Chapter 15
Program Development and Programming Languages

Chapter 15 Objectives

What Is a Computer Program?
1 What is a computer program?
   ♦ Set of instructions that directs computer to perform tasks

The Program Development Life Cycle
1 What is the program development life cycle (PDLC)?
   ♦ Steps followed to build computer programs

The Program Development Life Cycle
1 How is program development related to system development?
   ♦ Program development is an ongoing process within system development

Step 1 – Analyze Problem
What is involved in analyzing the problem?

Step 1 – Analyze Problem
1 What is an IPO chart?
   ♦ Identifies program's inputs, outputs, and processing steps
   ♦ Used to establish design specifications

Step 2 – Design Programs
What is involved in designing programs?

Step 2 – Design Programs
1 What is a hierarchy chart?
   ♦ Used to show program modules graphically
   ♦ Also called structure chart or top-down chart

Step 2 – Design Programs
1 What is structured design?
   ♦ Technique that builds all program logic from combination of three basic control structures

Step 2 – Design Programs
1 What is a sequence control structure?
   ♦ Shows one or more actions following each other in order
   ♦ Actions could be
     • Inputs
     • Processes
     • Outputs

Step 2 – Design Programs
1 What is a selection control structure?
   ♦ Tells program which action to take, based on a certain condition
Step 2 – Design Programs

What is an if-then-else control structure?

Step 2 – Design Programs

What is a case control structure?

Step 2 – Design Programs

What is a repetition control structure?
1.Used when program performs one or more actions repeatedly as long as certain condition is met

Step 2 – Design Programs

What is a do-while control structure?
2.Repeats one or more times as long as condition is true

Step 2 – Design Programs

What is a do-until control structure?
2.Tests condition at end of loop

Step 2 – Design Programs

What is a proper program?
2.No dead code
2.No infinite loops
2.One entry point
2.One exit point

Step 2 – Design Programs

How are entry and exit points shown?
2.Each control structure should have one entry point and one exit point

Step 2 – Design Programs

What is a program flowchart?
2.Graphically shows logic in a solution algorithm

Step 2 – Design Programs

What is a Nassi-Schneiderman (N-S) chart?
2.Graphically shows logic in a solution algorithm

Step 2 – Design Programs

What is pseudocode?
2.Uses condensed form of English to convey program logic

Step 2 – Design Programs

What is a quality review?
Review of program design
• Desk check
• Structured walkthrough

Step 3 – Code Programs
1 What is involved in coding programs?
2 • Two steps
   • Translating solution algorithm into a programming language
   • Entering programming language code into the computer

Step 4 – Test Programs
1 What is involved in testing programs?
2 • Goal is to ensure program runs correctly and is error free
   • Three types of errors
     • Syntax
     • Logic
     • Run time

Step 4 – Test Programs
1 What is debugging?
2 • Process of locating and correcting syntax and logic errors in program

Step 5 – Formalize Solution
1 What is involved in formalizing a solution?
2 • Programmer performs two activities
   • Reviews program code
   • Reviews documentation

Step 6 – Maintain Programs
1 What is involved in maintaining programs?
2 • Two activities
   • Identify errors
   • Identify enhancements
     – Involves modifying existing programs to improve their functionality

Categories of Programming Languages
1 What are the categories of programming languages?

Categories of Programming Languages
1 What are low- and high-level programming languages?

Categories of Programming Languages
1 What is machine language?
2 • Only language computer understands directly

Categories of Programming Languages
1 What is assembly language?
Instructions made up of symbolic instruction codes

### Categories of Programming Languages

#### What is a third-generation language (3GL)?
- Uses a series of English-like words to write instructions
  - Procedural language
    - Requires program instructions to tell computer what to accomplish and how to do it

#### What is a compiler?
- Program that converts entire source program into machine language before executing it

#### What is an interpreter?
- Program that translates and executes one program code statement at a time
  - Does not produce an object program

#### What is a fourth-generation language (4GL)?
- Syntax is closer to human language than that of a 3GL
  - SQL and report generator are examples

#### What is a fifth-generation language (5GL)?
- Provides visual or graphical interface for creating source code
  - Visual Basic.NET is an example

### Object-Oriented Program Development

#### What is the object-oriented (OO) approach?
- Programmer can package data and program (or procedure) into a single unit, called an object
  - Class is larger category of objects

#### What is an object-oriented programming (OOP) language?
- Language that uses the OO approach
  - OOP is event-driven
    - Checks for and responds to set of events
  - C++ is complete object-oriented language

### Programming Languages

#### What are the most widely used programming languages?
- Hundreds of programming languages exist
41 Programming Languages
1 What is BASIC?
2 ◆ Designed for use as a simple, interactive problem-solving language
   ◆ Beginner’s All-purpose Symbolic Instruction Code

42 Programming Languages
1 What is Visual Basic?
2 ◆ Windows-based application that assists programmers in developing event-driven Windows-based applications

43 Programming Languages
1 What is COBOL?
2 ◆ Procedural language with English-like statements that make it easy to read, write, and maintain
   ◆ Common Business -Oriented Language
   ◆ 70 billion lines of code exist

44 Programming Languages
1 What is C?
2 ◆ Powerful language designed primarily to write system software

45 Programming Languages
1 What is C++?
2 ◆ Object-oriented programming language
   ◆ Includes all elements of C language, plus additional features for working with object-oriented concepts

46 Programming Languages
1 What is RPG?
2 ◆ Easy-to-write nonprocedural language used primarily in small businesses
   ◆ Report Program Generator

47 Program Development Tools
1 What are program development tools?
2 ◆ User-friendly software products designed to help both program developers and nontechnical users create solutions to information requirements

48 Program Development Tools
1 What is Visual Basic for Applications (VBA)?
2 ◆ Used to write own macros in Word, Excel, Access, and PowerPoint
   ◆ Use objects, classes, and other object-oriented concepts
Web Page Program Development
What Web page development tools are available?

Web Page Program Development
How does HTML code look?

Web Page Program Development
How are special effects and forms added to a Web page?

Web Page Program Development
What is the common gateway interface (CGI)?
1. Communications standard that defines how Web server communicates with clients

Web Page Program Development
What is dynamic HTML (DHTML)?
1. Allows you to include more graphical interest and interactivity on Web page

Web Page Program Development
What are XML, XHTML, and WML?

Web Page Program Development
What is the .NET Platform?
1. Environment for developing and running applications
2. Allows for creation and running of Web services

Web Page Program Development
What is Web page authoring software?
1. Creates sophisticated Web pages using a tool that is much easier to use than HTML
2. Generates HTML

Multimedia Program Development
What is multimedia authoring software?
1. Combines text, graphics, animation, audio, and video into interactive presentation
2. Also called authorware

Multimedia Program Development
How is multimedia authoring software used?
1. Creates computer-based training (CBT)
2. CBT software called courseware
3. Distance learning, distance education, or online learning

Selecting a Programming Language or Program Development Tool
What factors should be considered in selecting a programming language?

Summary of Program Development and Programming Languages
What is a computer program?
The program development life cycle
Object-oriented program development
Programming languages
Program development tools
Web page program development
Multimedia program development
Selecting a programming language