PETER NORTON'S®

Introduction to Computers

- Web integrated activities
- Self-assessments to reinforce main concepts
- Online Resource: www.mhhe.com/peternorton

Technology Education

Chapter 13A

Creating Computer Programs

McGraw-Hill Technology Education

What Is a Computer Program?

- Computer programs
  - Also called software
  - Are a list of instructions
  - Instructions are called code
  - CPU performs the instructions
  - Three types
    - Operating system
    - Utility
    - Application

Software Is Stored In Many Files

- Executable files
  - Contain the instructions for the CPU
  - Have extensions of .exe, or .com

Software Is Stored In Many Files

- Dynamic link libraries
  - Partial executable file
  - Used to support executable files
  - Have .dll extensions

Software Is Stored In Many Files

- Initialization files
  - Contain configuration settings for software
  - Have a .ini extension
  - Modern programs use the registry

Software Is Stored In Many Files

- Help files
  - Contain information about the software
  - Information is indexed and searchable
  - Provides an online manual
  - Have a .chm or .hlp extension

Software Is Stored In Many Files

- Batch files
  - Used to automate tasks
  - Hold a series of OS commands
  - Have a .bat extension

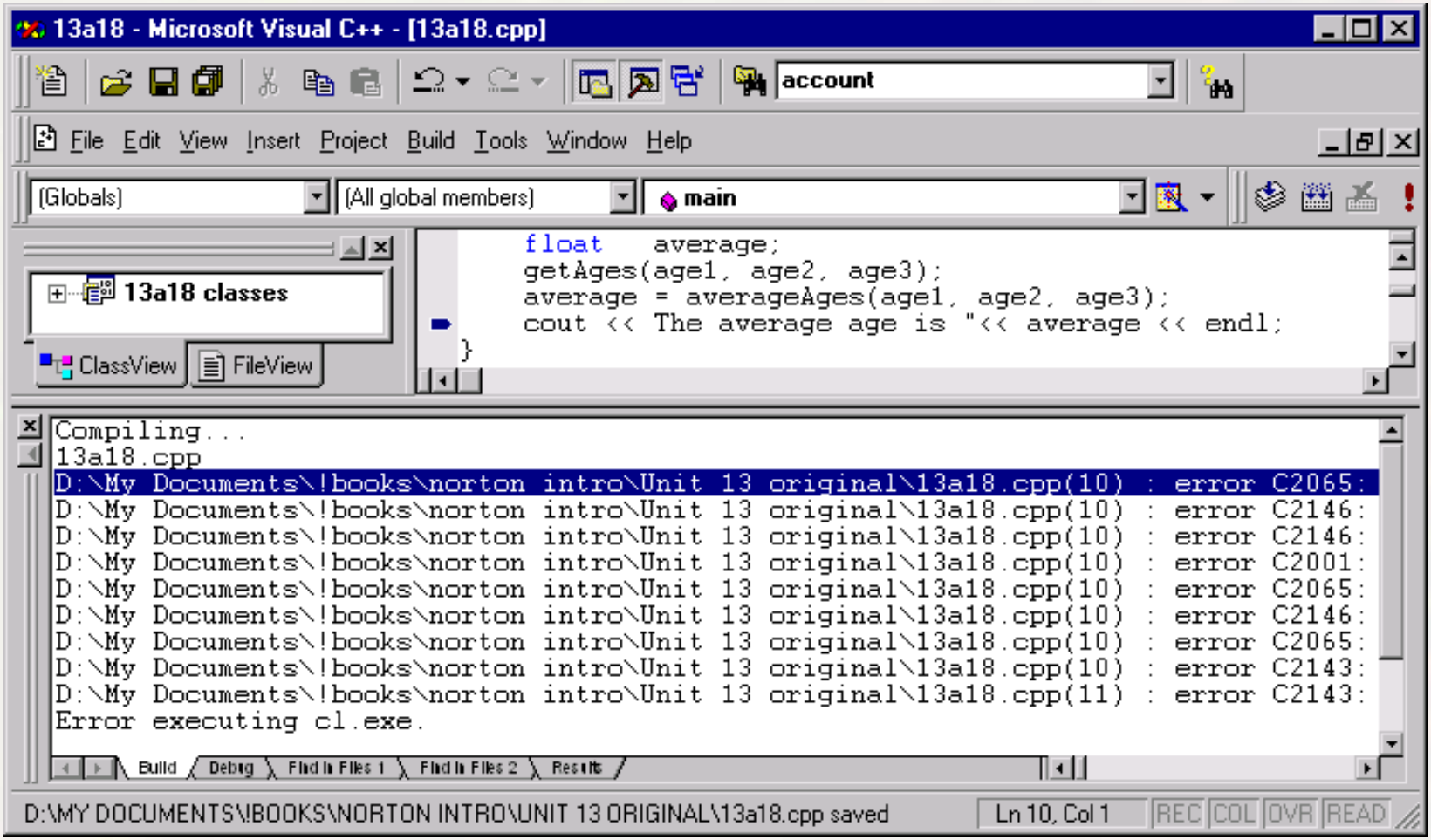
Hardware/Software Interaction

- Program execution
  - Software executes at the CPU level
  - Code to play a sound
    - Code generates an interrupt
    - CPU tells the sound card to play
    - Sound card plays the file
  - Programmer creates the code

Hardware/Software Interaction

- Code
  - Statements written in a programming language
  - Writing code can be tedious
    - Code must be perfect
    - Order of steps must be exact
  - Writing code is quite exciting
    - Problems are solved
    - New ideas are formed

Writing Code



Hardware/Software Interaction

- Machine code
  - Recall that computers think in binary
  - Code is translated into machine code
    - CPU executes the machine code
  - CPUs have a unique machine code

Hardware/Software Interaction

- Programming languages
  - Simplifies the writing of code
    - English is used to describe the binary
  - Original code is called source code
  - Several hundred languages exist

Hardware/Software Interaction

- Compilers and interpreters
  - Converts source code into binary
    - Allows code to execute
  - Checks source code for correctness

Hardware/Software Interaction

- Compiler
  - Creates an executable file
    - Contents are called object code
  - Executable can run on its own
  - Each language has its own compiler
  - C++ and Java are compiled languages

Hardware/Software Interaction

- Interpreter
  - Runs program one line at a time
  - More flexible than compilers
  - Slower than compilers
  - Always needed to execute program
  - Visual Basic and Perl are interpreted

Planning a Computer Program

- Plans
  - The steps to solve a problem
  - Describe the expected results
  - Programming without a plan is difficult

Planning Tools

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

Planning Tools

- Input-processing-output (IPO) charts
  - Determines what is needed
  - Input column
    - Data inputted by the user
  - Processing column
    - Pseudo code describing the problem solution
  - Output column
    - Desired output from the program

IPO Chart

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	

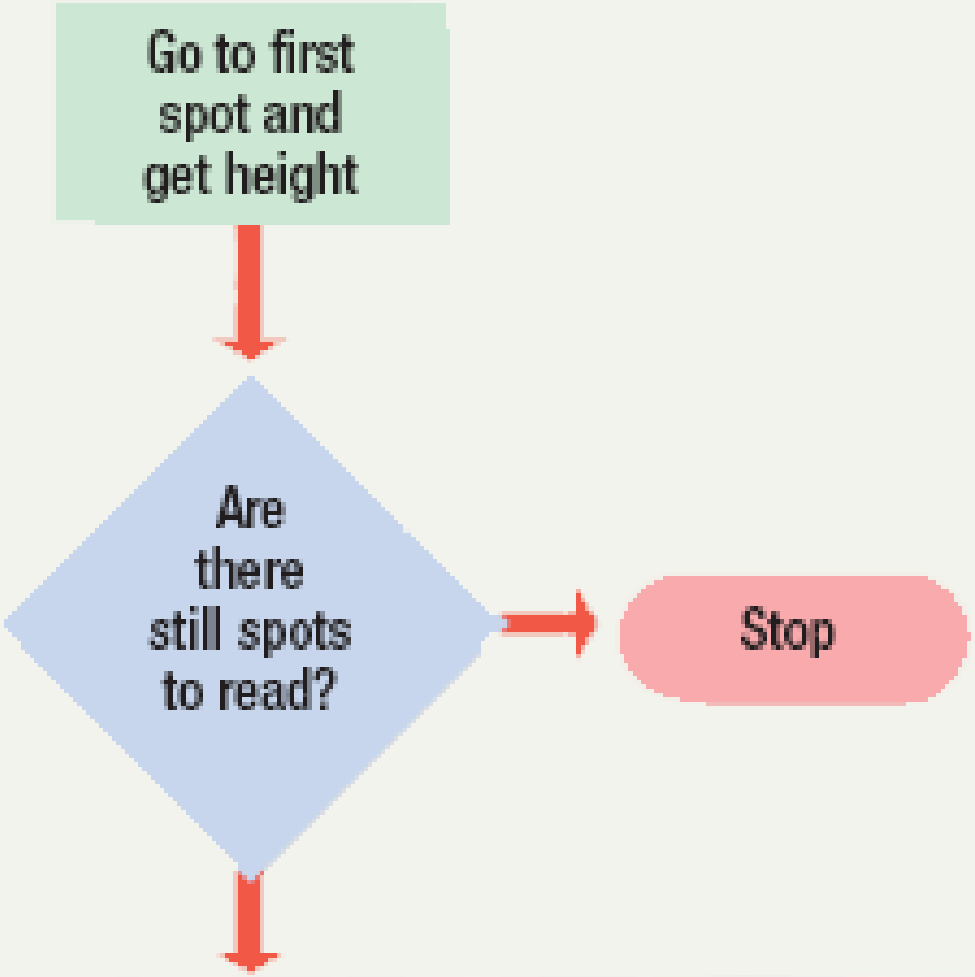
How Programs Solve Problems

- Program control flow
  - Order program statements are executed
  - Typically executed in order
  - Constructs can change the flow
    - Decision statements
    - Loops

How Programs Solve Problems

- Algorithm
  - Set of steps
  - Always leads to a solution
  - Steps are always the same
  - Flowcharts can describe algorithms
    - Structured tool for drawing algorithms
  - Algorithms appear in all programs

Flowchart


Go to first spot and get height
Are there still spots to read?
Stop

How Programs Solve Problems

- Heuristic
  - Set of steps
  - Solution is usually found
  - Solution may not be optimal
  - Used when algorithms fail
    - Algorithm is nonexistent or too complex
  - Appear in more complex applications
    - Data mining
    - Anti-virus software

Structured Programming

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

Structured Programming

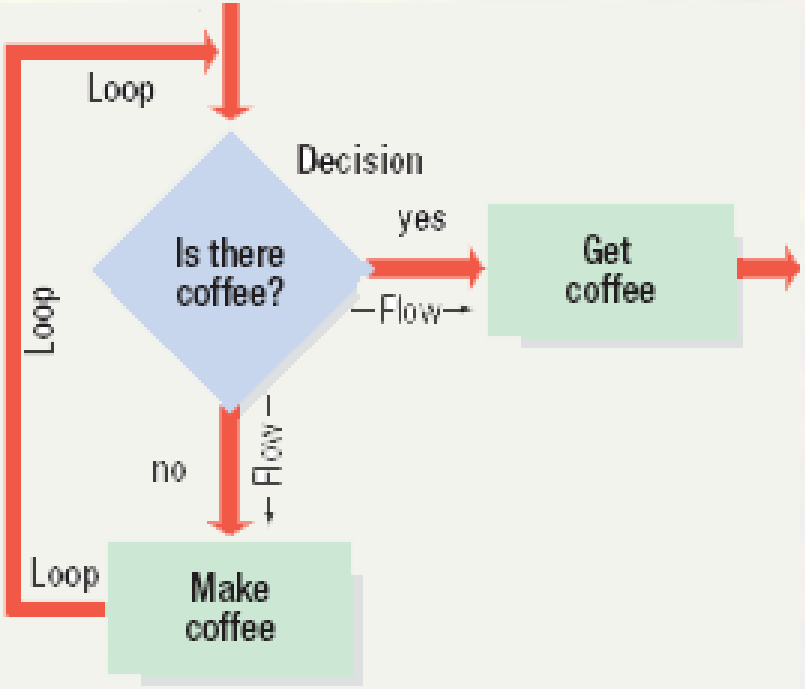
- Sequence structure
  - Describes the flow of the program
  - Typically executed in order
  - Branching statements allow multiple flows

Structured Programming

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

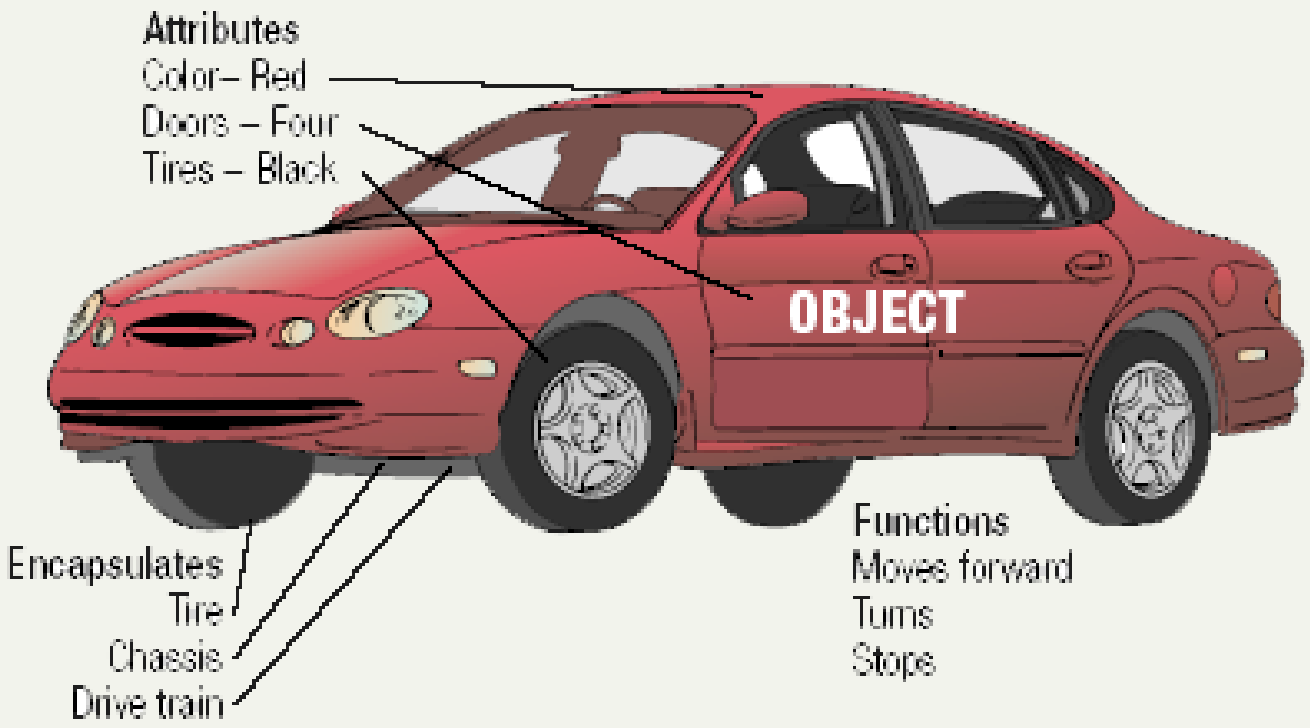
Structured Programming

- 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

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

Object Oriented Programming

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

Chapter 13A

End of Chapter