## 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 if all the numbers in the array data are distinct. If not find the number that appears multiple times and print it.

Solutions:

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

int main()
{
    int i,j;
    int data[7];
    int found = 0, num;

    printf("Enter 7 integers\n");
    for (i=0; i<7; i++)
        scanf("%d",&data[i]);

    for (i=0; i<7; i++)
        for (j=i+1; j<7; j++)
            if (data[i]==data[j])
            {
                found = 1;
                num = data[i];
            }

    if (found == 1)
        printf("%d appears multiple times in the array",num);
    else
        printf("All the numbers are distinct\n");
    return(0);
}
```
2. (20 pts) Trace the execution of the following program. What will be the final values of array num printed?

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

int main()
{
    int num[6]={3,1,2,4,7,5};
    int i,j,temp;

    for (j=1; j<6; j=j+1)
        for (i=j; i+1<6; i=i+2)
        {
            printf("%d %d\n",i,i+1);
            temp = num[i];
            num[i] = num[i+1];
            num[i+1] = temp;
        }

    for (i=0; i<6; i++)
        printf("num[%d] = %d\n",i,num[i]);
}
```

Solutions:

```
1 2
3 4
2 3
4 5
3 4
4 5
num[0] = 3
num[1] = 2
num[2] = 7
num[3] = 5
num[4] = 4
num[5] = 1
```
3. (20 pts) What is the output of the following program? Show all your work for partial credit.

```c
#include <stdio.h>

struct data {
    int width;
    int height;
};

int mystery2(struct data d1) {
    return(d1.width+2*d1.height);
}

int main() {
    int i=2;
    int x;
    struct data mydata={3,5};

    while (i<25) {
        mydata.width = i;
        mydata.height = i+1;

        if ((i>8) && (i<15))
            x = mystery2(mydata)-i;
        else if (i<8)
            x = mystery2(mydata)+i;
        else
            x = mystery2(mydata)+1;
        printf("%d %d\n",i,x);
        i = i + 3;
    }

    return(0);
}
```
Solutions:

2 10
5 22
8 27
11 24
14 30
17 54
20 63
23 72
4. (20 pts) Write a complete program to read a file of rectangles represented as length and width fields and find and print the rectangle with the largest area.

Sample file named rectangles.txt given below. Each line has the length and width of a rectangle.

8.5 9.2
2.3 10.7
3.4 7.8
14.5 17.9

Output for above file should be

Maximum area is 259.549988 for rectangle with length 14.500000 and width 17.900000

Solutions:

```c
#include <stdio.h>
int main()
{
    FILE *ifile;
    float length, width;
    float maxarea=0, maxlen, maxwidth;

    ifile = fopen("rectangles.txt","r");

    while (feof(ifile) <= 0)
    {
        fscanf(ifile,"%f %f",&length,&width);
        if (length * width > maxarea)
        {
            maxarea = length * width;
            maxlen = length;
            maxwidth = width;
        }
    }

    printf("Maximum area is %f for rectangle with length %f and width %f", maxarea,maxlen,maxwidth);
    fclose(ifile);
    return(0);
}
```