

```
1. parseLMC " INP//some comments\nSTART STA FIRST//\n LDA FIRST\n SUB SECOND\n OUT\nlabel2 HLT\nFIRST DAT 3\nSECOND DAT 5\n"
```

```
[(Nothing,INP),(Just "START",STA FIRST),(Nothing,LDA FIRST),(Nothing,SUB SECOND),(Nothing,OUT),(Just "label2",HLT),(Just "FIRST",DAT 3),(Just "SECOND",DAT 5)]
```

```
2. putStrLn $ showProgram $ parseLMC " INP//some comments\nSTART STA FIRST//\n LDA FIRST\n SUB SECOND\n OUT\nlabel2 HLT\nFIRST DAT 3\nSECOND DAT 5\n"
```

```
INP
START STA FIRST
  LDA FIRST
  SUB SECOND
  OUT
label2 HLT
FIRST DAT 3
SECOND DAT 5
```

```
3.mkInitEnv $ parseLMC " INP//some comments\nSTART STA FIRST//\n LDA FIRST\n SUB SECOND\n OUT\n HLT\nFIRST DAT 3\nSECOND DAT 5\n"
```

```
Env {mailboxes = [("FIRST",3),("SECOND",5)], accumulator = Nothing, pc = 1,
instructions = [INP,STA FIRST,LDA FIRST,SUB SECOND,OUT,HLT,DAT 3,DAT 5], labelAddr
= [("START",1),("FIRST",6),("SECOND",7)]}
```

- **Question:** DAT 作为 initialization 是否算在 instructions?
- 如果上问回答为否, 则 labelAddr 中应当不包含那些 DAT 的 label?

```
4. putStrLn $ showProgram $ parseLMC "START LDA ZERO\n STA RESULT\n STA COUNT\n INP\n BRZ END\n STA VALUE\nLOOP LDA RESULT\n ADD VALUE\n STA RESULT\n LDA COUNT\n ADD ONE\n STA COUNT\n SUB VALUE\n BRZ ENDLOOP\n BRA LOOP\nENDLOOP LDA RESULT\n OUT\n BRA START\nEND HLT\nRESULT DAT\nCOUNT DAT\nONE DAT 1\nVALUE DAT\nZERO DAT\n"
```

```
START LDA ZERO
STA RESULT
STA COUNT
INP
BRZ END
STA VALUE
LOOP LDA RESULT
ADD VALUE
STA RESULT
LDA COUNT
ADD ONE
STA COUNT
SUB VALUE
BRZ ENDLOOP
BRA LOOP
ENDLOOP LDA RESULT
OUT
BRA START
END HLT
RESULT DAT 0
```

COUNT DAT 0  
ONE DAT 1  
VALUE DAT 0  
ZERO DAT 0

5. evalProgram \$ parseLMC "START LDA ZERO\n STA RESULT\n STA COUNT\n INP\n BRZ END\n STA VALUE\nLOOP LDA RESULT\n ADD VALUE\n STA RESULT\n LDA COUNT\n ADD ONE\n STA COUNT\n SUB VALUE\n BRZ ENDLOOP\n BRA LOOP\nENDLOOP LDA RESULT\n OUT\n BRA START\nEND HLT\nRESULT DAT\nCOUNT DAT\nONE DAT 1\nVALUE DAT \nZERO DAT\n"

3  
9  
4  
16  
15  
225  
22  
484  
0