CSCI 4342.001 Programming Assignment 04 (100 Points)

Suspense: November 16, 2021 NLT 12:30PM

OBJECTIVES:

- Demonstrate basic competency in Python programming.
- Implement Python functions.
- Write a basic interpreter.

ASSIGNMENT ASSISTANCE:

- This homework assignment is due at the beginning of the class period on the due date.
- This assignment is restricted to individual effort. You may not receive help from any other person.
- Any resource used (other than Dr. Nix or the course text) must be documented in the code (as comments) detailing the source and describing exactly what was learned and how that information was used. Submissions will be severely penalized if copied in part or in whole from any source.
- If you need help, visit your instructor during his posted office hours. If your schedule cannot accommodate any of these times, then email your instructor to schedule a different time.

PROBLEM DESCRIPTION:

1. Your task is to expand a working version of Program 03; you will submit a program called `IntCodeComputerV3.py` which reads in an intcode program from a separate text file and executes it.

2. `IntCodeComputerV2` is missing one key feature: it needs support for parameters in relative mode.

    a. Parameters in mode `2`, **relative mode**, behave very similarly to parameters in position mode: the parameter is interpreted as a position. Like position mode, parameters in relative mode can be read from or written to.

    b. The important difference is that relative mode parameters doesn't usually count from address `0`. Instead, they count from a value called the **relative base**.

    c. The address to which a relative mode parameter refers is the value of the parameter plus the current relative base. Initially, the relative base starts at `0`. When the relative base is `0`, relative mode parameters and position mode parameters with the same value refer to the same address. However, the relative base can be modified within the Intcode program.

d. For example, given a relative base of `50`, a relative mode parameter of `-7` refers to memory address `50 + -7 = 43`.

e. The relative base is modified with the relative base offset instruction:

i. Opcode `9` adjusts the relative base by the value of its only parameter. The relative base increases (or decreases, if the value is negative) by the value of the parameter.

ii. Another example, if the relative base is `2000`, then after the instruction `109,19`, the relative base would be `2019`. If the next instruction were `204,-34`, then the value at address `1985` would be output.

3. Your Intcode computer will also need a few other capabilities:

a. The computer's available memory should be much larger than the initial program. Memory beyond the initial program starts with the value 0 and can be read or written like any other memory. (It is invalid to try to access memory at a negative address, though.)

b. The computer should have support for large numbers.

c. Here are some example programs that use these features:

`109,1,204,-1,1001,100,1,100,1008,100,16,101,1006,101,0,99` takes no input and produces a copy of itself as output.

`1102,34915192,34915192,7,4,7,99,0` should output a 16-digit number.

`104,1125899906842624,99` should output the large number in the middle.

4. You should not need to import any external library for use in any solution.

5. Your program should work in either a Windows environment or a Linux environment.

6. Your program should have no extraneous output other than the prompt for input (opcode `3`) and the specified value for output (opcode `4`).

7. You should submit your work on the Linux server. Upload a backup copy to D2L.

SUBMISSION:

- Review the Evaluation below to ensure you have met all the requirements.
- Submit electronic copy of `IntCodeComputerV3.py` to the Linux server.

EVALUATION

a)	Project is late or not submitted at all.	-100
b)	Project does not run without throwing an exception.	-40
c)	Method signatures do not match the specification.	-20 per method
d)	Calculations/output are incorrect.	-15 per method
e)	Code is not well organized or properly indented.	-10
f)	Code is inadequately commented for readability.	-10
g)	Code does not contain student's name, course section, and date of submission.	-10
h)	Code is not submitted to the Linux server	-15