School Of Mechanical & Manufacturing Engineering, NUST

Department of Mechanical Engineering

CS-114 - Fundamentals of Programming

Lab Manual # 02

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School Of Mechanical & Manufacturing Engineering, NUST

Department of Mechanical Engineering

Lab Manual # 02
Variables, Constants and Data types

Objective:

This lab is about familiarization with different data types, developing an understanding of variables and constants taking input from the user, showing output to the screen, and writing simple programs.

Lab Tasks:

Task 1:

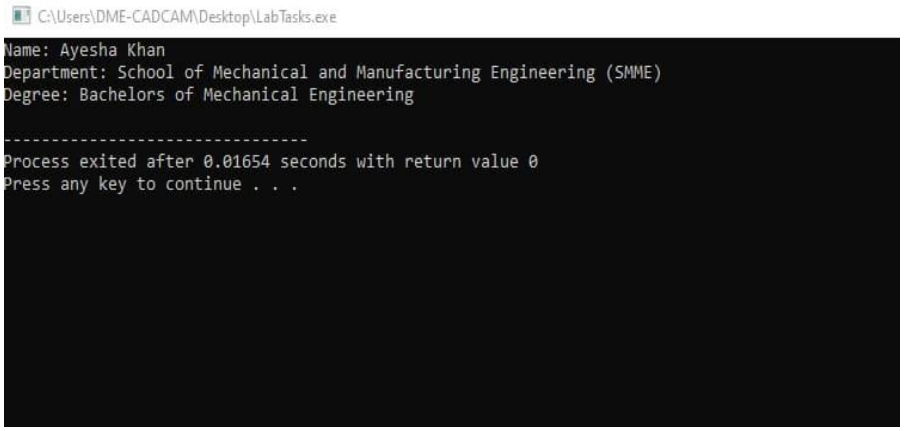
Write a C++ code that displays your name, department, and degree on the console. Make sure the three things are in three different lines.

Code:

Inputfornumbers.cpp | Task1.cpp

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

int main()
{
    cout<<"Name: Ayesha Khan\n";
    cout<<"Department: School of Mechanical and Manufacturing Engineering (SMME)\n";
    cout<<"Degree: Bachelors of Mechanical Engineering\n";

    return 0;
}
```

Output:



Task 2:

Write a C++ code that takes two numbers and displays the addition, subtraction, division, multiplication, and square of given numbers, on the console window. Make sure to comment your code.

Code:

```cpp
#include <iostream>
using namespace std;
int main()
{
    float num1, num2, res;
    num1 = 8;
    num2 = 7;
    cout<<"First Number is 7\n";
    cout<<"Second Number is 8\n";
    res = num1 + num2;
    cout<<"Addition Result = "<<res<<endl;
    res = num1 - num2;
    cout<<"Subtraction Result = "<<res<<endl;
    res = num1 * num2;
    cout<<"Multiplication result = "<<res<<endl;
    res = num1/num2;
    cout<<"Division Result = "<<res<<endl;
    res = num1*num1;
    cout<<"Square of First Number = "<<res<<endl;
    res = num2*num2;
    cout<<"Square of Second Number = "<<res<<endl;

    return 0;
}
```

Output:

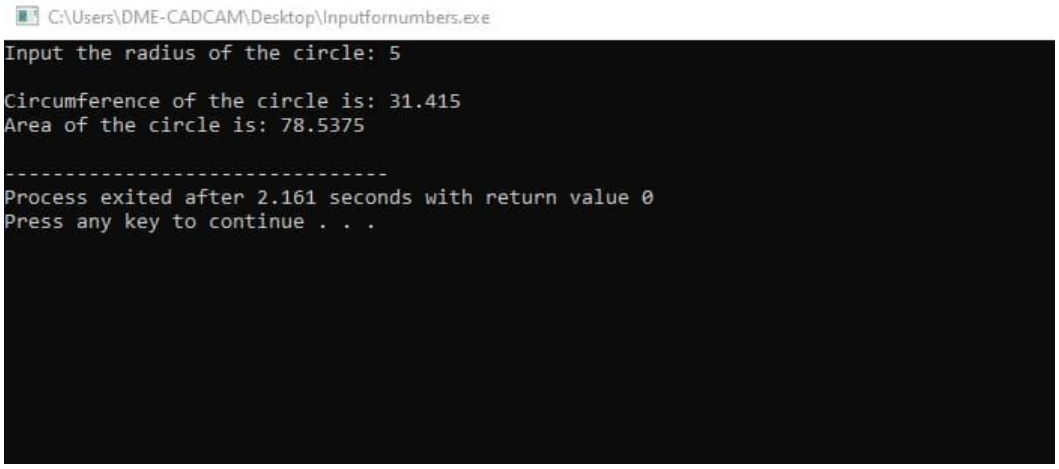
Task 3:

Write a code in C++ that takes radius of a circle as input from user and outputs the circumference and area. The output should be clear and readable. Add proper comments to the code. You can set the value of π up to 3 decimal places.

Code:

```
#include <iostream>
using namespace std;
int main()
{
    float pi = 3.1415f;
    float r, a, c;
    cout<<"Input the radius of the circle: ";
    cin>>r;
    cout<<endl;
    c = 2*pi*r;
    a = pi * r * r;
    cout<<"Circumference of the circle is: "<<c<<endl;
    cout<<"Area of the circle is: "<<a<<endl;

    return 0;
}
```

Output:



Task 4:

Write a C++ code that prints out the following sequence: 0, 1, 1, 2, 3, 5, 8, 13 using three variables.

Code:

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

int main()
{
    int first, second, sum;
    first = 0;
    second = 1;
    sum = first + second;
    cout<<first<<", "<<second<<", "<<sum;
    first = second;
    sum = first + second;
    cout<<", "<<sum;
    second = sum;
    sum = first + second;
    cout<<", "<<sum;
    first = second;
    second = sum;
    sum = first + second;
    cout<<", "<<sum;
    first = second;
    second = sum;
    sum = first + second;
    cout<<", "<<sum;
    first = second;
    second = sum;
    sum = first + second;
    cout<<", "<<sum;

    return 0;
}
```

Output:

```
C:\Users\DME-CADCAM\Desktop\LabTasks.exe
0, 1, 1, 2, 3, 5, 8, 13
--------------------------------
Process exited after 0.03313 seconds with return value 0
Press any key to continue . . .
```

Home Tasks:

Task 1:

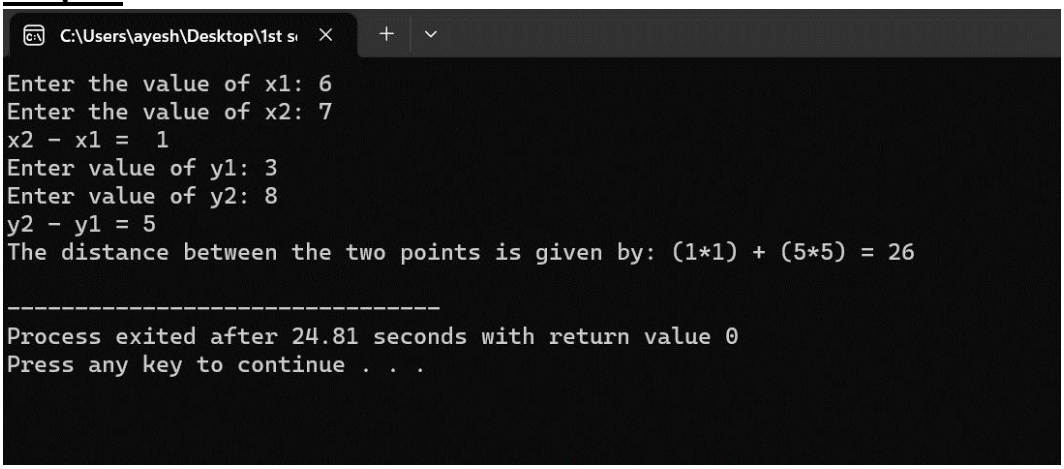
Write a C++ program to calculate the distance between two points. The values of coordinates should be input by the user.

$$d = \left(x_2 - x_1\right)^2 + \left(y_2 - y_1\right)^2$$

Code:

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

int main()
{
    //declaring variables
    float x1, y1, x2, y2, x, y, d;
    //Using cin to get values of x1, x2, y1 and y2 from the user, and then displaying the value of difference of coordinates using cout
    cout<<"Enter the value of x1: ";
    cin>>x1;
    cout<<"Enter the value of x2: ";
    cin>>x2;
    x = x2 - x1;
    cout<<"x2 - x1 =  "<<x<<endl;
    cout<<"Enter value of y1: ";
    cin>>y1;
    cout<<"Enter value of y2: ";
    cin>>y2;
    y = y2 - y1;
    cout<<"y2 - y1 = "<<y<<endl;
    //d is the distance formula between the two points. Using cout to display the distance between the points
    d = (x*x) + (y*y);
    cout<<"The distance between the two points is given by: ("<<x<<"*"<<x<<")"<< + ("<<y<<"*"<<y<<") = "<<d<<" units"<<endl;

    return 0;
}
```

Output:



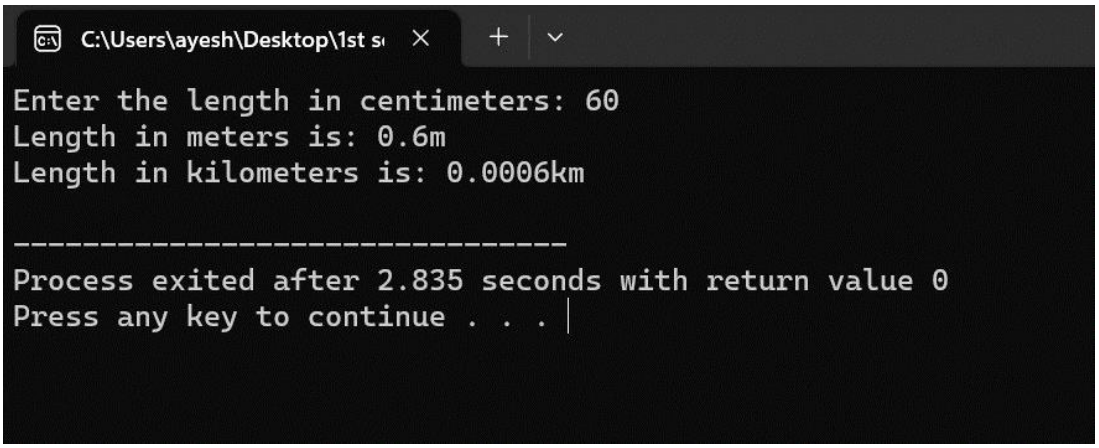
Task 2:

Write a code in C++ to take the length from the user in centimeters and convert it into meters and kilometers.

Code:

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

int main()
{
    //Declaring variables
    float cm, m, km;
    //Inputing length in centimeters from the user
    cout<<"Enter the length in centimeters: ";
    cin>>cm;

    //Calculating length in meters and kilometers
    m = cm * 0.01;
    km = cm * 0.00001;

    //Displaying those lengths
    cout<<"Length in meters is: "<<m<<"m"<<endl;
    cout<<"Length in kilometers is: "<<km<<"km"<<endl;

    return 0;
}
```

Output:



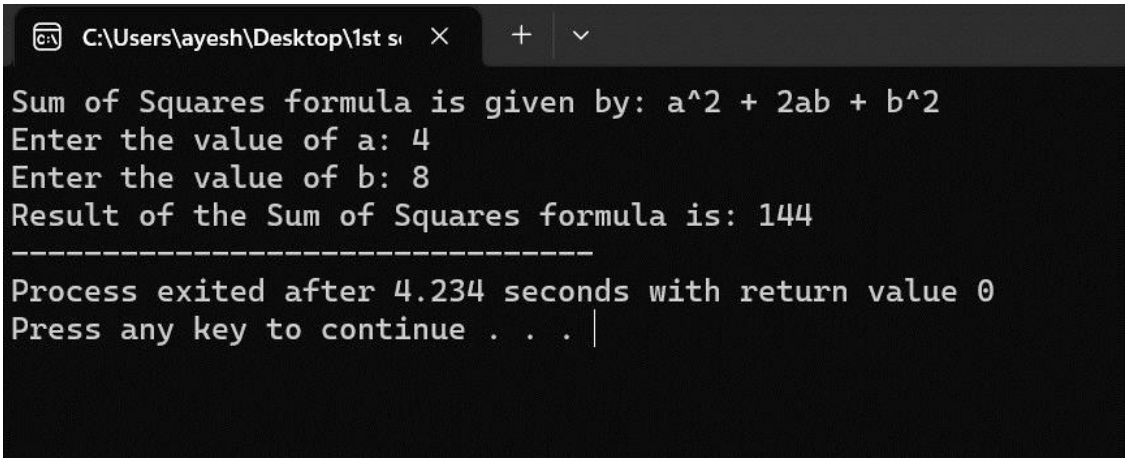
Task 3:

Write a code in C++ that takes values of a and b from the user and displays the result of a polynomial $a^2 + 2ab + b^2$.

Code:

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

int main()
{
    cout<<"Sum of Squares formula is given by: a^2 + 2ab + b^2"<<endl;
    //Declaring the variables
    float a, b, p;

    //Using cout and cin to input the values of a and b from the user
    cout<<"Enter the value of a: ";
    cin>>a;
    cout<<"Enter the value of b: ";
    cin>>b;

    //Calculating the value of the polynomial
    p = (a*a) + (2*a*b) + (b*b);

    //Displaying the value of the polynomial
    cout<<"Result of the Sum of Squares formula is: "<<p;


    return 0;
}
```

Output:



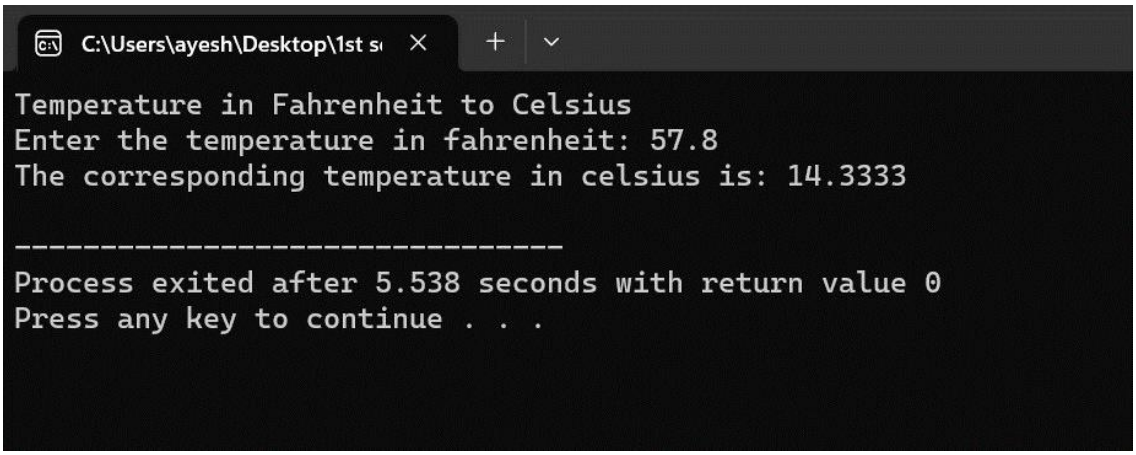
Task 4:

Write a program in C++ to convert temperature in Fahrenheit to Celsius.

Code:

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

int main()
{
    cout<<"Temperature in Fahrenheit to Celsius"<<endl;

    //Declaring variables for temperature in fahrenheit and celsius
    double fahrenheit, celsius;

    //Inputting temperature in Fahrenheit from the user
    cout<<"Enter the temperature in fahrenheit: ";
    cin>>fahrenheit;

    //Formula for fahrenheit to celsius conversion
    celsius = (fahrenheit - 32.0) * 5.0 / 9.0;

    //Displaying the corresponding temperature in Fahrenheit
    cout<<"The corresponding temperature in celsius is: "<<celsius<<endl;

    return 0;

}
```

Output:



Conclusion:

In this lab, I learned how to use cout and cin to display something and to get input from the user. I also learned different data types and when and where to use them. I learned how to perform different arithmetic operations in C++ as well.