НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ КОРАБЛЕБУДУВАННЯ ІМЕНІ АДМІРАЛА МАКАРОВА

Algorithms & Programming

(p.4 – control flow, loops)

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Loops

- Loops are Kotlin's way of executing code multiple times. In this lecture, you'll learn about three types of loops: the while loop, the do-while loop, for loop.
- If you know another programming language, you'll find the concepts and maybe even the syntax to be familiar.

While loop

- A while loop repeats a block of code while a condition is true. You create a while loop this way:

```
while (<CONDITION>) {
    <LOOP CODE>
}
```

While loop

- The loop checks the condition for every iteration.
- If the condition is true, then the loop executes and moves on to another iteration.
- If the condition is false, then the loop stops.
- Just like if expressions, while loops introduce a scope.
- The simplest while loop takes this form:

```
while (true) {
}
```

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While loop

- The simplest while loop takes this form:

```
while (true) {
}
```

- This is a while loop that never ends because the condition is always true. Of course, you would never write such a while loop, because your program would spin forever!
- This situation is known as an **infinite loop**, and while it might not cause your program to crash, it will very likely cause your computer to freeze.

While loop

- Here's a more useful example of a while loop:

```
var sum = 1
while (sum < 1000) {
    sum = sum + (sum + 1)
}
```

This code calculates a mathematical sequence, up to the point where the value is greater than 1000.

What value will be in sum variable after this code was executed?

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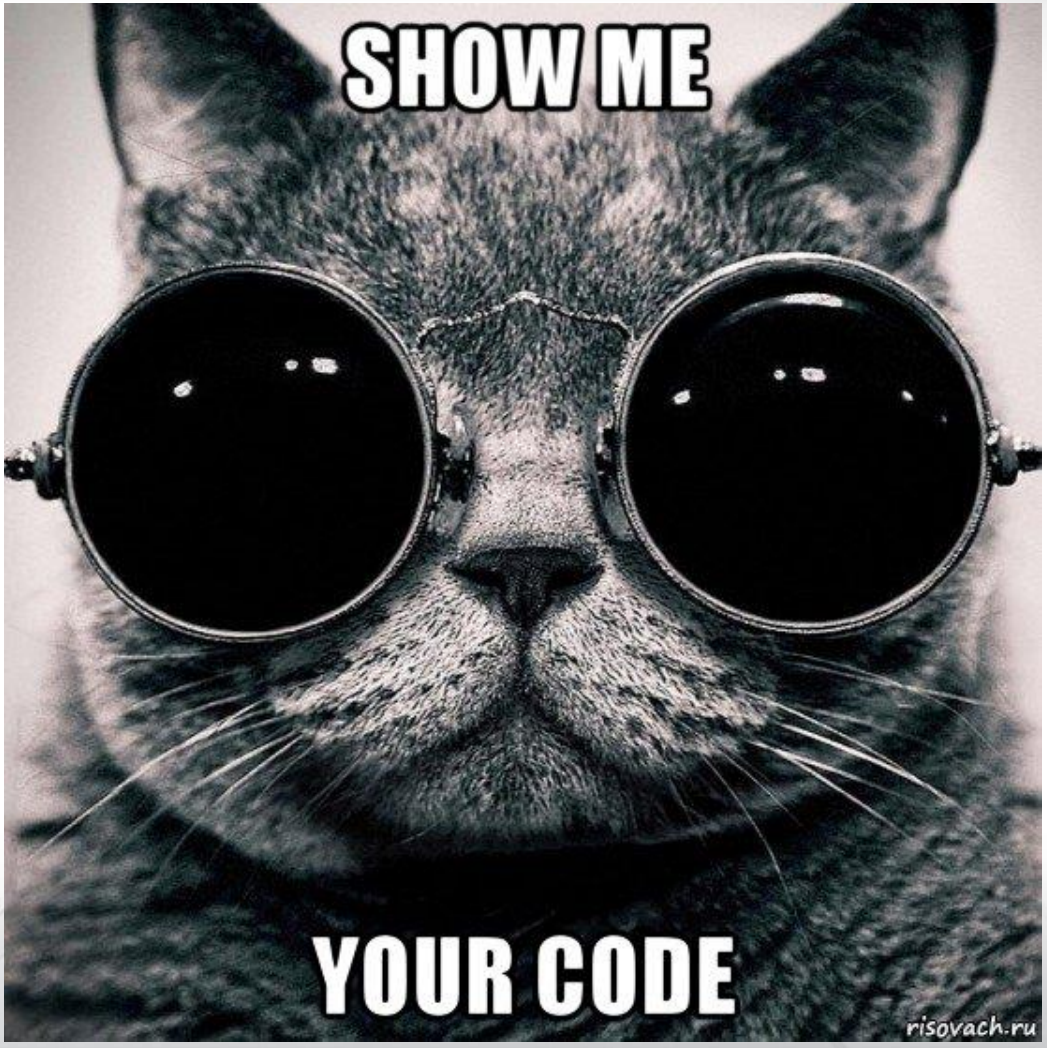
Let’s code!



do-while loop

- A variant of the while loop is called the **do-while loop**.
- It differs from the while loop in that the condition is evaluated *at the end* of the loop rather than at the beginning.
- You construct a do-while loop like this:

```
do {
     <LOOP CODE>
} while (<CONDITION>)
```

do-while loop

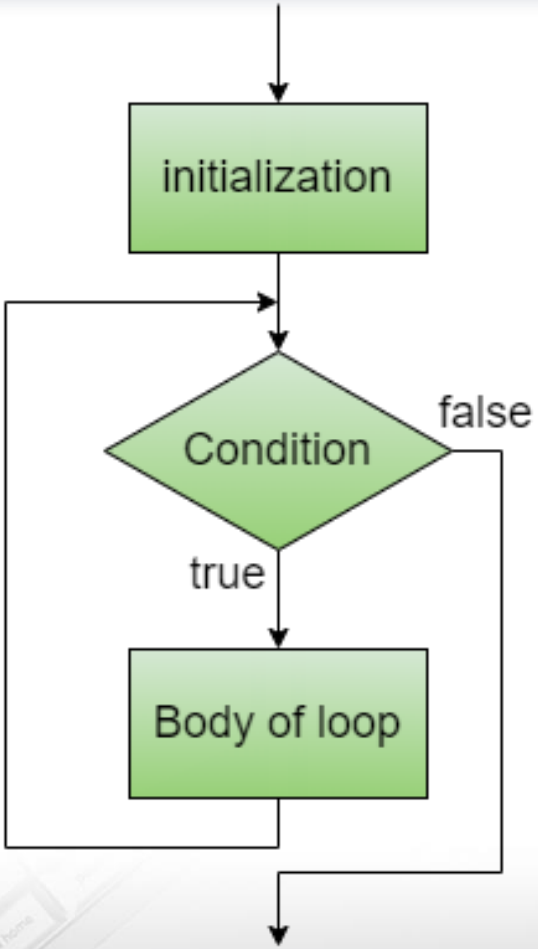
- Here's the example from the last section, but using a do-while loop:

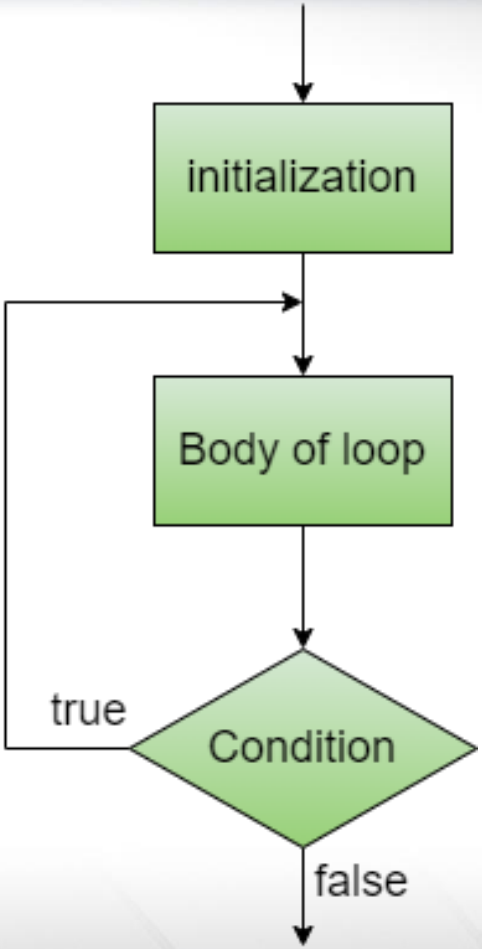
```
sum = 1
do {
     sum = sum + (sum + 1)
} while (sum < 1000)
```

In this example, the outcome is the same as before. However, that isn't always the case; you might get a different result with a different condition.

Why? And when?

while vs do-while





Breaking out of a loop

- Sometimes you want to break out of a loop early.
- You can do this using the break statement, which immediately stops the execution of the loop and continues on to the code after the loop.
- For example, consider the following code:

```
sum = 1
while (true) {
    sum = sum + (sum + 1)
    if (sum >= 1000) {
        break
    }
}
```

For loops

- This is probably the most common loop you'll see, and you'll use it to run code a certain number of times.
- You construct a for loop like this:

```
for (<CONSTANT> in <RANGE>) {
    <LOOP CODE>
}
```

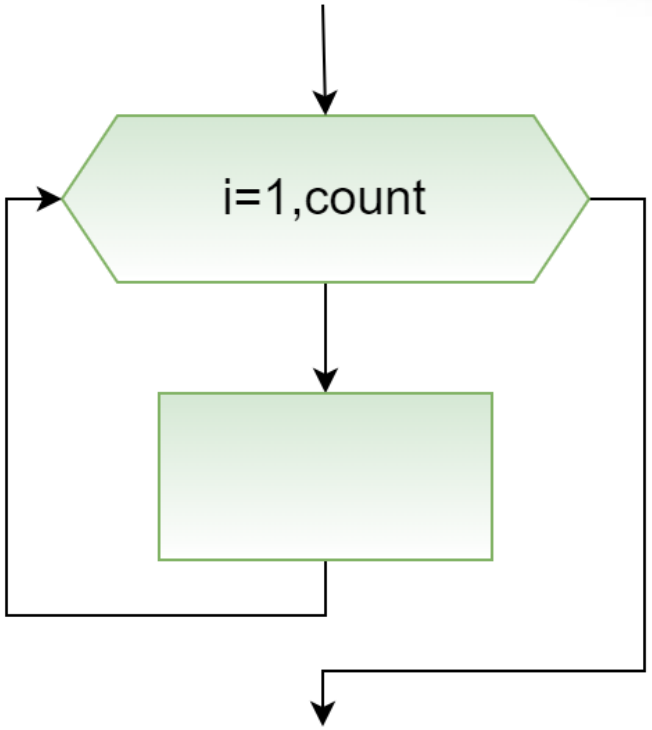
For loops

- The loop begins with the for keyword, followed by a name given to the loop constant (more on that shortly), followed by in, followed by the range to loop through. Here's an example:

```
val count = 10
var sum = 0
for (i in 1..count) {
    sum += i
}
```

In the code above, the for loop iterates through the range 1 to count. At the first iteration, i will equal the first element in the range: 1. Each time around the loop, i will increment until it's equal to count; the loop will execute one final time and then finish.

For loops - Flowchart



Notes about for loop

- If you'd used a half-open range, the last iteration would see i equal to count - 1.
- In terms of scope, the i constant is only visible inside the scope of the for loop, which means it's not available outside of the loop.

repeat loop

- Sometimes you only want to loop a certain number of times, and so you don't need to use the loop constant at all.
- In that case, you can employ a repeat loop, like so:

```
sum = 1
var lastSum = 0
repeat(10) {
    val temp = sum
    sum += lastSum
    lastSum = temp
}
```

for loops

- It’s also possible to only perform certain iterations in the range.
- For example, imagine you wanted to compute a sum similar to that of triangle numbers, but only for odd numbers:

```
sum = 0
for (i in 1..count step 2) {
    sum += i
}
```

for loops

- You can even count down in a for loop using downTo.
- In this case if count is 10 then the loop will iterate through the following values (10, 8, 6, 4, 2).

```
sum = 0
for (i in count downto 1 step 2) {
    sum += i
}
```

continue statement

- Sometimes you'd like to skip a loop iteration for a particular case without breaking out of the loop entirely.
- You can do this with the continue statement, which immediately ends the current iteration of the loop and starts the next iteration.
- The continue statement gives you a higher level of control, letting you decide where and when you want to skip an iteration.

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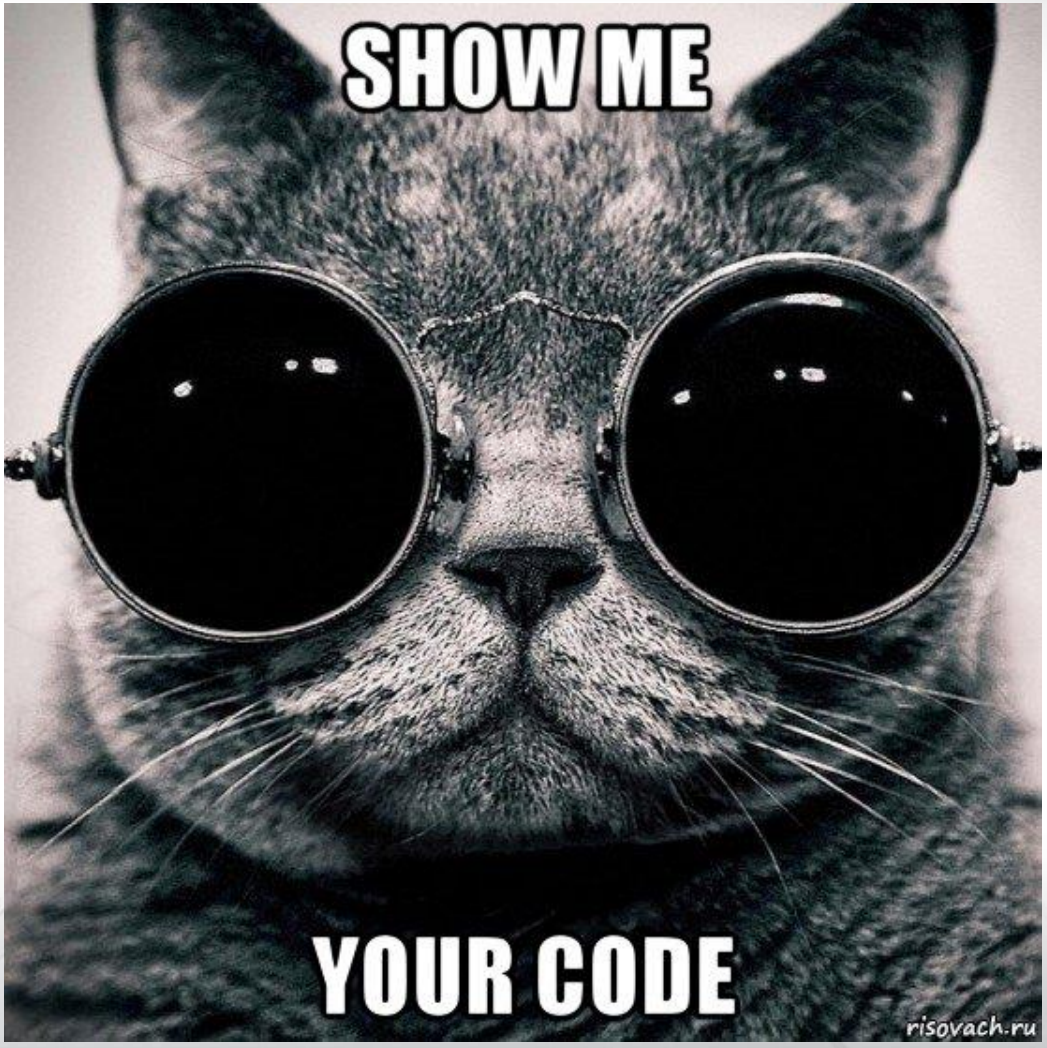

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Questions?

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