

Floating Point Program

COSC-230
Assignment

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Topics

- Assignment
- Requirements
- Testing
- Plagiarism
- Submission

Task

- You will be writing five (5) assembly functions.

```
void map(double *values,  
        uint64_t num_values,  
        double (*mapping_func)(double left, double right),  
        double map_value);
```

```
double map_add(double left, double right);  
double map_sub(double left, double right);  
double map_min(double left, double right);  
double map_max(double left, double right);
```

Map Function

- Map will go through an array of doubles and execute a function on each one.
- The parameters to the map function have the following meaning.
 - `double *values` – An array of doubles
 - `uint64_t num_values` – The total number of elements in the values array.
 - `double (*mapping_func)(double left, double right)` – A function pointer for the mapping function.
 - `double map_value` – The value to pass to the right mapping function parameter.

Map C++ Version

```
void map(double *values,
         uint64_t num_values,
         double (*mapping_func)(double left, double right),
         double map_value)
{
    uint64_t i;
    for (i = 0; i < num_values; i++) {
        values[i] = mapping_func(values[i], map_value);
    }
}
```

Mapping Functions C++

```
double map_add(double left, double right)
{
    return left + right;
}
```

```
double map_sub(double left, double right)
{
    return left - right;
}
```

```
double map_min(double left, double right)
{
    if (left < right) return left;
    else return right;
}
```

```
double map_max(double left, double right)
{
    if (left > right) return left;
    else return right;
}
```

Requirements

- You must properly use the stack so that you can call the mapping function.
- Use numeric labels for your loop.
- Use the ABI names for registers
 - ABI names: t0, a0, s0, etc.
 - Index names: ~~x10, x15, x20, etc.~~

Testing

- The .cpp template file executes your map function.
- It is executed through the console.
 - You are first asked which operation. There are four operations: + (add), - (subtract), ^ (maximum), and v (minimum).
- Compile with the following command.

```
~> riscv64-unknown-linux-gnu-g++ -o lab lab.cpp lab.S  
~> ./lab
```


Example #1 (Max)

```
~> ./lab
```

```
What operation do you want to perform? ^
```

```
Enter map value: 10
```

```
Enter values (CTRL-D when done)
```

```
30
```

```
40
```

```
-10
```

```
-20
```

```
Performing map...done.
```

```
Printing results.
```

```
30
```

```
40
```

```
10
```

```
10
```

Example #2 (Min)

```
~> ./lab
What operation do you want to perform? v
Enter map value: -5
Enter values (CTRL-D when done)
-100
100
200
300
-5
-10
Performing map...done.

Printing results.
-100
-5
-5
-5
-5
-10
```

Example #3 (Add)

```
~> ./lab
```

```
What operation do you want to perform? +
```

```
Enter map value: -5
```

```
Enter values (CTRL-D when done)
```

```
100
```

```
200
```

```
-100
```

```
-200
```

```
Performing map...done.
```

```
Printing results.
```

```
95
```

```
195
```

```
-105
```

```
-205
```

Example #4 (Sub)

```
~> /map
```

```
What operation do you want to perform? -
```

```
Enter map value: 6
```

```
Enter values (CTRL-D when done)
```

```
10
```

```
20
```

```
-10
```

```
-20
```

```
30
```

```
0
```

```
6
```

```
Performing map...done.
```

```
Printing results.
```

```
4
```

```
14
```

```
-16
```

```
-26
```

```
24
```

```
-6
```

```
0
```

Plagiarism Policy

- This is an **individual assignment**.
- You must NOT be able to see anyone else's code.
- Do NOT send your code and do not accept someone sending you code.
- Do NOT use any online source, such as Chegg, Stackoverflow, etc.
- You MAY use the online notes that I have created for you.
- You MUST cite anyone with whom you worked with, including classmates, students in another class, professors, and TAs.
 - Please note that even if you cite another student, professor, or TA, it does NOT mean you may share code.
- If you cannot attest to the truthfulness of not cheating using the bullets above. DO NOT submit your code. It is better just to get a 0 here and let it be done. If you proceed with copied code, the office of Student Conduct and Community Standards (SCCS) will become involved.

Submission

- Make sure your code compiles and assembles with the following command.

```
~> riscv64-unknown-linux-gnu-g++ -o lab lab.cpp lab.S  
~> ./lab
```

- Replace **lab** with the name of your lab.
 - Make sure you have comments in your code, including a header and inline comments.
 - Submit only your .S file.

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