COMS W1114 - Java Lab

Lab 5
Wednesday, February 25, 2004
&
Thursday, February 26, 2004

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Note

- HW2 now due Tuesday, March 2 at 11a
  - Extra credit for submissions at original date of 2/26 @ 5p
- HW1 Theory is graded
- Midterm on March 9 (<2 weeks!)

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What we are covering today

- Review from Lab 4
  - Switch Statements
  - Methods
  - Constructors
- Variable scope
- Basic I/O
- Big Picture so far

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if…else…if

```
if (condition){
    <statement1>
    <statement2>
}
else if (condition){
        <statement3>
        <statement4>
}
else{
    <statement5>
}
```

```
if (args.length==0) {
   System.out.println("no input entered");
}
else if(myArray.length==1){
   System.out.println("one input entered");
}
else {
   System.out.println(">1 input entered");
}
```

switch

```
switch (variable){
   case value1:
        <statement1>
        <statement2>
        break;
   case value2:
        <statement3>
        <statement4>
        break;
   default:
        <statement5>
}
```

```
switch (args.length) {
     case 0:
        System.out.println("no input
        entered");
        break;
     case 1:
        System.out.println("one input
        entered");
        break;
     default:
        System.out.println(">1 input
        entered");
}
```

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Methods

- A method groups together statements in a logical manner
- So far we have seen a single method in any given java program

```
public static void main(String[] args){
      //method body (statements) goes here
}
```

- Components of a method declaration
  - public :: other java classes could hypothetically call this method
  - static ::
  - void :: return type
  - main :: identifier – name of method
  - ( ) :: delimits the input variables
  - String[] args :: the input variable TYPE and NAME (>1 variable are comma separated)
- There can be more than one method in a program. The way to jump from method to method is by **calling** the method
- Components to a method call:
  input values, return value

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Constructors

- Every class has a special method called a constructor.
- Like main, the constructor has a special syntax. No return value etc, only needs an identifier. The identifier *must* match the class name.
- In the main method, we will be calling the constructor for the class. to call the constructor method, we use the keyword 'new' before its identifier
- Difference between a regular method call and a constructor method call
  - *new* keyword
  - **never** a return value

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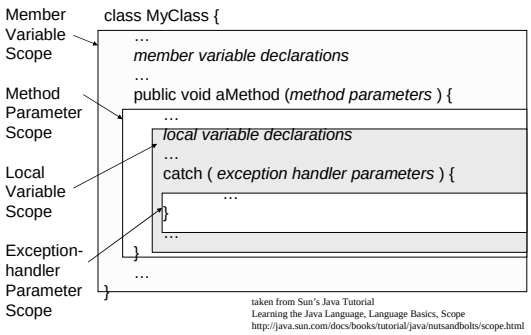
Example of constructors

```
class Example{

  Example(int a, int b){
       if (isValidDiv(a,b)); // this is the method call!
            System.out.print(a+" / "+ b + " is "+divide(a,b));
       else
            System.out.println("you tried to divide by 0");
  }

  public boolean is ValidDiv(int a,int b ){
       if (b==0){
          return false;
       }
       else{
          return true;
       }
   }

  public double divide(int a, int b){
       //we assume isValidDiv was called so we will not divide by zero
       double div=0;
       div = (double) a / (double) b;
       return div;
  }

   public static void main(String[] args){
       System.out.println("program starts here");
       new Example(Integer.valueOf(args[0].intValue(), Integer.valueOf(args[1].intValue());
   }
}
```


Variable Scope



taken from Sun's Java Tutorial
Learning the Java Language, Language Basics, Scope
http://java.sun.com/docs/books/tutorial/java/nutsandbolts/scope.html

Basic I/O = Input/Output

- Interactive Input
  - So far we've seen command line input and output to System.out
  - Not interactive
- Package Access
  - use objects someone else writes
- File I/O
- Basic Exception handling

Interactive Input(1)

- Java uses *streams*
  - simply a sequence of data that comes from a source
    - keyboard data
    - file data
- There are predefined classes to use!
  - InputStreamReader
  - BufferedReader

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Interactive Input(2)

- InputStreamReader
  - (check out the Java API)
- BufferedReader
  - (check out the Java API)
- To use them, we must import them; they are not default features.
  - use the **import** statement
  - **import** belongs at the beginning of your class file
  - import each class
    - import java.io.InputStreamerReader;
    - import java.io BufferedReader;
    - OR
    - import java.io.*;

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Interactive Input(3)

```
import java.io.InputStreamReader;
import java.io.BufferedReader;

public class Lab5Example{


}
```

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Interactive Input(4)

- Create a BufferedReader called *stream*…
  BufferedReader stream = new BufferedReader();
  let's look at the constructor for BufferedReader in the API
- We need to send it an input stream. So, create an InputStreamReader object:
  new InputStreamReader();
- We see from the API it needs an input stream to connect to. Use System.in (look familiar?)
  new InputStreamReader(System.in);
- Put it all together:

```
BufferedReader stream = new BufferedReader(new InputStreamReader(System.in));
```


Interactive Input(5)

```
import java.io.InputStreamReader;
import java.io.BufferedReader;

public class Lab5Example{
       public static void main(String[] args)throws IOException{
                BufferedReader stream = new BufferedReader(new InputStreamReader(System.in));

       }

}
```

note! throws IOException
what?
why?

Interactive Input(6)

- Now we have an object called *stream* to use
- It gives us access to System.in (here, the keyboard)
- So how do we use it?
  - look at the methods a BufferedReader has
    - read() Read a single character.
    - readLine() Read a line of text. After you hit [Enter].
    - others…

Interactive Input(7)

```
import java.io.InputStreamReader;
import java.io.BufferedReader;

public class Lab5Example{
       public static void main(String[] args)throws IOException{
              System.out.print("Please enter your name: ");

              BufferedReader stream = new BufferedReader(new InputStreamReader(System.in));
              String input = stream.readLine();

              System.out.println("Hello "+input);
       }

}
```


Interactive Input(8)

- That's it? Yes.
- How to read non Strings?
  - as we did with command line input via *args*[] but read from *stream* instead:

double d =
Double.parseDouble(**stream**.readLine()).doubleValue();

File I/O

- Input similar. Using different objects:
  - FileReader instead of inputStreamReader
  - new File("filename"); instead of System.in
  - No BufferedReader equivalent needed (for now)

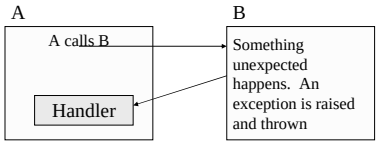
FileReader inFile = new FileReader(new File("inputfile.txt"));
char input = inFile.read();

- Need to explicitly close our Files
  inFile.close();
- We'll cover output in next lab.

Basic Exception Handling(1)

- What happens if 'readLine()' called but you are at end of file (EOF)
  - an **Exception** (EOFException) is *thrown*
- What happens if there is a problem while keyboard input?
  - an **Exception** (IOException) is *thrown*

Basic Exception Handling(2)



What is the Handler?

A "try…catch" block…

```
try {
    <statements>
}
catch ( Exceptiontype e1) {
   statements to react and recover
}
catch ( Exceptiontype e2) {
   statements to react and recover
}
…etc
```


Basic Exception Handling(3)

- As we saw, we need to declare **`throws ExceptionType`** when an object throws an exception
- We need to catch the exception somewhere with the `try…catch` block.

The Java API

- API = Application Programming Interface
  - interface: a contract for objects
- The java API contains information about all of Java's Objects
  - http://java.sun.com/j2se/1.4.2/docs/api/
  - Constructors
  - Methods
  - Fields

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The Big Picture So Far

- We've covered the fundamentals of programming:
  - Datatypes: Primitives, Objects, Arrays
  - Iteration/Looping: While, For, do…while
  - Conditionals: if…else…elseif, switch statement
  - Objects: Constructors, Methods, a Variable's Scope
  - Basic I/O: interactive I/O, file I/O, Basic Exception Handling
- What's next? How to use what we've learned do to something useful
  - Coding practices, Debugging tools, advanced I/O
  - Object Oriented (OO) Design
    - properties, references, abstraction, inheritance
  - GUIs, Event based programming
  - Packaging code, more Java API

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Notes

- We have covered through Chapter 4 in Java Gently. Make sure you are caught up. There are many details to be sure you know.
  - We are not using the book's Display and Stream objects, so do not confuse those with what we did here.
- HW3 is going out. Start early! It is longer than what we've seen so far.
- Midterm on Tuesday, March 9.

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