



# Computer Fundamentals

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Lecture 19



# Planning a Computer Program

## ➤ Plans

- ❑ The steps to solve a problem
- ❑ Describe expected results
- ❑ Programming without a plan is difficult
- ❑ Three planning tools discussed
  - Pseudocode
  - IPO chart
  - Flowchart



# Planning Tools

## ➤ Pseudocode

- ☐ Natural language statements that resemble code
- ☐ Describes what must be done
- ☐ Can be written by non-programmers
- ☐ Programmers develop unique versions



# Planning Tools (cont.)

## ➤ Input-processing-output (IPO) charts

- ❑ Determines what is needed
- ❑ Input column
  - Data inputted by user
- ❑ Processing column
  - Pseudocode describing problem solution
- ❑ Output column
  - Desired output from program

The IPO Chart for a Program That Calculates Gross Pay for an Hourly Employee

Input	Processing	Output
Hours worked	Input hours worked	Gross pay
Hourly wage	Input hourly wage	
	Validate data	
	Pay = hours worked * hourly wage	
	Display gross pay	

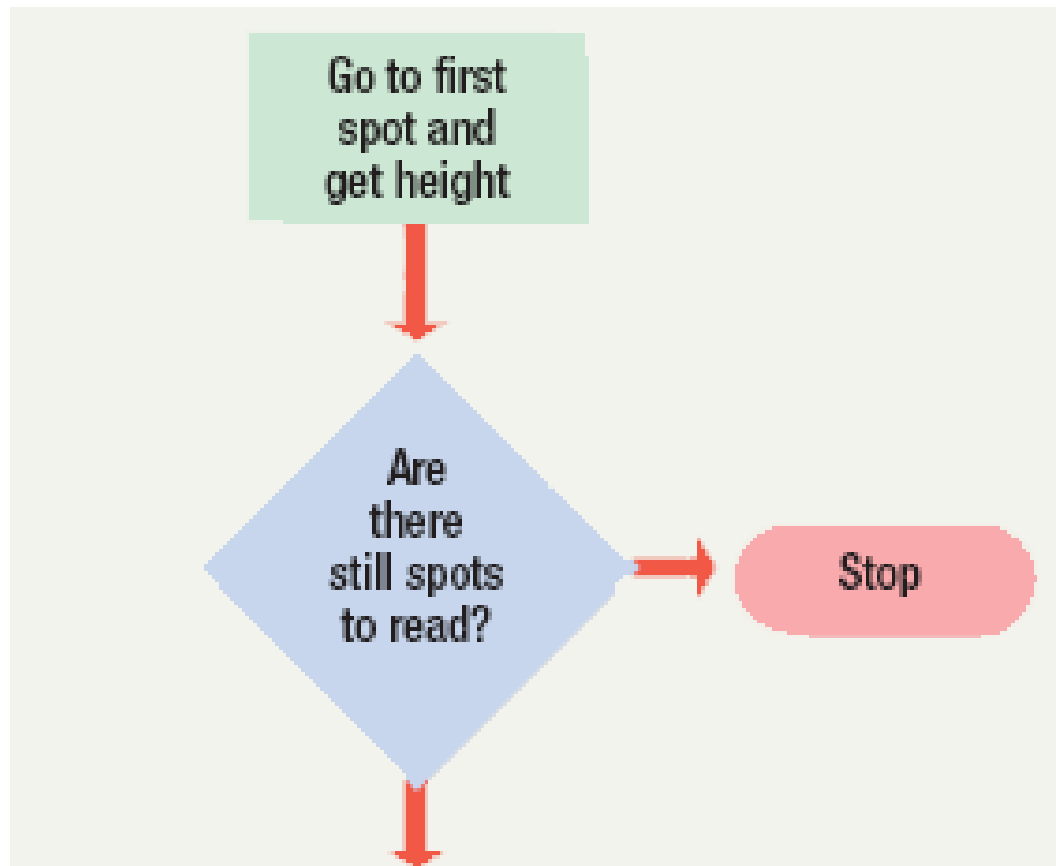




# Planning Tools (cont.)

## ➤ Flow Chart

- Diagrammatic representation of program





# How Programs Solve Problems (cont.)

- Algorithm
  - ❑ Set of steps to accomplish a task
    - Always leads to a solution
  - ❑ Flowcharts can describe algorithms
    - Structured tool for drawing algorithms



# How Programs Solve Problems (cont.)

## ➤ Heuristic

- ❑ Set of steps
  - Solution is usually found
- ❑ Rule or method that helps solve problems faster than doing all computing
- ❑ Solution may not be optimal
- ❑ Used when algorithms fail
  - Algorithm is nonexistent or too complex
- ❑ Appear in more complex applications
  - Data mining
    - Practice of examining large pre-existing databases in order to generate new information
  - Anti-virus software
    - File trying to write on hard disk, access emails



# Structured Programming

- Programming using defined structures
- Creates easy to read code
- Programs are efficient and run fast
- Several defined structures





# Structured Programming (cont.)

- Program control flow
  - ❑ Order in which program statements are executed
  - ❑ Typically executed in proper order
  - ❑ Branching statements allow multiple flows
  - ❑ Constructs can change the flow
    - Decision statements
    - Loops

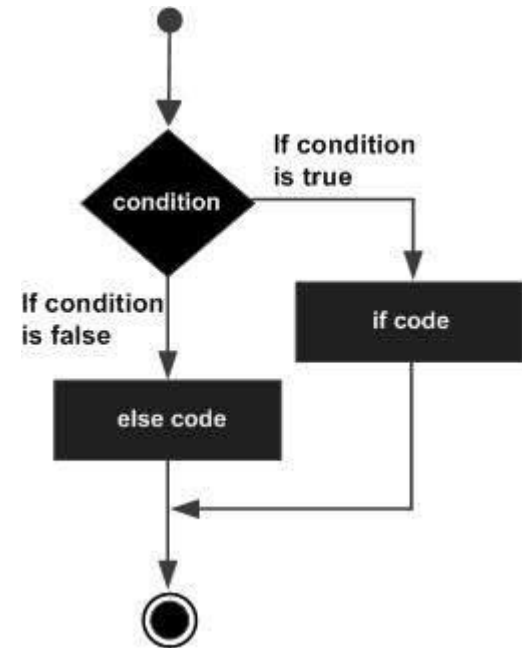


# Structured Programming (cont.)

## ➤ Selection statement

- ❑ Also called conditional statement
- ❑ Performs a true or false test
- ❑ Determines which code to execute next

```
if(true)
    { // statement(s) will execute if the
      boolean expression is true }
else
    { // statement(s) will execute if the
      boolean expression is false }
```





# Structured Programming (cont.)

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

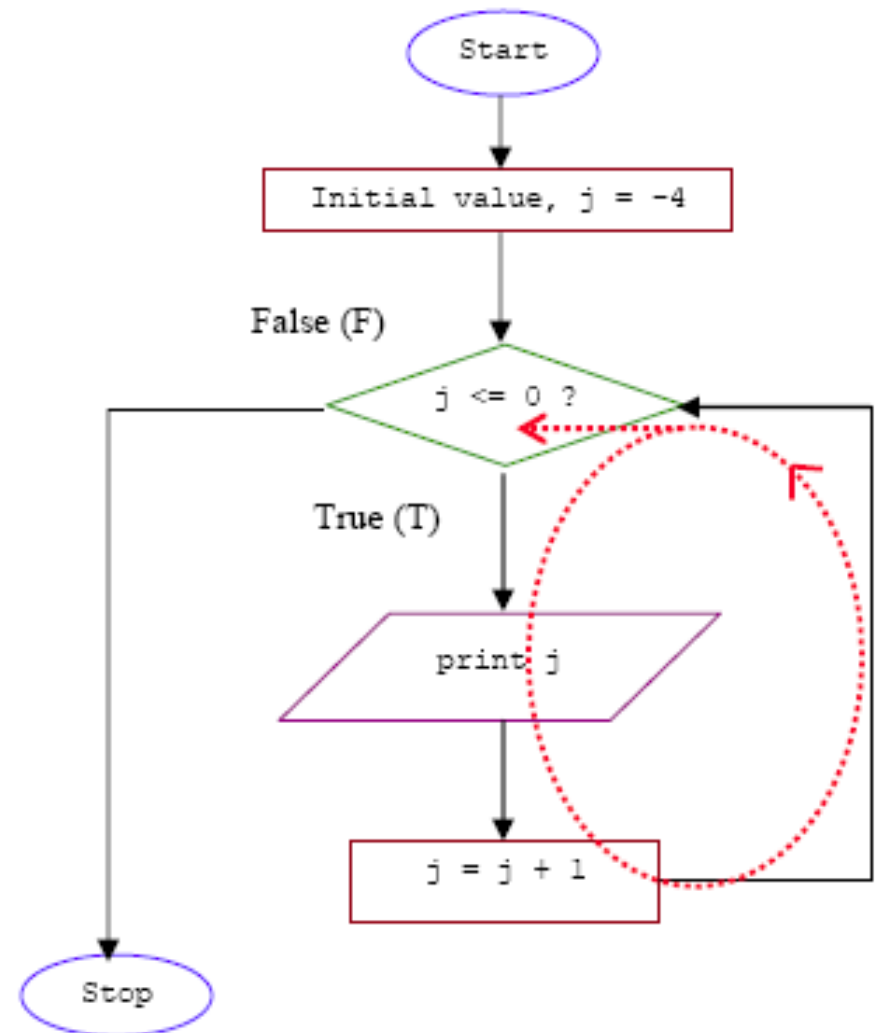
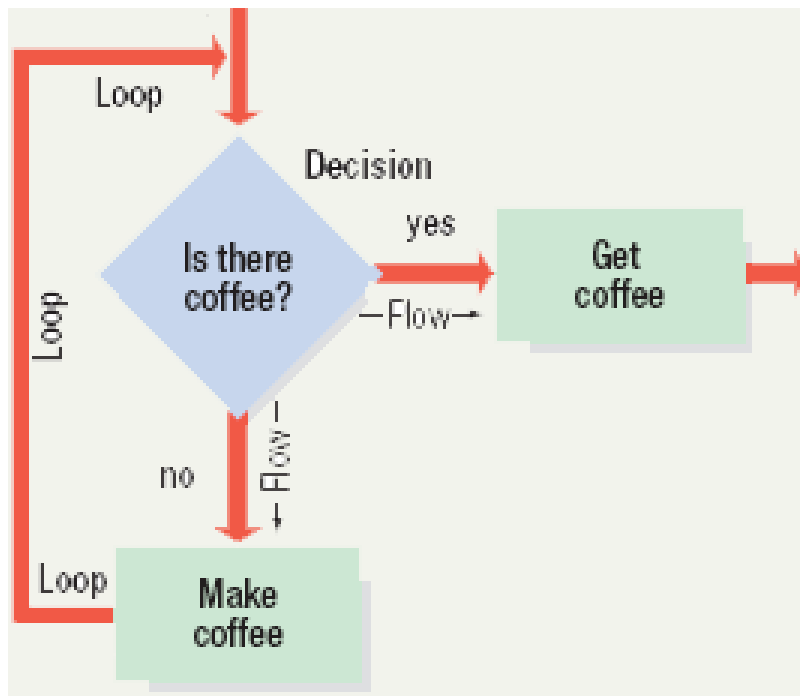
int main ()
{ // local variable declaration:
  int a = 100; // check the boolean condition
  if( a < 20 )
  { // if condition is true then print the following
    cout << "a is less than 20" << endl;
  }
  else
  { // if condition is false then print the following
    cout << "a is not less than 20" << endl;
  }
  cout << "value of a is " << a << endl;
  return 0;
}
```



# Structured Programming (cont.)

## ➤ Repetition statements

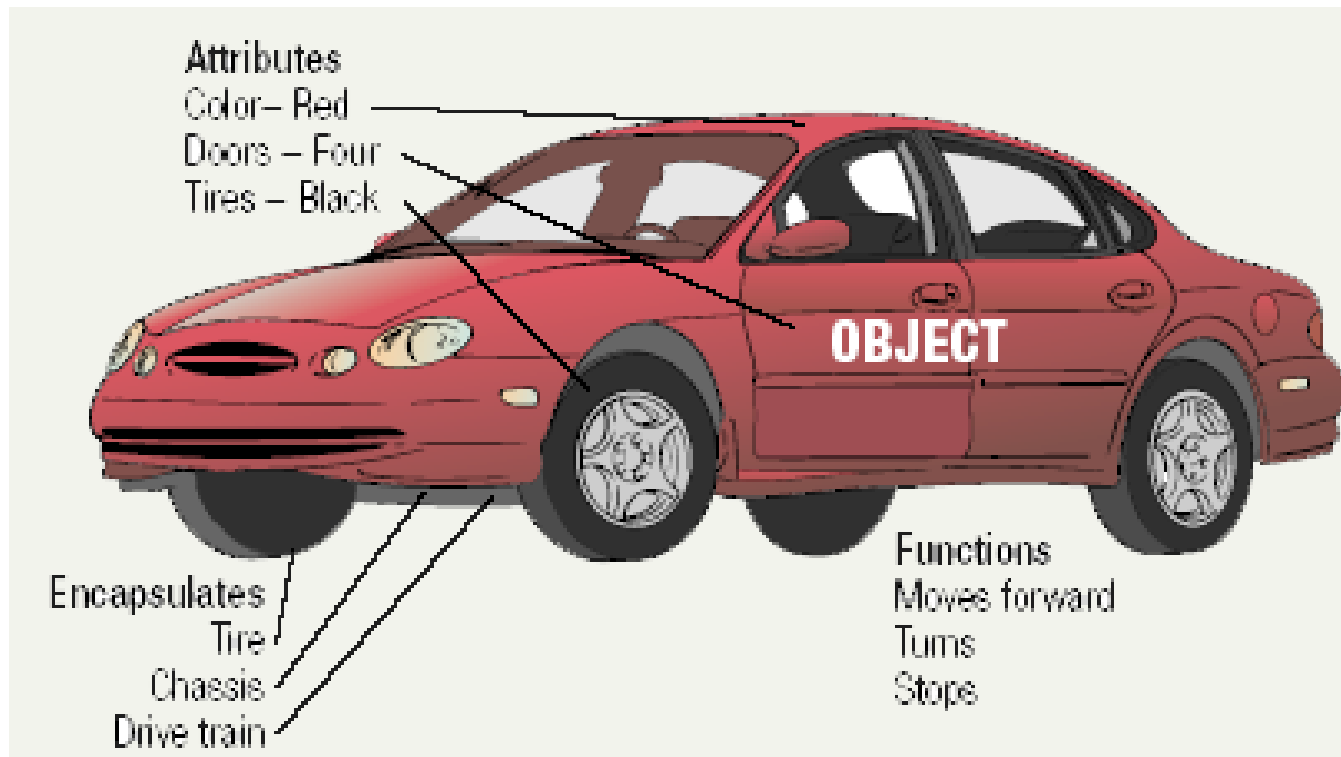
- ❑ Also called looping structures
- ❑ Repeats a section of code
  - Until an exit condition is reached





# Object Oriented Programming

- Also known as OOP
- Enhances structured programming
- Intuitive method of programming





# Object Oriented Programming (cont.)

## ➤ Class

- ❑ Used to specify form of an object
- ❑ Combines data representation and methods for manipulating that data into one neat package
- ❑ Data and functions within a class called members of the class

## ➤ Object

- ❑ Class provides the blueprints for objects
- ❑ So object is created from class
- ❑ Objects of a class declared with exactly same sort of declaration as that of basic variables



# Object Oriented Programming (cont.)

- OOP develops objects
  - ❑ All real world items are objects
  - ❑ OOP develops code versions
    - Contains data about the item
    - Contains functionality
  - ❑ Object brings both into one package



# Object Oriented Programming (cont.)

## ➤ Inheritance

- ❑ Child class inherits attributes and functions from parent class

## ➤ Code reuse

- ❑ Code used in many projects
- ❑ Speeds up program development
- ❑ Simplifies program development





# Object Oriented Programming (cont.)

## ➤ Encapsulation

- ❑ Object Oriented Programming concept
- ❑ Binds together data and functions that manipulate the data
- ❑ Keeps both safe from outside interference and misuse
- ❑ Data encapsulation led to important OOP concept of data hiding



# Object Oriented Programming (cont.)

```
class Computer // Standard way of defining the class
{
public:
// This means that all of the functions below this(and any variables)
// are accessible to the rest of the program.
// NOTE: That is a colon, NOT a semicolon...
Computer(); // Constructor
~Computer(); // Destructor
void setspeed ( int p );
int readspeed();
protected:
// This means that all the variables under this, until a new type of
// restriction is placed, will only be accessible to other functions in the
// class. NOTE: That is a colon, NOT a semicolon...
int processorspeed;
};
// Do Not forget the trailing semi-colon
```