Announcements

- Homework 4 is out, due last day of class: December 4 before class
- Final Review Thursday 12/4
- Final Exam: Tuesday, 12/16, 1:10 pm - 4:00 pm
  Mudd 233 (our normal room)
Review

- Software Engineering:
  - Waterfall method
  - “Extreme Programming”
  - More interaction with customer, fast iterations, refactoring, pair programming
Today

- A look at C++ and Java
C Family

- Since C was so popular, many programming languages were designed based on C
- Two Object-Oriented languages derived from C are C++ and Java
  - C++ in 1979 (C with Classes)/1983 (C++)
  - Java in 1995 (!)
C vs. C++

- C++ is compiled just like C into machine code (GCC includes C++ compilers with -lstdc++)
- New set of standard libraries
- Implements OOP “classes”
- Gives the programmer the choice of old-style, “procedural” programming or Object-Oriented
C vs. Java

- Compiled by javac (Java Compiler) into Virtual Machine Code. Run on Virtual Machine
  - Java Virtual Machine is implemented on various systems to provide portability
  - Strictly implements OOP classes
  - Garbage collection (automates memory management)
Hello World

- #include <stdio.h>   /* Hello World In C */
  int main()
  {
      printf("Hello, World!\n");
  }

- #include <iostream> // Hello World In C++
  int main()
  {
      std::cout << "Hello, World!" << std::endl;
  }

- class HelloWorld { // Hello World In Java
    static public void main(String args[]) {
        System.out.println("Hello, World!");
    }
}
hello.cpp

- `#include <iostream> // Hello World In C++`
- `int main()`
  - `{`  
    - `std::cout << "Hello, World!" << std::endl;`
  - `}`

- **iostream** is C++’s stdio.h
- `std::cout` is like `fprintf(stdout, "...",...)`
- `std::endl` is like `\n`
HelloWorld.java

- class HelloWorld { // Hello World In Java
  static public void main(String args[]) {
    System.out.println("Hello, World!");
  }

- static: **main** function belongs class HelloWorld
- public: it is accessible to other classes
- System.out.println is like printf("...
\n");
- String args[] is an array of strings (like *argv[])

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More examples: C

```c
#include <stdio.h>
int main()
{
    float velocity = 11.2;

    printf("Earth’s escape velocity is %f kph\n", velocity);

    return 0;
}

/* Example from Java Essentials for C and C++ Programmers by Barry Boone */
```
More examples: C++

```cpp
#include <iostream>

int main()
{
    float velocity = 11.2;

    std::cout << "Earth’s escape velocity is "
               << velocity
               << " kph" << std::endl;

    return 0;
}

// Example from Java Essentials for C and C++
// Programmers by Barry Boone
```
class Escape {
    public static void main (String args[]) {

        float velocity = 11.2;

        System.out.println("Earth’s escape velocity is "
                           + velocity
                           + " kph");
    }
}

// Example from Java Essentials for C and C++
// Programmers by Barry Boone
Classes and Methods

- The Java function, System.out.println() looks like we call a function that is a field in a struct.

- Recall the OOP definition of a class: a collection of variable fields and functions

- These functions are aka “methods”

- println() is a method of the object System.out
Overloading

- C++, Java can **overload** functions & operators
  - C is limited: one function per function name
    ```
    int square(int x);
    ```
  - e.g. multiple “square” functions that return and take different types (float, int, etc)
  - e.g. the ‘+’ operator for strings automatically converts floats, ints, etc in Java
CS Department Course Offerings

- COMS 1007 - Taught in Java. More focused on OOP, and introduces graphics, networking

- COMS 3101 - Various 1-credit courses (should be light workload or only part of the semester) to learn a new language.