CS 152
Computer Programming
Fundamentals
Variables and Types

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Hello, World!

```
/** A program to greet the world on standard output. */
public class HelloWorld {
  public static void main(String[] args) {
    System.out.println("Hello, World!");
  }
}
```

It is traditional to start with a hello world program when learning a new programming language.

Structure of a Java Program

- Class name matches file name.[1]
- Class name should start with capital letter.[2]
- Program starts in `main` method.
- Sequence of statements in main define what the program actually does.
- Class can contain other methods and variable declarations, but don't worry about that for now.

[1] Won't compile otherwise.

[2] Coding standards

Compiling and Running

When you press the run button in IntelliJ, several things happen behind the scenes.[3]

1. Your source code is saved in a `.java` file.
2. Java *compiler* converts source into *bytecode*, saved in `.class` file.
3. The Java Virtual Machine (JVM) translates bytecode into instructions for your actual computer hardware.

[3] You'll do these steps yourself in CS251.

Java Comments

Comments are notes to yourself or to another human that should be ignored by the compiler. Java has three different types of comments:

- **One liner** - `// Here's my one line comment`
  Used to make notes and explain local variables
- **Multi liner** - `/* Several lines of comments */`
  When using more than one line, this is often done
- **Javadoc** - `/** Javadoc formatted comment here */`
  Used for API documentation.

Program statements

A program statement is usually a line of code that may be (or not) followed by a delimiter of some sort, that indicates one step in program execution.

Several statements make a program.

Java Statements

- Most Java statements are followed by a semicolon – ';'
- Example 1: `int x = 5;`
- Example 2: `System.out.println("Hello!");`
- Some statements (like if statements and loops), are not followed with a semicolon

Program blocks

A program block is a number of statements that have somehow been grouped together, this might be in a method, in a loop, or by themselves.

Java blocks are surrounded by curly braces { }, or in case where there's just one line in a block, the braces can be left out. (Be careful with that!)[4]

[4] Coding standards say no.

Variables

- Are used to hold pieces of information
- Refers to a location in memory
- Should have descriptive names
- Can have different *data types*

Java Variables

Java is what's called a *strictly typed* language. It's like math where you have to have all units match up in a calculation. Java types have to match up as well.

- All java variables have a specific type
- Converting between the types can be done with type casting (if allowed)
- Can have arbitrarily long variable names (use with caution)
- Must be declared before usage
- Start variable names with a lowercase letter.[5]

[5] Coding standards

Java Primitive Data Types

- **boolean** - Truth values, i.e., `true` or `false` - 1 bit
- **char** - Unicode Characters (2 bytes)
- **byte** - One byte
- **short** - Short integer (2 bytes)
- **int** - Regular integer (4 bytes)

$$(-2^{31} \Longrightarrow (2^{31} - 1))$$

- **long** - Large integer (8 bytes)
- **float** - Floating point (4 bytes)
- **double** - Floating point (8 bytes)

$$(2^{-1074} \Longrightarrow (2 - 2^{-52}) \cdot 2^{1023})$$

Declaring Java Variables

On the general form it's:

`<data type> <name>;`

Some examples:

```
int x = 10;
double pi = 3.14159265;
char c;
```