

LAB THREE

ARRAYS, POINTERS, SOURCE CODE CONTROL

CS2263, Fall 2021

LEARNING OUTCOMES

At the conclusion of the lab, students should be able to

- Write C programs that reference arrays using pointers
- Use git repositories for simple source code control

RESOURCES

Source code available at:

<https://github.com/yunghsianglu/IntermediateCProgramming>

EXERCISE ZERO

Choose a location in your home directory on the lab machine to hold your CS2263 source code. Clone your existing (and empty) repo from the FCS git server using the command

```
$ git clone https://vcs.cs.unb.ca/git/cs2263-<yourId>
```

Here is a screen shot of the command and response:

```
[wightman@gaea Lab2]$ git clone https://vcs.cs.unb.ca/git/cs2263-wightman
Cloning into 'cs2263-wightman'...
Username for 'https://vcs.cs.unb.ca': wightman
Password for 'https://wightman@vcs.cs.unb.ca':
warning: You appear to have cloned an empty repository.
[wightman@gaea Lab2]$
```

Now move into the local area

```
$ cd cs2263-<yourId>
```

SUBMIT:

- A screen shot of cloning and moving into the local area

EXERCISE ONE

Modify and run the `arithmetic1.c` program from the textbook, page 55, by adding the printing, in the hex notation using the `%p` format, of the memory addresses stored in the variables `iptr`, `cptr`, and `dptr`.

QUESTIONS:

- Are the pointer variables incremented correctly? Show your calculations based on the memory addresses printed by your program.
- Are the increments for different pointers the same? Explain why.

SUBMIT:

- the modified source code
- the screen shot of the output from your program
- the screenshot of you pushing the program source to the FCS git
- The answers to the questions in this section

EXERCISE TWO

Write and test a C program uses the C function that prints every element of the array of integers twice: first by referencing the value of each array element with the integer index and then by referencing the same value in the array with the pointer (which is then incremented to get to the next value). On each line of output include: the array element index, the array element value, the array element memory address and then the array element value again. Test your program on

```
int arr[] = {10, 11, 12, 13, 14, 15, 16}
```

The first line of output should resemble:

```
0    10    0xffffffffffffff1234    10
```

SUBMIT:

- the modified source code
- the screen shot of the output from your program
- the screenshot of you pushing the program source to the FCS git

EXERCISE THREE

Write and test a C program uses the C function

```
int arrindex (int * p1, int * p2)
```

that given the array of integers and the pointer to the element of this array returns the index value of this array element.

Test your function with the following statements (that needs to be debugged):

```
1  int arr[] = {10, 11, 12, 13, 14, 15, 16};
2  for (int i; i < sizeof(arr)/sizeof(arr[0]); i++)
3  |   printf ("%d  %d /n", i, arrindex( & a[0], & a[i]));
```

SUBMIT:

- the source code
- the screen shot of the output from your program
- the screenshot of you pushing the program source to the FCS git

EXERCISE FOUR

Modify and test the `wrongindex.c` program from the textbook, page 75. Ignore warnings for the purposes here. Print the memory addresses of `x`, `y`, and of **all** elements of the array `arr`.

QUESTIONS:

- “Draw” the memory stack for your program
- Are the results from your program different from the results shown in the textbook? Explain why.

SUBMIT:

- the modified source code
- the screen shot of the output from your program
- the screenshot of you pushing the program source to the FCS git

EXERCISE FIVE

- remove one of your source files from your local area

```
$ rm <filename>
```

- Restore it from the FCS git:

```
$ git checkout -- <filename>
```

SUBMIT:

- A screen shot of both your removing and restoring the file from git

SUBMISSION

Before the due date for this lab, students should submit a single zip or tar file (named *LastName_FirstName_Lab3.zip* or *LastName_FirstName_Lab3.tar*) online to the lms containing:

- the required material for each question (use the headings indicating the question number) in a single pdf file (named *LastName_FirstName_Lab3.pdf*)
- Your source code directory:
 - This should include all of your source files, including any test programs.
 - This should not include object (.o) files and executables. Nobody needs to see those.

POST LAB IDEA

Choose a location in your home directory on the lab machine and clone the github repo for the textbook source files:

```
$ git clone 'https://github.com/yunghsianglu/IntermediateCProgramming.git'
```