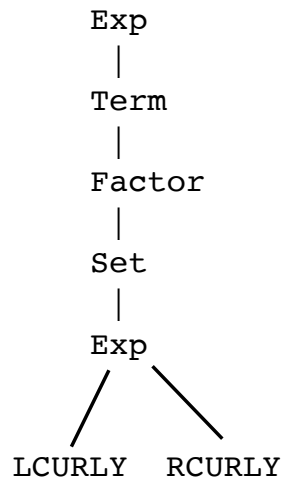
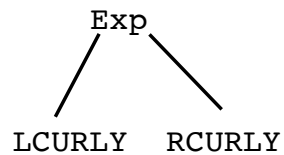


Rui Yin
2019/3/4
Homework 5

CFG 1

$\text{exp} \rightarrow \text{LCURLY RCURLY} \mid \text{LCURLY list RCURLY} \mid \text{term}$
 $\text{term} \rightarrow \text{term PLUS factor} \mid \text{factor}$
 $\text{factor} \rightarrow \text{factor UNION set} \mid \text{factor INTERSECT set} \mid \text{set}$
 $\text{set} \rightarrow \text{LPAREN set RPAREN} \mid \text{exp}$
 $\text{list} \rightarrow \text{COUNTRY} \mid \text{list HASH COUNTRY}$

This CFG is ambiguous. Consider the following two parse trees for expression {}:



CFG 2

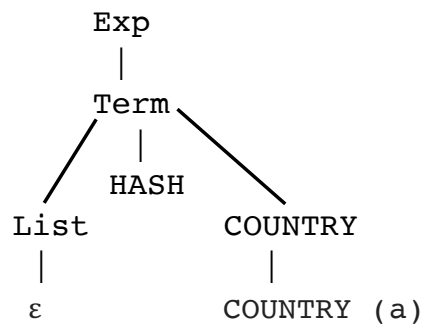
$\text{exp} \rightarrow \text{exp PLUS term} \mid \text{term}$
 $\text{term} \rightarrow \text{term UNION factor} \mid \text{term INTERSECT factor} \mid \text{LPAREN exp RPAREN} \mid \text{factor}$
 $\text{factor} \rightarrow \text{LCURLY list RCURLY}$
 $\text{list} \rightarrow \text{COUNTRY} \mid \text{list HASH COUNTRY}$

This CFG doesn't allow {}, which is a legal expression. It cannot be derived from list since there is no epsilon in list terminal.

CFG 3

```
exp → exp PLUS term | term
term → term UNION factor | term INTERSECT factor | factor
factor → LPAREN exp RPAREN | LCURLY list RCURLY
list → epsilon | COUNTRY | list HASH COUNTRY
```

{ ε # Country } is an illegal expression but would be in this CFG.



CFG 4

```
exp → exp PLUS term | term
term → term UNION factor | term INTERSECT factor | factor
factor → LPAREN exp RPAREN | LCURLY RCURLY | LCURLY list RCURLY
list → list HASH COUNTRY | COUNTRY
```

Correct

CFG 5

```
exp → exp PLUS term | term
term → term UNION factor | term INTERSECT factor | factor
factor → LPAREN factor RPAREN | LCURLY list RCURLY
list → epsilon | nlist
nlist → COUNTRY | nlist HASH COUNTRY
```

{{ U {} } } is a legal expression but this CFG doesn't allow. The UNION and INTERSECT cannot be derived from terminal factor since it only allows parenthesis and curly braces expression.