Discovering Computers
FUNDAMENTALS, Third Edition

Chapter 11
Information System Development and Programming Languages
Today

• Group work
• Programming exercise
• 8 programming languages
• Programming exercise
• Discussion
Software acquisition

How would you get the software you need to do the jobs you need to do?

• Purchase it

How do businesses get the software they need to do the jobs they need to do?

• Purchase it

• Develop it – write it themselves
Programming Languages

Computers are dumb – they only do what we tell them.

Computer Program – set of instructions that tells the computer what to do.

Programming Language - Used to write software.

- Commands
- Syntax
- Spelling and punctuation
Write your own code...

- You are a team of computer programmers
- The programming language has 7 instructions
  1. Start
  2. Stop
  3. Stand up
  4. Sit down
  5. Turn left
  6. Turn right
  7. Step forward one step
- Write the code to get a classmate from sitting in a chair at the back of the room to sitting in a chair at the front of the room.
Programming Languages

What are low-level languages and high-level languages?

Low-level language
- Machine-dependent
- Runs only on one type of computer
- Machine and assembly languages are low-level

High-level language
- Often machine-independent
- Can run on many different types of computers
What is **machine language**?

- Only language computer directly recognizes
- Uses a series of binary digits (1s and 0s) with a combination of numbers and letters that represent binary digits
What is **assembly language**?

- Instructions made up of symbolic instruction codes, meaningful abbreviations and codes
- **Source program** contains code to be converted to machine language
What is COBOL?

- Designed for business applications
- English-like statements make code easy to read, write, and maintain
- COmmon Business-Oriented Language

```plaintext
* COMPUTE REGULAR TIME PAY
  MULTIPLY REGULAR-TIME-HOURS BY HOURLY-PAY-RATE
  GIVING REGULAR-TIME-PAY.

* COMPUTE OVERTIME PAY
  IF OVERTIME-HOURS > 0
    COMPUTE OVERTIME-PAY = OVERTIME-HOURS * 1.5 * HOURLY-PAY-RATE
  ELSE
    MOVE 0 TO OVERTIME-PAY.

* COMPUTE GROSS PAY
  ADD REGULAR-TIME-PAY TO OVERTIME-PAY
  GIVING GROSS-PAY.

* PRINT GROSS PAY
  MOVE GROSS-PAY TO GROSS-PAY-OUT.
  WRITE REPORT-LINE-OUT FROM DETAIL-LINE
  AFTER ADVANCING 2 LINES.
```
What is C?

- Powerful language originally designed to write system software
- Requires professional programming skills

```c
/* Compute Regular Time Pay */
rt_pay = rt_hrs * pay_rate;

/* Compute Overtime Pay */
if (ot_hrs > 0)
    ot_pay = ot_hrs * 1.5 * pay_rate;
else
    ot_pay = 0;

/* Compute Gross Pay */
gross = rt_pay + ot_pay;

/* Print Gross Pay */
printf("The gross pay is %d\n", gross);
```
What is Java?

- Developed by Sun Microsystems
- Similar to C++ but uses just-in-time (JIT) compiler to convert source code into machine code
What is **RPG** (Report Program Generator)?

- Used for generating reports, performing computations, and updating files

```plaintext
C* COMPUTE REGULAR TIME PAY
C   RTHRS   MULT RATE   RTPAY  72
C*
C* COMPUTE OVERTIME PAY
C   OTHRS   IFGT 0
C   RATE   MULT 1.5   OTRATE  72
C   OTRATE   MULT OTHRS   OTPAY  72
C     ELSE
C     INZ   OTPAY  72
C*
C* COMPUTE GROSS PAY
C   RTPAY   ADD OTPAY   GRPAY  72
C*
C* PRINT GROSS PAY
C   EXCPTDETAIL
C*
O* OUTPUT SPECIFICATIONS
OOPRINT   E   DETAIL
O          23 'THE GROSS PAY IS $'
O          GRPAY  J   34
```
What is a fourth-generation language (4GL)?

- Nonprocedural language that allows access to data in database
- Popular 4GL is **SQL**, query language that allows users to manage data in relational DBMS

```sql
SELECT LAST_NAME, FIRST_NAME, GROSS_PAY
FROM EMPLOYEE
WHERE OVERTIME_HOURS > 0
ORDER BY LAST_NAME;
```

<table>
<thead>
<tr>
<th>LAST_NAME</th>
<th>FIRST_NAME</th>
<th>GROSS_PAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiqua</td>
<td>Martin</td>
<td>780.00</td>
</tr>
<tr>
<td>Charles</td>
<td>Leslie</td>
<td>715.00</td>
</tr>
<tr>
<td>Guillan</td>
<td>Anita</td>
<td>847.50</td>
</tr>
</tbody>
</table>

...
What are other available programming languages?

- ADA
- ALGOL
- APL
- BASIC
- FORTH
- FORTRAN
- HYPERTALK
- LISP
- LOGO
- MODULA-2
- PASCAL
- PILOT
- PL/1
- PROLOG
- SMALLTALK
What is **HTML** (Hypertext Markup Language)?

- Used to create Web pages

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**HTML**

```html
<doc>
  <head>
    <title>Document Title</title>
    <meta name="description" content="Description of the document"/>
    <meta name="keywords" content="Keywords of the document"/>
    <link rel="stylesheet" href="style.css"/>
  </head>
  <body>
    <h1>Section 1</h1>
    <p>This is a paragraph of text.</p>
    <p><a href="link.html">Click here to go to another page</a></p>
    <button onclick="alert('You clicked a button!');">Click me!</button>
  </body>
</doc>
```

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**Example of HTML Code**

```html
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8">
    <title>My First HTML Document</title>
  </head>
  <body>
    <h1>Welcome to My First HTML Document</h1>
    <p>This is a paragraph of text.</p>
    <button onclick="alert('You clicked a button!');">Click me!</button>
  </body>
</html>
```
What is a sequence control structure?

- Control structure that shows actions following each other in order

  - Control structure depicts logical order of program instructions
What is a selection control structure?

- Tells program which action to take, based on a certain condition

- If-then-else control structure—yields one of two possibilities: true or false

Diagram:
- Temperature < 60
  - YES: Put on a jacket
  - NO: Go outside
What is a repetition control structure?

- Enables program to perform one or more actions repeatedly
  - **Do-while control structure**—repeats as long as condition is true
    - Asks the question first
  - **Do-until control structure**—repeats until condition is true
    - Asks the question last
What are the final values of a, b, and c after the following programs run?

Start
   a=2
   b=4
   c=10
   While c>6
     perform changeBAndC()
   endwhile
   if a=2 then
     perform changeA()
   else
     perform changeBAndC()
   endif
   print a,b,c
Stop

changeBAndC()
   b=b+1
   c=c-1
Return

changeA()
   a=a+1
   b=b-1
return
Discussion

The U.S. Department of Commerce predicts more than a million new technology workers will be needed over the next five years. Typical programmers earn up to $90,000, with substantial signing bonuses and annual pay hikes. Yet, applicant supply is not keeping up with corporate demand. To ease the shortage, companies are tempting high-school students with attractive training programs that lead to lucrative jobs. The market for programmers, however, has fluctuated wildly, and today’s need is no guarantee of tomorrow’s employment.

- Will students who begin technological training right out of high school have a background general enough for other pursuits if their interest fades or the market withers?
- Should companies be allowed to sign high-school students?