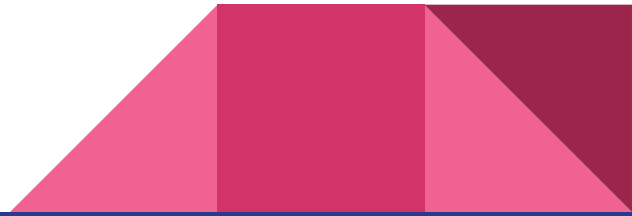
Griffin’s OH 1/28/22

COMSW 1004 - Introduction to Computer Science and Programming in Java

Objectives for the Day

- Introduction
- Logistics
- Review: What is Computer Science and What is an Algorithm
- Review: Pseudocode, Linear Search, Binary Search
- Review: Introduction to Algorithm Analysis
- New: Basic Programming in Java (Hello World!)
- New: Debugging your Code 1: Learn to read the compiler
- Questions on PSET 1 (Due Monday Jan 31st)



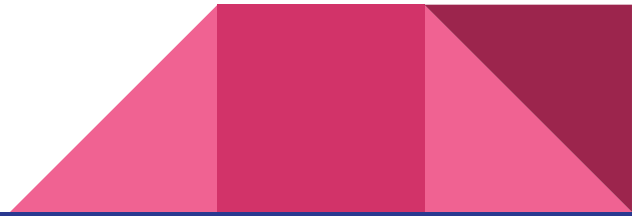
Introduction

My name is Griffin, I am a first-year student at Columbia studying Computer Science in SEAS.

I have been programming in Java for a little over 3 years, I have been programming in general for around 4 years

In my Junior year of High School I took Oracle's Certification exam for Java and passed.

Currently I am enrolled in COMSW 3134 Data Structures and Algorithms



Logistics

My office hours will be structured as follows:

First 40 Minutes will be Review of Material Covered previously in lecture

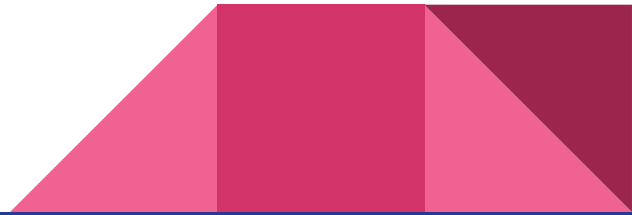
Second 40 Minutes will be introducing new concepts that you will see in lecture soon (or saw in the last 2 lectures as I make these a week in advance)

Last 40 Minutes will be answering questions in regards to the PSET for the week and material

Review: What is Computer Science and What is an Algorithm

Computer Science is the study of algorithms which include, their formal and mathematical properties, hardware and linguistic realizations, and their applications

Algorithms are well-ordered collections of unambiguous and effectively computable operations that when executed produces a result and halts in a finite amount of time.



Review: Pseudocode, Linear Search, Binary Search

Pseudocode is a way to write code in an english like format that is easy to understand, used mainly to write out algorithms before you write them in another language

Linear Search an algorithm that searches for a particular element's index in a collection of items by starting from the beginning and going to the end. Average Run time O(N)

Binary Search an algorithm that searches for a particular element's index in a collection of items by starting in the middle and cutting the list in half each iteration. Average Runtime O(logN)

Review: Introduction to Algorithm Analysis

An important concept in Computer Science is the runtime complexity of algorithms. We want to have the fastest algorithm possible for whatever problem we are trying to solve. When we analyze different components of code we can denote their runtime complexity by using something called Big-O notation. Take the following example:

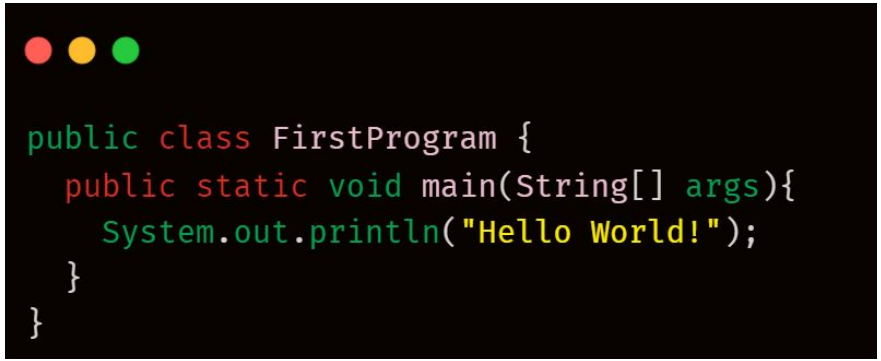
```
public class BigONotationTest {

  public static void main(String[] args){
    for(int i = 0; i < args.length; i++){
      System.out.println(args[i]);
    }
  }
}
```

This algorithm has to perform args.length operations which we express as *n* so the runtime would be O(n)

Basic Programming in Java | Program Structure

Hopefully by now, you know how to write a basic Java program, here is the classic Hello World program and we'll use it to break down the structure of a Java program:



```
public class FirstProgram {
  public static void main(String[] args){
    System.out.println("Hello World!");
  }
}
```

1. Class Definition: All programs you will write in Java are enclosed within classes if you are starting from scratch one of the first lines you write is the class definition, the class name and the filename must match
2. Main Method: In order to run a program, you'll need to define a main method just as I have

Basic Programming in Java | Variables and Types

```java
public class FirstProgram {

  public static void main(String[] args){
    int myFirstInt = 5;
    double myFirstDouble = 5.0;
    String myFirstString = "hello world!";
    System.out.println(myFirstString);
  }

}
```

Variables allow you to store data, Java is strongly typed, meaning you have to specify the datatype upon declaration.

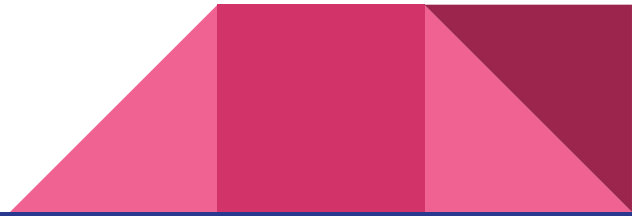
The three most common types of variables you will use over the semester are “int”, “double”, and “String”

int - stores 32 bit integer values
double - stores 64 bit floating values
String - stores sequences of characters

Basic Programming in Java | Variables and Types

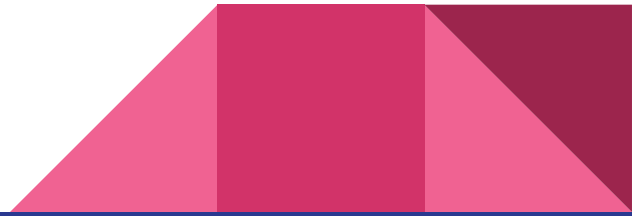
There are multiple different data types in Java, some are more useful than others but they all have a purpose here are the data types in Java:

1. byte
2. short
3. int
4. long
5. float
6. double
7. char



Debugging your Code 1: Learn to read the compiler

When you are starting to learn a new language, you'll often spend more time trying to figure out what is wrong with your program rather than implementing the actual logic, so it is important to learn how to debug your program and ensure you get a program that not only compiles but meets the specifications of the assignment at hand. Let us examine this piece of code and see what the compiler would say and how to fix it.



```
public class CompilerErrorTester {


  public static void main(String[] args){

    int amountOfChairs = 5;
    System.out.println(amountOfChair);

  }

}
```

Here is the code snippet:

Notice that the variable names are different, the variable was assigned the name “amountOfChairs” and the variable name I try to use is “amountOfChair” this is obviously and issue, and the Java Compiler will indeed catch this issue for us, on the following slide I will show the compiler

```
 *
Last login: Tue Jul 21 14:33:35 2020 from 192.168.10.226
codio@annual-textile:~/workspace$ javac CompilerErrorTester.java && java CompilerErrorTester
CompilerErrorTester.java:5: error: cannot find symbol
    System.out.println(amountOfChair);
                       ^
  symbol:   variable amountOfChair
  location: class CompilerErrorTester
1 error
codio@annual-textile:~/workspace$
```

Here is the feedback that the compiler gives you upon trying to compile the program, notice that it gives you a distinct error: “cannot find symbol” it also gives you the line number on which the error has occurred and the distinct symbol that couldn’t be found. All of these are pieces of information that you can utilize in tracking down the bugs in your program.