CS 1713
Introduction to Computer Programming II
Midterm 2 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. (20 pts) What is the **output** of the following program? Show all your work. Draw the contents of the array.

```c
#include <stdio.h>

int function1(int data[8], int a, int b)
{
    data[a]=b;
    return(b-1);
}

int main()
{
    int data[10];
    int i,x;

    for (i=0; i<10; i++)
        data[i]=i;

    i=2;
    while (i<=8)
    {
        x = function1(data,i,i*(i-1));
        printf("%d %d
",i,x);
        i = i + 1;
    }
}
```

**Solution:**

```
2   1
3   5
4  11
5  19
6  29
7  41
8  55
```
2. (30 pts) Write a function to find the number of occurrences of "the" in a string. Count both "The" and "the" in a string. Count words that start with "the" and "The" as well. Sample execution of the function and function prototype is given below.

"The red car hit the blue car" returns 2
"An apple a day keeps the doctor away" returns 1
"There is a car on the street" returns 1

Solution:

```c
int countthe(char *str)
{
    int count = 0;
    while (((*str != '\0') && (*(str+1) != '\0') && (*(str+2) != '\0'))
    {
        if ((str == 'T' || *str == 't') && (*(str+1) == 'h') && (*(str+2) == 'e'))
            count++;
        str++;
    }
    return(count);
}
```
3. (20 pts) Write a single function to find the minimum and maximum in an array. Add your code to the below function example. Add the additional parameters you need for minimum and maximum. *size* is the size of array *data*.

**Solution:**

```c
void findminmax(int data[], int size, int *minptr, int *maxptr)
{
    int i;
    *minptr = data[0];
    *maxptr = data[0];

    for (i=0; i<size; i++)
    {
        if (data[i] > *maxptr)
            *maxptr = data[i];
        if (data[i] < *minptr)
            *minptr = data[i];
    }
}
```
4. (30 pts) **Complete the following program** to find the most frequent character in a string. If there are multiple characters with the same frequency, you can print one of them. Read a string from the user and print the most frequent character. Sample executions are given below

"appleforapple" has most frequent character 'p', since 'p' appears 4 times
"an apple a day" has most frequent character 'a' since 'a' appears 4 times
"abcddcbd" has most frequent character 'd' since 'd' appears 3 times

**Solution:**

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

// returns how many times ch appears in str
int countchar(char ch, char *str) {
    int count = 0;
    while (*str != '\0') {
        if (*str == ch)
            count++;
        str++;
    }
    return(count);
}

int main() {
    char str[100];
    char *str1;
    char mostfrequent;
    int maxcount = 0, count = 0;
    fgets(str,100,stdin);
    str1=str;

    while (*str1 != '\0') {
        count = countchar(*str1,str1);
        if (count> maxcount) {
            mostfrequent = *str1;
            maxcount = count;
        }
        str1++;
    }
    printf("Most frequent character is %c\n",mostfrequent);
    printf("It appears %d times\n",maxcount);

    return 0;
}
```