

Java

Tooling, variables and basic control flow

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Overview

1. Recap
2. Tooling
3. Warm Up
4. Deep dive into variables
5. Boolean
... and the basics of control flow
6. Loops

Recap

Recap 2/3

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

Recap 3/3

```
1 import java.util.Scanner;
2 public class Talk {
3     public static void main (String[] args) {
4         Scanner scanner = new Scanner(System.in);
5         System.out.println("Hi, how old are you?");
6         int age = scanner.nextInt();
7         int age2 = age + 5;
8         System.out.println("In 5 years, you'll be " + age2);
9     }
10 }
```

Tooling

What we need...

What tools do we actually need to develop JAVA?

- texteditor (Notepad)
- compiler (javac)
- Java Virtual Machine (java)

What we want...

For easy programming we want to have

- supporting (intelligent) editor with
 - direct control of a compiler
 - auto start of the application after compilation
 - debugger (later)

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- Visualstudio Code

<https://code.visualstudio.com/>



What is Visual Studio Code (VS Code)

- fundamentally its just an editor
- but it can be extended with add-ons
- add-ons allow for example
 - syntax highlighting
 - code completion
 - debugging features

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Let's take a look at VS Code...

Warm Up

Warm Up Task

Task

- Open visual studio code and create a new file *calculator.java*
- write a class *Calculator* with the basic framework of a java application (see slide 3)
- read in two numbers and add them

Play around with mathematical operations

- + addition
- subtraction
- * multiplication
- / devision

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Did you encounter any problems?

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Did you encounter any problems?

What happens when you devide 5 by 2?

Deep dive into variables

Deep Dive: Variables

Java knows many different **types** of variables.

You should know the following variable types:

Name	Example	Definition
int	<code>int i = 3261;</code>	Whole numbers (-2,147,483,648 to 2,147,483,647)
float	<code>float f = 0.420f</code>	Floating point numbers up to 7 decimal digits
boolean	<code>boolean b = false;</code>	Binary state - True or False
char	<code>char c = 'a';</code>	Single character or ASCII code

Deep Dive: Variables

Java knows many different **types** of variables.

Good to know but not really important

Name	Example	Definition
byte	byte b = 11;	Whole numbers (-128 to 127)
long	long l = 31L;	Whole numbers (very big)
double	double d = 43.23d;	Like float - just twice as precise
short	short s = 423;	Whole numbers (-32,768 to 32,767)

Basic mathematical operations

You can use these basic operations when working with *int*, *float* (, *long*, *double*, *short*)

Addition	$a + b$;
Subtraction	$a - b$;
Multiplication	$a * b$;
Division	a / b ;
Modulo	$a \% b$;
Increment	$a++$;
Decrement	$a--$;

Try it yourself

```
1 int a = 9*4; // = 36
2 int a = 9+4; // = ??
3 int a = 9%4; // = ??
4 int a = 9/4; // = ??
```

```
1 float a = 9*4; // = ??
2 float a = 9+4; // = ??
3 float a = 9%4; // = ??
4 float a = 9/4; // = ??
```

```
1 int i = 3000 * 2; // = ??
2 short s = 3000 * 2; // = ??
```

Task

Play around with different variable types.
What are the boundaries of the types?

Try it yourself

```
1 int a = 9*4; // = 36
2 int a = 9+4; // = ??
3 int a = 9%4; // = ??
4 int a = 9/4; // = ??
```

```
1 float a = 9*4; // = ??
2 float a = 9+4; // = ??
3 float a = 9%4; // = ??
4 float a = 9/4; // = ??
```

```
1 int i = 3000 * 2; // = ??
2 short s = 3000 * 2; // = ??
```

Variable types have different sizes!

```
1 incompatible types: possible lossy conversion from int to
   short
```

Boolean

... and the basics of control flow

Boolean and boolean algebra

```
1 boolean b = true || false;
```

- With booleans, we can make logical decisions and control how our code “flows”.
- Without booleans, code would be boring and always do the exact same thing.

Boolean and boolean algebra

```
1 boolean b = true || false;
```

A boolean can only be *true* or *false*

```
1 boolean a = false;  
2 boolean b = true;
```


Booleans

- What do we need booleans for?
 - to control how our program flows
 - to make decisions
- **conditions** are booleans

Conditions and if-statements

- What do we use conditions and **if-statements** for?
 - to execute different code depending on the value of the condition

```
1 if(condition) {  
2     // do something cool!  
3 }
```

Conditions and if-statements

- What do we use conditions and **if-statements** for?
 - to execute different code depending on the value of the condition

```
1 if(condition) {  
2     // do something cool!  
3 }
```

- conditions need to evaluate to *true* so the code inside ... is executed

```
1 if(true) {  
2     // ...the code...  
3 }
```

Conditions and if-statements

Conditions can be *boolean* variables

```
1 boolean myBoolean = true;  
2 if(myBoolean) {  
3     // do something cool!  
4 }
```

Or comparisons

```
1 int i;  
2 ...  
3 if(i > 10) {  
4     // do something cool!  
5 }
```

Conditions and comparisons

We can compare variables to each other using comparison operators

- the result is a *boolean*

```
1 1 < 3      // ??  
2 3 > 2      // ??  
3 3 <= 3     // ??  
4 1 >= 1     // ??  
5 1 == 1     // ??
```

Conditions and comparisons

We can compare variables to each other using comparison operators

- the result is a *boolean*

```
1 1 < 3      // ??
2 3 > 2      // ??
3 3 <= 3     // ??
4 1 >= 1     // ??
5 1 == 1     // ??
```

We also can use comparisons as conditions

```
1 int a = 3;
2 int b = 11;
3 if(a < b) {
4     System.out.println("a is smaller than b!");
5     System.out.println("Condition is true!");
6 }
```

Conditions and comparisons

We can also define **else** cases

```
1 int age = 12;
2 int minAge = 18;
3 if(age >= minAge) {
4     System.out.println("Come on in!");
5 } else {
6     System.out.println("You're too young.");
7 }
```

What does this program do?

Try it yourself

Task 1 [easy]

Write a program that prints a text out when a condition is *true*

Task 2 [medium]

Write a program that prints the absolute difference of two int a, int b.

a=7, b=9 → 2

a=9, b=7 → 2

Task 3 [hard]

Remember the size of different data types? e.g short and int?

Write a program that prints the product (*) of two short only if the product does not exceed the limit of short (32,767) only using variables of type short.

Loops

Loops

- **Loops** let us execute the same code multiple times
- Loops continue as long as a condition is true (“satisfied”)
- Java has two general types of loops: **while** and **for**

Loops

A *while* loop is the easiest

.. do something while (as long as) a condition is satisfied

```
1 boolean myLoopCondition = true;
2 while(myLoopCondition) {
3     // this section will get executed multiple times
4 }
```

Question: How long will this loop continue for?

Loops

A *while* loop is the easiest

.. do something while (as long as) a condition is satisfied

```
1 boolean myLoopCondition = false;  
2 while(myLoopCondition) {  
3     // this section will get executed multiple times  
4 }
```

Question: How long will this loop continue for?

Loops

How do we avoid infinite loops?

→ We can use variables to dynamically change our loop condition once we want to

```
1 int a = 0;
2 while(a < 10) {
3     a = a+1; // increment a
4     System.out.println(a);
5 }
```

Question: What happens here?

Loops

With **continue** and **break** we can escape a loop or skip an iteration

```
1 int a = 0;
2 while(true) {
3     if(a == 10) {
4         break;
5     }
6     a++;
7 }
```

Question: What happens here?

Try it yourself - the final task

Your first JAVA game!

Write a game which first calculates a random number and lets the user guess the number afterwards.

The user should be promoted to enter a number

- if the number is larger than the random number the program should output *"To large!"*
- if the number is small than the random number the program should output *"To small!"*
- if the number is the random number the program should output *"You got it!"*
- also output the number of tries the user took to guess the number

```
1 //Generating a random number between a min and a max value
2 int min = 5
3 int max = 10;
4 int random = ((Math.random() * (max - min)) + min);
```

That's it!

- Be encouraged to keep working on the tasks
- Feel free to reach out
 - to send your results
 - to tell me about problems you ran into

Next lesson

- for-loops
- Functions
- Arrays (non-primitive data types)
- more practical examples!