

CS-111

# Fundamentals of Computer Programming

Lecture 2 (Part – I)

## Program Development

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# Road Map for Today

- RECAP
- Developing a program
- Introduction to C++
- Typical C++ Environment

# Developing a Program

# Problem Solving and Implementation

A programming task can be divided into two phases:

## 1. *Problem Solving*

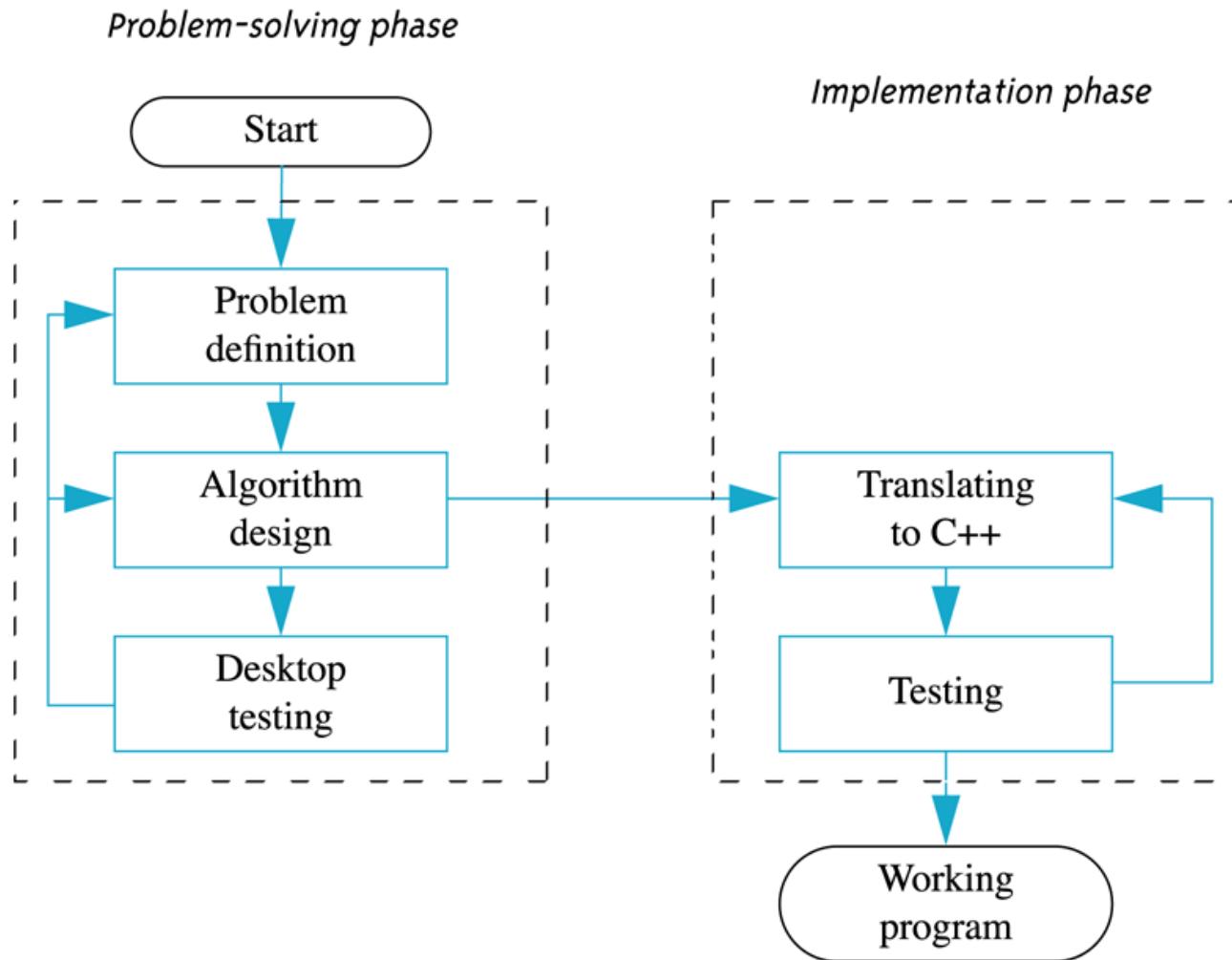
- Define: Clearly describe a problem
- Design its solution: Produce an ordered sequence of steps that describes solution to the problem

## 2. *Implementation Phase*

- Implement the program in some programming language
- Write code, compile, link, test, debug

# Problem Solving and Implementation

## Program Design Process



# **Define a Problem:**

Break the definition of the problem down into manageable steps. Example: input, processing, output

**Display whether the temperature entered by the user is below or above freezing point?**

**Input;**      **Read the temperature from keyboard**

**Processing;** **Test the temperature – below or above freezing point**

**Output;**      **Display the result on screen**

# Design the solution

## **Algorithm:**

- A precise rule or set of rules specifying how to solve a problem
  - A sequence of language independent steps which may be followed to solve a problem.
- An algorithm can be developed with a:

**Pseudo code**

**Flowchart**

# Algorithm

## Pseudo code

- Artificial, informal language that helps us develop algorithms
- Similar to everyday English
- Not actually executed on Computers
- Helps us think out a program before writing it

Easy to convert into a corresponding C++ program

Consists only of executable statements

# Algorithm

## Flowchart

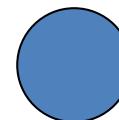
- Diagrammatic or graphical representations of steps for solving the given problem.
- Use standard symbols developed by ANSI (American National Standard Institute)

# Building Blocks of Flowchart

Start and End



Connector



Arrows



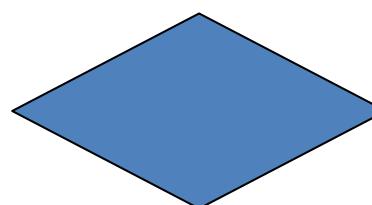
Processing Steps



Input/ Output



Decision



## Defining a Problem:

Break the definition of the problem down into manageable steps; Input, Processing; Output

### Example -1:

Read in the temperature. If the temperature is less than  
0 indicate below freezing on the screen. Else if the  
temperature is above freezing then indicate the same on  
the monitor screen.

# Algorithm – Pseudo code

Example -1:

Print “Enter Temperature”

Read the Temp

if (Temp < 0) then

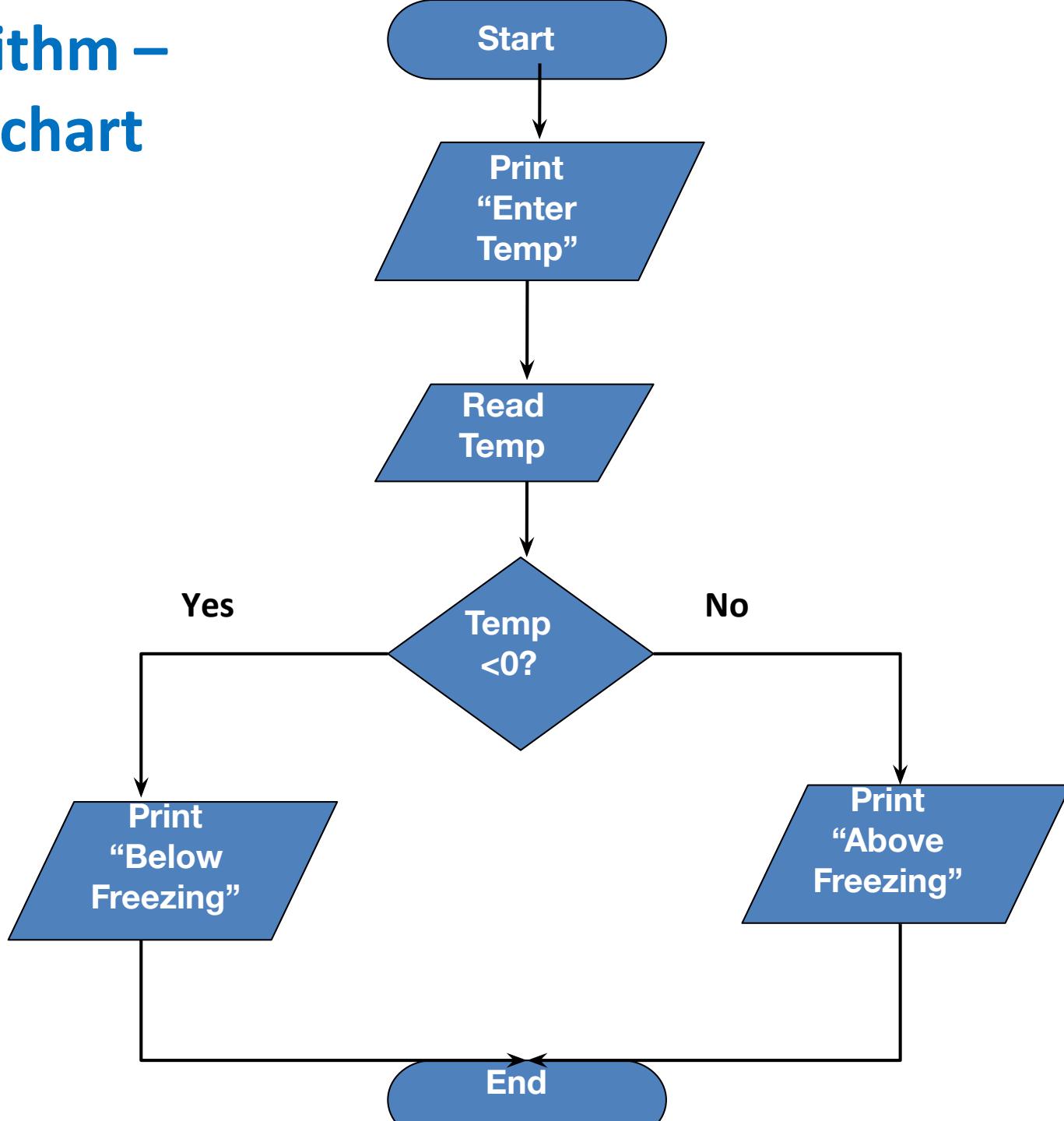
Print “BELOW FREEZING”

else

Print “ABOVE FREEZING”

endif

# Algorithm – Flowchart



## Define The Problem

### Example-2;

Determine the sum of first 50 natural numbers.

## Break into steps

Input – Nil

Processing: Sum the numbers from 1 to 50

Output - Sum

## Design the Solution

### Example-2;

Determine the sum of first 50 natural numbers.

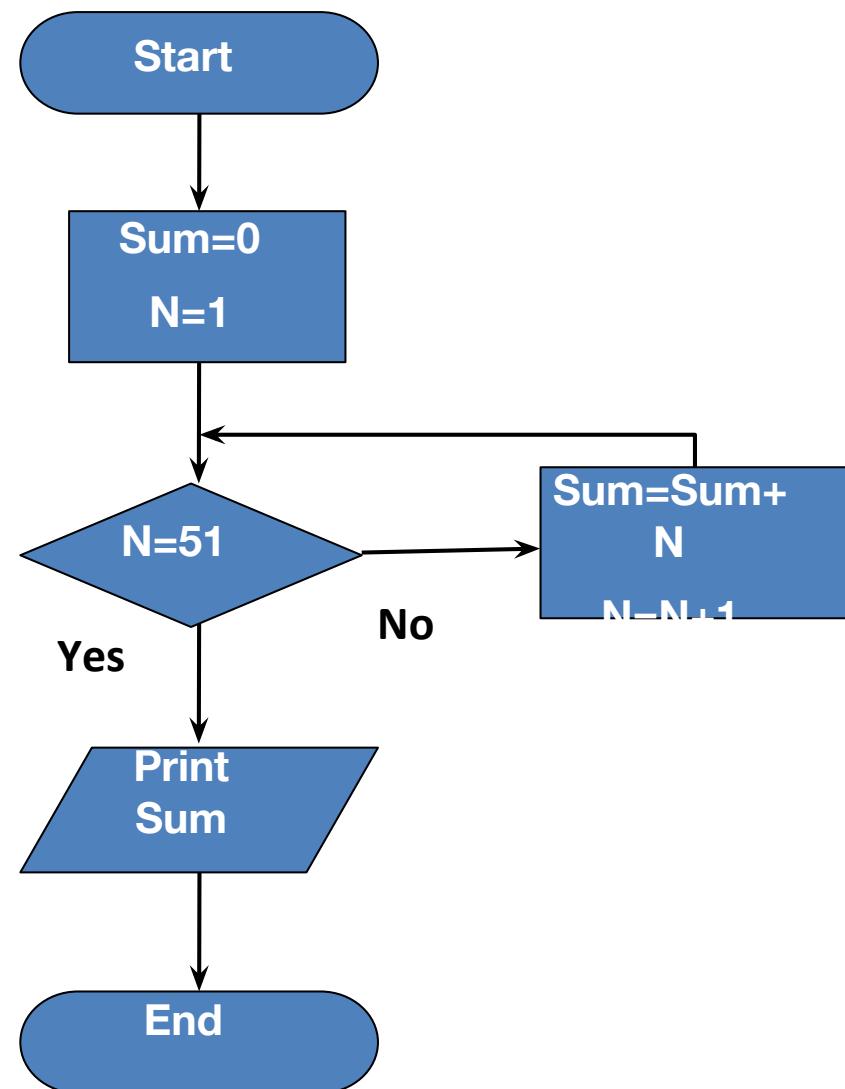
### Algorithm; Pseudo Code

1. Set N=1  
    Set Sum = 0
2. Repeat step 3 & 4 while N <= 50
3. Sum = Sum + N
4. N = N + 1
5. Print Sum
6. end

# Design the Solution

**Example-2;** Determine the sum of first 50 natural numbers.

Algorithm; Flow Chart

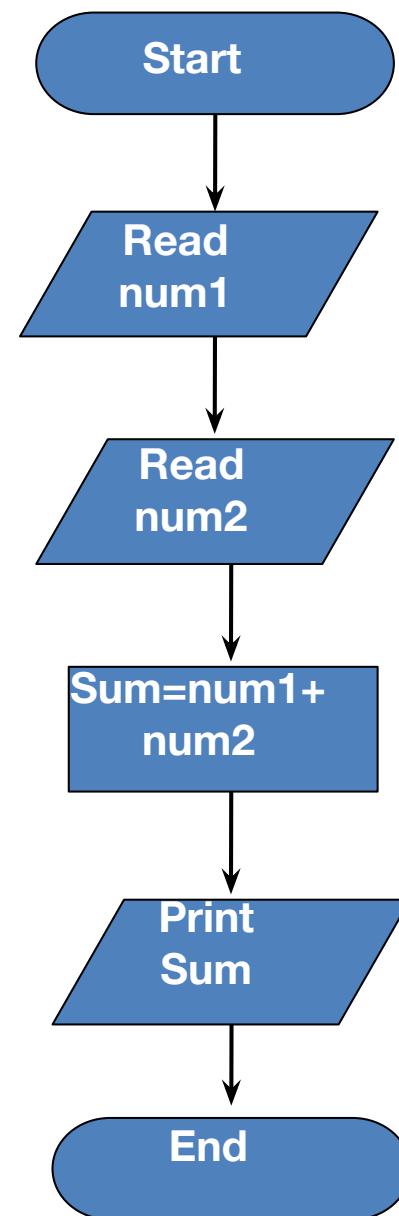


# Example 3: Adding two Numbers

## Pseudo code

---

- 1 *Prompt the user to enter the first integer*
  - 2 *Input the first integer*
  - 3
  - 4 *Prompt the user to enter the second integer*
  - 5 *Input the second integer*
  - 6
  - 7 *Add first integer and second integer, store result*
  - 8 *Display result*
- 



# Introduction to C++

# Introduction to C++

- Where did C++ come from?
  - Derived from the C language
  - C was derived from the B language
  - It was originally called “**C with Classes**” and was renamed C++ in 1983
- Why the ‘++’?
  - ++ is shorthand for adding 1 to a number in programming, so C++ roughly means **“one better than C.”**

# C++ History

- C developed by Dennis Ritchie at AT&T Bell Labs in the 1970s.
  - Used to maintain UNIX systems
  - Many commercial applications written in c
- C++ developed by Bjarne Stroustrup at AT&T Bell Labs in the 1980s.
  - Overcame several shortcomings of C
  - Incorporated object oriented programming
  - C remains a subset of C++

# A Sample C++ Program

- A simple C++ program begins this way

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

```
int main()
{
```

- And ends this way

```
    return 0;
}
```

# Typical C++ Environment

## Basics of a Typical C++ Environment

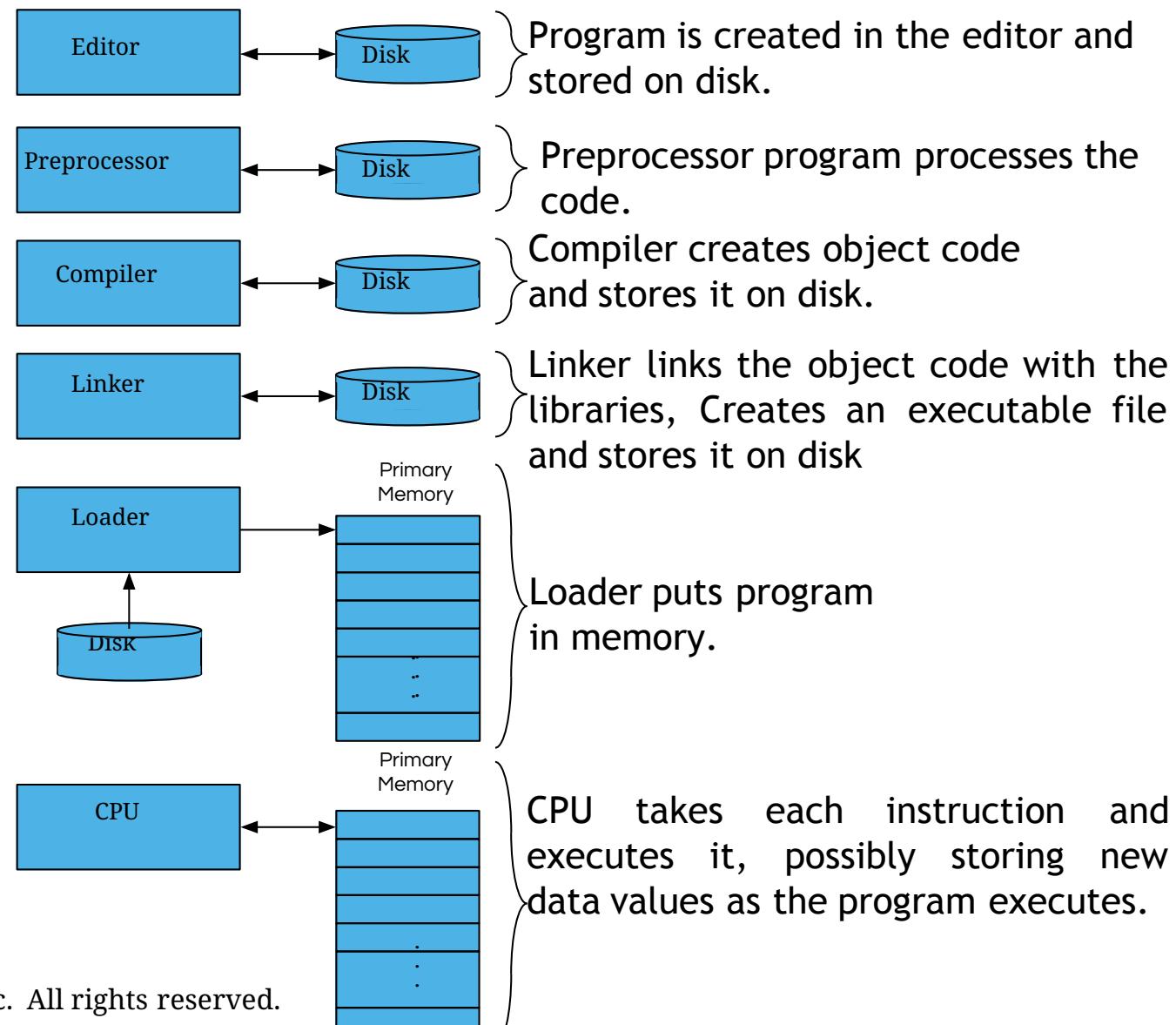
- C++ systems
  - Program-development environment
  - Language
  - C++ Standard Library
- C++ program names extensions
  - .cpp
  - .cxx
  - .cc
  - .C

## Basics of a Typical C++ Environment

### Phases of C++ Programs:

1. Edit
2. Preprocess
3. Compile
4. Link
5. Load
6. Execute

# Basics of a Typical C++ Environment



## Basics of a Typical C++ Environment

- Common Input/output functions
  - **cin (See-in)**
    - Standard input stream
    - Normally keyboard
  - **cout (See-out)**
    - Standard output stream
    - Normally computer screen
  - **cerr (See-err)**
    - Standard error stream
    - Display error messages

# A Simple Program: Printing a Line of Text

- Before writing the programs
  - **Comments**
    - Document programs
    - Improve program readability
    - Ignored by compiler
    - Single-line comment
      - Begin with `//`
    - Multiple-line comment
      - Begin with `/*` and end with `*/`
      - `/* ... */`
  - **Preprocessor directives**
    - Processed by preprocessor before compiling
    - Begin with `#`



## Outline

fig01\_02.cpp

fig01\_02.cpp  
output (1 of 1)

```

1 // Fig. 1.2: fig01_02.cpp
2 // A first program in C++
3 #include <iostream>
4
5 // function main begins
6 int main()
7 {
8     std::cout << "Welcome to"
9
10    return 0; // successfully
11 } // end function main

```

Function **main** returns

Left brace { begins  
function body.

exactly once in every  
C++ program.

Corresponding right  
brace } ends function  
body.

Name Stream insertion  
operator  
namespace **std**:

Keyword **return** is one  
of several means to exit  
function; value **0**  
indicates program  
terminated successfully.

Single-line  
comments

or directive to

ears

Statements end with a  
semicolon ;.

Welcome to C++!