

Chapter 7: User-Defined Functions II

Extra Programming Examples

Laboratory Exercises (2)

Part 1: An Example of Value Parameters

A Program that illustrates how a value parameter works.

```
#include<iostream>

using namespace std;

void funcValueParam(int num);

int main()
{
    int number = 6;

    cout << "Line 2: Before calling the function " << "funcValueParam,
    number = " << number << endl;

    funcValueParam(number);

    cout << "Line 4: After calling the function " << "funcValueParam,
    number = " << number << endl; return 0;
}

void funcValueParam(int num)
{
    cout << "Line 5: In the function funcValueParam, " << "before
    changing, num = " << num << endl;

    num = 15;

    cout << "Line 7: In the function funcValueParam, "<< "after changing,
    num = " << num << endl;
}
```

Part 2: Examples of Reference Parameters

Example 1: A Program that illustrates how a reference parameter works. This program calculates the factorial of a number.

```
#include <iostream>
using namespace std;

void getNumber(int &num)
{
    cout<<"Enter a number: "<<endl;
    cin>>num;
}

void calculateFactorial(int n)
{
    int i, fact = 1;
    for (i=1; i<=n; i++)
    {
        fact = fact * i;
    }
    cout<<"The factorial of "<<n<<" is: "<<fact;
}

int main()
{
    int a;
    getNumber(a);
    calculateFactorial(a);
    return 0;
}
```

Example 2: A Program that illustrates how a reference parameter works. This program swaps two numbers using call by reference

```
#include <iostream>

using namespace std;

void swapNums(int &x, int &y)
{
    int z = x;
    x = y;
    y = z;
}

int main()
{
    int firstNum = 10;
    int secondNum = 20;

    cout << "Before swap: " << "\n";
    cout << firstNum << secondNum << "\n";

    // Call the function. will change the values of firstNum and secondNum
    swapNums(firstNum, secondNum);

    cout << "After swap: " << "\n";
    cout << firstNum << secondNum << "\n";

    return 0;
}
```

Part 3: Function Overloading

A program that reads two integers and two characters. Overload the function larger to be able to compare the two integers and also compare the two characters. Use the following prototypes:

int larger(int x, int y);

char larger(char first, char second);

```
#include<iostream>
using namespace std;
int larger(int x, int y);
char larger(char first, char second);
int main()
{
    int a,b;
    char c,d;

    cout<< "Enter two integers\n";
    cin>>a>>b;
    cout<<"The larger number is: "<<larger(a,b)<<endl<<endl;

    cout<<"Enter two characters\n";
    cin>>c>>d;

    cout<<"The larger character is: "<<larger(c,d)<<endl<<endl;
}
int larger(int x, int y)
{
    if(x > y)
        return x;
    return y;
}
```

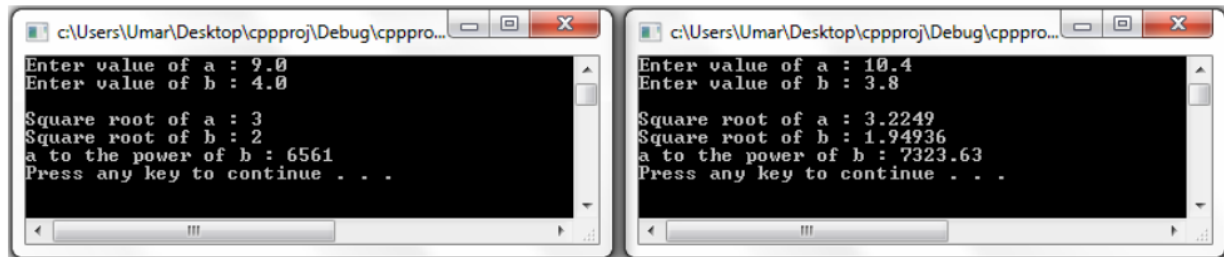
```
char larger(char x, char y)
{
    if(x > y)
        return x;
    return y;
}
```

EXERCISES

Predefined Functions & User defined Functions

KEYWORDS: Math.h, function prototype, return, double

Program 1: Write a program that takes as input two real numbers and displays their square root and power as output. You can use the built-in library functions.

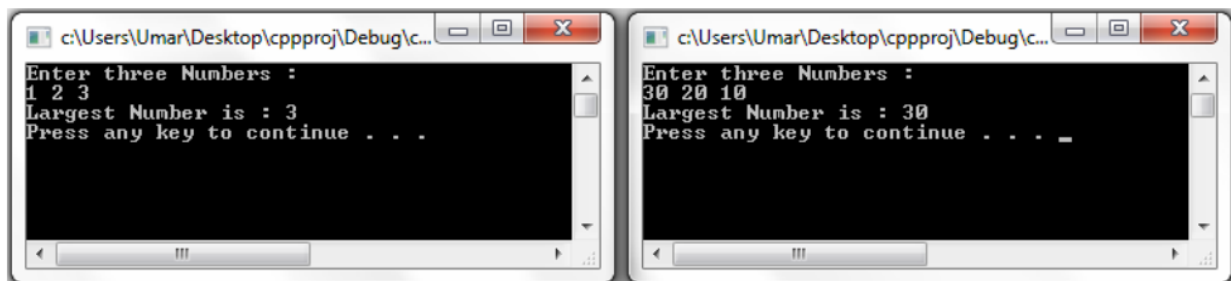


```
c:\Users\Umar\Desktop\cppproj\Debug\cpppro...
Enter value of a : 9.0
Enter value of b : 4.0
Square root of a : 3
Square root of b : 2
a to the power of b : 6561
Press any key to continue . . .

c:\Users\Umar\Desktop\cppproj\Debug\cpppro...
Enter value of a : 10.4
Enter value of b : 3.8
Square root of a : 3.2249
Square root of b : 1.94936
a to the power of b : 7323.63
Press any key to continue . . .
```

Sample Output: Program 1

Program 2: Write a function to that takes two integer numbers as input and returns the largest of two number as output. Use the above function to find the largest of three numbers entered by the users.

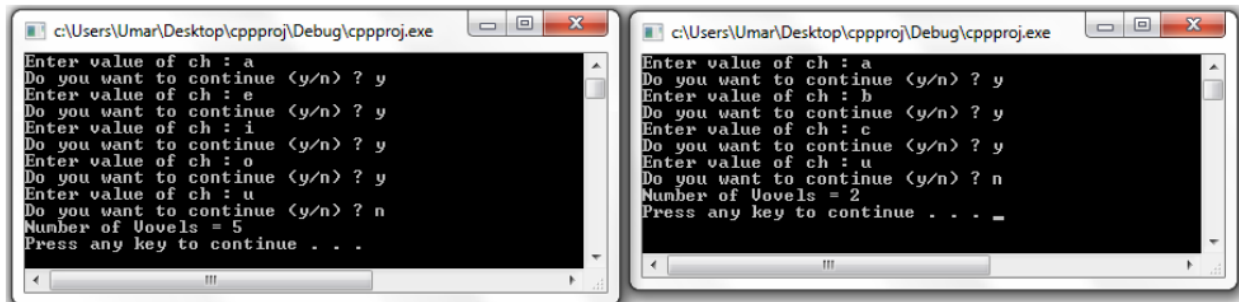


```
c:\Users\Umar\Desktop\cppproj\Debug\c...
Enter three Numbers :
1 2 3
Largest Number is : 3
Press any key to continue . . .

c:\Users\Umar\Desktop\cppproj\Debug\c...
Enter three Numbers :
30 20 10
Largest Number is : 30
Press any key to continue . . .
```

Sample Output: Program 2

Program 3: Write a value-returning function isVowel that returns the value true if a given character is a vowel and false otherwise. Write a program that prompts the user to input a sequence of characters and outputs the number of vowels. (Use the function isVowel).



```
c:\Users\Umar\Desktop\cppproj\Debug\cppproj.exe
Enter value of ch : a
Do you want to continue (y/n) ? y
Enter value of ch : e
Do you want to continue (y/n) ? y
Enter value of ch : i
Do you want to continue (y/n) ? y
Enter value of ch : o
Do you want to continue (y/n) ? y
Enter value of ch : u
Do you want to continue (y/n) ? n
Number of Vowels = 5
Press any key to continue . . .

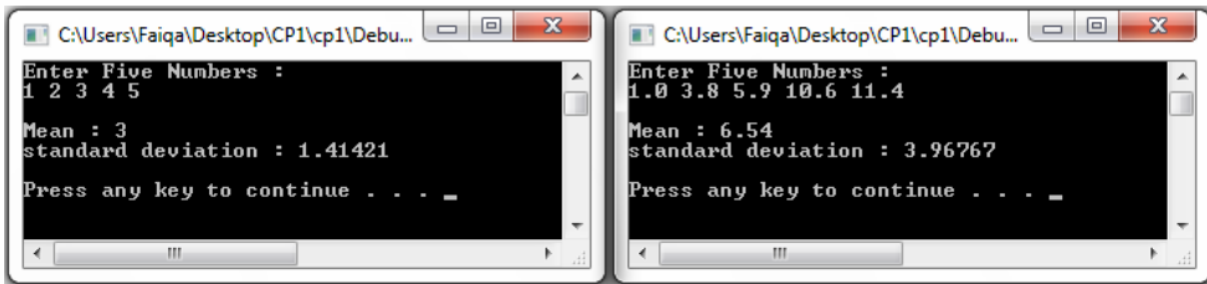
c:\Users\Umar\Desktop\cppproj\Debug\cppproj.exe
Enter value of ch : a
Do you want to continue (y/n) ? y
Enter value of ch : b
Do you want to continue (y/n) ? y
Enter value of ch : c
Do you want to continue (y/n) ? y
Enter value of ch : u
Do you want to continue (y/n) ? n
Number of Vowels = 2
Press any key to continue . . .
```

Sample Output: Program 3

Program 4: Write a program that takes as input five numbers and outputs the mean (average) and standard deviation of the numbers. If the numbers are x1, x2,x3, x4, and x5, then the mean is $x = (x1 + x2 + x3 + x4 + x5)/5$ and the standard deviation is:

$$x = \sqrt{\frac{(x1 - x)^2 + (x2 - x)^2 + (x3 - x)^2 + (x4 - x)^2 + (x5 - x)^2}{5}}$$

Your program must contain at least the following functions: a function that calculates and returns the mean and a function that calculates the standard deviation.



```
C:\Users\Faiqa\Desktop\CP1\cp1\Debu...
Enter Five Numbers :
1 2 3 4 5
Mean : 3
standard deviation : 1.41421
Press any key to continue . . . _

C:\Users\Faiqa\Desktop\CP1\cp1\Debu...
Enter Five Numbers :
1.0 3.8 5.9 10.6 11.4
Mean : 6.54
standard deviation : 3.96767
Press any key to continue . . . _
```

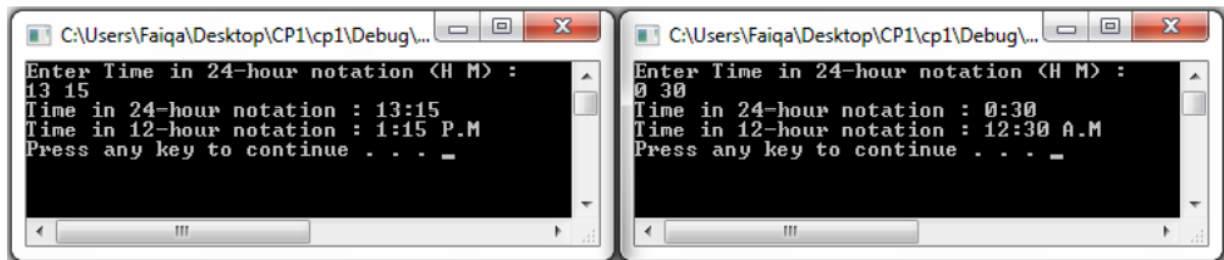
Sample Output: Program 4

EXERCISES

Functions and Parameter Passing

KEYWORDS: formal parameter, call by value, call by reference, local variable, global variable, static variable

Program 1: Write a program to convert the time from 24-hour notation to 12-hour notation. Your program must contain a function that converts the time from 24-hour notation to 12-hour notation. For 12-hour time notation, your program must display AM or PM. Use pass by reference method.

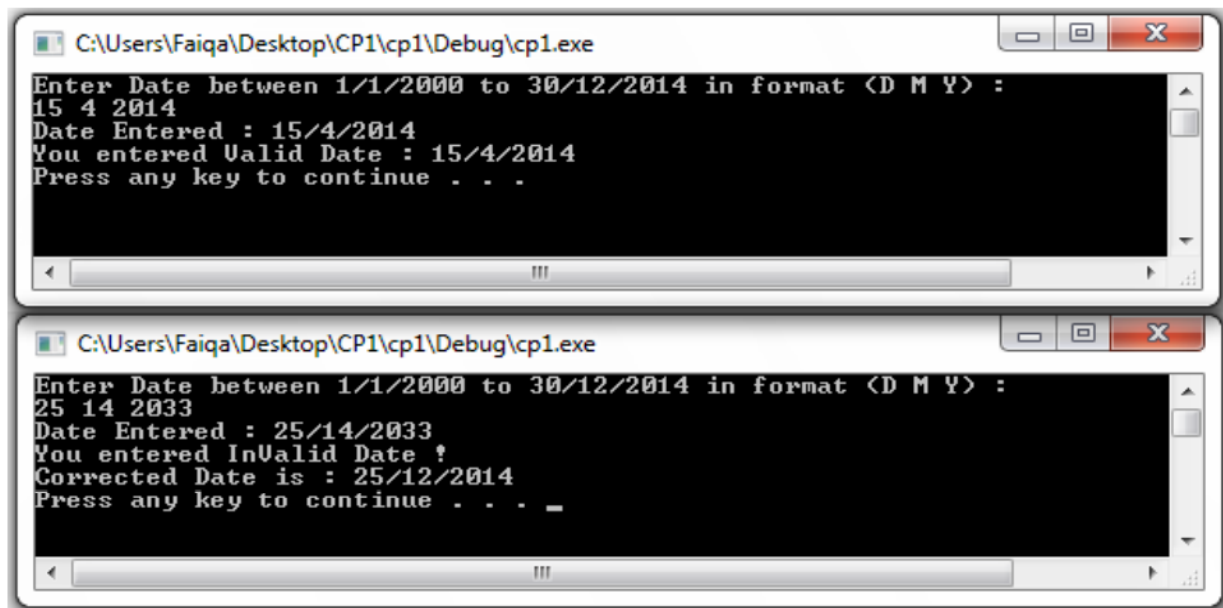


```
C:\Users\Faiqa\Desktop\CP1\cp1\Debug\...
Enter Time in 24-hour notation <H M> :
13 15
Time in 24-hour notation : 13:15
Time in 12-hour notation : 1:15 P.M
Press any key to continue . . . _

C:\Users\Faiqa\Desktop\CP1\cp1\Debug\...
Enter Time in 24-hour notation <H M> :
0 30
Time in 24-hour notation : 0:30
Time in 12-hour notation : 12:30 A.M
Press any key to continue . . . _
```

Sample Output: Program 1

Program 2: Write a function that accept integer values for day, month and year and return them in valid format. If day is above 30, then it converts day to 30. If month is above 12 then it converts month to 12. Similarly, if day or month is below 1 then it converts them to 1. Finally, it ensures that the years are between 2000 and 2015. If all inputs are valid then it returns true, else it returns false. Write a program that prompts user to input day, month, and year. The program then validates them using the function written above and displays validate if all the input are valid. Otherwise, the program displays invalid and the corrected values of input returned by the function. Use pass by reference method.

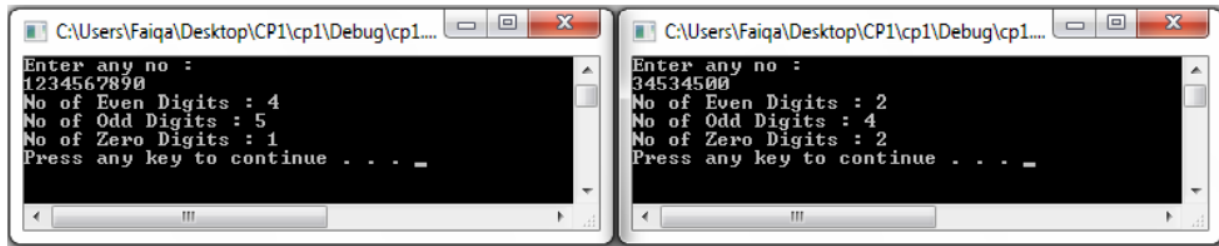


```
C:\Users\Faiqa\Desktop\CP1\cp1\Debug\cp1.exe
Enter Date between 1/1/2000 to 30/12/2014 in format <D M Y> :
15 4 2014
Date Entered : 15/4/2014
You entered Valid Date : 15/4/2014
Press any key to continue . . . _

C:\Users\Faiqa\Desktop\CP1\cp1\Debug\cp1.exe
Enter Date between 1/1/2000 to 30/12/2014 in format <D M Y> :
25 14 2033
Date Entered : 25/14/2033
You entered Invalid Date !
Corrected Date is : 25/12/2014
Press any key to continue . . . _
```

Sample Output: Program 2

Program 3: Write a function that takes as parameter an integer (as a long value) and returns the number of odd, even, and zero digits. Also write a program to test your function. Use pass by reference method



```
Enter any no :  
1234567890  
No of Even Digits : 4  
No of Odd Digits : 5  
No of Zero Digits : 1  
Press any key to continue . . . _  
  
Enter any no :  
34534500  
No of Even Digits : 2  
No of Odd Digits : 4  
No of Zero Digits : 2  
Press any key to continue . . . _
```

Sample Output: Program 3