WYATT NAPIER — CS 320 ASSIGN 6

ORIGINAL GRAMMAR:

$\langle id \rangle$ ::= a | b | c | ... | z

$\langle dig \rangle$ ::= 0 | 1 | 2 | ... | 9

$\langle expr \rangle$ ::= () | $\langle dig \rangle$ | $\langle id \rangle$
| let $\langle id \rangle$ = $\langle expr \rangle$ in $\langle expr \rangle$
| $\langle expr \rangle$; $\langle expr \rangle$
| begin $\langle expr \rangle$ end

QUESTION 1: Demonstrate the grammar above is ambiguous.
Sentence: 0 ; 1 ; 2. This can be derived in multiple ways.

$$
\begin{aligned}
&< expr > \\
&< expr >; < expr > \\
&< dig >; < expr > \\
&0; < expr > \\
&0; < expr >; < expr > \\
&0; < dig >; < expr > \\
&0; 1; < expr > \\
&0; 1; < dig > \\
&0; 1; 2
\end{aligned}
$$

OR

$$
\begin{aligned}
&< expr > \\
&< expr >; < expr > \\
&< expr >; < dig > \\
&< expr >; 2 \\
&< expr >; < expr >; 2 \\
&< expr >; < dig >; 2 \\
&< expr >; 1; 2 \\
&< dig >; 1; 2 \\
&0; 1; 2
\end{aligned}
$$

QUESTION 3: Modify this grammar to remove the ambiguity.

MODIFIED GRAMMAR:

⟨*id*⟩ ::= a | b | c | ... | z

⟨*dig*⟩ ::= 0 | 1 | 2 | ... | 9

⟨*expr*⟩ ::= () | ⟨*dig*⟩ | ⟨*id*⟩
| let ⟨*id*⟩ in ⟨*expr*⟩
| () ; ⟨*expr*⟩
| ⟨*dig*⟩ ; ⟨*expr*⟩
| ⟨*id*⟩ ; ⟨*expr*⟩
| let ⟨*id*⟩ in ⟨*expr*⟩ ; ⟨*expr*⟩
| begin ⟨*expr*⟩ end ; ⟨*expr*⟩
| begin ⟨*expr*⟩ end

MODIFIED GRAMMAR:

⟨*id*⟩ ::= a | b | c | ... | z

⟨*dig*⟩ ::= 0 | 1 | 2 | ... | 9

⟨*expr*⟩ ::= () | ⟨*dig*⟩ | ⟨*id*⟩
| let ⟨*id*⟩ in ⟨*expr*⟩
| () ; ⟨*expr*⟩
| ⟨*dig*⟩ ; ⟨*expr*⟩
| ⟨*id*⟩ ; ⟨*expr*⟩
| let ⟨*id*⟩ in ⟨*expr*⟩ ; ⟨*expr*⟩
| begin ⟨*expr*⟩ end ; ⟨*expr*⟩
| begin ⟨*expr*⟩ end

QUESTION 3: Demonstrate the revised grammar fixes the ambiguity.
Sentence: 0 ; 1 ; 2

$$
\begin{aligned}
&< expr > \\
&< dig >; < expr > \\
&0; < expr > \\
&0; < dig >; < expr > \\
&0; 1; < expr > \\
&0; 1; < dig > \\
&0; 1; 2
\end{aligned}
$$