

Objectives

- More Java fundamentals
 - `java.lang` classes: `Math` and `String` class
 - Control Structures
 - Arrays

Review: Assign 0

- How did it go?
 - How long did it take?
- Linux:
 - How do you make a directory?
 - How do you view the contents of a directory?
- My conventions

Review

- How do we display output in Java?
- What are some of the primitive data types of Java?
- What is the syntax for declaring a variable in Java?

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Review

- What is the keyword for a constant value?
- What are some examples of Java classes?
- What does **static** mean?
 - How do you call a static method?
- What do the following control structures look like in Java?
 - If, While, For
- What is the syntax for logic operators in Java?
- What is the syntax used so that you can use a class in your program?

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Review: Python Transition **Warning**

You cannot **redeclare** a variable name in the same scope

- OK:

```
int x = 3;
x = -3;
```

- Not OK:

```
int x = 3;
int x = -3;
...
boolean x = true;
```

Compiler errors

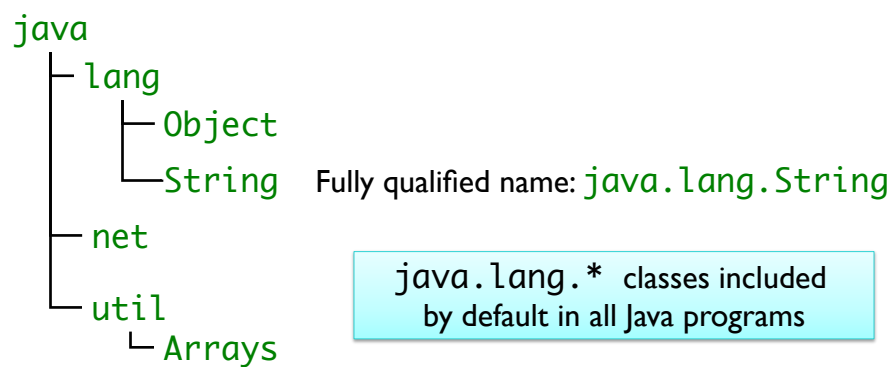
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Java Libraries

- Organized into a hierarchy of **packages**



`java.lang.*` classes included by default in all Java programs

```

javax
org

```

Many, many more classes and packages

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java.lang.Math class

- Example Uses:

```

double y = Math.pow(x, a);
double z = Math.sin(y);
double d = Math.exp(4.59) * Math.PI;
  
```

method

constant

Use `Classname.methodname()` to call
Math's methods because they're **static**
static: for (or of) the class

MathExample.java

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Effective Java: Code Inefficiency

- Avoid creating unnecessary objects:

```
String s = new String("text"); // DON'T DO THIS
```

- Do this instead:

```
String s = "text";
```

Why?

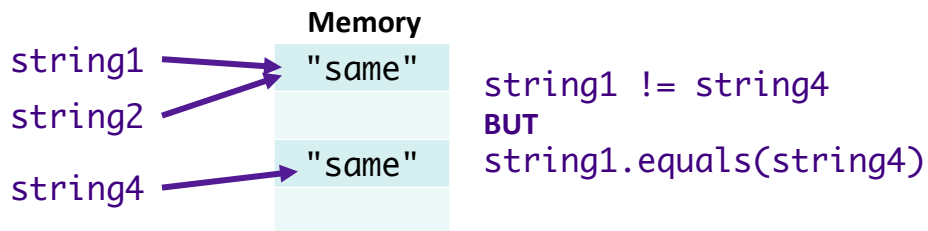
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Python Gotcha: String Comparisons

- `string1 == string4` will **not** yield the same result as `string1.equals(string4)`
 - `==` tests if the *objects* are the same
 - **not** if the *contents* of the objects are the same
 - Similar to `is` operator in Python



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Equals.java

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Apple's goto fail in SSL

```

hashOut.data = hashes + SSL_MD5_DIGEST_LEN;
hashOut.length = SSL_SHA1_DIGEST_LEN;
if ((err = SSLFreeBuffer(&hashCtx)) != 0)
    goto fail;
if ((err = ReadyHash(&SSLHashSHA1, &hashCtx)) != 0)
    goto fail;
if ((err = SSLHashSHA1.update(&hashCtx, &clientRandom)) != 0)
    goto fail;
if ((err = SSLHashSHA1.update(&hashCtx, &serverRandom)) != 0)
    goto fail;
if ((err = SSLHashSHA1.update(&hashCtx, &signedParams)) != 0)
    goto fail;
if ((err = SSLHashSHA1.final(&hashCtx, &hashOut)) != 0)
    goto fail;

```

<https://nakedsecurity.sophos.com/2014/02/24/anatomy-of-a-goto-fail-apples-ssl-bug-explained-plus-an-unofficial-patch/>

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    goto fail;
if ((err = SSLHashSHA1.update(&hashCtx, &signedParams)) != 0)
    goto fail;
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Scoping Issues: Python Gotcha

- Everything between { } is a block of code
 - Has an associated *scope*

```

if (purchaseAmount < availableCredit) {
    availableCredit -= purchaseAmount;
    boolean approved = true;
}
if( ! approved )
    System.out.println("Denied");

```

Out of scope
Will get a compiler error
(cannot find symbol)

How do we fix this code?

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Fixed

- Move **approved** outside of the **if** statement

```
boolean approved = false;
if (purchaseAmount < availableCredit) {
    availableCredit -= purchaseAmount;
    approved = true;
}

if( ! approved )
    System.out.println("Denied");
```

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Control Flow: **switch** statement

- Like a big **if/else if** statement
- Works with variables with datatypes **byte**, **short**, **char**, **int**, and **String**

```
int x = 3;
switch(x) {
    case 1:
        System.out.println("It's a 1.");
        break;
    case 2:
        System.out.println("It's a 2.");
        break;
    default:
        System.out.println("Not a 1 or 2.");
}
```

Control Flow: **switch** statement

```

switch(grade) {
    case 'a':
    case 'A':
        System.out.println("Congrats!");
        break;
    case 'b':
    case 'B':
        System.out.println("Not too shabby!");
        break;
    ... // Handle c, d, and f ...
    default:
        System.out.println("Error: not a grade");
}

```

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Grades.java

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Control Flow: **for** Loop Example

```

System.out.println("Counting down...");

for (int count=5; count >= 1; count--) {
    System.out.println(count);
}
System.out.println("Blastoff!");

```

↑
shortcut

- What is the counter variable?
- What is the condition?
- What is the output?
- How written in Python?

Can't print out count
with Blastoff. Why?

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Review

- How do you create an array?
- How do you determine the size of an array?
- How can you sort an array?

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Arrays

- Assigning one array variable to another → both variables refer to the same array
 - Similar to Python
- Draw picture of below code:

```
int [] fibNums = {1, 1, 2, 3, 5, 8, 13};
int [] otherFibNums;

otherFibNums = fibNums;
otherFibNums[2] = 99;

System.out.println(otherFibNums[2]);
System.out.println(fibNums[2]);
```

fibNums[2] and otherFibNums[2] are both equal to 99

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java.util.Arrays

- **Arrays** is a class in `java.util`
- Methods for sorting, searching, `deepEquals`, fill arrays
- To use class, need **import** statement
 - Goes at top of program, before class definition

```
import java.util.Arrays;
```

`ArraysExample.java`

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Command-Line Arguments

- Similar to Python's `sys` module

```
# Make sure there are sufficient arguments.
if len(sys.argv) < 2:
    print "Error: invalid number of command-line arguments"
    print "Usage: python", sys.argv[0], "<filename>"
    sys.exit(1)
```

Contains the command-line arguments

```
public static void main(String[] args) {
    if( args.length < 1 ) {
        System.out.println("Error: invalid number of arguments");
        System.out.println("Usage: java MyProgram <filename>");
        System.exit(1);
    }
}
```

Example Use:
`java MyProgram filename`

Command-Line Arguments

- In Python, `sys.argv[0]` represented name of program
- **Not same in Java**
 - Command-line arguments do not include the classname

```
# Make sure there are sufficient arguments.
if len(sys.argv) < 2:
    print "Error: invalid number of command-line arguments"
    print "Usage: python", sys.argv[0], "<filename>"
    sys.exit(1)
```



Have to specify program name in Java, e.g.,

```
System.out.println("Usage: java MyProgram <filename>");
```

To Do

- **Assign 1**
 - Part 1: Fixing compiler and logic errors from program
 - Part 2: Writing a program to compute a gymnastics score at the Olympics
 - Part 3: Reverse a string
 - EC opportunity
 - Due Friday before class