow \texttt{<} \mid \texttt{>} \mid \texttt{<=} \mid \texttt{>=} \mid \texttt{=} \mid \texttt{!=}
\end{aligned}
$$