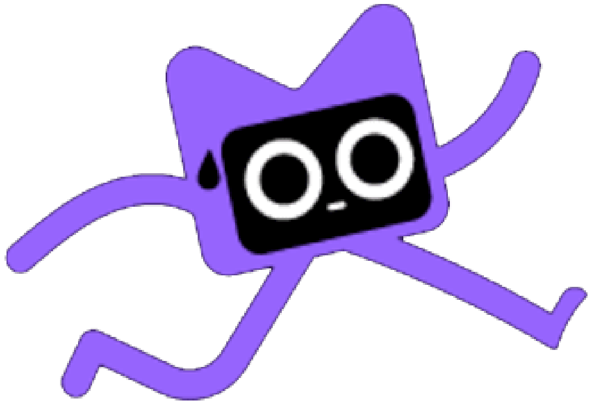
НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ КОРАБЛЕБУДУВАННЯ ІМЕНІ АДМІРАЛА МАКАРОВА

Algorithms & Programming

(p.2 - functions)



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Functions

- Functions are a core part of many programming languages.
- A function lets you define a block of code that performs a task.
- Then, whenever your app needs to execute that task, you can run the function instead of having to copy and paste the same code everywhere.

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Function basics

- Imagine you have an app that frequently needs to print your name.
- You can write a function to do this:

```
fun printMyName() {
    println("My name is Eugeny")
}
```

The code above is known as a function declaration. You define a function using the **fun** keyword.

With your function defined, you can use it like so:

```
printMyName()
```

This prints out the following:

```
My name is Eugeny
```

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Function parameters

- Sometimes you want to **parameterize** your function, which lets the function perform differently depending on the data passed into it via its **parameters**.
- As an example, consider the following function:

```
fun printMultipleOfFive(value: Int) {
    println("$value * 5 = ${value * 5}")
}
```

And after declaring it, you can use this function, as shown here:

```
printMultipleOfFive(10)
```

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Function parameters

- In any function, the parentheses contain what’s known as the **parameter list**.
- These parentheses are required both when declaring and when invoking the function, even if the parameter list is empty.
- In the example, you call the function with an **argument** of 10

So, as result, you can see:

```
10 * 5 = 50
```

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Function parameters

- Take care not to confuse the terms "**parameter**" and "**argument**".
- A function declares its ***parameters*** in its parameter list.
- When you call a function, you provide values as ***arguments*** for the functions parameters.

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Function parameters

You can take this one step further and make the function more general. With two parameters, the function can print out a multiple of any two values.

```
fun printMultipleOf(multiplier: Int, andValue: Int) {
    println("$multiplier * $andValue = ${multiplier * andValue}")
}
```

Than you can call it with line

```
printMultipleOf(4, 2)
```

There are now two parameters inside the parentheses after the function name: one named `multiplier` and the other named `andValue`, both of type `Int`

Named arguments

- Sometimes it is helpful to use **named arguments** when calling a function to make it easier to understand the purpose of each argument

```
printMultipleOf(multiplier = 4, andValue = 2)
```

This is especially helpful when a function has several parameters

Default values

- You can also give **default values** to parameters:

```
fun printMultipleOf(multiplier: Int, value: Int = 1) {
    println("$multiplier * $value = ${multiplier * value}")
}


printMultipleOf(4)
```

The difference is the = 1 after the second parameter, which means that if no value is provided for the second parameter, it defaults to 1.
Therefore, this code prints the following:

```
4 * 1 = 4
```

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Return values

- You can use a function to manipulate data. You simply take in data through parameters, manipulate it and then return it.
- Here's how you define a function that returns a value:

```
fun multiply(number: Int, multiplier: Int): Int {
    return number * multiplier
}
```

Inside the function, you use a return statement to return the value. In this example, you return the product of the two parameters.

Using of Pair

- It’s also possible to return multiple values through the use of Pairs:

```
fun multiplyAndDivide(number: Int, factor: Int): Pair<Int, Int> {
    return Pair(number * factor, number / factor)
}

val (product, quotient) = multiplyAndDivide(4, 2)
```

This function returns *both* the product and quotient of the two parameters by returning a Pair containing two Int values.

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Function in expression

- If a function consists solely of a single expression, you can assign the expression to the function using = while at the same time not using braces, a return type, or a return statement:

```
fun multiplyInferred(number: Int, multiplier: Int) =
                                         number * multiplier
```

In such a case, the type of the function return value is *inferred* to be the type of the expression assigned to the function.

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Parameters as values

- Function parameters are constants by default, which means they can’t be modified.

```
fun incrementAndPrint(value: Int) {
    value += 1
    print(value)
}
```

And result will be:

```
val cannot be reassigned
```

Parameters as values

- If you want a function to alter a parameter and return it, you must do so indirectly by declaring a new variable like so:

```
fun incrementAndPrint(value: Int): Int {
    val newValue = value + 1
    println(newValue)
    return newValue
}
```

Overloading

- What if you want more than one function with the same name?

```
fun getValue(value: Int): Int {
    return value + 1
}

fun getValue(value: String): String {
    return "The value is $value"
}
```

This is called **overloading** and lets you define similar functions using a single name.

Overloading

- The compiler must still be able to tell the difference between these functions within a given scope.
- Whenever you call a function, it should always be clear which function you’re calling.
- This is usually achieved through a difference in the parameter list:
  - A different number of parameters.
  - Different parameter types.

Note: The return type alone is not enough to distinguish two functions.

Functions as variables

- Functions in Kotlin are simply another data type.
- You can assign them to variables and constants just as you can any other type of value, such as an Int or a String.

```
fun add(a: Int, b: Int): Int {
    return a + b
}
```

This function takes two parameters and returns the sum of their values. You can assign this function to a variable using the **method reference operator**, ::, like so:

```
var function = ::add
```

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Functions as variables

- The fact that you can assign functions to variables comes in handy because it means you can pass functions to other functions.
- Here's an example of this in action:

```
fun printResult(function: (Int, Int) -> Int, a: Int, b: Int) {
    val result = function(a, b)
    print(result)
}


printResult(::add, 4, 2)
```

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Writing good functions

- The best (easiest to use and understand) functions do *one simple task* rather than trying to do many.
- This makes them easier to mix and match and assemble into more complex behaviors.
- Good functions also have a well defined set of inputs that produce the same output every time.
- This makes them easier to reason about and test in isolation.

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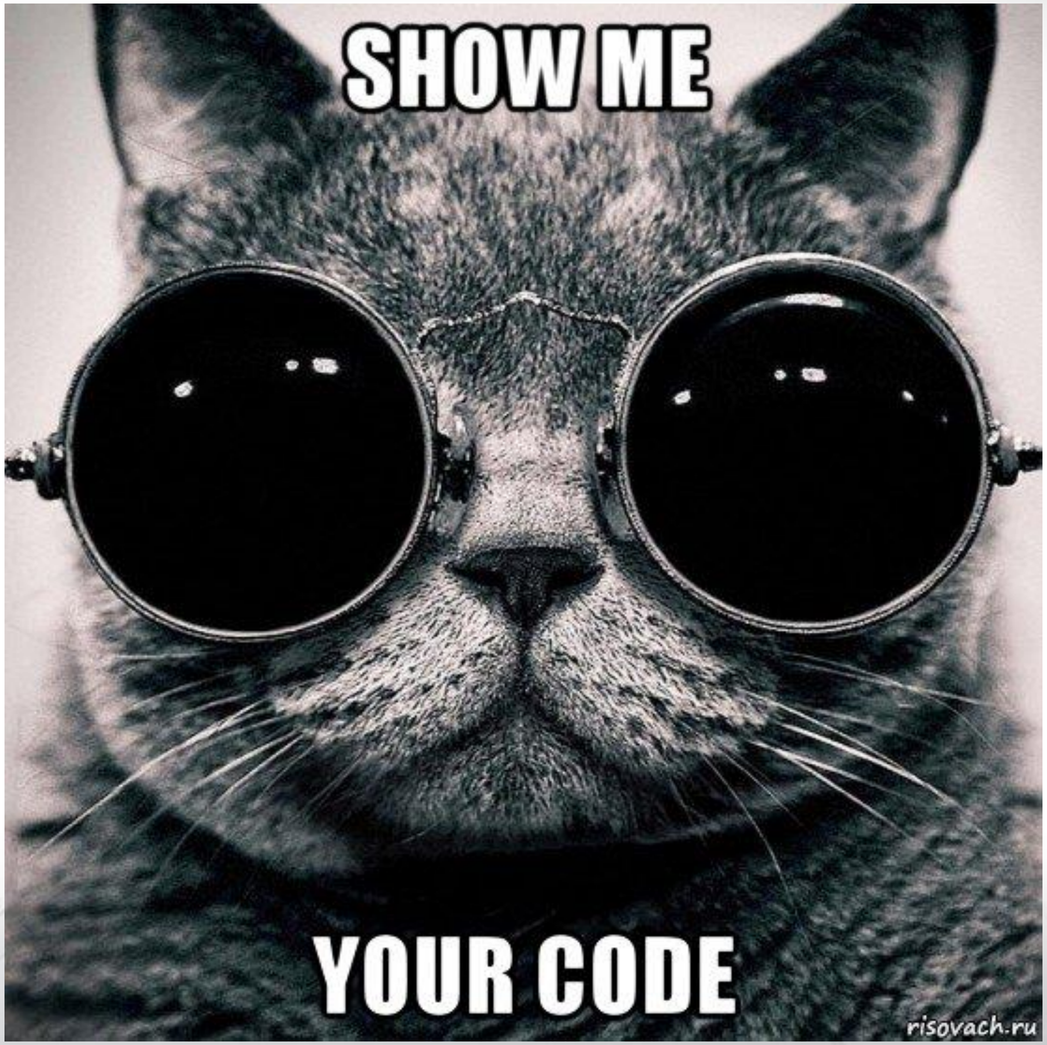
Let's code!



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Questions?

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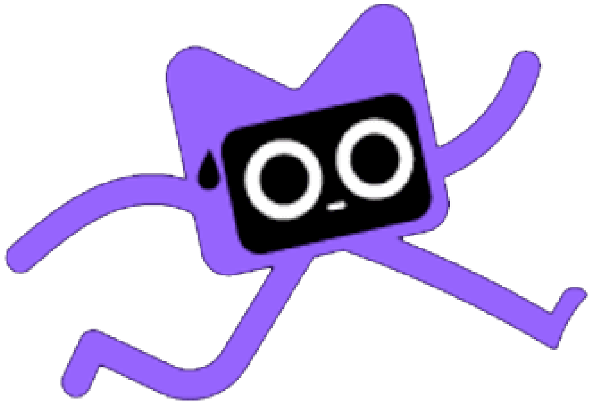

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