## CS 1713
Introduction to Computer Programming II
Midterm Solutions

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NAME:__________________________

**Instructions**
1. Do all of the 4 problems
3. You have 50 minutes for the exam
4. Show all your work
5. Do not separate midterm papers

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1. (30 pts) Complete the following program to find the *difference* of a set of numbers in an array. Difference of a set of numbers is the difference between largest element and smallest element in the set. For example, the array \{2, 4, 6, 3, 9, 10\} has difference of 8 since largest element is 10 and smallest element is 2 resulting in difference of 10-2=8.

**Solution:**

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

int main()
{
   int i;
   double num[6];
   double max;
   double min;
   double difference;

   printf("Enter 6 doubles\n");
   for (i=0; i<6; i++)
      scanf("%lf", &num[i]);

   max = num[0];
   min = num[0];
   for (i=0; i<6; i++)
      {
      if (num[i]>max)
         max = num[i];
      if (num[i]<min)
         min = num[i];
      }
   difference = max-min;

   printf("Difference is %lf\n", difference);
   return(0);
}
```
2. (20 pts) Trace the execution of the following program. What will be the final values of array $a$ printed?

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

int main()
{
    int a[7]={1,2,4,8,16,32,64};
    int i;

    for (i=1; i<6; i=i+2)
        if (i<4)
            {
                a[i] = (a[i-1]+a[i+1])/2;
                a[i-1] = a[i]+1;
            }
        else
            {
                a[i] = a[6-i];
                a[i-1] = a[i]-1;
            }

    for (i=0; i<7; i++)
        printf("a[%d] = %d\n",i,a[i]);
}
```

Solution

- $a[0] = 3$
- $a[1] = 2$
- $a[2] = 11$
- $a[3] = 10$
- $a[4] = 1$  
- $a[5] = 2$
- $a[6] = 64$
3. (20 pts) What is the output of the following program? Show all your work for partial credit.

```c
#include <stdio.h>

int function1(int a, int b)
{
    return((a-1)*(b+1)/2);
}

int main()
{
    int i;
    int x;

    for (i=2; i<10; i=i+1)
    {
        if (i>10)
            x = function1(i, i-1);
        else
            x = function1(i-1, i);
        printf("%d\n", x);
    }

    return(0);
}
```

Solution

0
2
5
9
14
20
27
35
4. (30 pts) Write a complete program to compute the following expression. Read the value of \( n \) from the user and write a **single loop** to evaluate the expression

\[ \sum_{i=1}^{n} \frac{1}{i} + \sum_{i=1}^{n} \frac{1}{2i} \]

Solution:

```c
#include <stdio.h>

int main()
{
    int n,i;
    float sum = 0;

    printf("Enter n\n");
    scanf("%d",&n);

    for (i=1; i<=n; i=i+1)
        sum = sum + 1.0/i + 1.0/(2*i);

    printf("Sum = %.2f\n",sum);

    return(0);
}
```