



College of Electrical & Mechanical Engineering, NUST



Department of Mechanical Engineering

## CS-114 - Fundamental of Programing

### Lab Manual # 03

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## Lab Manual # 03 Variables, constants and data types

### Objective:

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

### Description:

#### Variables

Variables are the names you give to computer memory locations which are used to store information to be referenced and manipulated in a computer program.

#### Creating variables

Creating variables is also called **declaring variables** in C++ programming.

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

int main() {
    int a;
    int b;
}
```

The above program creates two variables to reserve two memory locations with names a and b using `int` keyword to specify variable data type which means we want to store integer values in these two variables. Similarly, you can create variables to store `long`, `float`, `char` or any other data type. For example –

```
/* variable to store long value */
long a;
/* variable to store float value */
float b;
```

#### Store Values in Variables:

```
int main() {
    int a;
    int b;
    a = 10;
    b = 20;
}
```

```
int main() {
    int a = 10;
    int b = 20;
}
```



## Get input from user

The cin object in C++ is an object of class istream. It is used to accept the input from the standard input device i.e. keyboard. It is associated with the standard C input stream stdin.

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

int main() {
    int a, b, sum;
    cout<<"Enter first number"<<endl;
    cin>>a;
    cout<<"Enter second number"<<endl;
    cin>>b;
    sum = a+b;
    cout<<"Addition of two number is:"<<sum<<endl;
}
```

## C++ Datatypes

A variable in C++ must be a specified data type. The data type specifies the size and type of information the variable will store:

Data Type	Size	Description
<b>int</b>	4 bytes	Stores whole numbers, without decimals
<b>float</b>	4 bytes	Stores fractional numbers, containing one or more decimals. Sufficient for storing 7 decimal digits
<b>double</b>	8 bytes	Stores fractional numbers, containing one or more decimals. Sufficient for storing 15 decimal digits
<b>boolean</b>	1 byte	Stores true or false values
<b>char</b>	1 byte	Stores a single character/letter/number, or ASCII values

### Example:

```
int myNum = 5; // Integer (whole number)
float myFloatNum = 5.99; // Floating point number
double myDoubleNum = 9.98; // Floating point number
char myLetter = 'D'; // Character
bool myBoolean = true; // Boolean
string myText = "Hello"; // String
```



## Defining Constants

There are two simple ways in C++ to define constants –

- Using **#define** preprocessor.
- Using **const** keyword.

### The #define Preprocessor

Following is the form to use #define preprocessor to define a constant –

#define identifier value

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

#define LENGTH 10
#define WIDTH 5
#define NEWLINE '\n'

int main() {
    int area;

    area = LENGTH * WIDTH;
    cout << area;
    cout << NEWLINE;
    return 0;
}
```

### The const Keyword

You can use const prefix to declare constants with a specific type as follows –

const type variable = value;

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

int main() {
    const int LENGTH = 10;
    const int WIDTH = 5;
    const char NEWLINE = '\n';
    int area;

    area = LENGTH * WIDTH;
    cout << area;
    cout << NEWLINE;
    return 0;
}
```



### **Lab Task:**

1. 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  $\pi$  up to 3 decimal places.
2. Write a code in C++ that takes values of a and b from the user and displays result of polynomial  $a^2 + 2ab + b^2$ .
3. Write a program that asks the user to enter a value for x and then displays the value of the following polynomial  $2x^5 + 3x^4 - x^3 - 2x^2 + 7x - 6$ . To calculate  $x^5$  you will have to use `pow(x, 5)`.  
Note: include `math.h` library for `pow`.
4. Take two complex number from user and add them. Print the resultant complex number.

### **Home Task:**

1. Write a program to calculate the distance between two points using distance formula when coordinates of both the points are input by user. Distance formula is given by

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$d$  = distance  
 $(x_1, y_1)$  = coordinates of the first point  
 $(x_2, y_2)$  = coordinates of the second point

- Give meaningful names to all the variables and properly initialize them. Your console should be very intuitive and output must be clear and readable. Add comments to every line of code. Verify the results of your program with your mathematical working on paper.
2. Write a code in C++ to take length from user in centimeter and convert it into meter and kilometer.
  3. Write a code in C++ to enter P, T, R and calculate Simple Interest.
  4. Write a program in C++ to convert temperature in Fahrenheit to Celsius.

### **Useful links for practice:**

<https://www.w3schools.com/>

<https://www.codecademy.com/learn/learn-c-plus-plus>