

ITEC1620
Object-Based Programming

Lecture 4
Introduction to Java

Iconic Programming and Java

- Iconic programs
 - Real programs without the syntax and overhead
- Overhead
 - Text editor and compiler
- Syntax
 - Click on “Java” button

Programming languages

- Machine code
 - Binary instructions used by CPU
- Assembly code
 - Mnemonic equivalents to machine code
- High-level programming languages
 - Useful structures composed of multiple assembly/machine instructions

The Java programming language

- 4th Generation Language
 - High-level instructions for structured and object-oriented programming concepts
- Pure object-oriented language
 - Everything in Java is an object
 - C/C++ is a composite language
- Write once, run everywhere

Programming in Java

- Text editors/programming environments
 - Store unformatted text for compiler
- Compiler – javac
 - Convert source code (.java file) into bytecode (machine code for JVM)
- Execute – java
 - Execute bytecode (.class file) on machine by using Java Virtual Machine

Java syntax

- Basic shell

```
public class MyClass
{
    public static void main (String[] args)
    {
    }
}
```

Style

- Good spacing makes a program easier to read
 - Spacing is ignored by the compiler, so it is only for style
- Expected style
 - Braces are always on a line by themselves
 - Everything inside braces is indented one tab more than the previous brace

Java syntax – sequence

- Declarations
 - `int variableName;`
- Assignments
 - `variableName = /* some expression */;`
- Output
 - `System.out.println(/* stuff */);`

Java syntax – branches

- Basic shell

```
if (/*boolean expression*/)
{
    // conditional statements
}
```

Java syntax – exclusive branches

```
if (/*boolean expression*/)
{
    // conditional statements
}
else
{
    // default statements
}
```

Java syntax – multiple branches

```
if (/*boolean expression*/)
{
    // conditional statements
}
else if (/*boolean expression*/)
{
    // more conditional statements
}
```

Java syntax – general branching

- if statement, boolean expression, and conditional statement(s)
- Optional and arbitrary number of else if statements
- Optional (at most one) else statement
- Note: at most one branch is followed – see Iconic Programmer for “flow”

Java syntax – loops

- Basic shell

```
while (/*boolean expression*/)
{
    // repeatable statements
}
```

Java syntax – required loops

do

{

 // repeatable statements

} while (/*boolean expression*/)

- Statements done once before evaluation of condition

Java syntax - counted loops

```
for (int i = 0; i < count; i++)  
{  
    // repeatable statements  
}
```

- Statements done a known number of times

Counted vs. Uncounted loops

- while
 - Implies waiting for a condition to change
 - Unknown number of times through loop
- for
 - Implies “for each value in a set”
 - Known number of times through loop

For Loop conversion

```
for (initialization; condition; update)
{ // repeatable statements }
```

```
initialization
while (condition)
{
    // repeatable statements
    update
}
```

Sample For Loop I

- Write a for loop that outputs the values from 1 to 10

Sample For Loop II

- Write a for loop that takes a user specified number of inputs and finds the largest value

```
// int numbers = /* user input */;
```

```
// int largest;
```


0-indexed counting

for (int i = 1; i <= count; i = i+1)

vs.

for (int i = 0; i < count; i = i+1)

- We normally start counting at 1
- Computers start counting at 0
 - 100 + 0, 100 + 1, 100 + 2, etc

Common errors with loops

- Off-by-one errors
 - How many times through the loop?
`for (int i = start; i < end; i = i+1)`
- Counter after loop
 - What is the output?
`int count;`
`for (count=0; count<10; count=count+1);`
`System.out.println(count);`

Questions?

Java sample

- Write a code section that determines (and outputs) the number of quarters, dimes, nickels, and pennies to provide the minimum number of coins for a given amount of cents

```
// int cents = /* some value */;
```

Data

Processes

Readings and Assignments

- Text sections (5th or 6th edition)
 - 1.4, 1.5, 5.2, 5.5, 5.7, 5.8
- Text sections (7th edition)
 - 1.4, 1.5, 5.2, 5.4, 6.3, 6.4
- Tutorial – Hello World
- Tutorial – Flowchart conversion