Lab 3

A screen shot of cloning and moving into the local area

```
C:\Users\momou>ssh mmoustaf@gc112m38.cs.unb.ca
mmoustaf@gc112m38.cs.unb.ca's password:
Last login: Tue Oct  5 14:37:55 2021 from 10.6.104.109
[mmoustaf@gc112m38 ~]$ cd cs2263
[mmoustaf@gc112m38 ~/cs2263]$ cd Labs/Lab3
[mmoustaf@gc112m38 Lab3]$ git clone https://vcs.cs.unb.ca/git/cs2263-mmoustaf
Cloning into 'cs2263-mmoustaf'...
Username for 'https://vcs.cs.unb.ca': mmoustaf
Password for 'https://mmoustaf@vcs.cs.unb.ca':
warning: You appear to have cloned an empty repository.
[mmoustaf@gc112m38 Lab3]$ cd cs2263-mmoustaf
[mmoustaf@gc112m38 cs2263-mmoustaf]$
```

Exercise 1

Modified Arithmetic 1 source code

```c
// arithmetic1.c
#include <stdio.h>
#include <stdlib.h>
int main (int argc ,char * * argv)
{
  int    arr1[] = {7, 2, 5, 3, 1, 6, -8, 16, 4};
  char   arr2[] = {'m', 'q', 'k', 'z', '%', '>'};
  double arr3[] = {3.14, -2.718, 6.626, 0.529};
  int len1 = sizeof(arr1) / sizeof(int);
  int len2 = sizeof(arr2) / sizeof(char);
  int len3 = sizeof(arr3) / sizeof(double);
  printf("lengths = %d, %d, %d\n", len1, len2, len3);

  int    * iptr = arr1;
  char   * cptr = arr2;
  double * dptr = arr3;
  printf("values = %d, %c, %f\n", * iptr, * cptr, * dptr);
  printf("Hex notations: %p, %p, %p\n", iptr, cptr, dptr);
  iptr ++;
  cptr ++;
  dptr ++;
  printf("values = %d, %c, %f\n", * iptr, * cptr, * dptr);
  printf("Hex notations: %p, %p, %p\n", iptr, cptr, dptr);
  iptr ++;
  cptr ++;
  dptr ++;
  printf("values = %d, %c, %f\n", * iptr, * cptr, * dptr);
  printf("Hex notations: %p, %p, %p\n", iptr, cptr, dptr);
  iptr ++;
  cptr ++;
  dptr ++;
  printf("values = %d, %c, %f\n", * iptr, * cptr, * dptr);
  printf("Hex notations: %p, %p, %p\n", iptr, cptr, dptr);
  return EXIT_SUCCESS;
}
```

Arithmetic 1 output

```
[mmoustaf@gc112m38 cs2263-mmoustaf]$ gcc -o arithmetic1 arithmetic1.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ ./arithmetic1
lengths = 9, 6, 4
values = 7, m, 3.140000
Hex notations: 0x7ffda0da7d90, 0x7ffda0da7d80, 0x7ffda0da7d60
values = 2, q, -2.718000
Hex notations: 0x7ffda0da7d94, 0x7ffda0da7d81, 0x7ffda0da7d68
values = 5, k, 6.626000
Hex notations: 0x7ffda0da7d98, 0x7ffda0da7d82, 0x7ffda0da7d70
values = 3, z, 0.529000
Hex notations: 0x7ffda0da7d9c, 0x7ffda0da7d83, 0x7ffda0da7d78
```

Pushing the program to the FCS git

```
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git push origin master
Username for 'https://vcs.cs.unb.ca': mmoustaf
Password for 'https://mmoustaf@vcs.cs.unb.ca':
Counting objects: 3, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 602 bytes | 0 bytes/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://vcs.cs.unb.ca/git/cs2263-mmoustaf
 * [new branch]      master -> master
```

Answers to the questions:

Question 1:

sizeof char = 1

sizeof int = 4

sizeof double = 8

The differences between each increment in the char pointer variable is 1.

The differences between each increment in the int pointer variable is 4.

The differences between each increment in the double pointer variable is 8.

Char:	int:	double
80	90	60
+ 1	+ 4	+ 8
81	94	68
+ 1	+ 4	+ 8
82	98	70
+ 1	+ 4	+ 8
83	9C	78
	(Hex C = 12)	

(Because Hex)

Question 2:

Are the increments for different pointers the same? Explain why.

They are not the same, because each type has a storage size different from that of another type. The storage size for a char is 1 byte. That of an int is 4 bytes. That of a double is 8 bytes

Exercise 2

Modified Source Code

```c
#include <stdio.h>
#include <stdlib.h>

int main()
{
    int arr[] = {10, 11, 12, 13, 14, 15, 16};
    int i = 0;
    int *arrp = arr;
    while (i <= 6)
    {
      printf("%d\t%d\t\t%p\t\t%d\n\n", i, arr[i],&arr[i], *arrp++);

      i++;
    }
    return EXIT_SUCCESS;
}
```

Two.c Output

```
0       10              100x7ffa9d6faa00                10

1       11              110x7ffa9d6faa00                11

2       12              120x7ffa9d6faa00                12

3       13              130x7ffa9d6faa00                13

4       14              140x7ffa9d6faa00                14

5       15              150x7ffa9d6faa00                15

6       16              160x7ffa9d6faa00                16
```

Pushing Two.c to the FCS git

```
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git add Two.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git commit -m "Adding Two.c"
[master 752ae83] Adding Two.c
 1 file changed, 22 insertions(+)
 create mode 100644 Two.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git commit -m "Adding Two.c"
# On branch master
# Your branch is ahead of 'origin/master' by 1 commit.
#   (use "git push" to publish your local commits)
#
nothing to commit, working directory clean
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git push origin master
Username for 'https://vcs.cs.unb.ca': mmoustaf
Password for 'https://mmoustaf@vcs.cs.unb.ca':
Counting objects: 4, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 464 bytes | 0 bytes/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://vcs.cs.unb.ca/git/cs2263-mmoustaf
   ae53623..752ae83  master -> master
[mmoustaf@gc112m38 cs2263-mmoustaf]$
```

Exercise Three

Source code

```c
#include <stdio.h>
#include <stdlib.h>

int arrindex (int * p1, int * p2)
{
    return p2-p1;
}

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

Three.c Output

```
[mmoustaf@gc112m38 Lab3]$ gcc -o Three Three.c
[mmoustaf@gc112m38 Lab3]$ ./Three
i: 0   arrindex: 0
i: 1   arrindex: 1
i: 2   arrindex: 2
i: 3   arrindex: 3
i: 4   arrindex: 4
i: 5   arrindex: 5
i: 6   arrindex: 6
```

Pushing Three.c to the FCS git

```
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git add Three.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git commit -m "Adding Three.c"
[master 346c59c] Adding Three.c
 1 file changed, 17 insertions(+)
 create mode 100644 Three.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git push origin master
Username for 'https://vcs.cs.unb.ca': mmoustaf
Password for 'https://mmoustaf@vcs.cs.unb.ca':
Counting objects: 4, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 488 bytes | 0 bytes/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://vcs.cs.unb.ca/git/cs2263-mmoustaf
   752ae83..346c59c  master -> master
```

Exercise 4

Wrongindex.c Source Code

```c
/*
 * wrongindex.c
 */
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
int main(int argc, char * * argv)
{
  int x = -2;
  int arr[] = {0, 1, 2, 3, 4};
  int y = 15;
  printf("& x      = %p, & y      = %p\n", & x, & y);
  printf("& arr[0] = %p, & arr[4] = %p\n", & arr[0],
   & arr[4]);
  printf("x = %d, y = %d\n", x, y);
  printf("X memory address: %p\n", &x);
  printf("Y memory address: %p\n", &y);
  int i;
  for (i = 0; i < 5; i++)
  {
    printf("The memory address of array[%d] is %p\n", i, &arr[i]);
  }
  arr[-1] = 7;
  arr[5]  = -23;
  printf("x = %d, y = %d\n", x, y);
  printf("X memory address: %p\n", &x);
  printf("Y memory address: %p\n", &y);
  for (i = 0; i < 5; i++)
  {
    printf("The memory address of array[%d] is %p\n", i, &arr[i]);
  }
  arr[6]  = 108;
  printf("x = %d, y = %d\n", x, y);
  printf("X memory address: %p\n", &x);
  printf("Y memory address: %p\n", &y);
  for (i = 0; i < 5; i++)
  {
    printf("The memory address of array[%d] is %p\n", i, &arr[i]);
  }
  arr[7]  = -353;
  printf("x = %d, y = %d\n", x, y);
  printf("X memory address: %p\n", &x);
  printf("Y memory address: %p\n", &y);
  for (i = 0; i < 5; i++)
  {
    printf("The memory address of array[%d] is %p\n", i, &arr[i]);
  }
  return EXIT_SUCCESS;
}
```

Wrongindex.c output

```
& x      = 0x7fffd11f7258, & y      = 0x7fffd11f723c
& arr[0] = 0x7fffd11f7240, & arr[4] = 0x7fffd11f7250
x = -2, y = 15
X memory address: 0x7fffd11f7258
Y memory address: 0x7fffd11f723c
The memory address of array[0] is 0x7fffd11f7240
The memory address of array[1] is 0x7fffd11f7244
The memory address of array[2] is 0x7fffd11f7248
The memory address of array[3] is 0x7fffd11f724c
The memory address of array[4] is 0x7fffd11f7250
x = -2, y = 7
X memory address: 0x7fffd11f7258
Y memory address: 0x7fffd11f723c
The memory address of array[0] is 0x7fffd11f7240
The memory address of array[1] is 0x7fffd11f7244
The memory address of array[2] is 0x7fffd11f7248
The memory address of array[3] is 0x7fffd11f724c
The memory address of array[4] is 0x7fffd11f7250
x = 108, y = 7
X memory address: 0x7fffd11f7258
Y memory address: 0x7fffd11f723c
The memory address of array[0] is 0x7fffd11f7240
The memory address of array[1] is 0x7fffd11f7244
The memory address of array[2] is 0x7fffd11f7248
The memory address of array[3] is 0x7fffd11f724c
The memory address of array[4] is 0x7fffd11f7250
x = 108, y = 7
X memory address: 0x7fffd11f7258
Y memory address: 0x7fffd11f723c
The memory address of array[0] is 0x7fffd11f7240
The memory address of array[1] is 0x7fffd11f7244
The memory address of array[2] is 0x7fffd11f7248
The memory address of array[3] is 0x7fffd11f724c
The memory address of array[4] is 0x7fffd11f7250
```

Pushing wrongindex.c to the FCS git

```
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git add wrongindex.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git commit -m "Adding wrongindex.c"
[master 8b82a53] Adding wrongindex.c
 1 file changed, 49 insertions(+)
 create mode 100644 wrongindex.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git push origin master
Username for 'https://vcs.cs.unb.ca': mmoustaf
Password for 'https://mmoustaf@vcs.cs.unb.ca':
Counting objects: 4, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 595 bytes | 0 bytes/s, done.
Total 3 (delta 1), reused 0 (delta 0)
To https://vcs.cs.unb.ca/git/cs2263-mmoustaf
   346c59c..8b82a53  master -> master
[mmoustaf@gc112m38 cs2263-mmoustaf]$
```

Exercise 5

```
[mmoustaf@gc112m38 cs2263-mmoustaf]$ rm arithmetic1.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ ls
Three.c  Two.c  wrongindex.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ git checkout -- arithmetic1.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$ ls
arithmetic1.c  Three.c  Two.c  wrongindex.c
[mmoustaf@gc112m38 cs2263-mmoustaf]$
```