**CSC 3210 – Assignment #2**

**Spring 2022**

**Objective:** Learn memory organization/layout, data transfer concepts and instructions, direct memory access, memory allocation.

**Requirements:**

1. **(5 points) Implement the following expression in assembly language:**

EDX = (val3 + val4) - (val2 - val1) - (5/3)\*7

* + - Assume that val1, val2, val3 and val4 are 16-bit integer variables
    - You need to implement the expression the way it is provided, you cannot do any reduction on the expression while implementing it.
* Initialize val1 with 120 (hexadecimal), val2 with 39 (hexadecimal), val3 with 20 (hexadecimal) and val4 with 27 (hexadecimal)
* You are NOT allowed to update the values of any variables.
  + - Use ONLY **mov, add, sub,** **movzx, movsx, or neg** instructions whenever needed.
    - Use the debugger to verify your answer.
  + **Submit the following:**
* Save your source code using your last name, Lastname1.asm and upload the Lastname1.asm
* Screenshot (showing the code and register window) of EDX register contains the correct result.

A screenshot of a computer

Description automatically generated with medium confidence

1. **(5 points) Implement the following expression in assembly language:**

ECX = –(val3 + val1) + (-val4 – val2) + 3

* + - Assume that val1 is 8-bit variable, val2 is 16-bit variable, val3 is 32-bit variable, and val4 is 8-bit variable.
    - You need to implement the expression the way it is provided, you cannot do any reduction on the expression while implementing it.
    - Initialize val1 with 12 (decimal), val2 with 9 (decimal), val3 with 2 (decimal), val4 with 20 (decimal),
    - **You are NOT allowed to** **update the values** stored in val1, val2, val3 and val4
    - Use mov, add, sub, movsx, movzx, or neg instructions whenever needed.
    - Use the debugger to verify your answer.
  + **Submit the following:**
* Save your source code using your last name, Lastname2.asm and upload the Lastname2.asm
* Screenshot (showing the code and register window) of ECX register contains the correct result.

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1. **(5 points) Write an assembly program to compute the following expressions**

* Create a DWORD array named ‘z’ of size 3 using DUP operator. Leave the array ‘z’ uninitialized. You can denote the items in the array as [, where is the first item, is the second item, is the third item
* Update each array item using the following expressions.

* Where x, y, r are 16-bit integer memory *variables*.
* x = 10, y = 15, r = 4
* Use mov, movzx, movsx, add, sub instructions only.
* (hint: Do not alter the value of x, y and r during the computation. Transfer them to appropriate registers to do computation)
* At the end, open memory window to see the variable z stored in memory (little endian format).
* Use the debugger to verify your answer.
  + **Submit the following:**
    - Rename the asm file using your last name as Lastname3.asm
    - Screenshot of the code and memory window showing the content of the variable z (little endian format).

A screenshot of a computer

Description automatically generated with medium confidence

**Note:**

* **Submit** your source code by **only** uploading **.ASM file** using **iCollege** in the respective assignment dropbox:
* Lastname1.ASM, Lastname2.ASM, Lastname3.ASM
* **Put the following information as Comment header** for .ASM files:

Student: Full name

Class: CSC3210

Assignment#: 2

Description: This program ………….

* Follow the program standards as presented in your book. Pay more attention to code comments and

consistent indentation.