Intro to Java/Review

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How Java differs from Python

- You cannot simply “run” the code
- Java is compiled and not interpreted like Python
- This means that if Java is not perfectly set up it will not compile and it needs a lot more to be setup than python does

Hello World in Python

```
print(“Hello World!”)
```

Hello World in Java (in a file called Main.java)

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

public class Main {

This is the first line of our file.

For the time being it will always start with public class “name of file” {

The name of file must match the file name. For example, if your file is called Potato.java then the first line would be

public class Potato {

public static void main(String[] args) {

- This is called the main method. Whatever is in here it what will run when you hit run
- Its syntax is ALWAYS the same
- IntelliJ will create this for you, but you should know how to write it on your own.
- The use of the worlds, public, static and void will be addressed later

System.out.println("Hello world!");

- This is the equivalent of of print(“Hello world”) in python as long as the class is defined and the main method exists.
- Must end in a ; (all lines of code in java that are not ending in {, [, (must end in a ;)

Hello World in Java (in a file called Main.java)

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

Day 2 - intro to java

If long is “better” than int…

Why would we ever use int anymore?

Data Types in Java - slightly more complex than Python

Data Type	Size	Description
byte	1 byte	Stores whole numbers from -128 to 127
short	2 bytes	Stores whole numbers from -32,768 to 32,767
int	4 bytes	Stores whole numbers from -2,147,483,648 to 2,147,483,647
long	8 bytes	Stores whole numbers from -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
float	4 bytes	Stores fractional numbers. Sufficient for storing 6 to 7 decimal digits
double	8 bytes	Stores fractional numbers. Sufficient for storing 15 decimal digits
boolean	1 bit	Stores true or false values
char	2 bytes	Stores a single character/letter or ASCII values

What does that mean?

A bit is super simple… it is either 0 or 1 (you can think of it a part of a computer 0 means electricity is not currently flowing through it, 1 electricity is flowing)

A byte is 8 consecutive bits. And gives us 2^8 = 256 possible states

Data Types in Java - The ones we will actually use

Data Type	Size	Description
int	4 bytes	Stores whole numbers from -2,147,483,648 to 2,147,483,647
long	8 bytes	Stores whole numbers from -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
double	8 bytes	Stores fractional numbers. Sufficient for storing 15 decimal digits
boolean	1 bit	Stores true or false values
char	2 bytes	Stores a single character/letter or ASCII values

Java is a Typed language

- Each variable needs its type declared when creating the variable
- The variable can only store that data type

In python we can do

x = 3

x = ”Hello”

In Java

```
public class Main {
    public static void main(String[] args) {
        int x = 3; // x will always be an int. It cannot be anything else
        System.out.println(x);
    }
}
```

In Java

```
public class Main {
    public static void main(String[] args) {
        int x = 3;
        x = 4.4;   // This will cause an error
        x = 3     // will also cause an error because of the lack of ;
        System.out.println(x);
    }
}
```

If statements

- In python we had if, elif, else
- In java it is if, else if and else

From python

```
x = 5

if x < 10:

    print(“This is less than 10”)
```

to Java

```
public class Main {
    public static void main(String[] args) {
        int x = 4;
        if (x < 10) {
            System.out.println("This is less than 10");
        }
    }
}
```

From python

```
x = 5

if x < 10:

        print(“This is less than 10”)

elif x < 20:

        print(“x is …”)

else:

        print(“x is …”)
```

to Java

```
public class Main {
    public static void main(String[] args) {
        int x = 4;
        if (x < 10) {
            System.out.println("This is less than 10");
        } else if (x < 20) {
            System.out.println("x is …");
        } else {
            System.out.println("x is …");
        }
    }
}
```

Do not use Scanners!!!!

- Like input() from python
- Scanners are banned from this class. If you need to use a number code it in a variable. For example:

```
public class Main {
    public static void main(String[] args) {
        Scanner myObj = new Scanner(System.in);
        System.out.println("What is your number?");
        int x = myObj.nextInt();
        System.out.println("You number + 12 is :" + (x + 12));
    }
}
```

Do not use Scanners!!!!

- Becomes:
- If you want to change the value that is being run, change x and recompile/run the program.

```
public class Main {
    public static void main(String[] args) {
        int x = 25;
        System.out.println("You number + 12 is :" + (x + 12));
    }
}
```

Loops in Java

For

While

Do while (we wont be using this one)

For loop Structure

```
for(initial value; condition; increment) {
        // body of code
}
```

while loop

```
Initial value;
while(condition) {
        // body of code
        increment;
}
```

For loop Structure

```
for(int i = 0; i < 10; i++) {
        System.out. println(“i = “ + i);
}
```

while loop

```
int i = 0;
while(i < 10) {
        System.out. println(“i = “ + i);
        i++;
}
```

Practice

Write a java program that has a defined variable x. All of this should be in your main. We will discuss methods after

The program should print “x is greater than 10” or “x is less than 10 “ or “x is equal to 10”

Then it should print “x is a multiple of 3” if it is

Then it should print “x is a prime number” if it is

Day 3 - Java Review

2 More data types

Strings

- Consecutive sequence of chars
- It is an object in Java
- == does not work, we must use .equals()
- Behaves like a list in python but [index] does not work
- .charAt(index) will give us a the equivalent of [index] from python

Strings

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

Arrays (list from python but more useless)

- Every item must be the same data type
- Declared using type[]
- IMMUTABLE
- Can be accessed like python lst[index]
- Declare with {} or as object
- int[] myIntArray = new int[3]; // each element of the array is initialised to 0

Arrays (list from python but more useless)

```
public static void main(String[] args) {
        int[] listOfNumbers = {1,2,3,4};
        for(int i = 0; i < listOfNumbers.length; i++) {
            System.out.println(listOfNumbers[i]);
        }
    }
```

Given our limited understanding of memory

Why do indices start at 0?

HashMaps

- Java’s version of the python dictionary
- Will not be covered in this class

When you get stuck and resort to google

https://stackoverflow.com/questions/1200621/how-do-i-declare-and-initialize-an-array-in-java

Short form ways exist

- Java has new improved adaptations
  - For example java has an equivalent to “for item in lst:”
  - It also has something for “range(0, 100)”
  - You are welcome to use those on assignments but not tests
  - If your sibling in year 2 of their software eng/comp sci program says our code is old Java or inefficient… they aren't wrong but tell them your teacher knows this and wants you to do it the “old” way
  - Why am I doing this?

Functions in Java

- In python we had functions. In Java the equivalent is called a Method
- Methods are slightly more complex as Java is a type language
- In python if we had def myFunction(x): then x could be any value and any data type
- The return could also be any data type.
- Methods go outside and before the main method

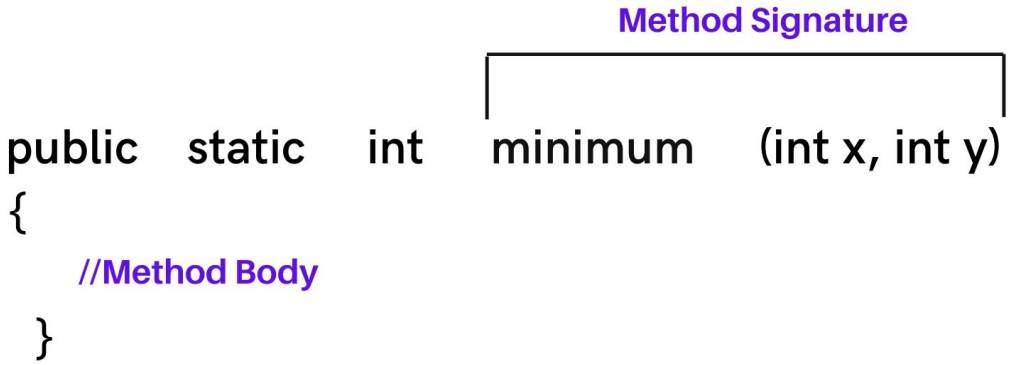
Method in Java

```
public static int addTen(int x) {
        x = x + 10;
        return x;
    }
```

Simple Java method that takes in an integer and returns and integer

Method signature

Is in the first line of the method. Consists of the method name and the parameter types + names



Other words on the first line.

Key modifiers that we will discuss more later in the course. For now all our methods will start with

public static <return type> signature

First line for the calculateShipping function

```
public static double calculateShipping(int weight) {
```

First line for the tax function

```
public static double calculateTax(int income) {
```

First line for the palindrome function

```
public static boolean isPalindrome(String word) {
```

First line for the evenOddDiff function

```
public static int evenOddDiff(int[] numbers) {
```

Method comments

EVERY method created needs a comment

The structure is the following

```
// methodName(type1, type2, ...) -> return type

// purpose: <Some english sentences that ties in the name of the parameters to the
//                expected output>
```

File Header comment

```
/**
* Author: <Your name> , <student number>
* Last Date of Edit: <Some date>
*/
```

Using libraries

- Just like in python we have libraries in Java
- Code written for us that we can import
- Syntax is also `import  library`
- Names look a little different

Here is the math library

```
import java.lang.Math;
```

Using libraries

Once imported, all methods can be accessed by doing

Math.<name of function>

https://docs.oracle.com/javase/8/docs/api/java/lang/Math.html

Re-do assignment 0

- In Java
- Each solution should be a method
- Methods should not print anything to screen. If you want to print, save the returned value and print that
- Each method should have comments (we will use the same structure as last year)
- Your main method should call each of the methods you created to demonstrate their use
- We will go over each solution together after