The Agenda for Today

- HTML Forms
- Introduction to Objects
- Programming in General
- Getting Started in JAVA

Introduction to Objects

- **Object Instance**
  - Attributes (properties): associated data
  - Operations: actions that change attributes
    - *Methods* in JAVA
    - *Member functions* in C++
- **Object Class**
  - Category or set of objects
  - Share same attributes, operations and relationships to other objects
Example: Object Class

<table>
<thead>
<tr>
<th>WIZARD</th>
<th>Class name</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Attributes</td>
</tr>
<tr>
<td>age</td>
<td></td>
</tr>
<tr>
<td>house</td>
<td></td>
</tr>
<tr>
<td>claimToFame</td>
<td>Operations</td>
</tr>
<tr>
<td>changeName(…)</td>
<td></td>
</tr>
<tr>
<td>incrementAge()</td>
<td></td>
</tr>
<tr>
<td>calculateDOB()</td>
<td></td>
</tr>
</tbody>
</table>

Example: Object Instances

w1: Wizard

name = “Albus Dumbledore”
age = 161
house = “Gryffindor”
claimToFame = “Defeated dark wizard Grindelwald”

w2: Wizard

name = “Harry Potter”
age = 21
house = “Gryffindor”
claimToFame = “Survived deadly curse by Voldemort”

Objects and older constructs

• Operation/ Method = function/procedure
• Object Instance = FAT variable containing multiple pieces of data and its own functions
Naming Conventions

- Convention:
  - Attributes/operation names begin with lower-case characters
  - Class and type names are capitalized
- Common Operations:
  - get*, set*, is*

Programming in General

- Algorithms
- Pseudocode
- Reusable Components
- Testing and Debugging

Algorithms and Pseudocode

- Hardest part in designing methods: coming up with a plan or strategy for carrying out the action
- Algorithm: set of instructions for solving a problem. So precise that even a dumb computer could follow the instructions and get the same results
- Pseudocode: an algorithm written in a mixture of English and some programming language
Reusable Components

- Most programs combine already existing components
- Be sure to design classes so that they are reusable

Testing and Debugging

- Syntax Error: a grammatical mistake
- Run-time Error: detected when program is run
- Logic Error: incorrect but legal

Development Cycle

- Write or edit source code
- Compile source code
- Execute program
- Fix bugs that emerge during compilation
- Fix bugs that emerge during execution
Getting Started in JAVA

- A Little JAVA History
- Compile and Execute a Simple Program
- Declare Variables
- Arithmetic Expressions, the Math Class
- Define a Simple Method

JAVA: Definition

1. An island of Indonesia separated from Borneo by the Java Sea, an arm of the western Pacific Ocean. Center of an early Hindu Javanese civilization, Java was converted to Islam before the arrival of the Europeans (mainly the Dutch) in the late 16th century.

JAVA: Definition

2. A trademark used for a programming language designed to develop applications, especially ones for the Internet, that can operate on different platforms.

3. *informal:* Brewed coffee
A Little JAVA History

- 1991: Programming Language for Home Appliances (Gosling)
- 1994: Coupled with HotJava web-browser (Naughton and Payne)
- 1995: Netscape made browsers capable of running Java programs

Source to Byte Code

- The Java compiler translates the class definitions and programs into byte code
- Byte code is executed by an interpreter, called a Java Virtual Machine

Demo Step 1

- Embed method in a class definition

```java
public class Demonstrate {
    ...
}
```

- Explicit values are said to be literal
- Java is `blank insensitive`, but `case sensitive`
public class Demonstrate {
    public static void main (String[] args) {
        System.out.println("The movie rating is ");
        System.out.println(6 + 9 + 8);
    }
}

Demo Step 3: Compile & Execute

- At the command prompt:
  - Type "javac Demonstrate.java"
  - (this generates a file Demonstrate.class)
  - Type "java Demonstrate"
- What will the output be?
- Data in this program is said to be
  - Wired in or hard coded

Quidditch is a game played in mid-air on broomsticks that is a cross between rugby, basketball and the emergency room. Each team consists of seven players; three Chasers, two Beaters, one Seeker and one Keeper. The Keeper acts as a goalie against the other team making a score in one of their three hoops. The Chasers work together to score, using a ball known as the Quaffle. Scoring with the Quaffle is worth ten points. Two other balls known as Bludgers are enchanted to try and knock the players from their brooms. It is up to the Beaters to keep this from happening. Equipped with bats similar to those used in Cricket, Beaters work furiously to keep their teammates from being injured by Bludgers. Last and never least, the Seekers have the important task of catching the Snitch. This ball is the size of a walnut with wings and flies around the Pitch independently. Capture of the Snitch is worth 150 points, and it automatically ends the game. However, this doesn't mean the team that catches the Snitch automatically wins. The game can also be ended with the mutual consent of both team captains.
Declaring Variables in JAVA

- Identifiers are names of variables
  - E.g. age, claimToFame, many$$$, no_way
- Variables are reserved chunks of memory that contain values.
- Type of variable determines how much memory is allocated to it.

Some Variable Types

- char: 2 bytes: characters
- byte, short, int, long: increasing: integers
- float, double: 4, 8: floating point number
- OTHERS: boolean, String, arrays etc

public class Demonstrate{
    public static void main(String argv[])
    {
        int script, acting, direction;
    }
}

COMMENTING YOUR CODE

- // This is a one-line comment
- /* This comment
   just goes on
   and on and on...
  */
- NOTE: no nesting of comments.
ARITHMETIC EXPRESSIONS

- The usual operators: +, -, *, /
- Modulus: % (remainder in division)
- The usual precedence rules apply
- Mixing data types in expressions
- Casting an expression
  - Original data type remains unchanged
- Assignment operates from R to L

The Math Class

```java
public class Demonstrate {
    public static void main(String[] argv) {
        System.out.println("natural log of 10:");
        System.out.println(Math.log(10));
        System.out.println("abs value of -10:");
        System.out.println(Math.abs(-10));
        System.out.println("max of 2 and 3:");
        System.out.println(Math.max(2,3));
        System.out.println("5th power of 6:");
        System.out.println(Math.pow(6,5));
        System.out.println("sqrt of 7:");
        System.out.println(Math.sqrt(7));
        System.out.println("sine of 8 rad:");
        System.out.println(Math.sin(8));
        System.out.println("Random no.(0,1):");
        System.out.println(Math.random());
    }
}
```

Defining a Simple Method

```java
public class Demonstrate {
    public static void main(String[] argv) {
        int script = 6, acting = 9, direction = 8;
        System.out.print("The rating of the movie is");
        System.out.println(movieRating(script, acting, direction));
    }

    public static int movieRating(int s, int a, int d) {
        return s + a + d;
    }
}
```
Defining Methods in Multiple Files

```java
public class Movie {
    public static int movieRating (int s, int a, int d) {
        return s + a + d;
    }
}
```

```java
public class Demonstrate {
    public static void main(String argv[]) {
        int s = 6, a = 9, d = 8;
        System.out.print("The rating of the movie is");
        System.out.println(Movie.movieRating(s,a,d));
    }
}
```

Other Things to Know

- You can define more than one class in the same file.
- To call a method in a different class, preface the method name with the class name and join with a dot.
- You can define multiple methods with the same name in the same class as long as they have different signatures (i.e. arrangement of parameter data types).