Please follow the guidelines and submission procedure from the previous homework, replacing the appropriate tags with `hw04`. (Reminder: Include a README file and sample inputs and outputs as outlined there.) The rules for using outside resources are also similar to those used earlier, as are other guidelines on code and input-output. As before, use of the class discussion forum for elucidating the details is expected and strongly encouraged.

The main task for this homework is **implementing a *compiler* for the extended calculator language** of HW02. (The program implemented for HW02 is an *interpreter* for the extended calculator language.)

In more detail, the **input** consists of a valid program in the calculator language of calc.py as discussed in class, extended to support the div and mod operators from HW02 (but not the list operations of HW03). The **output** consists of (only) a well-formatted (using the textbook's conventions) JCoCo assembly language program such that, when that program is executed (say, using the *coco* command), it performs the actions specified by the input calculator program. In particular, the output of such an execution (of the output of this homework's compiler) should be exactly equal to the output of the interpreter from HW02 on the same input.

Unlike the previous homeworks, this homework's program (the compiler) does not have a uniquely specified correct output for a given input, since there are several assembly language programs that are equivalent (in the above sense) to a given calculator language program.

The following sample inputs and outputs illustrate some of these details. (The formatting of the outputs should be improved if possible but the presented form is acceptable.)

Sample Input 1:

```
xyzzy = -300000 + 5 * 7 - 3
xyzzy
```

Sample Output 1:

```
Function: main/0
Constants: 300000, 0, 5, 7, 3, None
Locals: xyzzy
Globals: print
BEGIN
  LOAD_CONST  0
  LOAD_CONST  1
  ROT_TWO
  BINARY_SUBTRACT
  LOAD_CONST  2
  LOAD_CONST  3
  BINARY_MULTIPLY
  BINARY_ADD
  LOAD_CONST  4
  BINARY_SUBTRACT
  STORE_FAST  0
  LOAD_FAST  0
  LOAD_FAST  0
  LOAD_GLOBAL  0
  ROT_TWO
  CALL_FUNCTION  1
  POP_TOP
  LOAD_CONST  5
  RETURN_VALUE
END
```

Sample Input 2:

```
tri = 1 + 2 + 3 + 4 + 5
pin = 1 * 2 * 3 * 4 * 5
ssq = 1*1 + 2*2 + 3*3 + 4*4 + 5*5
scb = 1*1*1 + 2*2*2 + 3*3*3 + 4*4*4 + 5*5*5
tri
pin
ssq
scb
```

Sample Output 2:

```
Function: main/0
Constants: 1, 2, 3, 4, 5, None
Locals: tri, pin, ssq, scb
Globals: print
BEGIN
  LOAD_CONST  0
  LOAD_CONST  1
  BINARY_ADD
  LOAD_CONST  2
  BINARY_ADD
  LOAD_CONST  3
  BINARY_ADD
  LOAD_CONST  4
  BINARY_ADD
  STORE_FAST  0
  LOAD_FAST  0
  LOAD_CONST  0
  LOAD_CONST  1
  BINARY_MULTIPLY
  LOAD_CONST  2
  BINARY_MULTIPLY
  LOAD_CONST  3
  BINARY_MULTIPLY
  LOAD_CONST  4
  BINARY_MULTIPLY
  STORE_FAST  1
  LOAD_FAST  1
  LOAD_CONST  0
  LOAD_CONST  0
  BINARY_MULTIPLY
  LOAD_CONST  1
  LOAD_CONST  1
  BINARY_MULTIPLY
  BINARY_ADD
  LOAD_CONST  2
  LOAD_CONST  2
  BINARY_MULTIPLY
  BINARY_ADD
  LOAD_CONST  3
  LOAD_CONST  3
  BINARY_MULTIPLY
  BINARY_ADD
  LOAD_CONST  4
  LOAD_CONST  4
  BINARY_MULTIPLY
  BINARY_ADD
  STORE_FAST  2
  LOAD_FAST  2
  LOAD_CONST  0
  LOAD_CONST  0
  BINARY_MULTIPLY
  LOAD_CONST  0
  BINARY_MULTIPLY
  LOAD_CONST  1
  LOAD_CONST  1
  BINARY_MULTIPLY
  LOAD_CONST  1
  BINARY_MULTIPLY
  BINARY_ADD
  LOAD_CONST  2
  LOAD_CONST  2
  BINARY_MULTIPLY
  LOAD_CONST  2
  BINARY_MULTIPLY
  BINARY_ADD
  LOAD_CONST  3
  LOAD_CONST  3
  BINARY_MULTIPLY
  LOAD_CONST  3
  BINARY_MULTIPLY
  BINARY_ADD
  LOAD_CONST  4
  LOAD_CONST  4
  BINARY_MULTIPLY
  LOAD_CONST  4
  BINARY_MULTIPLY
  BINARY_ADD
  STORE_FAST  3
  LOAD_FAST  3
  LOAD_FAST  0
  LOAD_GLOBAL  0
  ROT_TWO
  CALL_FUNCTION  1
  POP_TOP
  LOAD_FAST  1
  LOAD_GLOBAL  0
  ROT_TWO
  CALL_FUNCTION  1
  POP_TOP
  LOAD_FAST  2
  LOAD_GLOBAL  0
  ROT_TWO
  CALL_FUNCTION  1
  POP_TOP
  LOAD_FAST  3
  LOAD_GLOBAL  0
  ROT_TWO
  CALL_FUNCTION  1
  POP_TOP
  LOAD_CONST  5
  RETURN_VALUE
END
```