

Colby Crutcher

Lab 1

Secure Coding

Question 1

- a. (3 points) Execute the program and explain the output.

```
colbycrutcher@Colbys-MacBook-Pro Lab1 % ./q1
p is 0x16da9664b
The value at p is C
Now p is 0x16da9664c
```

- The first line points p to the address of c, and prints out that value. So it prints “p is 0x16da9664b” which is the memory location address.
- The second print value states “The value of p is C”. This points *p to c, and returns the character ‘C’.
- The third print says “Now p is 0x16da9664c”. Prior to this print statement, $p = p + 1$ was used and p is a memory address, it sends the new address in memory.

- b. (3 points) Modify the code to perform the same pointer arithmetic on a pointer to an int. Execute the program and explain the output.

```
colbycrutcher@Colbys-MacBook-Pro Lab1 % ./q1
p is 0x16bb56648
The value at p is 1
Now p is 0x16bb5664c
```

- The output is essentially the same. I had to change the char in the f-string to accept an integer, as well as making defined c and *p as ints. The first line is the address in memory for p, the second just shows the value is an integer, and the address changes when we change the pointer address to + 1.

- c. (3 points) Modify the code again to perform the same pointer arithmetic on a pointer to a double. Execute the program and explain the output.

```
colbycrutcher@Colbys-MacBook-Pro Lab1 % ./q1
p is 0x16fc9e640
The value at p is 1.230000
Now p is 0x16fc9e648
```

This modification changes the output to accept a double/floating point value (allow decimal values). The same output occurs, it prints the address, then the double, then adds 1 to the address's value, ultimately changing the address where p is stored.

- d. (6 points) What should happen if the line $p = p + 1$ is changed to $p = p + 2$ in parts a-c above? Execute the program with this change (for all of parts a-c) to verify your answer.
- a. This changes the address value from 0x16d69a64b to 0x16d69a64d. The 'b' at the end of the address value changed to a 'd'.

```
colbycrutcher@Colbys-MacBook-Pro Lab1 % ./q1
p is 0x16d69a64b
The value at p is C
Now p is 0x16d69a64d
```

- b. This changes the address from 0x16b48a648 to 0x16b48a650, a change of 2.

```
colbycrutcher@Colbys-MacBook-Pro Lab1 % ./q1
p is 0x16b48a648
The value at p is 1
Now p is 0x16b48a650
```

- c. This changes the address from 0x16d322640 to 0x16d322650, essentially just a change of +10 to the address value.

```
colbycrutcher@Colbys-MacBook-Pro Lab1 % ./q1
p is 0x16d322640
The value at p is 1.230000
Now p is 0x16d322650
```

Question 2

- (5 points) In the following program, add required lines of code to print the value and address of variable x in fun1, and variable y in fun2. Execute the program and precisely explain the output

```
colbycrutcher@Colbys-MacBook-Pro Lab1 % ./q2
Address of x: 0x16bca2628
Value of x: 5
Address of y: 0x16bca262c
Value of y: 10
```

- fun1 takes in an int, and in main it is the value 5. From there I print the address, and then the value of x, which indeed is 5.
- fun2 doesn't take in any parameters, but declares the variable y as 10. I then print the address of y using %p, and feed it &y (which means address of y). After that I just print the int value of y.

Question 3

- (5 points) Write a program that declares and initializes (to any value) a double and an int. Your program should then print the address and the value stored in each of the variables, along with the amount of memory each variable occupies.

```
int main(){  
    int a = 5;  
    double b = 2.0;  
  
    printf("Address of a: %p\n", &a);  
    printf("Value of a: %d\n", a);  
  
    printf("Address of b: %p\n", &b);  
    printf("Value of b: %f\n", b);  
  
    return 0;  
}
```

```
colbycrutcher@Colbys-MacBook-Pro Lab1 % ./q3  
Address of a: 0x16ba12648  
Value of a: 5  
Address of b: 0x16ba12640  
Value of b: 2.000000
```