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.

Next

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

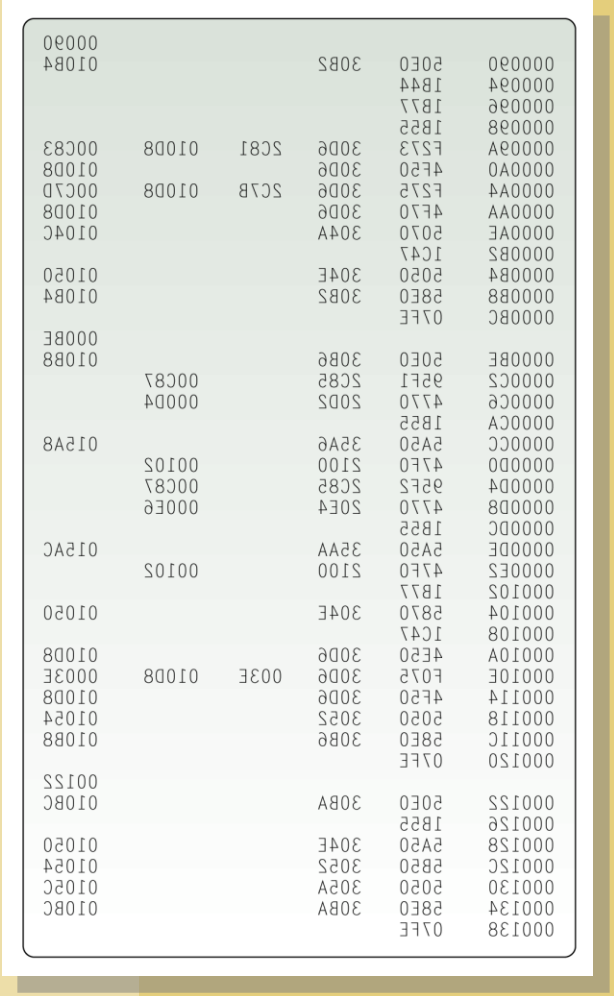
- Often machine-independent
  can run on many different types of computers

Next

Programming Languages

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



Next

Programming Languages

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

```
*         THIS MODULE CALCULATES THE REGULAR TIME PAY
CALCSTPY  EQU   *
          ST    14,SAVERTPY
          SR    4,4
          SR    7,7
          SR    5,5
          PACK  DOUBLE,RTHRSIN
          CVB   4,DOUBLE
          PACK  DOUBLE,RATEIN
          CVB   7,DOUBLE
          ST    7,RATE
          MR    4,7
          ST    5,RTPAY
          L     14,SAVERTPY
          BR    14
*         THIS MODULE CALCULATES THE OVERTIME PAY
CALCOTPY  EQU   *
          ST    14,SAVEOTPY
TEST1     CLI   CODEIN,C'0'
          BH    TEST2
          SR    5,5
          A     5,=F'0'
          ST    5,OTPAY
          B     AROUND
TEST2     SR    4,4
          SR    7,7
          SR    5,5
          PACK  DOUBLE,OTHRSIN
          CVB   4,DOUBLE
          PACK  DOUBLE,RATEIN
          CVB   7,RATE
          MR    4,7
          MR    4,=F'1.5'
          ST    5,OTPAY
AROUND    L     14,SAVEOTPY
          BR    14
*         THIS MODULE CALCULATES THE GROSS PAY
CALCGPAY  EQU   *
          ST    14,SAVEGPAY
          SR    5,5
          A     5,RTPAY
          A     5,OTPAY
          ST    5,GRPAY
          L     14,SAVEGPAY
          BR    14
```


Next

Programming Languages

What is COBOL?

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

```
*    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.
```



Click to view Web Link,
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from left navigation,
then click COBOL
below Chapter 11

p. 426 Fig. 11-17

Next

Programming Languages

What is C?

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

```
/* 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;

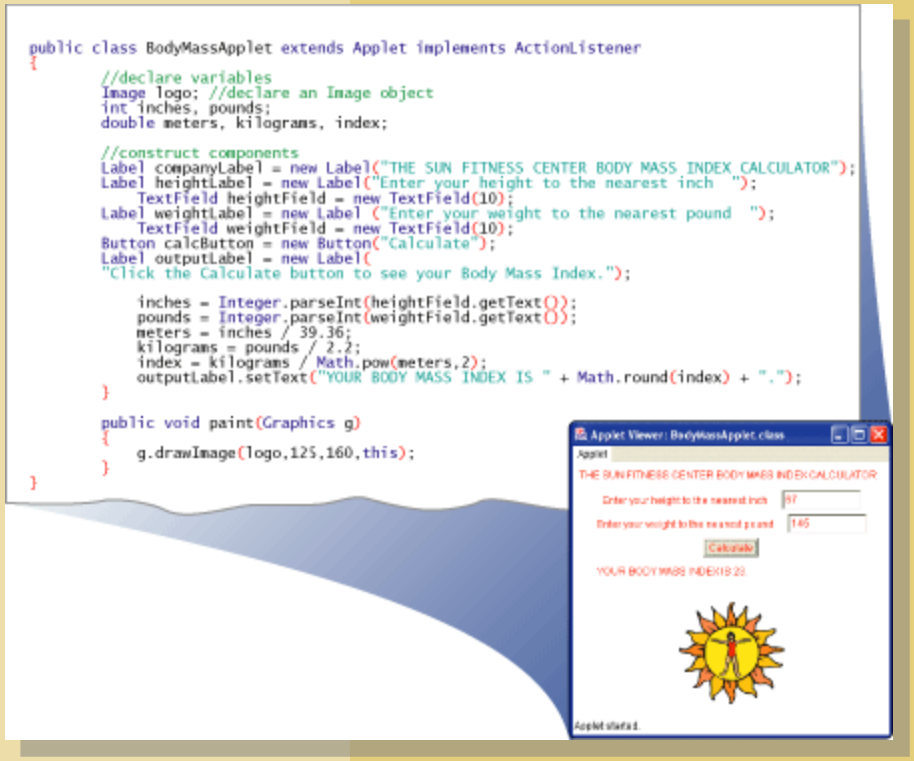
/* Print Gross Pay                                             */
printf("The gross pay is %d\n", gross);
```

p. 427 Fig. 11-18

Programming Languages

What is Java?

- Developed by Sun Microsystems
- Similar to C++ but uses just-in-time (JIT) compiler to convert source code into machine code



```
public class BodyMassApplet extends Applet implements ActionListener
{
        //declare variables
        Image logo; //declare an Image object
        int inches, pounds;
        double meters, kilograms, index;

        //construct components
        Label companyLabel = new Label("THE SUN FITNESS CENTER BODY MASS INDEX CALCULATOR");
        Label heightLabel = new Label("Enter your height to the nearest inch  ");
            TextField heightField = new TextField(10);
        Label weightLabel = new Label ("Enter your weight to the nearest pound  ");
            TextField weightField = new TextField(10);
        Button calcButton = new Button("Calculate");
        Label outputLabel = new Label(
        "Click the Calculate button to see your Body Mass Index.");

            inches = Integer.parseInt(heightField.getText());
            pounds = Integer.parseInt(weightField.getText());
            meters = inches / 39.36;
            kilograms = pounds / 2.2;
            index = kilograms / Math.pow(meters,2);
            outputLabel.setText("YOUR BODY MASS INDEX IS " + Math.round(index) + ".");
        }

        public void paint(Graphics g)
        {
            g.drawImage(logo,125,160,this);
        }
}
```

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p. 427 - 428 Fig. 11-19

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Programming Languages

What is RPG (Report Program Generator)?

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

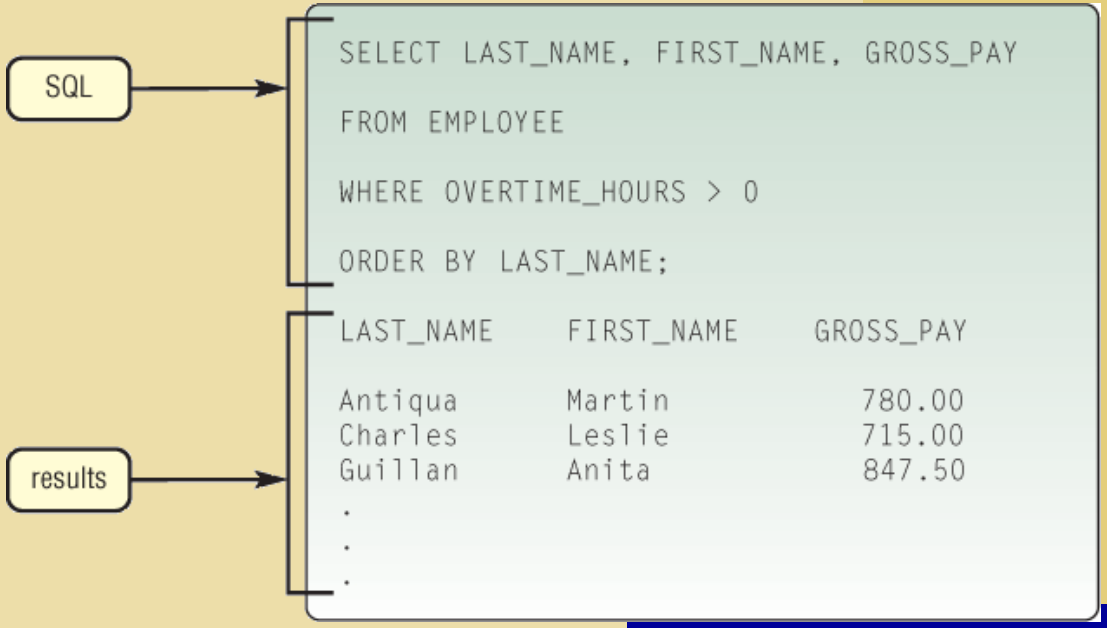
```
C* COMPUTE REGULAR TIME PAY
C           RTHRS     MULT RATE            RTPAY     72
C*
C* COMPUTE OVERTIME PAY
C           OTHRS     IFGT 0
C           RATE      MULT 1.5             OTRATE    72
C           OTRATE    MULT OTHRS           OTPAY     72
                      ELSE
C                     INZ                  OTPAY     72
C
C* COMPUTE GROSS PAY
C           RTPAY     ADD  OTPAY           GRPAY     72
C
C* PRINT GROSS PAY
C                     EXCPTDETAIL
C
C*
O* OUTPUT SPECIFICATIONS
OQPRINT  E            DETAIL
O                                  23 'THE GROSS PAY IS $'
O                     GRPAY  J      34
```


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Programming Languages

What is a fourth-generation language (4GL)?

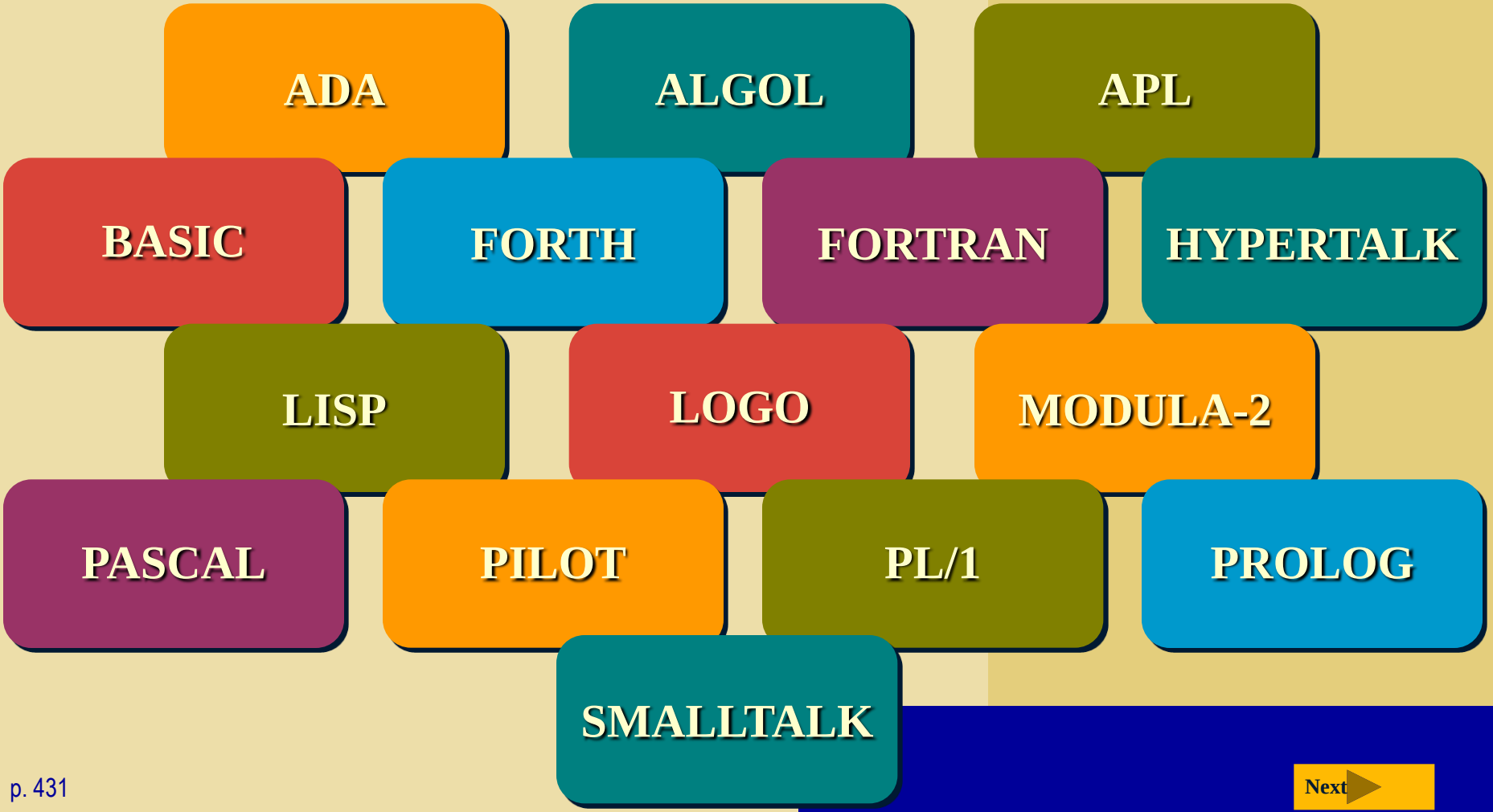
- Nonprocedural language that allows access to data in database
- Popular 4GL is SQL, query language that allows users to manage data in relational DBMS



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Programming Languages

What are other available programming languages?

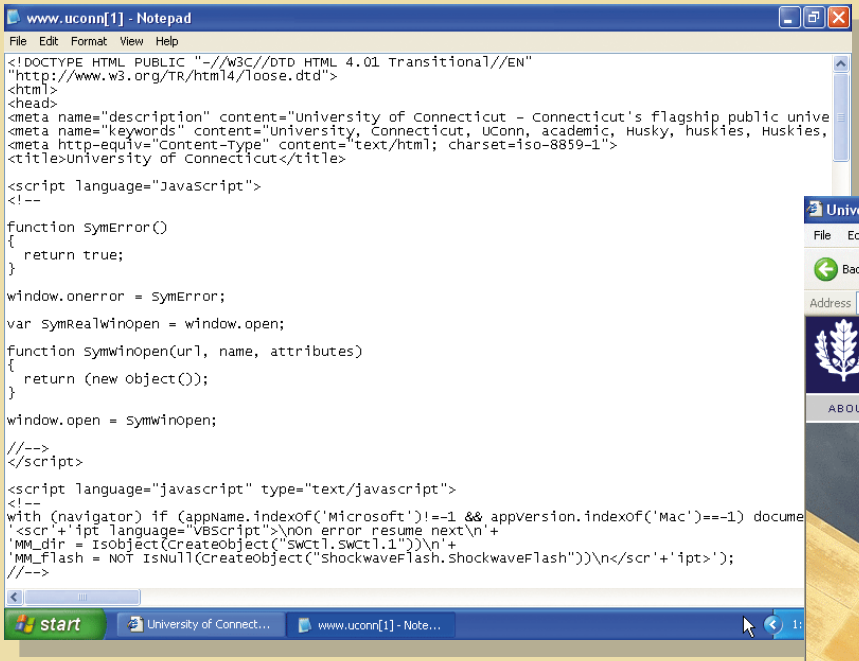


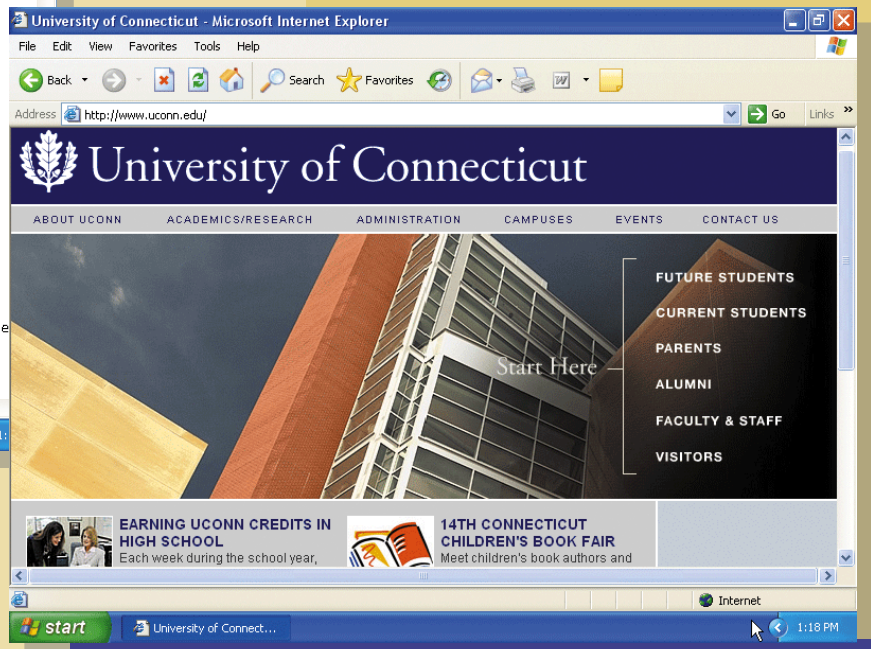
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Programming Languages

What is HTML (Hypertext Markup Language)?

- Used to create Web pages





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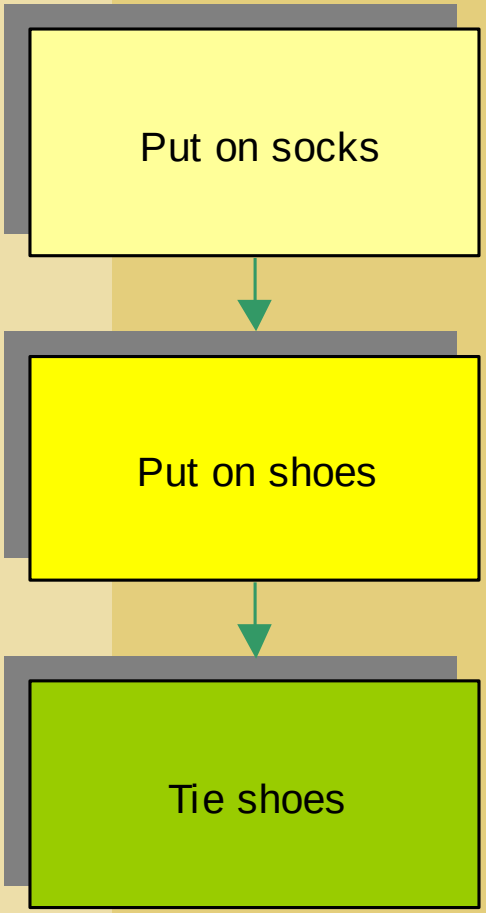
p. 433 Fig. 11-25

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The Program Development Cycle

What is a sequence control structure?

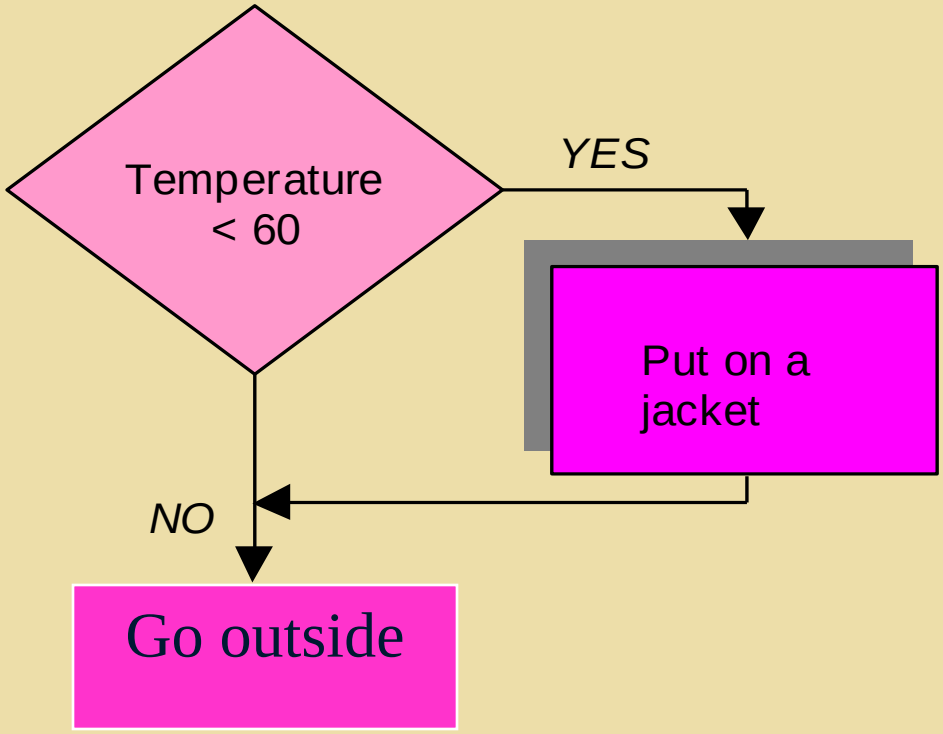
- **Control structure that shows actions following each other in order**
  - **Control structure** depicts logical order of program instructions



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The Program Development Cycle

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

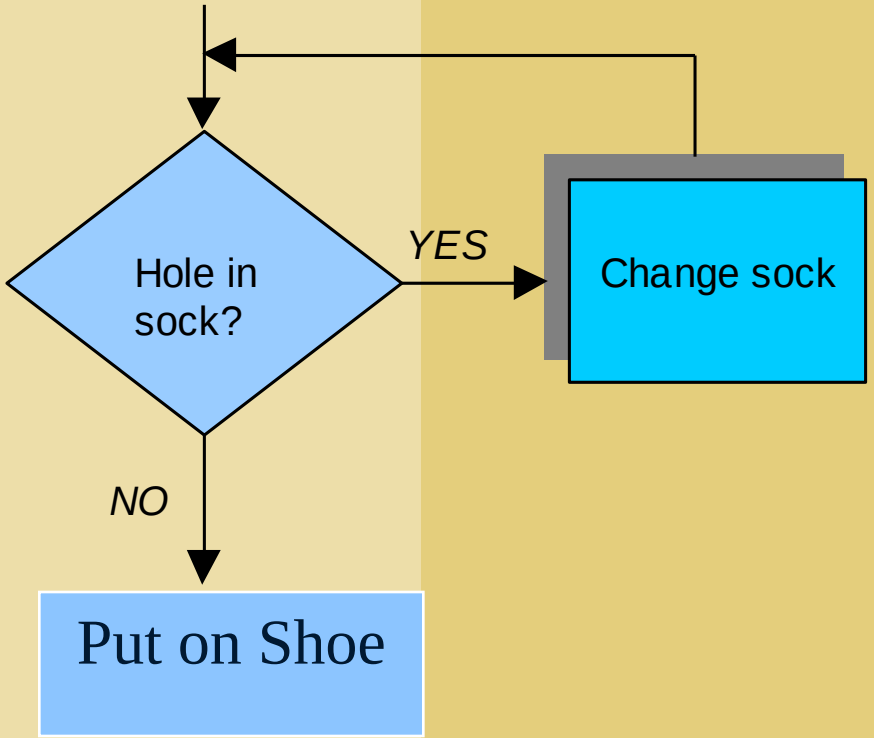
p. 440 Fig. 11-31

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The Program Development Cycle

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



Next

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*?