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## Introduction to C++ Programming Lab (BPLCK105D/205D)

I/II Semester  
(common to all branches)  
LAB MANUAL

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Visit : <https://tinyurl.com/yc5h2mu9>



The versioned repository of all the programs can be found here as a GitLab Repository  
[https://gitlab.com/lab\\_manuals/22plc15d\\_intro\\_to\\_cpp\\_programming\\_lab\\_manual](https://gitlab.com/lab_manuals/22plc15d_intro_to_cpp_programming_lab_manual)



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# Contents

Code::Blocks Usage	iii
1 Sorting	1
2 Summation	3
3 Shift Operation	5
4 Function Overloading	7
5 Inheritance	9
6 Multilevel Inheritance	11
7 File Operations	13
8 Binary File Operations	15
9 Exception Handling	17
10 Array Bound Exception	19

# Listings

1.1	01SortElem.cpp	1
1.2	OUTPUT	2
2.1	02Summation.cpp	3
2.2	OUTPUT	4
3.1	03SwapValue.cpp	5
3.2	OUTPUT	6
4.1	04FuncOverload.cpp	7
4.2	OUTPUT	8
5.1	05ShapeHeirarchy.cpp	9
5.2	OUTPUT	10
6.1	06MultiLevelInheritance.cpp	11
6.2	OUTPUT	12
7.1	07FileOPerations.cpp	13
7.2	OUTPUT	14
8.1	08BinaryFileOperations.cpp	15
8.2	OUTPUT	16
9.1	09ExceptionDemo.cpp	17
9.2	OUTPUT	18
10.1	10ArrayBoundExceptionDemo.cpp	19
10.2	OUTPUT	20

# Preface

## Usage of Free and Open Source Software

This manual has been developed for the lab component of the newly introduced subject **Introduction to C++ Programming Lab** (BPLCK105D/205D) for the first year students of VTU. This manual has been prepared entirely using [Free Software](#). The following Free Software has been used in preparation of this manual.

**Operating System** [Ubuntu](#) 22.04.1 LTS (Jammy Jellyfish)

**Linux Kernel** 5.15.0-56-generic

**Compiler** [g++](#) 11.3.0

**IDE** [Code::Blocks](#) 20.03

**Version Control** [git](#) 2.34.1

**Typesetting** [Texmaker](#) 5.0.3 with [LaTeX](#)

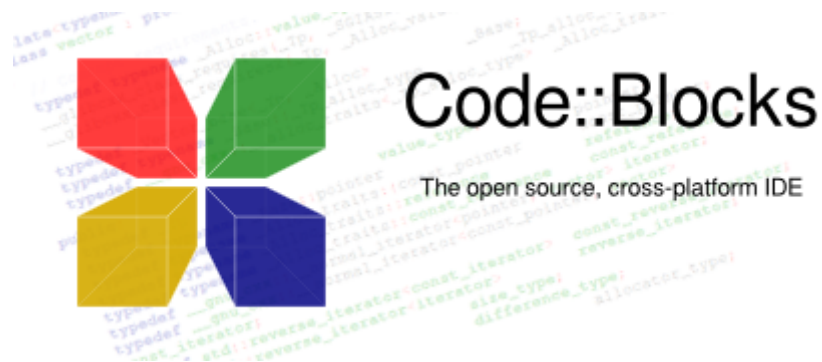
**Image Editing** [GIMP](#) 2.10.30

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Use and spread the word of Free Software. Free Software leads to a Free Society!

**Prabodh C P**

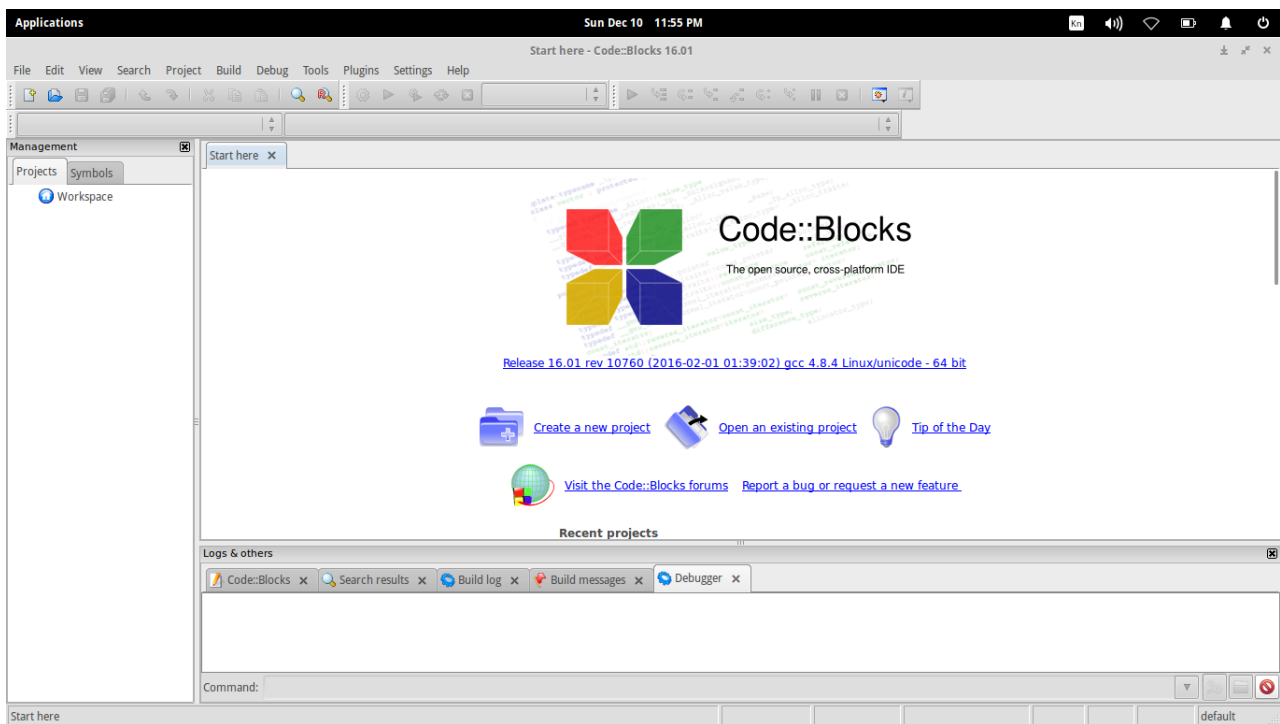
# CODE::BLOCKS



## CODE::BLOCKS TUTORIAL

### Using Code::Blocks to compile and execute a C++ Program

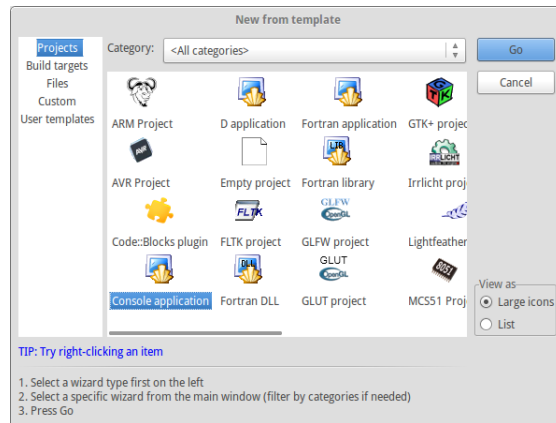
To launch Code::Blocks IDE, Click on  
**Applications** → **Programming** → **Code::Blocks IDE**  
You will get a window as shown below



Code::Blocks creates what is called a Workspace to keep track of the project you are working on. It is possible for you to be working on multiple projects within your workspace. A project is a collection of one or more source (as well as header) files. Source files are the files that contain the source code for your program. If you are developing a C++ program, you are writing C++ source code (.cpp files).

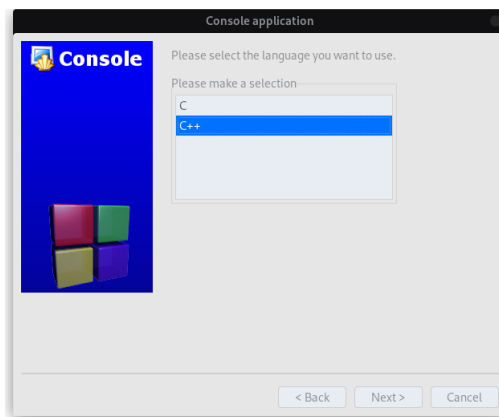
First start a new Project by clicking on **Create a new project**

**OR** To create a project, click on the **File** pull-down menu, open **New** and then **Project**. You get this pop-up window

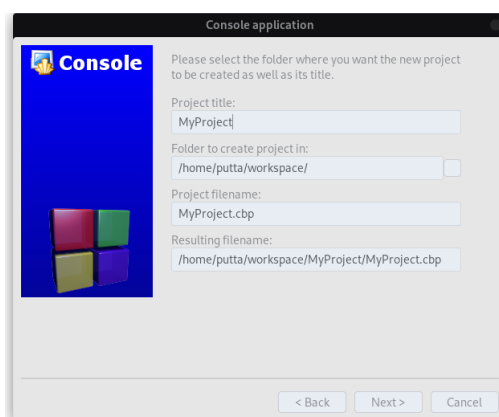


Choose Console application

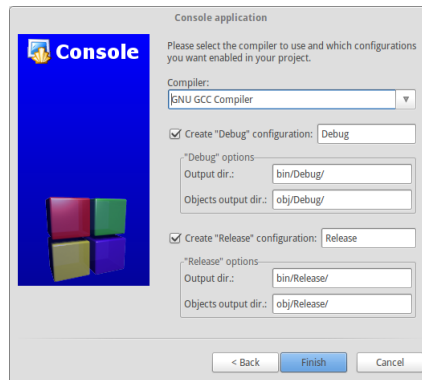
Then in the next window select the programming language C++ (and not C)



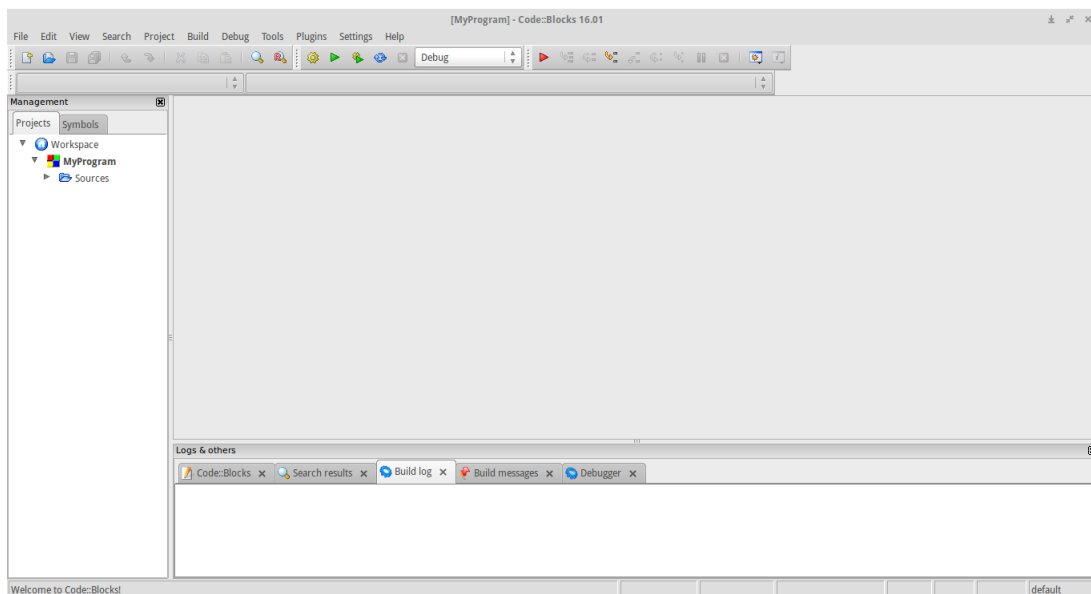
In the next step give the Project Title and specify the folder where you want to save your project. (**Note** : Dont use any special characters or whitespaces for project title and folder names)



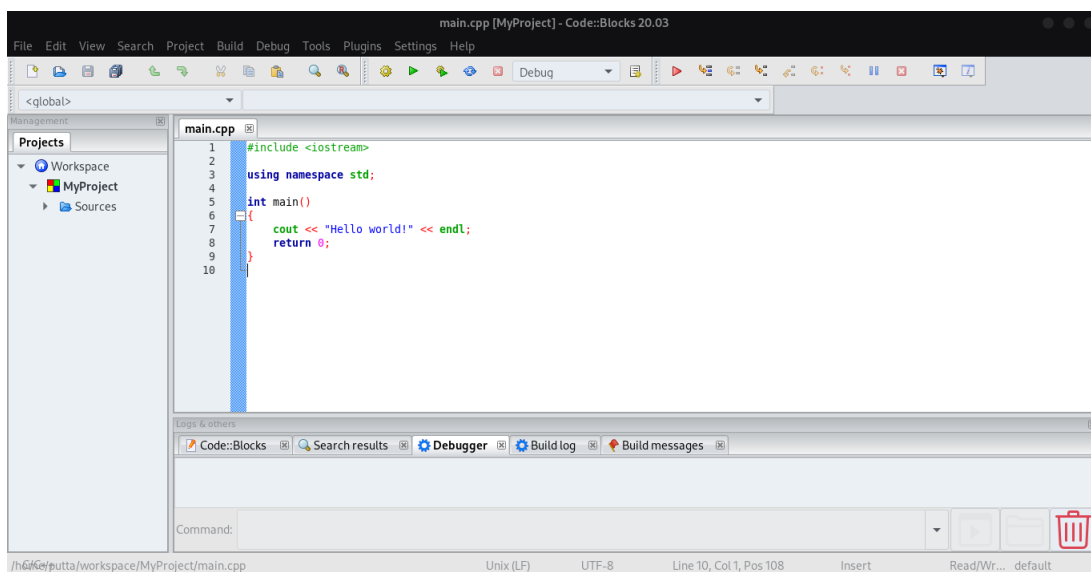
Finally you will be prompted to choose the compiler. Just choose the default options here (Don't change the options). You should be using GNU GCC Compiler. Click Finish to create the new project.



The system will then return to the [MyProgram] window and you are ready to write your program. In the Management area of the screen (Shift-F2 toggles the Management display), you will see the files that are part of the project in the Projects tab. To see the source files, click on the triangle symbol to expand the Workspace and its subdirectories.



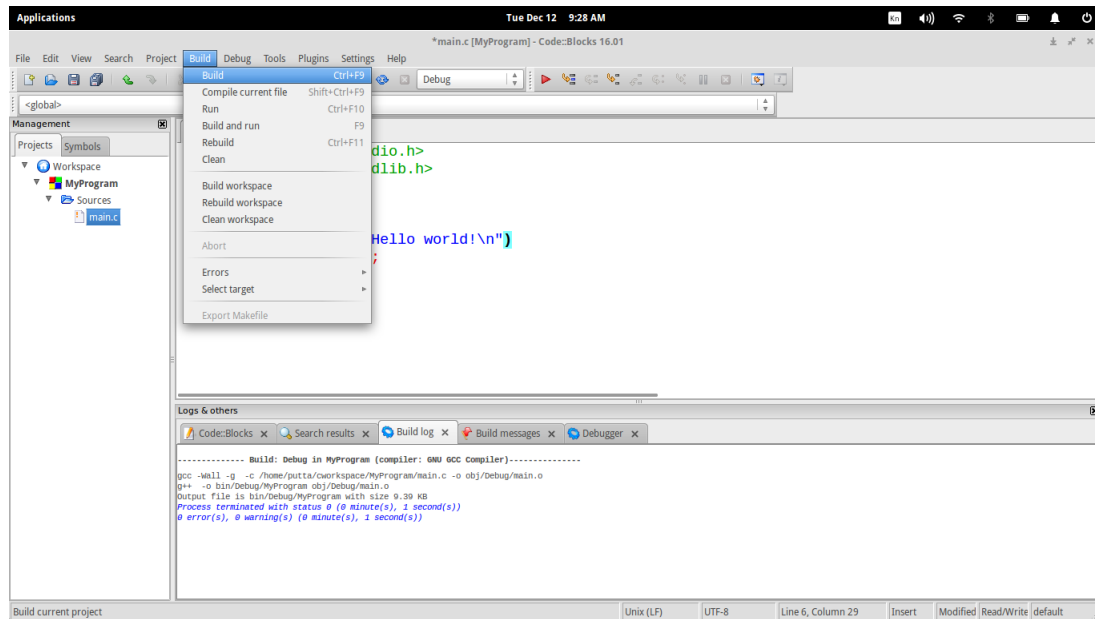
Under Sources, there is a file called **main.cpp**, which is automatically created for you when you build a console application. Click on **main.cpp**.



*main.cpp* contains a simple Hello World program which you can edit later to solve a programming problem. Now let us see how to compile and execute this *main.cpp* program. Just to understand the process of debugging we

knowingly introduce an error in the program by removing the semicolon after the printf statement. We will now compile the program (To compile a file means to take the instructions that you have written and translate it into machine code for the computer to understand).

Compile the project from the Build pull-down menu by clicking on **Build** option[**Ctrl+F9**].



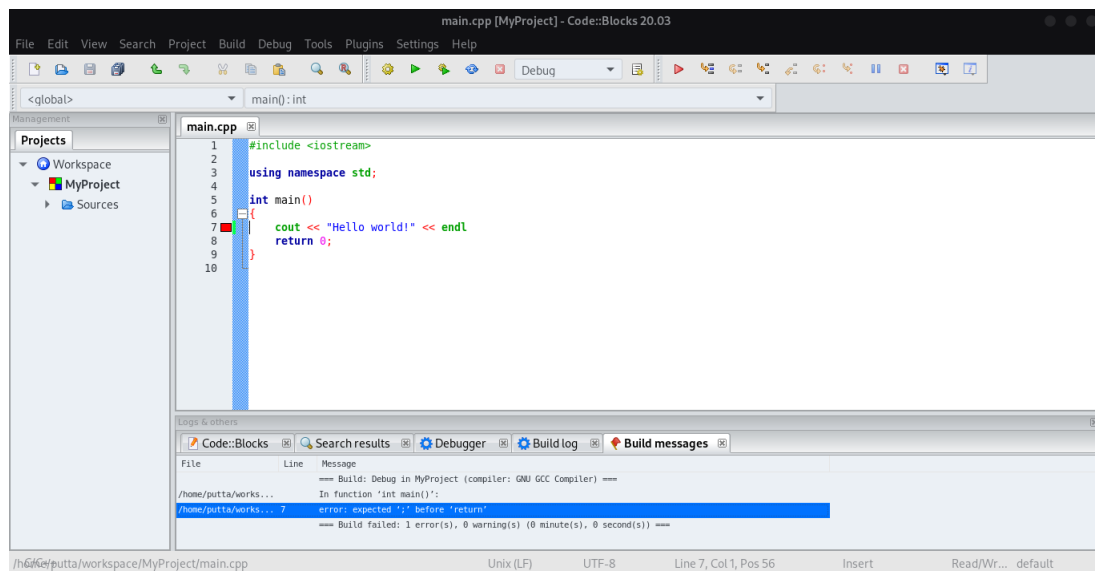
The error messages are shown in the Build messages window at the bottom. Let us now try to understand these error messages. === Build: Debug in MyProgram (compiler: GNU GCC Compiler) ===

main.c In function main:

main.c 7 error: expected ; before return

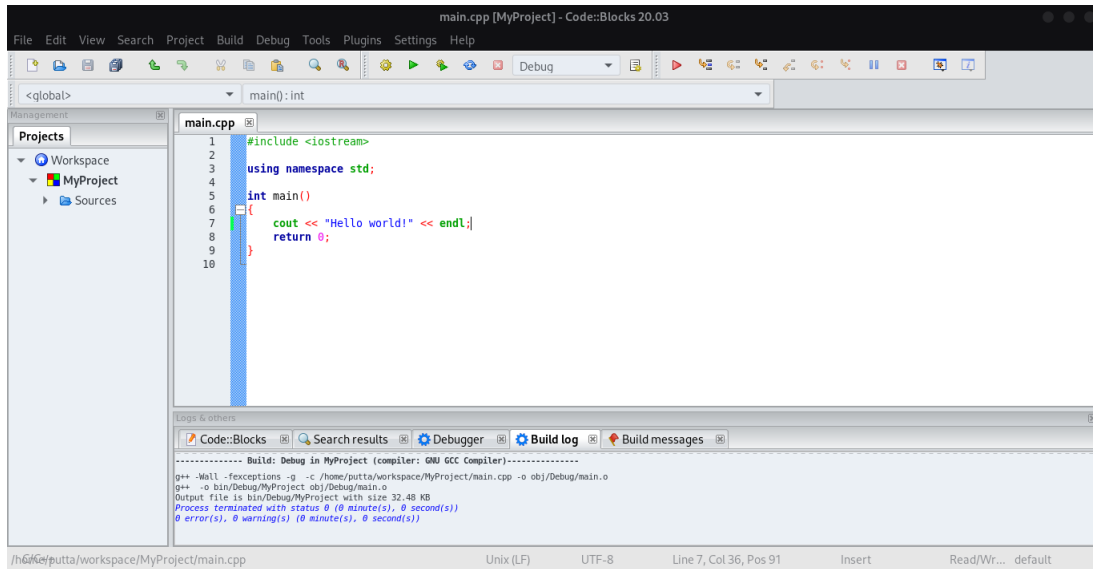
main.c 8 warning: control reaches end of non-void function [-Wreturn-type]

=== Build failed: 1 error(s), 1 warning(s) (0 minute(s), 1 second(s)) ===

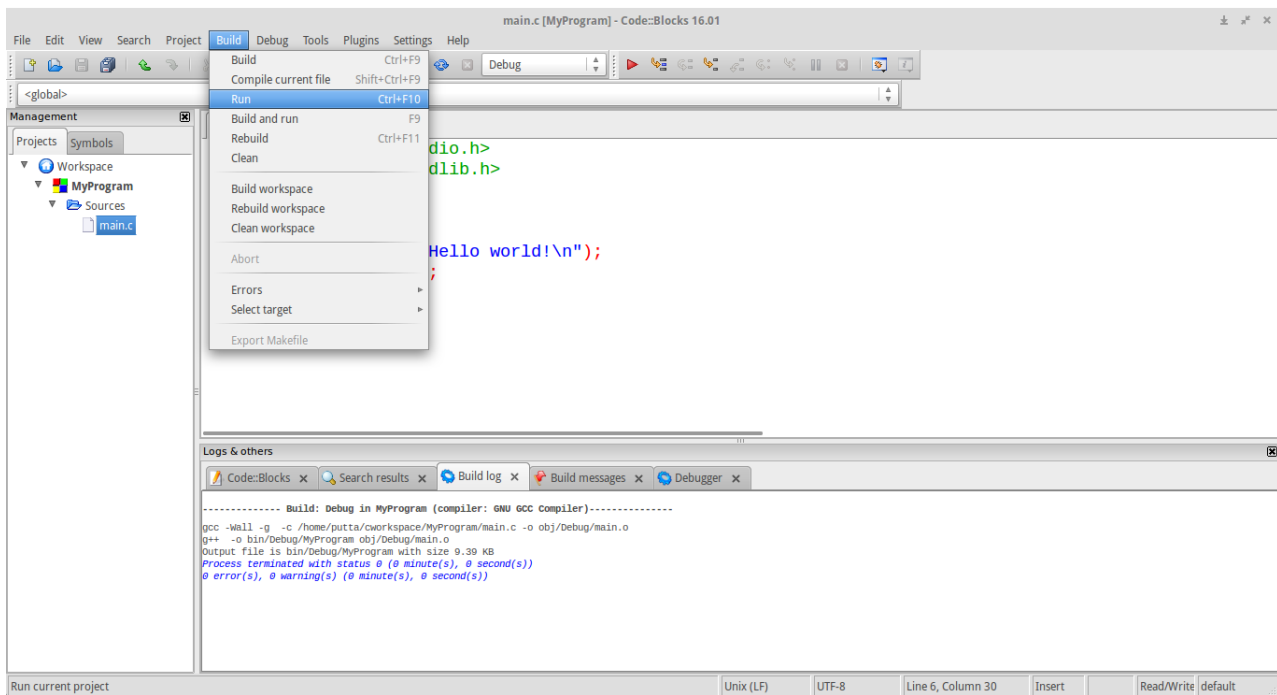


The error messages show the errors in syntax (and not the logical errors). It also indicates the line number and the type of error. Here in this example the error says that before the return statement in line no 7 a semicolon is missing. The next message is a warning message which has resulted because of the previous error. Now go to line number 6 and add a semicolon at the end. Now build your project again.

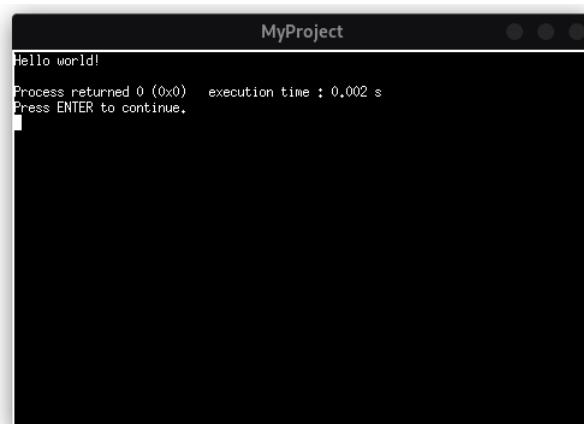




Now the build message window shows the following message. 0 error(s), 0 warning(s) (0 minute(s), 0 second(s)) This means that the errors and warnings have been successfully resolved. Now it is time to run the program. You can Execute the project from the Build pull-down menu by clicking on **Run** option[**Ctrl+F10**].



An output window pops displaying the output of the program. A greeting message "Hello world!" is printed on to the output console.



## Installing Code::Blocks IDE

If you want to install Code::Blocks IDE on your system, you can download it from its official webpage.

<http://www.codeblocks.org/>

It is available for Linux, Mac, Windows platforms.

On Debian/Ubuntu systems Code::Blocks can be installed by using the **apt** package manager. You have to be connected to the internet for necessary files to be downloaded. Run the following command.

**\$sudo apt install codeblocks**

For Windows download the binary whose name is like **codeblocks-17.12mingw-setup.exe**

# Chapter 1

## Sorting

### Question

Write a C++ program to sort the elements in ascending and descending order.

### C++ Code

```
1  /*****
2  *File           : 01SortElem.cpp
3  *Description    : Program to sort the elements in ascending and descending order.
4  *Author        : Prabodh C P
5  *Compiler      : gcc compiler, Ubuntu 22.04
6  *Date          : 26 December 2022
7  *****/
8
9  #include <iostream>
10 #include <iomanip>
11 #include <vector>
12 using namespace std;
13
14 /*****
15 *Function       : main
16 *Input parameters : no parameters
17 *RETURNS       : 0 on success
18 *****/
19 int main() {
20     vector<int> values;
21     int iNum, iElem;
22
23     cout << "Enter the number of elements : " ;
24     cin >> iNum;
25
26     cout << "Enter " << iNum << " values :";
27     for(int i=0;i<iNum;i++){
28         cin >> iElem;
29         values.push_back(iElem);
30     }
31
32     for(int i=0;i<iNum;i++){
33         cout << values[i] << " ";
34     }
35     cout << endl;
36
37
38     // sort(values.begin(), values.end());
39     //sorting in ascending order
40     cout << "Sorting in descending order" << endl;
```

```

41     for(int i=0;i<iNum;i++){
42         for(int j=0;j<iNum;j++){
43             if(values[i] < values[j]){
44                 int temp = values[i];
45                 values[i] = values[j];
46                 values[j] = temp;
47             }
48         }
49     }
50
51     for(int i=0;i<iNum;i++){
52         cout << values[i] << " ";
53     }
54     cout << endl;
55
56     // sort(values.begin(), values.end(), greater<int>());
57     //sorting in descending order
58     cout << "Sorting in descending order" << endl;
59     for(int i=0;i<iNum;i++){
60         for(int j=0;j<iNum;j++){
61             if(values[i] > values[j]){
62                 int temp = values[i];
63                 values[i] = values[j];
64                 values[j] = temp;
65             }
66         }
67     }
68
69     for(int i=0;i<iNum;i++){
70         cout << values[i] << " ";
71     }
72     cout << endl;
73     return 0;
74 }

```

Listing 1.1: 01SortElem.cpp

## Output

```

=====
1 putta:~/.../Programs$ g++ -Wall 01SortElem.cpp
2 putta:~/.../Programs$ ./a.out
3 Enter the number of elements : 5
4 Enter 5 values :5 1 2 4 3
5 5 1 2 4 3
6 Sorting in descending order
7 1 2 3 4 5
8 Sorting in descending order
9 5 4 3 2 1
10
11 putta:~/.../Programs$ ./a.out
12 Enter the number of elements : 6
13 Enter 6 values :6 1 2 5 4 3
14 6 1 2 5 4 3
15 Sorting in descending order
16 1 2 3 4 5 6
17 Sorting in descending order
18 6 5 4 3 2 1

```

Listing 1.2: OUTPUT

# Chapter 2

## Summation

### Question

*Write a C++ program to find the sum of all the natural numbers from 1 to n.*

### C++ Code

```
1  /*****
2  *File           : 02Summation.cpp
3  *Description    : Program to find the sum of all the natural numbers from 1 to n.
4  *Author         : Prabodh C P
5  *Compiler       : gcc compiler, Ubuntu 22.04
6  *Date          : 26 December 2022
7  *****/
8
9  #include <iostream>
10 #include <iomanip>
11 using namespace std;
12
13 /*****
14 *Function       : main
15 *Input parameters : no parameters
16 *RETURNS       : 0 on success
17 *****/
18
19 int main() {
20     int iNum, iSum = 0;
21
22     cout << "Enter the value of n : " ;
23     cin >> iNum;
24
25     for(int i=1;i<=iNum;i++){
26         iSum += i;
27     }
28     cout << "Sum of 1 to " << iNum << " is : " << iSum << endl;
29     cout << "Sum of 1 to " << iNum << " using formula is : " << iNum*(iNum+1)/2 <<
30     endl;
31     return 0;
32 }
```

Listing 2.1: 02Summation.cpp

## Output

```
=====
1 putta:~/.../Programs$ g++ -Wall 02Summation.cpp
2 putta:~/.../Programs$ ./a.out
3 Enter the value of n : 5
4 Sum of 1 to 5 is : 15
5 Sum of 1 to 5 using formula is : 15
6
7 putta:~/.../Programs$ ./a.out
8 Enter the value of n : 7
9 Sum of 1 to 7 is : 28
10 Sum of 1 to 7 using formula is : 28
```

Listing 2.2: OUTPUT

# Chapter 3

## Shift Operation

### Question

**Write a C++ program to swap 2 values by writing a function that uses call by reference technique.**

### C++ Code

```
1  /*****
2  *File           : 03SwapValue.cpp
3  *Description    : Program swap 2 values by writing a function that uses call by
4  *               : reference technique.
5  *Author        : Prabodh C P
6  *Compiler      : gcc compiler, Ubuntu 22.04
7  *Date         : 10 January 2023
8  *****/
9  #include <iostream>
10 #include <iomanip>
11 using namespace std;
12
13 void fnSwap(int&, int&);
14
15 /*****
16 *Function       : main
17 *Input parameters : no parameters
18 *RETURNS       : 0 on success
19 *****/
20 int main() {
21     int iNum1, iNum2;
22     cout << "Enter the value of m and n : " ;
23     cin >> iNum1 >> iNum2;
24     cout << "Values before Swapping m = " << iNum1 << " and n = " << iNum2 << endl;
25     fnSwap(iNum1, iNum2);
26     cout << "Values after Swapping m = " << iNum1 << " and n = " << iNum2 << endl;
27     return 0;
28 }
29
30 /*****
31 *Function       : fnSwap
32 *Input parameters : two parameters passed by reference
33 *RETURNS       : nothing
34 *****/
35 void fnSwap(int &p, int &q)
36 {
37     p = p ^ q;
38     q = p ^ q;
39     p = p ^ q;
40 }
```

Listing 3.1: 03SwapValue.cpp

## Output

```
=====
1 putta:~/.../Programs$ g++ -Wall 03SwapValue.cpp
2 putta:~/.../Programs$ ./a.out
3 Enter the value of m and n : 34 76
4 Values before Swapping m = 34 and n = 76
5 Values after Swapping m = 76 and n = 34
6
7 putta:~/.../Programs$ ./a.out
8 Enter the value of m and n : -12 89
9 Values before Swapping m = -12 and n = 89
10 Values after Swapping m = 89 and n = -12
```

Listing 3.2: OUTPUT



# Chapter 4

## Function Overloading

### Question

**Write a C++ program to demonstrate function overloading for the following prototypes.**

*add(int a, int b)*  
*add(double a, double b)*

### C++ Code

```
1  /*****
2  *File           : 04FuncOverload.cpp
3  *Description    : Program to demonstrate function overloading
4  *Author        : Prabodh C P
5  *Compiler      : gcc compiler, Ubuntu 22.04
6  *Date         : 26 December 2022
7  *****/
8
9  #include <iostream>
10 #include <iomanip>
11 using namespace std;
12
13 //Function Prototypes
14 void add(int, int);
15 void add(double, double);
16
17 /*****
18 *Function       : main
19 *Input parameters : no parameters
20 *RETURNS       : 0 on success
21 *****/
22
23 int main() {
24     int iNum1, iNum2;
25     double dVal1, dVal2;
26
27
28     cout << "Enter integer values for i1 and i2 : " ;
29     cin >> iNum1 >> iNum2;
30
31     cout << "Enter double values for d1 and d2 : " ;
32     cin >> dVal1 >> dVal2;
33
34     add(iNum1, iNum2);
35     add(dVal1, dVal2);
36
37     return 0;
38 }
```

```
39
40 void add(int p, int q)
41 {
42     cout << "Performing Integer Addition" << endl;
43     cout << "Sum of " << p << " and " << q << " is " << p+q << endl;
44 }
45
46 void add(double p, double q)
47 {
48     cout << "Performing Double Addition" << endl;
49     cout << "Sum of " << p << " and " << q << " is " << p+q << endl;
50 }
```

Listing 4.1: 04FuncOverload.cpp

## Output

```
=====
1 putta:~/.../Programs$ g++ -Wall 04FuncOverload.cpp
2
3 putta:~/.../Programs$ ./a.out
4
5 Enter integer values for i1 and i2 : 65 76
6 Enter double values for d1 and d2 : 5.6 7.8
7 Performing Integer Addition
8 Sum of 65 and 76 is 141
9 Performing Double Addition
10 Sum of 5.6 and 7.8 is 13.4
```

Listing 4.2: OUTPUT

# Chapter 5

## Inheritance

### Question

**Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle". Now, try calling the function by the object of each of these classes.**

### C++ Code

```
1  /*****
2  *File           : 05ShapeHeirarchy.cpp
3  *Description    : Program to illustrate inheritance.
4  *Author         : Prabodh C P
5  *Compiler      : gcc compiler, Ubuntu 22.04
6  *Date          : 26 December 2022
7  *****/
8
9  #include <iostream>
10 #include <iomanip>
11 using namespace std;
12
13 class Shape{
14     public:
15     void show();
16 };
17 void Shape::show() {
18     cout << "This is a Shape" << endl;
19 }
20
21 class Polygon : public Shape{
22     public:
23     void show();
24 };
25 void Polygon::show() {
26     cout << "Polygon is a Shape" << endl;
27 }
28
29 class Triangle : public Polygon{
30     public:
31     void show();
32 };
33 void Triangle::show() {
34     cout << "Triangle is a Polygon" << endl;
35 }
```

```

36
37 class Rectangle : public Polygon{
38     public:
39     void show();
40 };
41 void Rectangle::show(){
42     cout << "Rectangle is a Polygon" << endl;
43 }
44
45 class Square : public Rectangle{
46     public:
47     void show();
48 };
49 void Square::show(){
50     cout << "Square is a Rectangle" << endl;
51 }
52
53 /*****
54 *Function      :   main
55 *Input parameters :   no parameters
56 *RETURNS      :   0 on success
57 *****/
58
59 int main() {
60     Shape s1;
61     Polygon p1;
62     Rectangle r1;
63     Triangle t1;
64     Square sq1;
65
66     s1.show();
67     p1.show();
68     r1.show();
69     t1.show();
70     sq1.show();
71     return 0;
72 }

```

Listing 5.1: 05ShapeHeirarchy.cpp

## Output

```

=====
1 putta:~/.../Programs$ g++ -Wall 05ShapeHeirarchy.cpp
2 putta:~/.../Programs$ ./a.out
3 This is a Shape
4 Polygon is a Shape
5 Rectangle is a Polygon
6 Triangle is a Polygon
7 Square is a Rectangle

```

Listing 5.2: OUTPUT

## Chapter 6

# Multilevel Inheritance

### Question

**Suppose we have three classes Vehicle, FourWheeler, and Car. The class Vehicle is the base class, the class FourWheeler is derived from it and the class Car is derived from the class FourWheeler. Class Vehicle has a method 'vehicle' that prints 'I am a vehicle', class FourWheeler has a method 'fourWheeler' that prints 'I have four wheels', and class Car has a method 'car' that prints 'I am a car'. So, as this is a multi-level inheritance; we can have access to all the other classes methods from the object of the class Car. We invoke all the methods from a Car object and print the corresponding outputs of the methods. So, if we invoke the methods in this order, car(), fourWheeler(), and vehicle(), then the output will be**

**I am a car**

**I have four wheels**

**I am a vehicle**

**Write a C++ program to demonstrate multilevel inheritance using this.**

### C++ Code

```
1  /*****
2  *File           : 06MultiLevelInheritance.cpp
3  *Description    : Program to illustrate multi level inheritance.
4  *Author         : Prabodh C P
5  *Compiler       : gcc compiler, Ubuntu 22.04
6  *Date          : 12 January 2023
7  *****/
8  #include <iostream>
9  #include <iomanip>
10 using namespace std;
11
12 class Vehicle{
13     public:
14     void vehicle();
15 };
16 void Vehicle::vehicle(){
17     cout << "I am a vehicle" << endl;
18 }
19
20 class FourWheeler : public Vehicle{
21     public:
22     void fourWheeler();
23 };
24 void FourWheeler::fourWheeler(){
25     cout << "I have four wheels" << endl;
26 }
27
28 class Car : public FourWheeler{
29     public:
```

```

30     void car();
31 };
32 void Car::car() {
33     cout << "I am a car" << endl;
34 }
35
36 /*****
37 *Function      :   main
38 *Input parameters :   no parameters
39 *RETURNS      :   0 on success
40 *****/
41 int main() {
42     Car myCar;
43
44     myCar.car();
45     myCar.fourWheeler();
46     myCar.vehicle();
47     return 0;
48 }

```

Listing 6.1: 06MultiLevelInheritance.cpp

## Output

```

=====
1 putta:~/.../Programs$ g++ -Wall 06MultiLevelInheritance.cpp
2 putta:~/.../Programs$ ./a.out
3 I am a car
4 I have four wheels
5 I am a vehicle

```

Listing 6.2: OUTPUT

# Chapter 7

## File Operations

### Question

*Write a C++ program to create a text file, check file created or not, if created it will write some text into the file and then read the text from the file.*

### C++ Code

```
1  /*****
2  *File      : 07FileOperations.cpp
3  *Description : Program to perform file operations
4  *Author    : Prabodh C P
5  *Compiler  : gcc compiler, Ubuntu 22.04
6  *Date     : 12 January 2023
7  *****/
8  #include <iostream>
9  #include <fstream>
10 using namespace std;
11 /*****
12 *Function   : main
13 *Input parameters : no parameters
14 *RETURNS   : 0 on success
15 *****/
16 int main() {
17
18     string flName;
19     char mesg[40], ch;
20
21     cout << "Enter the file name you want to create : ";
22     cin >> flName;
23     cin.get(); //read the trailing enter character
24
25     ofstream fout(flName.c_str());
26     // fout.close();
27     if(fout.fail()){
28         cout << "\nFailed to create file." << endl;
29     }
30     else{
31         cout << "\nFile " << flName <<" created successfully" << endl;
32     }
33
34     cout << "Enter a message : ";
35     cin.getline(mesg,40);
36     fout << mesg << endl;
37     cout << "\nMessage written to file successfully\n" << endl;
38     fout.close();
39 }
```

```

40     ifstream fin(flName.c_str());
41     cout << "Here are the contents of " << flName << ":\n";
42
43     while (fin.get(ch)    // read character from file and
44            cout << ch;    // write it to screen
45            cout << "\nDone reading file contents\n" << endl;
46            fin.close();
47            return 0;
48 }

```

Listing 7.1: 07FileOperations.cpp

## Output

```

=====
1 putta:~/.../Programs$ g++ -Wall 07FileOperations.cpp
2 putta:~/.../Programs$ ./a.out
3 Enter the file name you want to create : random.txt
4
5 File random.txt created successfully
6 Enter a message : The universe is vast and endless
7
8 Message written to file successfully
9
10 Here are the contents of random.txt:
11 The universe is vast and endless
12
13 Done reading file contents
14
15 putta:~/.../Programs$ cat random.txt
16 The universe is vast and endless

```

Listing 7.2: OUTPUT



## Chapter 8

# Binary File Operations

### Question

*Write a C++ program to write and read time in/from binary file using fstream*

### C++ Code

```
1  /*****
2  *File      : 08BinaryFileOperations.cpp
3  *Description : Program to illustrate binary file operations
4  *Author    : Prabodh C P
5  *Compiler  : gcc compiler, Ubuntu 22.04
6  *Date     : 12 January 2023
7  *****/
8  #include <iostream>
9  #include <iomanip>
10 #include <fstream>
11 #include <cstring>
12 using namespace std;
13 class timeVal{
14     int hh, mm, ss;
15     char ampm[3];
16     public:
17     void setdata(int h, int m, int s, const char* half)
18     {
19         hh = h;
20         mm = m;
21         ss = s;
22         strcpy(ampm, half);
23     }
24     void showdata()
25     {
26         cout << "\nThe Time is : ";
27         cout << setfill('0') << setw(2) << hh << ":";
28         cout << setfill('0') << setw(2) << mm << ":";
29         cout << setfill('0') << setw(2) << ss << " ";
30         cout << ampm << endl << endl;
31     }
32 };
33
34 /*****
35 *Function   : main
36 *Input parameters : no parameters
37 *RETURNS   : 0 on success
38 *****/
39 int main()
40 {
```

```

41     timeVal writeObj, readObj;
42     int hh, mm, ss;
43     char ampm[3];
44     cout << "Enter Hours : "; cin >> hh;
45     cout << "Enter Minutes : "; cin >> mm;
46     cout << "Enter Seconds : "; cin >> ss;
47     cout << "Enter am or pm : "; cin >> ampm;
48     writeObj.setdata(hh,mm,ss,ampm);
49     ofstream outFile("TimeFile", ios::out | ios::binary);
50     if(!outFile) {
51         cout << "Cannot open file.\n";
52         return 1;
53     }
54     outFile.write((char *) &writeObj, sizeof(timeVal));
55     cout << "\nWritten the time object successfully to binary file" << endl;
56     outFile.close();
57
58     // now, read back;
59     ifstream inFile("TimeFile", ios::in | ios::binary);
60     if(!inFile) {
61         cout << "Cannot open file.\n";
62         return 1;
63     }
64     inFile.read((char *) &readObj, sizeof(timeVal));
65     cout << "\nRead the time object successfully from binary file" << endl;
66
67     readObj.showdata();
68     inFile.close();
69     return 0;
70 }

```

Listing 8.1: 08BinaryFileOperations.cpp

## Output

```

=====
1 putta:~/.../Programs$ g++ -Wall 08BinaryFileOperations.cpp
2 putta:~/.../Programs$ ./a.out
3 Enter Hours : 6
4 Enter Minutes : 35
5 Enter Seconds : 6
6 Enter am or pm : am
7
8 Written the object successfully to binary file
9
10 Read the object successfully from binary file
11
12 The Time is : 06:35:06 am
13
14 putta:~/.../Programs$ ./a.out
15 Enter Hours : 8
16 Enter Minutes : 5
17 Enter Seconds : 9
18 Enter am or pm : am
19
20 Written the object successfully to binary file
21
22 Read the object successfully from binary file
23
24 The Time is : 08:05:09 am

```

Listing 8.2: OUTPUT

# Chapter 9

## Exception Handling

### Question

**Write a function which throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception.**

### C++ Code

```
1  /*****
2  *File      : 09ExceptionDemo.cpp
3  *Description : Program to illustrate Exception Handling
4  *Author    : Prabodh C P
5  *Compiler  : gcc compiler, Ubuntu 22.04
6  *Date      : 12 January 2023
7  *****/
8  #include <iostream>
9  #include <iomanip>
10 using namespace std;
11
12 void fnDivide(int, int);
13 /*****
14 *Function   : main
15 *Input parameters : no parameters
16 *RETURNS   : 0 on success
17 *****/
18 int main(void) {
19
20     int iNum1, iNum2;
21
22     cout << "Enter the value of m and n : " ;
23     cin >> iNum1 >> iNum2;
24
25     try{
26         fnDivide(iNum1, iNum2);
27     }
28     catch (logic_error& e){
29         cout << "Processing error " << endl << e.what() << " occured.\n";
30     }
31
32     return 0;
33 }
34 /*****
35 *Function   : fnDivide
36 *Input parameters : two integers
37 *RETURNS   : nothing
38 *****/
39
```

```
40 void fnDivide(int v1, int v2){
41     double dRes;
42     if(v2 == 0)
43         throw logic_error("Division by Zero Exception");
44     dRes = (double)(v1)/v2;
45
46     cout << v1 << " divided by " << v2 << " is equal to " << dRes << endl << endl;
47 }
```

Listing 9.1: 09ExceptionDemo.cpp

## Output

```
=====
1 putta:~/.../Programs$ g++ -Wall 09ExceptionDemo.cpp
2 putta:~/.../Programs$ ./a.out
3 Enter the value of m and n : 9 4
4 9 divided by 4 is equal to 2.25
5
6 putta:~/.../Programs$ ./a.out
7 Enter the value of m and n : 5 0
8 Processing error
9 Division by Zero Exception occured.
```

Listing 9.2: OUTPUT

# Chapter 10

## Array Bound Exception

### Question

*Write a C++ program function which handles array of bounds exception using C++.*

### C++ Code

```
1  /*****
2  *File           : 10ArrayBoundExceptionDemo.cpp
3  *Description    : Program to illustrate array out of bound Exception
4  *Author        : Prabodh C P
5  *Compiler      : gcc compiler, Ubuntu 22.04
6  *Date         : 12 January 2023
7  *****/
8  #include <iostream>
9  #include <iomanip>
10 #include <cstdlib>
11 #include <vector>
12 using namespace std;
13 /*****
14 *Function       : main
15 *Input parameters : no parameters
16 *RETURNS       : 0 on success
17 *****/
18 int main(void) {
19
20     vector<int> values;
21     int iDx, iElem;
22
23     srand(time(NULL));
24     for(int i=0;i<100;i++){
25         iElem = rand() %10000;
26         values.push_back(iElem);
27     }
28
29     try{
30         //generate a random index and test repeatedly 10 times
31         for(int i=0;i<10;i++){
32             iDx = rand() % 200 - 50;
33             if(iDx < 0 || iDx >=100){
34                 cout << "Generated index " << iDx << " is invalid" << endl;
35                 throw logic_error("Array out of Bounds");
36             }
37             cout << "Generated index is " << iDx << " the value at that index is : "
38             << values[i] << endl;
39         }
```

```

40     }
41     catch (logic_error& e){
42         cout << "Processing error " << endl << e.what() << " exception occured.\n"
43         << endl;
44     }
45     return 0;
46 }

```

Listing 10.1: 10ArrayBoundExceptionDemo.cpp

## Output

```

=====
1 putta:~/.../Programs$ g++ -Wall 10ArrayBoundExceptionDemo.cpp
2
3 putta:~/.../Programs$ ./a.out
4 Generated index is 37 the value at that index is : 8497
5 Generated index is 65 the value at that index is : 1027
6 Generated index is 7 the value at that index is : 8655
7 Generated index is 3 the value at that index is : 994
8 Generated index 105 is invalid
9 Processing error
10 Array out of Bounds exception occured.
11
12 putta:~/.../Programs$ ./a.out
13 Generated index -31 is invalid
14 Processing error
15 Array out of Bounds exception occured.
16
17
18 putta:~/.../Programs$ ./a.out
19 Generated index is 43 the value at that index is : 8629
20 Generated index is 95 the value at that index is : 4852
21 Generated index is 45 the value at that index is : 9097
22 Generated index -9 is invalid
23 Processing error
24 Array out of Bounds exception occured.

```

Listing 10.2: OUTPUT