

# HW02

☰ Student Name	Muhammed Oğuz
☰ Student Number	1801042634
☷ Tags	Homework

## Table of Content

- [Table of Content](#)
- [Content of the Folder](#)
- [General Approach](#)
  - [Helper Files](#)
  - [Pseudocode](#)
  - [MIPS Assembly Problems](#)
  - [Reading File](#)
  - [Atoi Function](#)
  - [Writing to File](#)
- [Complexity](#)
  - [Time Complexity](#)
  - [Space Complexity](#)
- [Screenshots](#)
  - `file.txt` [Content](#)
  - [Terminal Output](#)
  - `out.txt` [Content](#)

## Content of the Folder

- hw2.asm → full solution in asm
- hw2.c → solutions to problem in C language
- file.txt → example inputs
- helper\_files folder → assembly solutions to some problems. (also they are in hw2.asm file)

## General Approach

### Helper Files

Helper files contains additional work while trying to implement some functions in assembly

### Pseudocode

First, I examine the problem. After that, I try to wrote a solution in C.

This is my solution `Pseudocode` .

```
findLongest(arr):
  resultArr <- Initialize
  resultArrSize = 0
  tempArr <- Initialize
  for i = 0 in arr
    tempArrSize = 0
    tempVal = arr[i]
    for (j = i) in arr
      if (arr[j] > tempVal)
        tempArr[tempArrSize++] = arr[j]
        tempVal = arr[j]

  if (tempArrSize > resultArrSize)
    resultArrSize = tempArrSize
    resultArr = tempArr

print resultArr
```

---

Than, I convert this algorithm to MIPS assembly.

## MIPS Assembly Problems

While I implementing this to assembly, I faced some issues about register counts. Sometimes register are not enough for me. But eventually I handled them.

## Reading File

In helper files folder. It contains some files when implementing functions.

While reading from while, I faced a issue that, MARS compiler can not handle inputs as integer. So I read all file as `string` and convert it to `integer` to hold in an array.

## Atoi Function

After reading file, all strings should be converted to integer. I use spaces as new input and used `newline` or `carriage return` to pass new array.

This atoi functions reads char by char, and converts them into integer.

## Writing to File

When writing to file, like reading, I have to convert integers to strings to write nicely.

While converting to integers to strings, I coded some parts a bit hardcoded. But It was necessary to handle them.

It converts single values with a corresponding zero on it.

For example, writes `3` as `03` to file. But it is not a problem since it has the same meaning.

## Complexity

### Time Complexity

My solution has two for loop inside each other.

It is the max complex thing in my algorithm. So my time complexity is  $O(n^2)$

### Space Complexity

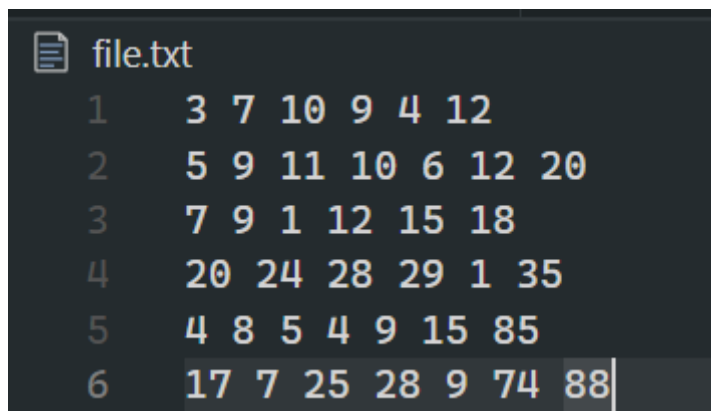
I creating an array for holding longestArr sequence. Also I creating a tempArr to hold every possible sequence.

Both of them could be larger like original array size `n`. So my space complexity is  $O(2n)$

## Screenshots

### `file.txt` Content

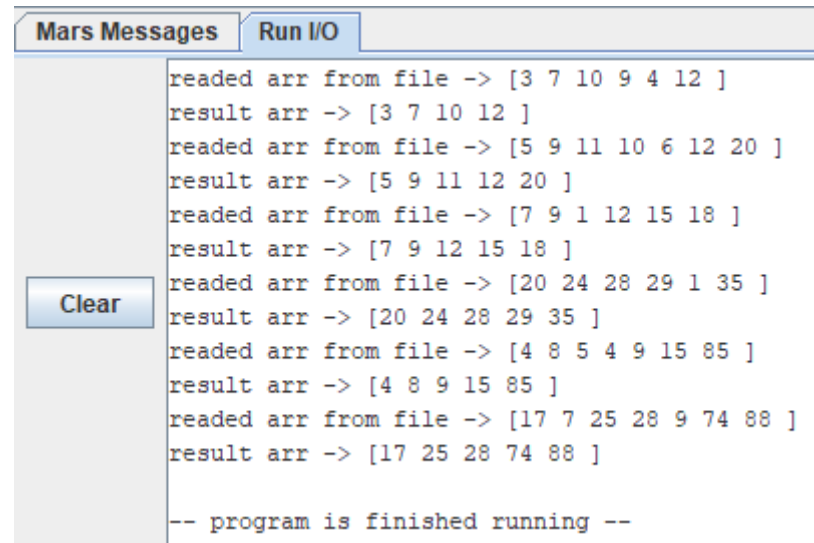
It reads all the file and inserts values to arrays.



```
file.txt
1 3 7 10 9 4 12
2 5 9 11 10 6 12 20
3 7 9 1 12 15 18
4 20 24 28 29 1 35
5 4 8 5 4 9 15 85
6 17 7 25 28 9 74 88
```

## Terminal Output

It contains 6 array. It has readed array first, after that, writes the result. And also writes the result to the `out.txt` file.



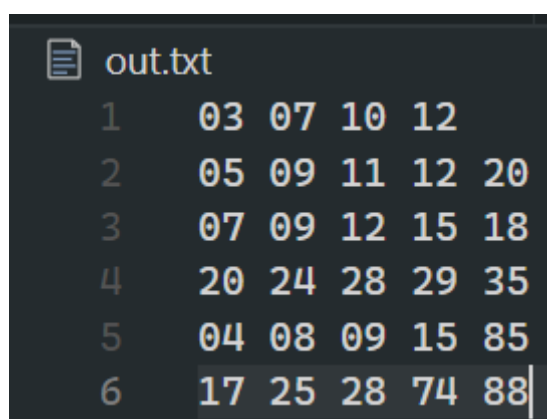
```
Mars Messages Run I/O
readed arr from file -> [3 7 10 9 4 12 ]
result arr -> [3 7 10 12 ]
readed arr from file -> [5 9 11 10 6 12 20 ]
result arr -> [5 9 11 12 20 ]
readed arr from file -> [7 9 1 12 15 18 ]
result arr -> [7 9 12 15 18 ]
readed arr from file -> [20 24 28 29 1 35 ]
result arr -> [20 24 28 29 35 ]
readed arr from file -> [4 8 5 4 9 15 85 ]
result arr -> [4 8 9 15 85 ]
readed arr from file -> [17 7 25 28 9 74 88 ]
result arr -> [17 25 28 74 88 ]

-- program is finished running --
```

## `out.txt` Content

This is the output of the program.

It contains zero before `1` size numbers. But it is not important since it has the same meaning.



```
out.txt
1    03 07 10 12
2    05 09 11 12 20
3    07 09 12 15 18
4    20 24 28 29 35
5    04 08 09 15 85
6    17 25 28 74 88
```