Data Structures and Algorithms

Prof. Ajit A. Diwan

Prof. Ganesh Ramakrishnan

Prof. Deepak B. Phatak

Department of Computer Science and Engineering

IIT Bombay

Session: Basic Built-in Data Types

Programs

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DATA STRUCTURES + ALGORITHMS = PROGRAMS

- A program prescribes 'what' is to be done with 'which' data

- A C++ program has Variables and Functions

  - Variables $\longleftrightarrow$ Data Structures

  - Functions $\longleftrightarrow$ Algorithms

Example Program

- Read two integers and output their sum

```cpp
#include <iostream>
using namespace std;
int main()
{
 int i, j;
 cin >> i >> j;
 cout << i+j << endl;
}
```

Example Program

- This program uses two variables and one function

- Variables are declared to be integers

- They can store integer values

- The only function reads two integers and outputs their sum

Data Structure

- Variables `i` and `j` are used to represent integers
- They form the data structure
- This is a **built-in** data structure `int` available as part of the C++ programming language
- A data structure is also called a data type in a programming language
- The data type of a variable defines its possible values and the operations that can be performed on it

Algorithm

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- The `main` function defines the algorithm

- This uses the **built-in** operation + for adding `int` variables

- It also uses functions defined in the `iostream` library for reading and printing `int` variables

- Many commonly required data structures and algorithms are available as built-in types or as part of libraries

Questions

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- Will this program correctly add two integers always?
  - If not, under what conditions is it guaranteed to work correctly?
- What are other possible **built-in** data structures that could have been used in this program?
- Write a program for adding two integers that is guaranteed to always work correctly.
  - In this case, you may need to use your own data structures rather than built-in ones.