CS324e - Elements of Graphics and Visualization

A Little Java

A Little Python

From Python to Java

- Most students have taken CS303e and CS313e which are taught using Python
- CS324E uses Java
- First couple of lectures and first two assignments an intro and review of Java
- First - look at common techniques in Python and Java equivalent
- Second - implement an interesting Java program

Learning Another Language

- "The first programming language to learn is the second hardest programming language to learn.

- The hardest programming language to learn is the ***second*** programming language."

Java

- A general purpose programming language
  - so is Python
- More geared towards object oriented programming
  - encapsulation, inheritance, polymorphism
- strongly typed
- braces used to distinguish blocks of code
- all code is part of some class (programmer defined data type)

Identifiers

- Identifiers composed of letters, digits, _, and $
  - must start with letter or _
  - by convention variable and method (function) names start with lower case and use camel case

    `typicalMethodName`
  - by convention class names start with a capital letter and use camel case

    `ArrayList`
  - constants use all upper case with _ between words

    `DAYS_PER_WEEK`

Basic Program

```
public class Hello {

    /**
     * Where the program starts
     */
    public static void main(String[] args) {
        System.out.println("Hello World!!");
        System.out.println("This is a Java program.");
    }

}
```

- `{}` for code blocks
- `main` is called when program run
- `;` at the end of statements
- `System.out.println` is standard output
  - analogous to print statement in Python
- comments, `/* stuff */` or `// stuff`

Variables

Python

```
i = 10
j = 20
k = i * j + i / j
x = 1.7526
name = "Olivia"
list = [1, 2, 3, 4]
blank = [0] * 10
```

Java

```
int i = 10;
int j = 20;
int k = i * j + i / j;
double x = 1.7526;
String name = "Olivia";
int[] list = [1, 2, 3, 4];
int[] blank = new int[10];
```

Variables

- Data Type of variable must be declared when variable declared
- Type can not be changed
  - sort of
- Can not assign an inappropriate (different data type) value to variable
- Typical: int, double, boolean, String, ArrayList
- Many more we will learn and use

Arrays vs. Lists

- Java has built in arrays, not lists
- Size is fixed and cannot be changed
- indices from 0 to length - 1
- no negative indices or wrap around
- The Java ArrayList and LinkedList classes are more like the Python list data type
  - classes, programmer defined data types
  - call methods on variables of type ArrayList

Example: get sum of squares

```
def main():
    small = input("enter the small number: ")
    large = input("enter the large number: ")
    total = 0
    for num in range(small, large + 1):
        print num
        total += num * num
    print total

main()
```

Example: get sum of squares

```
import java.util.Scanner;

public class SumSquares {

    public static void main(String[] args) {
        Scanner key = new Scanner(System.in);
        System.out.print("enter small number: ");
        int small = key.nextInt();
        System.out.print("enter large number: ");
        int large = key.nextInt();
        int total = 0;
        for(int num = small; num <= large; num++) {
            System.out.println(num);
            total += num * num;
        }
        System.out.println(total);
    }
}
```

Example: Count number of chars

```
def countChars():
    stuff = raw_input("enter a string: ")
    ch1 = raw_input("enter first char to look for: ")
    ch2 = raw_input("enter first char to look for: ")
    total = 0
    numAs = 0
    for ch in stuff:
        if ch == ch1 or ch == ch2:
            total += 1
        elif ch == "A" or ch == "a":
            numAs += 1

    print "num characters in",stuff, "that equal", ch1, "or", \
          ch2, "is", total
    print "num characters equal to A or a", numAs
```

Example: Count number of chars

```
public static void countChars() {
    Scanner sc = new Scanner(System.in);
    System.out.print("enter a string: ");
    String stuff = sc.nextLine();
    System.out.print("enter first char to look for: ");
    char ch1 = sc.nextLine().charAt(0);
    System.out.print("enter second char to look for: ");
    char ch2 = sc.nextLine().charAt(0);
    int total = 0;
    int numAs = 0;
    for(int i = 0; i < stuff.length(); i++) {
        char ch = stuff.charAt(i);
        if(ch == ch1 || ch == ch2)
            total++;
        else if(ch == 'A' || ch == 'a')
            numAs++;
    }
    System.out.println("num characters in " + stuff
            + " that equal " + ch1 +  " or " + ch2
            + " is " + total);
    System.out.println("num characters equal to A or a" + numAs);
}
```

Example: Search list for values

```
def search(data, cutoff):
    result = []
    for x in data:
        if x >= cutoff or x % 100 == 0:
            result.append(x)
    return result
```

Example: Search list for values

```
public static ArrayList<Integer> search(int[] data, int cutoff) {
    ArrayList<Integer> result = new ArrayList<Integer>();
    for(int x : data)
        if(x >= cutoff || x % 100 == 0)
            result.add(x);
    return result;
}

public static ArrayList<Integer> search2(int[] data, int cutoff) {
    ArrayList<Integer> result = new ArrayList<Integer>();
    for(int i = 0; i < data.length; i++)
        if(data[i] >= cutoff || data[i] % 100 == 0)
            result.add(data[i]);
    return result;
}
```