Lab 3
Compilers Spring 2022

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1. Exercise 4.7

1.a Left-most

num plus num times num plus num $
start
E $
T plus E $
T plus T plus E $
T plus T times F plus E $
F plus T times F plus E $
num plus T times F plus E $
num plus F times F plus E $
num plus num times F plus E $
num plus num times num plus E $
num plus num times num plus T $
num plus num times num plus F $
num plus num times num plus num $

1.b Right-most

num times num plus num times num $
start
E $
T plus E $
T times F plus E $
T times F plus T $
T times F plus T times F $
T times F plus T times num $
T times F plus F times num $
T times F plus num times num $
T times num plus num times num $
F times num plus num times num $
num times num plus num times num $

1.c c

This grammar allows you to start with either addition or multiplication on the left or right hand side. Since it allows E to be turned into T and T into F which can be turned into (E). It also allows for parans to be used to keep order of operation correct with the F -> (E) production.

2. Exercise 5.2c

```
parseStart(){
    parseVal()
    match($)
```

```
}
parseVal(){
    if (is num)
        match(num)
    else{
        match(lparen)
        parseExpr()
        match(rparen)
    }
}
parseExpr(){
    if (plus){
        match(plus)
        parseVal()
        parseVal()
    } else {
        match(prod)
        parseVals()
    }
}
parseVals(){
    if (value)
        parseVal()
        parseVals()
    else {}
}
```

3. Exercise 4.2.1

3.a a

```
a a + a *
S
S S *
S S + S *
a S + S *
a a + S *
a a + a *
```

3.b b

```
a a + a *
S
S S *
S S + S *
S S + a *
S a + a *
a a + a *
```

3.c c

```
-S
--S
--S
```

```
--*
---S
---S
---+
---S
---*
----a
-----a
------+
-------a
--------*
```