WYATT NAPIER — CS 320 ASSIGN 6

ORIGINAL GRAMMAR:

```
 \langle id \rangle ::= a \mid b \mid c \mid \dots \mid z 
 \langle dig \rangle ::= 0 \mid 1 \mid 2 \mid \dots \mid 9 
 \langle expr \rangle ::= () \mid \langle dig \rangle \mid \langle id \rangle 
 \mid \text{ let } \langle id \rangle = \langle expr \rangle \text{ in } \langle expr \rangle 
 \mid \langle expr \rangle ; \langle expr \rangle 
 \mid \text{ begin } \langle expr \rangle \text{ end }
```

QUESTION 1: Demonstrate the grammar above is ambiguous.

Sentence: 0; 1; 2. This can be derived in multiple ways.

$$< expr >$$
 $< expr >; < expr >$
 $< dig >; < expr >$
 $0; < expr >$
 $0; < expr >$
 $0; < expr >; < expr >$
 $0; < dig >; < expr >$
 $0; 1; < expr >$
 $0; 1; < expr >$
 $0; 1; < expr >$

OR

$$< expr> < expr> ; < expr> ; < expr> ; < expr> ; < dig> < expr> ; 2 < expr> ; < expr> ; 2 < expr> ; < expr> ; 2 < expr> ; < dig> ; 2 < expr> ; 1; 2 < dig> ; 1; 2 < dig> ; 1; 2$$

Sentince: 0; 7; 2 Lexpris Lexpris

(dig? 3, Lexpris)

(dig? 4, Lexpris)

(dig? (dig? (dig?)) Lexproj Lexpro Lexproj Lexpro Reciproj Lexpros (digo Ldigo

QUESTION 3: Modify this grammar to remove the ambiguity.

MODIFIED GRAMMAR:

```
 \langle id \rangle ::= a \mid b \mid c \mid ... \mid z 
 \langle dig \rangle ::= 0 \mid 1 \mid 2 \mid ... \mid 9 
 \langle expr \rangle ::= () \mid \langle dig \rangle \mid \langle id \rangle 
 \mid \text{ let } \langle id \rangle \text{ in } \langle expr \rangle 
 \mid () ; \langle expr \rangle 
 \mid \langle dig \rangle ; \langle expr \rangle 
 \mid \langle id \rangle ; \langle expr \rangle 
 \mid \text{ let } \langle id \rangle \text{ in } \langle expr \rangle ; \langle expr \rangle 
 \mid \text{ begin } \langle expr \rangle \text{ end } ; \langle expr \rangle 
 \mid \text{ begin } \langle expr \rangle \text{ end }
```

MODIFIED GRAMMAR:

```
 \langle id \rangle ::= a \mid b \mid c \mid ... \mid z 
 \langle dig \rangle ::= 0 \mid 1 \mid 2 \mid ... \mid 9 
 \langle expr \rangle ::= () \mid \langle dig \rangle \mid \langle id \rangle 
 \mid let \langle id \rangle in \langle expr \rangle in \langle expr \rangle 
 \mid () ; \langle expr \rangle 
 \mid \langle dig \rangle ; \langle expr \rangle 
 \mid \langle id \rangle ; \langle expr \rangle 
 \mid let \langle id \rangle in \langle expr \rangle in \langle expr \rangle ; \langle expr \rangle 
 \mid begin \langle expr \rangle end ; \langle expr \rangle 
 \mid begin \langle expr \rangle end
```

QUESTION 3: Demonstrate the revised grammar fixes the ambiguity.

Sentence: 0; 1; 2

$$< expr> < dig>; < expr> 0; < expr> 0; < expr> 0; < dig>; < expr> 0; 1; < expr> 0; 1; < dig> 0; 1; < dig> 0; 1; < dig> 0; 1; < dig> 0; 1; 2$$

Lentence: 0; 4; 2 Cexpr>
Ldig'; Rexpr> 2 dig > j Lexpr>
2 dig >