
Introduction to Java part 2

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Learning Goals

- Understand at a conceptual level
 - How do you print output?
 - How do you represent text?
 - How do you invoke object and class methods?
 - How do you know what methods a class has?

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Printing Output to the Console

- One of the things you often want to do in a program is output the value of something
- In Java the way to print to the console is to use
 - `System.out.println();`
 - Will print out the value of the thing in the parentheses and a new line
 - `System.out.print();`
 - To print just the thing in the parentheses without a new line

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A Semicolon (;) ends a Statement

- Java programs are made up of statements
 - Like sentences in English
- Java statements end in a semicolon not a period
 - The period is used to send a message to an object
 - `System.out.println()`
 - Or access data in the object
 - `System.out.println()`
- DrJava's interaction pane prints the result of statements without a semicolon
 - but not the result of statements with a semicolon
 - Use `System.out.println();` to force output

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Punctuation Exercise

- Fix the following:
 - The course was difficult it required five different texts.
 - that that is is that that is not is not
 - I was so happy, I could have jumped for joy
 - The clouds were slowly gathering, the leaves were shaking as the wind blew stronger.

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Console Output Exercise

- Use **System.out.println()** to print the results of expression to the console
 - `System.out.println(3 * 28);`
 - `System.out.println(14 - 7);`
 - `System.out.println(10 / 2);`
 - `System.out.println(128 + 234);`
 - `System.out.println("Hi" + "There");`
 - `System.out.println("128 + 234");`
- Try using **System.out.print()** instead
 - What is the difference?

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Strings

- Java has a type called: String
- A string is an object that has a sequence of characters in Unicode
 - It can have no characters (the null string "")
 - It can have many characters
 - "This is one long string with spaces in it. "
 - Everything in a string will be printed out as it was entered
 - Even math operations "128 + 234"
- Java knows how to add strings
 - It returns a new string with the characters of the second string after the characters of the first
 - With no added space

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Methods

- Classes in Java define methods
 - Recipes or functions $f(x) = x^2$
 - May take input
 - May produce an output
- Two Types
 - Object method
 - Sent as a message to an object
 - Implicitly passed the current object
 - Class method
 - Sent as a message to a class

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Method Exercise

- In DrJava's interaction pane try these
 - Object methods
 - "HI".toLowerCase()
 - "This is a string".indexOf("is")
 - " This is ".trim()
 - Class methods
 - Math.abs(13)
 - Math.abs(-13)
 - Math.min(3,4)
 - Character.getNumericValue('A')

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Message Always Have Parenthesis

- You can tell that `out.println()` is sending a message
 - Because of the `()`
- Messages always have `()`
 - Even if there are no parameters (arguments)
- If you are sending data along with a message it goes inside the parentheses
 - Separated by commas
 - `Math.min(3,4);`

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Common Errors

- Did you make any mistakes when you typed in the examples?
 - If you use the wrong case it won't work
 - > math.abs(-3)
 - Error: Undefined class 'math'
 - If you misspell something it won't work
 - > Mat.abs(-3)
 - Error: Undefined class 'Mat'
 - > Math.ab(-3)
 - Error: No 'ab' method in 'java.lang.Math'
- Use the up arrow key in DrJava to bring up the previous statement and fix it

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"Hi" is a String Object

- The compiler turns literal strings into string objects
 - Objects of the String class
 - In package java.lang
- Object methods are invoked by sending a message
 - with the same name as the method
 - the same type, number, and order of input parameters
 - to the object

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API Exercise

- The Classes defined as part of the Java language are documented in the API
 - <http://java.sun.com/j2se/1.5.0/docs/api/>
- Find the documentation for the following classes
 - String and Math
 - Find documentation for the methods used in the previous exercise
 - Try out some other methods for these classes

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Java Packages

- Java groups related classes into packages
- Common Packages
 - java.lang
 - Contains basic classes for the language
 - System, Math, Object, ...
 - java.io
 - Contains classes for input and output
 - java.awt
 - Contains basic user interface classes
 - javax.swing
 - Contains more advanced user interface classes

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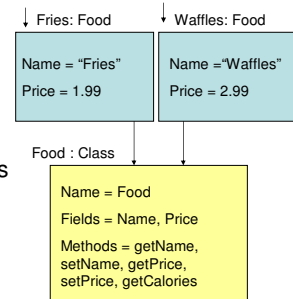
Class Methods versus Object Methods

- In the API documentation how can you tell which are class methods and which are object methods?
 - Look for the keyword **static** on the method
 - If it has the keyword static then it is a **class** method
 - If there is no keyword static then it is an object method

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What do Objects Look Like?

- Objects are created with space for their data
- Objects have a reference to the object that represents the class
 - Object of the class "Class"



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Java is Case Sensitive

- Some programming languages are case sensitive
 - Meaning that **double** isn't the same as **Double**
 - Or **string** isn't the same as **String**
- In Java primitive types are all lowercase
 - double, float, int,
- Class names start with an uppercase letter
 - So String and System are the names of classes

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Java Naming Conventions

- In Java **only** Class names start with an uppercase letter
 - System, BufferedImage, Picture
- All other names start with lowercase letters but uppercase the first letter of each additional word
 - picture, fileName, thisIsALongName

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Identifying Classes Exercise

- Which of these are primitive types, and which are the names of classes?
 - int
 - Picture
 - char
 - Double
 - Math
 - double
 - Integer
 - String

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Summary

- You can print out things using `System.out.println(expression);` or `System.out.print(expression);`
- You represent text using String objects
 - In pairs of double quotes
- String is a class
 - In the package `java.lang`
 - You can look up methods in the API
 - You can invoke methods on a string object
 - `"Hi".toLowerCase();`
- Class methods can be executed using the class name "dot" method name
 - `Math.min(3,4);`
 - A method is a class method if it has keyword "static"

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