

5.14 Lab Assignment 4

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Due Sunday by 11:59pm **Points** 95 **Submitting** a file upload
File Types asm and s **Available** after Mar 2 at 10am

Purpose: Rearrange the elements of an array by utilizing branching instructions

Program

Using this array:

```
threeints: .word 5, 255, -5
```

Write a program which uses branching instructions to rearrange the values of threeints such that:

- the smallest value of threeints is placed into the memory location of threeints's first element
- the second smallest value of threeints is placed into the memory location of threeints's second element
- the largest value of threeints is placed to the memory location of threeints's third element

Branching instructions should be used to implement the following high level if conditional logic:

if the first element is greater than the third element

take the original value in the memory location of threeint's first element and place it into a register

take the original value in the memory location of threeint's third element and place it into another register

take the smallest value of threeint and place it into the memory location of threeint's first element

take the original value that was in the memory location of threeint's first element and place it into the memory location of threeint's third element

if the second element is greater than the third element


take the value in the memory location of threeint's second element and place it into a register

take the value in the memory location of threeint's third element and place it into another register

take the second smallest value of threeint and place it into the memory location of threeint's second element

take the original value that was in the memory location of threeint's second element and place it into the memory location of threeint's third element

The program should complete when threeint's smallest value is placed in the first element, threeint's second smallest value is placed in the second element, and threeint's largest value is placed in the third element.

[Use The MIPS Technical Document To See The MIPS Assembly Language instructions](https://ccsf.instructure.com/courses/47907/files/7405493/download?download_frd=1)  [\(https://ccsf.instructure.com/courses/47907/files/7405493/download?download_frd=1\)](https://ccsf.instructure.com/courses/47907/files/7405493/download?download_frd=1) . You may wish to download the document and refer to it as you are writing the program.

Write comments in your program that state your name, the programming logic, and any details you feel you'd like to explain that state about how you are using the assembly language instructions.



This program is to be saved in its own file, with a .asm or a .s file extension. You may only use a .asm or .s file extension (MIPS assembly language programs are named using these files extensions). Once your program is working correctly, submit the program file to this assignment to receive a grade for your program.

Example Programs

Below is the source code of some example MIPS assembly language programs that can be used to help you write your programs. Feel free to download and run them in MARS to get yourself used to running assembly language programs and seeing how MARS's viewing areas, menus, and controls work.

Experiment with as much of MARS as you can, and pay close attention to what is displayed as you run the programs.

Try to run each program step by step, using MARS's Run > Step option so you can see what part of the MIPS architecture is changing as each instruction is being run. Then try to run each program fully using MARS's Run > Go option making sure you see in all of MARS's viewing areas and controls what happens in MARS during a program's normal running.

[intarrayelementaccess1.asm](https://ccsf.instructure.com/courses/47907/files/7444996/download?download_frd=1)  [\(https://ccsf.instructure.com/courses/47907/files/7444996/download?download_frd=1\)](https://ccsf.instructure.com/courses/47907/files/7444996/download?download_frd=1) [intarrayelementaccess2.asm](https://ccsf.instructure.com/courses/47907/files/7444995/download?download_frd=1)  [\(https://ccsf.instructure.com/courses/47907/files/7444995/download?download_frd=1\)](https://ccsf.instructure.com/courses/47907/files/7444995/download?download_frd=1)

