**CS309 Lab 4 ARM Program Basic**

**Objective**: The objective of this assignment is to get the students to learn the basics of ARM Assembly. This includes: output, input, comparisons, basic arithmetic, and loop controls. Students need to properly document their code and demonstrate they know how to use the GNU debugger.

**Part I: ARM Assembly Code Requirements**

The program is to prompt the user to enter a number between 1 and 100. **Reject** any invalid user inputs and terminate the program if invalid inputs are entered.

From 1 to the user entered number print out the number and the sum of all the integers to that point.

Terminate the program when all the numbers from 1 to the user entered number are printed.

Example of what the output should look like:

**This program will print the sum of the integers from 1 to a number you enter. Please enter an integer from 1 to 100.**

**You entered 4. Following is the number and the sum of the integers from 1 to n.**

| **Number** | **Sum** |
|---|---|
| **1** | **1** |
| **2** | **3** |
| **3** | **6** |
| **4** | **10** |

Your program needs to be well documented. Points will be deducted for code which is poorly documented. See the Student Lab Handbook for expected code comments.

**Prework:**

Students need to have a file which, at the very least contain the following:

1. Proper header information that include commands that assemble, link, run the file and run the file using the debugger that is specific for their file.
2. Data section that defines all the output strings.
3. Code comment sections that describe the major sections of the code with the output loop clearly identified.

If the student already has a working program this prework check is not required.

**Part II: GNU Debugger**

Refer to the Student Lab Handbook Appendix F on how to run the debugger. Students are to demo to the Lab TA the following:

1. Provide the starting address for the first string that is printed to the screen.
2. Set a breakpoint at the top of the loop that sums and prints the numbers.
3. Examine the contents of the registers that are being used for the counter and the sum.

4. Step through the loop one time and reexamine the contents of the registers being used for the counter and the sum to show they have been updated correctly.

Students are expected to answer questions related to your program or the use of the debugger from the TA.

This program was assigned:

Fall 2022

Fall 2019

Fall 2018

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Student _____ Lab Instructor: _____

Total Score: _____ Late Penalty? No _____ Yes: _____

| Feature | Points off |
|---|---|
| Code Comments/Documentation<br>- Class, Term, Author, Date.<br>- Purpose of software<br>- Documentation for the start of each loop.<br>- Documentation for error checking<br>- In-line comments that explain why the following code exists. | |
| | |
| Welcome and instruction message are displayed and clear. | |
| | |
| Does the program work for an input of 1? | |
| | |
| Does the program work for an input of 100? The correct final sum for 100 is 5050. | |
| | |
| Does the program work for a number between 1 and 100? | |
| | |
| Does the program reject a number less than 1? | |
| | |
| Does the program reject a number greater than 100? | |
| | |
| Does the program reject a string or character input (i.e., hello, A) | |
| | |
| **Debugger commands need to be demonstrated by the student** | |
| | |
| Provide the starting address for the first string that is printed to the screen. | |
| | |
| Set a breakpoint at the top of the loop that sums and prints the numbers. | |
| | |
| Examine the contents of the registers that are being used for the counter and the sum. | |
| | |
| Step through the loop one time and reexamine the contents of the registers being used for the counter and the sum to show they have been updated correctly. | |