Introduction to Computing
CS 151 - ON60
Department of Physics and Computer Science
Medgar Evers College
Exam 4

Instructions:

- **The exam requires writing a complete cpp file within an 120 minutes. It requires completing tasks in four sections.**
- **Accompanying this file is a template cpp file. You must modify the cpp file; however, you cannot add additional libraries to or remove any libraries from the file. All other modifications are allowed.**
- **Tables can be constructed using a spreadsheet application instead of being included the the cpp file.**
- **Your submissions must be submitted to the Exams directory of your github repository and/or as attachments on Google classroom under the Exam04 assessment. The files must have the accurate extensions.**
- **Cheating of any kind is prohibited and will not be tolerated.**
- **Violating and/or failing to follow any of the rules will result in an automatic zero (0) for the exam.**

TO ACKNOWLEDGE THAT YOU HAVE READ AND UNDERSTOOD THE INSTRUCTIONS ABOVE, AT THE BEGINNING OF YOUR SUBMISSION(S), ADD A COMMENT THAT CONSISTS OF YOUR NAME AND THE DATE

Grading:

Section	Maximum Points	Points Earned
Fundamentals	5	
Problem Solving	5	
Tracing	5	
Debugging	5	
Total	20	

Fundamentals

1. **In the commented section titled Fundamentals, for each of the following questions, write ONLY what is requested**

   a. Write a statement(s) that displays the uppercase letters in order in a line that excludes your initials.

   b. Write a statement(s) that declares a dynamic float array of size 100; and then, another statement(s) that deallocates the array.

   c. Write the definition of a void function named `S()` that takes two int pointer parameters and swaps the values of the parameters only if the value of the first parameter is less than the value of the second parameter.

   d. Given that an int variable named m has been declared, write a statement(s) that reads in a value from the user and stores the value in m until the user enters a multiple of 5.

   e. Given a string variable named n that has been intialized, write a statement(s) that uppercases all the letters of n. You can use the functions `tolower()` and `toupper()` if necessary.

Problem Solving

2. **A set is a collection of distinct items; that is, it is a collection of items such that no two items are the same. Furthermore, there are binary operations that can be performed on sets, which are called union, intersection and difference. Given any two sets, the union of the sets is a set that consist of all the elements from both sets, the intersection of the sets is a set that consist of only elements that are in both sets and the difference of the sets is a set that consist of the elements in the first set that are not in the second set. For instance, if the first set is equal to $\{1, 3, 4, 5, 9\}$ and the second set is equal to $\{2, 4, 7, 8, 9\}$, then the resulting union, intersection and difference of the sets are $\{1, 2, 3, 4, 5, 7, 8, 9\}$, $\{4, 9\}$ and $\{1, 3, 5\}$ respectively.**

   Using the above information, write a void function named `Operation()` that takes two int array parameters and an int parameter respectively. Given that the int parameter represents the size of both array parameters and that both array parameters represent sets, the function will display the result of the union of the array parameters enclosed in curly braces with each element separated by a comma as in the above examples. The display of the elements can be in any order. For instance, the caller `Operation(a,b,4)` where `a` equals `{2,6,5,1}` and `b` equals `{1,4,5,3}` will display `{1,2,3,4,5,6}` [same values, but not necessarily in the same order].

   Hint: An array search needs to be performed.

Tracing

3. **In the commented section titled Tracing, construct a trace table (or list) of the caller `P(a,0,4)` where `a = {72,53,81,70,65}` and the definition of `P()` is below.**

```
int P(int a[],int s,int e)
{
  int p = e, j = s - 1;

  for(int i = s;i < p;i += 1)
  {
    if(a[i] <= a[p])
    {
      j += 1;
      a[i] += a[j];
      a[j] = a[i] - a[j];
      a[i] = a[i] - a[j];
    }
  }
  a[p] += a[j+1];
  a[j+1] = a[p] - a[j+1];
  a[p] = a[p] - a[j+1];
  return (j + 1);
}
```

Debugging

4. **In the commented section titled Debugging, for each code segment, write ONLY the line number and the entire corrected line for each line that contains a syntax error and/or does not maintain the intent of the code.**

a. `/*Intent: given that the int parameter represents the size of the array parameter, it assigns each element its absolute value*/`

```
01 | void N(double a[],int n)
02 | {
03 |   for(int i = 0;i <= n;i += 1)
04 |   {
05 |     if(a[i] < 0)
06 |     {
07 |       a[i] += -1;
08 |     }
09 |   }
10 | }
```

b. `/*Intent: returns the greatest common divisor of the squares of the parameters*/`

```
01 | int G(int n,int m)
02 | {
03 |   int sm, sn = m * m, n * n;
04 |   int r;
05 |
06 |   while(sn != 0)
07 |   {
08 |     sm % sn = r;
09 |     sm = sn;
10 |     sn = r;
11 |   }
12 |   return sm;
13 | }
```

c. `/*Intent: given that the int parameter represents the size of the array parameter, it reverses the values of the array parameter*/`

```
01 | void R(string* v,int n)
02 | {
03 |   int t;
04 |
05 |   for(int i = 0;i < n / 2;i += 1)
06 |   {
07 |     t = v[i];
08 |     v[i] = v[n-i];
09 |     v[n-1-i] = t;
10 |   }
11 | }
```

d. `/*Intent: given that the int parameter represents the size of the array parameter, it returns true only if every previous element is less than or equal to the current element*/`

```
01 | bool M(double f[],int t)
02 | {
03 |   for(int i = 0;i < t;i += 1)
04 |   {
05 |     if(f[i-1] > f[i])
06 |     {
07 |       return false;
08 |     }
09 |
10 |   return true;
11 | }
```

e. `/*Intent: given that the int parameter represents the size of the array parameter, it assigns each element of the array the sum of positive consecutive integer up to its position*/`

```
01 | bool S(int a[],int n)
02 | {
03 |   a[0] = 1;
04 |
05 |   for(int j = 1;j < n;j += 1)
06 |   {
07 |     a[i] = a[i-1] + (i + 1);
08 |   }
09 | }
```