

Java

Introduction

Tobias Hanf, Manik Khurana

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Java-Course

1. Proceeding

2. Your first program

Hello World!

Setting up VSCode

3. Basics

Some definitions

Calculating

Text with Strings

Proceeding

About this course

Requirements

- You know how to use a computer
- Please bring your computer with You

Proceeding

- There will be around 14 lessons
- Each covers a topic and comes with excercises

Question

What is your programming knowledge?

- None
- Tried it once or twice
- Basic knowledge
- Advanced
- 1337 h4x0rz

Some resources

- You can ask your tutor
- Book: Head first Java
<https://katalog.slub-dresden.de/id/0-1680506722>
- StackOverflow, FAQs, Online-tutorials, ...
- Official documentation
<https://docs.oracle.com/javase/8/>
- Material-Repository
<https://github.com/t-hanf/java-lessons>

- Write an email to
tobias.hanf@mailbox.tu-dresden.de
manik.khurana@mailbox.tu-dresden.de
- Use the "Contact Teacher" button
- Write an email to the programming mailing list (all tutors)
programmierung@ifsr.de
- Other options, maybe Discord, Matrix, Messenger??

Pros:

- Syntax like C++
- Strongly encourages OOP
- Platform-independent (JVM)
- Very few external libraries
 - > Easy to use and very little to worry about

Cons:

- A lot of unnecessary features in the JDK
- Slower than assembly
- No multi-inheritance
- Weak generics
- Mediocre support for other programming paradigms
 - > Neither fast, small nor geeky

Your first program

Hello World

DEMO

Creating your Working Environment

Open the Terminal

```
1  mkdir myProgram
2  cd myProgram
3  touch Hello.java
4  vim Hello.java
```

Hello World!

This is an empty JavaClass. Java Classes always start with a capital letter

```
1  public class Hello {  
2  
3  }  
4
```

Hello World!

This is a small program printing *Hello World!* to the console:

```
1 public class Hello {  
2     public static void main(String[] args) {  
3         System.out.println("Hello World!");  
4     }  
5 }  
6
```

How to run your program

save your program by pressing 'esc', then ':w' exit vim by typing ':q' (and hit return) then:

```
1   javac Hello.java
2   java Hello
3
```

Hello World in an IDE

DEMO

Setting up a code editor

Visual Studio Code is a extensible code editor

- You can download VSCode at
<https://code.visualstudio.com/>
- Install the Java extension
"Language Support for Java(TM) by Red Hat"

Or download Eclipse

- <https://www.eclipse.org/downloads/>

Basics

What is programming ?

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- telling a computer what to do
- different instructions
- store a data (memory)
- do something with this data (compute)
- list instruction in order

Code concepts

```
1      public class Hello {  
2          // Calculates some stuff and outputs everything on  
the console  
3          public static void main(String[] args) {  
4              System.out.println(9 * 23);  
5          }  
6      }  
7  
```


Code concepts

```
1      public class Hello {  
2          // Calculates some stuff and outputs everything on  
the console  
3          public static void main(String[] args) {  
4              int x;  
5              x = 9;  
6              int y = 23;  
7              int z;  
8              z = x * y;  
9  
10             System.out.println(z);  
11         }  
12     }  
13
```

Comments

```
1 public class Hello {  
2     // prints a "Hello World!" on your console  
3     public static void main(String[] args) {  
4         System.out.println("Hello World!");  
5     }  
6 }  
7
```

You should always comment your code.
Code is read more often than it is written.

- // single line comment
- /* comment spanning multiple lines */

About the Semicolon

```
1 public class Hello {  
2     // prints a "Hello World!" on your console  
3     public static void main(String[] args) {  
4         System.out.println("Hello World!") ;  
5     }  
6 }  
7
```

Semicolons conclude all statements.

Blocks do not need a semicolon.

Blocks

```
1 public class Hello {  
2     // prints a "Hello World!" on your console  
3     public static void main(String[] args) {  
4         System.out.println("Hello World!");  
5     }  
6 }  
7
```

Everything between { and } is a *block*.

Blocks may be nested.

Naming of Variables

- The names of variables can begin with any letter or underscore. Usually the name starts with small letter.
- Compound names should use CamelCase.
- Use meaningful names.

```
1 public class Calc {  
2     public static void main(String[] args) {  
3         int a = 0; // not very meaningful  
4         float myFloat = 5.3f; // also not meaningfull  
5         int count = 7; // quite a good name  
6  
7         int rotationCount = 7; // there you go  
8     }  
9 }  
10
```

Primitive data types

Java supports some primitive data types:

`boolean` a truth value (either **true** or **false**)

`int` a 32 bit integer

`long` a 64 bit integer

`float` a 32 bit floating point number

`double` a 64 bit floating point number

`char` an unicode character

`void` the empty type (needed in later topics)

Calculating with *int* i

```
1  public class Calc {  
2      public static void main(String[] args) {  
3          int a;  
4          a = 7;  
5          System.out.println(a);  
6          a = 8;  
7          System.out.println(a);  
8          a = a + 2;  
9          System.out.println(a);  
10     }  
11 }  
12
```

Calculating with *int* ii

```
1  public class Calc {  
2      public static void main(String[] args) {  
3          int a; // declare variable a  
4          a = 7; // assign 7 to variable a  
5          System.out.println(a); // prints: 7  
6          a = 8;  
7          System.out.println(a); // prints: 8  
8          a = a + 2;  
9          System.out.println(a); // prints: 10  
10     }  
11 }
```

After the first assignment the variable is initialized.

Calculating with *int* iii

```
1  public class Calc {  
2      public static void main(String[] args) {  
3          int a = -9;  
4          int b;  
5          b = a;  
6          System.out.println(a);  
7          System.out.println(b);  
8          a++;  
9          System.out.println(a);  
10     }  
11 }
```

Calculating with *int* iv

```
1 public class Calc {  
2     public static void main(String[] args) {  
3         int a = -9; // declaration and assignment of a  
4         int b; // declaration of b  
5         b = a; // assignment of b  
6         System.out.println(a); // prints: -9  
7         System.out.println(b); // prints: -9  
8         a++; // increments a  
9         System.out.println(a); // prints: -8  
10    }  
11 }  
12
```

Some basic mathematical operations:

Addition	<code>a + b;</code>
Subtraction	<code>a - b;</code>
Multiplication	<code>a * b;</code>
Division	<code>a / b;</code>
Modulo	<code>a % b;</code>
Increment	<code>a++;</code>
Decrement	<code>a--;</code>

Calculating with *float* i

```
1 public class Calc {  
2     public static void main(String[] args) {  
3         float a = 9;  
4         float b = 7.5f;  
5         System.out.println(a); // prints: 9.0  
6         System.out.println(b); // prints: 7.5  
7         System.out.println(a + b); // prints: 16.5  
8     }  
9 }  
10
```

Calculating with *float* ii

```
1 public class Calc {  
2     public static void main(String[] args) {  
3         float a = 0.1f;  
4         float b = 0.2f;  
5  
6         System.out.println(((a + b) == 0.3));  
7     }  
8 }
```

Calculating with *float* iii

```
1 public class Calc {  
2     public static void main(String[] args) {  
3         float a = 0.1f;  
4         float b = 0.2f;  
5  
6         System.out.println(((a + b) == 0.3)); // false  
7         System.out.println((a + b));  
8     }  
9 }  
10
```

Float has a limited precision.

This might lead to unexpected results!

Mixing *int* and *float*

```
1 public class Calc {  
2     public static void main(String[] args) {  
3         float a = 9.3f;  
4         int b = 3;  
5         System.out.println(a + b); // prints: 12.3  
6         float c = a + b;  
7         System.out.println(c); // prints: 12.3  
8     }  
9 }  
10
```

Java converts from **int** to **float** by default, if necessary.
But not vice versa.

Strings

A String is not a primitive data type but an object.
We discuss objects in detail in the next section.

```
1 public class Calc {  
2     public static void main(String[] args) {  
3         String hello = "Hello World!";  
4         System.out.println(hello); // print: Hello World!  
5     }  
6 }  
7
```


Concatenation

```
1 public class Calc {  
2     public static void main(String[] args) {  
3         String hello = "Hello";  
4         String world = " World!";  
5         String sentence = hello + world;  
6         System.out.println(sentence);  
7         System.out.println(hello + " World!");  
8     }  
9 }  
10
```

You can concatenate Strings using the +. Both printed lines look the same.

Strings and Numbers

```
1  public class Calc {  
2      public static void main(String[] args) {  
3          int factorA = 3;  
4          int factorB = 7;  
5          int product = factorA * factorB;  
6          String answer =  
7              factorA + " * " + factorB + " = " + product;  
8          System.out.println(answer); // prints: 3 * 7 = 21  
9      }  
10 }  
11
```

Upon concatenation, primitive types will be replaced by their current value as *String*.