



Kotlin not-to-do list

WHAT YOU SHOULD AVOID DOING IN KOTLIN

@MarcinMoskala





Part 1: Good code

Chapter 1: Safety

- Item 1: Limit mutability
- Item 2: Minimize the scope of variables
- Item 3: Eliminate platform types as soon as possible
- Item 4: Do not expose inferred types
- Item 5: Specify your expectations on arguments and state
- Item 6: Prefer standard errors to custom ones
- Item 7: Prefer `null` or `Failure` result when the lack of result is possible
- Item 8: Handle nulls properly
- Item 9: Close resources with `use`
- Item 10: Write unit tests

Chapter 2: Readability

- Item 11: Design for readability
- Item 12: Operator meaning should be consistent with its function name
- Item 13: Avoid returning or operating on `Unit?`
- Item 14: Specify the variable type when it is not clear
- Item 15: Consider referencing receiver explicitly
- Item 16: Properties should represent state, not behavior
- Item 17: Consider naming arguments
- Item 18: Respect coding conventions

Part 2: Code design

Chapter 3: Reusability

- Item 19: Do not repeat knowledge
- Item 20: Do not repeat common algorithms

...



YOU SHALL NOT PASS!



Hiding too much

Item 14: Specify the variable type when it is not clear

```
val num = 10
```

```
val name = "Marcin"
```

```
val ids = listOf(12, 112, 554, 997)
```

```
val data = getData()
```



Item 14: Specify the variable type when it is not clear

```
val num = 10
```

```
val name = "Marcin"
```

```
val ids = listOf(12, 112, 554, 997)
```


```
val data: UserData = getData()
```



Type inference is exact

```
open class Animal
class Zebra: Animal()

fun main() {
    var animal: Animal = Zebra()
    animal = Animal()
}
```

An orange triangle is located in the bottom right corner of the slide.

Item 4: Do not expose inferred types

```
interface CarFactory {  
    fun produce() = DEFAULT_CAR  
}
```

Fiat126P



```
val DEFAULT_CAR = Fiat126P()
```



Null safety



Java types and nullability

	Java		Kotlin
<code>@Nullable</code>	Type	←→	Type?
<code>@NotNull</code>	Type	←→	Type
	Type	←→	?

Some of nullability annotations supported by Kotlin

- **JetBrains** (`@Nullable` and `@NotNull` from `org.jetbrains.annotations`)
- **Android** (`@Nullable` and `@NonNull` from `androidx.annotation`, `com.android.annotations` and `android.support.annotations`)
- **JSR-305** (`@Nullable`, `@CheckForNull` and `@Nonnull` from `javax.annotation`)
- **JavaX** (`@Nullable`, `@CheckForNull`, `@Nonnull` from `javax.annotation`)
- **FindBugs** (`@Nullable`, `@CheckForNull`, `@PossiblyNull` and `@NonNull` from `edu.umd.cs.findbugs.annotations`)
- **ReactiveX** (`@Nullable` and `@NonNull` from `io.reactivex.annotations`)
- **Eclipse** (`@Nullable` and `@NonNull` from `org.eclipse.jdt.annotation`)
- **Lombok** (`@NonNull` from `lombok`)

// Java

```
public class UserRepo {  
    public User getUser() {  
        //...  
    }  
}
```

Platform type



// Kotlin

```
val repo = UserRepo()  
val user1 = repo.user           // Type of user1 is User!  
val user2: User = repo.user    // Type of user2 is User  
val user3: User? = repo.user   // Type of user3 is User?
```

Item 3: Eliminate platform types as soon as possible

```
// Kotlin  
fun statedType() {  
    val value: String = JavaClass().value // NPE  
    //...  
    println(value.length)  
}  
  
fun platformType() {  
    val value = JavaClass().value  
    //...  
    println(value.length) // NPE  
}
```

String!

```
1  
2 interface UserRepo {  
3     fun getUsername() = JavaClass().value
```

Declaration has type inferred from a platform call, which can lead to unchecked nullability issues. Specify type explicitly as nullable or non-nullable. [more...](#) (⌘F1)

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```

```
class RepoImpl: UserRepo {  
    override fun getUsername(): String? {  
        return null  
    }  
}  
  
fun main() {  
    val repo: UserRepo = RepoImpl()  
    val text: String = repo.getUsername()  
    print("User name length is ${text.length}")  
}
```

Runtime NPE

Receiver hiding

```
sourceList += SourceEntity().apply {  
    id = it.id  
    category = it.category  
    country = it.country  
    description = it.description  
}
```


Item 15: Consider referencing receiver explicitly

```
fun <T : Comparable<T>> List<T>.quickSort(): List<T> {  
    if (size < 2) return this  
    val pivot = this.first()  
    val (smaller, bigger) = this.drop(1)  
        .partition { it < pivot }  
    return smaller.quickSort() + pivot + bigger.quickSort()  
}
```

Item 15: Consider referencing receiver explicitly

```
class Node(val name: String) {  
  
    fun makeChild(childName: String) =  
        create("$name.$childName")  
            .apply { print("Created $name") }  
  
    fun create(name: String): Node? = Node(name)  
}  
  
val node = Node("parent")  
node.makeChild("child") // Prints: Created parent
```

Item 15: Consider referencing receiver explicitly

```
class Node(val name: String) {  
  
    fun makeChild(childName: String) = Error: Receiver is nullable  
        create("$name.$childName")  
            .apply { print("Created #{this.name}") }  
  
    fun create(name: String): Node? = Node(name)  
}  
  
val node = Node("parent")  
node.makeChild("child") // Prints nothing
```

Item 15: Consider referencing receiver explicitly

```
class Node(val name: String) {  
  
    fun makeChild(childName: String) =  
        create("$name.$childName")  
            .apply { print("Created ${this?.name}") }  
  
    fun create(name: String): Node? = Node(name)  
}  
  
val node = Node("parent")  
node.makeChild("child") // Prints: Created parent.child
```

Item 15: Consider referencing receiver explicitly

```
class Node(val name: String) {  
  
    fun makeChild(childName: String) =  
        create("$name.$childName")  
            .also { print("Created ${it?.name}") }  
  
    fun create(name: String): Node? = Node(name)  
}  
  
val node = Node("parent")  
node.makeChild("child") // Prints: Created parent.child
```

Item 41: Avoid member extensions

```
class PhoneBook {  
    // ...  
  
    fun String.isPhoneNumber() =  
        length == 7 && all { it.isDigit() }  
}
```

```
PhoneBook().apply { "1234567890".isPhoneNumber() }
```

Item 41: Avoid member extensions

```
class PhoneBook {  
    // ...  
}
```

```
private fun String.isPhoneNumber() =  
    length == 7 && all { it.isDigit() }
```

```
val ref = String::isPhoneNumber
```

```
val str = "1234567890"
```

```
val boundedRef = str::isPhoneNumber
```

Item 41: Avoid member extensions

```
class A {  
    val a = 10  
}  
class B {  
    val a = 20  
    val b = 30  
  
    fun A.test() = a + b  
}
```

Where is it from?

```
class A {  
    //...  
}  
class B {  
    //...  
  
    fun A.update() = ...  
}
```

What shall we update?
A or B?

The background consists of a solid blue field with a diagonal split. The upper-left portion is a lighter shade of blue, and the lower-right portion is a vibrant orange. The text is centered in the white space between these two colors.

Choosing short over
readable

Readability vs conciseness

APL: `life←{↑1 ωV.Λ3 4=+/,-1 0 1° .Θ-1 0 1° .ⓐCω}`

J: `life=:[:+/(3 4=/[[:+/(,/, "0/~i:1)|.])*.1,:]`

Item 11: Design for readability

```
if (person != null && person.isAdult) {  
    view.showPerson(person)  
} else {  
    view.showError()  
}
```

```
person?.takeIf { it.isAdult }  
    ?.let(view::showPerson)  
    ?: view.showError()
```



```
if (person != null && person.isAdult) {  
    view.showPerson(person)  
    view.hideProgressWithSuccess()  
} else {  
    view.showError()  
    view.hideProgress()  
}
```

```
person?.takeIf { it.isAdult }  
    ?.let {  
        view.showPerson(it)  
        view.hideProgressWithSuccess()  
    } ?: run {  
        view.showError()  
        view.hideProgress()  
    }
```

Item 11: Design for readability

```
if (person != null && person.isAdult) {  
    view.showPerson(person)  
} else {  
    view.showError()  
}
```



```
person?.takeIf { it.isAdult }  
    ?.let(view::showPerson)  
    ?: view.showError()
```

Show when person is `null`, not adult,
or `showPerson` returns `null`.

Item 13: Avoid returning or operating on `Unit`?

Why would we return `Unit`??

To use nullability support for other purposes.



```
fun api(): Any? {  
    if (!correctHash()) return "Incorrect hash"  
    //...  
}
```

```
fun correctHash(): Boolean = call.hasCorrectHash
```



Item 12: Operator meaning should be consistent with its function name

```
fun Int.factorial(): Long = (1..this).product()
```

```
print(10 * 6.not()) // 7200
```

```
print(10 * !6) // 7200
```

```
operator fun Int.not() = factorial()
```



Item 12: Operator meaning should be consistent with its function name

Operator	Corresponding Function
+a	a.unaryPlus()
-a	a.unaryMinus()
!a	a.not()
++a	a.inc()
--a	a.dec()
a+b	a.plus(b)
a-b	a.minus(b)
a*b	a.times(b)
a/b	a.div(b)
a..b	a.rangeTo(b)
a in b	a.contains(b)

x + y

=

x.plus(y)

Item 12: Operator meaning should be consistent with its function name

```
val a = "1, 2, 3, 4"  
print(a.removeAll(", ")) // 1234
```



Erik Hellman 🍰 @ErikHellman · Jun 15

Since nobody can stop me...

If you forget how String.replace works, this is a great tip!

```
operator fun String.rem(other: String): String {  
    return replace(other, "")  
}
```

🗨️ 2 🔄 🍷 1 ✉️



Unclear cases

```
operator fun Int.times(operation: () -> Unit): ()->Unit = {  
    repeat(this) { operation() }  
}
```

```
val tripledHello = 3 * { print("Hello") }
```

```
tripledHello() // Prints: HelloHelloHello
```

Unclear cases

```
operator fun Int.times(operation: () -> Unit): ()->Unit {  
    repeat(this) { operation() }  
}
```

```
3 * { print("Hello") } // Prints: HelloHelloHello
```

Unclear cases

```
infix fun Int.timesRepeated(operation: ()->Unit) = {  
    repeat(this) { operation() }  
}
```

```
val tripledHello = 3 timesRepeated { print("Hello") }  
tripledHello() // Prints: HelloHelloHello
```

```
repeat(3) { print("Hello") } // Prints: HelloHelloHello
```



Disrespecting contracts

Item 27: Minimize elements visibility

- A class cannot be responsible for its own state when properties that represent this state can be changed from the outside.
- It is easier to track how class changes when they have more restricted visibility.

```
class UserRepository {  
    private var prevUser: User? = null
```

```
    fun getUser(): User {  
        // ...  
    }
```

```
    private fun connectWithDb(): Connection {  
        // ...  
    }
```

```
}
```

- It is easier to learn and maintain a smaller interface.
- When we want to make changes, it is way easier to expose something new, rather than to hide an existing element.

Item 29: Respect abstraction contract

```
class Employee {  
    private fun privateFunction() {  
        println("You won't get me!")  
    }  
}
```

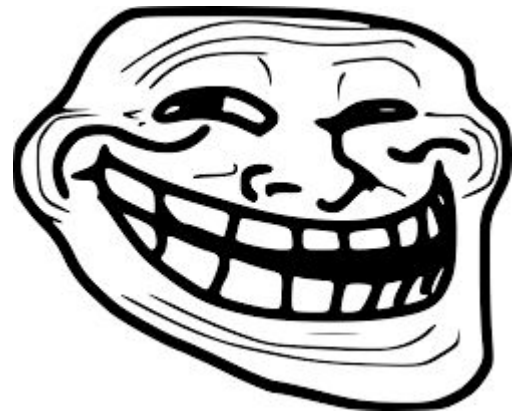
```
Employee:class  
    .declaredMemberFunctions  
    .first { it.name == "privateFunction" }  
    .apply { isAccessible = true }  
    .call(Employee()) // Prints: You won't get me!
```



Item 29: Respect abstraction contract

```
inline fun <reified T> T.callMethod(name: String): Any? =  
    T::class  
        .declaredMemberFunctions  
        .first { it.name == name }  
        .apply { isAccessible = true }  
        .call(this)
```

```
Employee().callMethod("privateFunction")  
// You won't get me!
```




```
class UserRepository {  
    private var prevUser: User? = null  
  
    fun getUser(): User {  
        // ...  
    }  
  
    private fun connectWithDb(): Connection {  
        // ...  
    }  
}
```

Item 28: Define contract with documentation

```
abstract class LoggedView {  
  
    /**  
     * Method defining how logout dialog should look like.  
     * Used internally when session expires.  
     * Should not be used directly.  
     */  
    protected fun showLogoutDialog() {  
        //...  
    }  
}
```

I FIND YOUR LACK OF DOCUMENTATION

DISTURBING

Item 29: Respect abstraction contract

```
/**  
 * Returns a new read-only list of given elements.  
 * The returned list is serializable (JVM).  
 */  
public fun <T> listOf(vararg elements: T): List<T> = ...
```

```
val list = listOf(1,2,3)
```

```
if (list is MutableList) {  
    list.add(4)  
}
```



```
val list = listOf(1,2,3)  
val mutable = list.toMutableList()  
mutable.add(4)
```

```
Exception in thread "main" java.lang.UnsupportedOperationException  
    at java.util.AbstractList.add(AbstractList.java:148)  
    at java.util.AbstractList.add(AbstractList.java:108)  
    at Simplest_versionKt.main(Simplest_version.kt:6)
```

Item 37: Respect the contract of `equals`

```
/**  
 * Indicates whether some other object is "equal to" this one. Implementations must fulfil the following  
 * requirements:  
 *  
 * * Reflexive: for any non-null value `x`, `x.equals(x)` should return true.  
 * * Symmetric: for any non-null values `x` and `y`, `x.equals(y)` should return true if and only if  
 * * Transitive: for any non-null values `x`, `y`, and `z`, if `x.equals(y)` returns true and  
 * * Consistent: for any non-null values `x` and `y`, multiple invocations of `x.equals(y)` consistently  
 * * Never equal to null: for any non-null value `x`, `x.equals(null)` should return false.  
 *  
 * Read more about [equality](https://kotlinlang.org/docs/reference/equality.html) in Kotlin.  
 */  
public open operator fun equals(other: Any?): Boolean
```

Item 37: Respect the contract of equals

```
class Time(  
    val millisArg: Long = -1,  
    val isNow: Boolean = false  
) {  
    val millis: Long  
        get() = if (isNow) System.currentTimeMillis() else millisArg  
  
    override fun equals(other: Any?): Boolean =  
        other is Time && millis == other.millis  
}
```

```
val now = Time(isNow = true)  
now == now // Sometimes true, sometimes false  
List(100000) { now }.all { it == now } // Most likely false
```

Not reflexive
Not consistent

You cannot trust:

- contains
- Set
- assertEquals
- ...

Item 36: Prefer class hierarchies to tagged classes

```
sealed class Time  
data class TimePoint(val millis: Long) : Time()  
object Now: Time()
```

Item 37: Respect the contract of `equals`

```
class Complex(val real: Double, val img: Double) { Not symmetric
  override fun equals(other: Any?): Boolean =
    if (other is Double) img == 0.0 && real == other
    else other is Complex && real == other.real && img == other.img
}
```

```
Complex(1.0, 0.0).equals(1.0) // true
1.0.equals(Complex(1.0, 0.0)) // false
```

```
val list = listOf<Any>(Complex(1.0, 0.0))
list.contains(1.0) // ?
```

You cannot trust:

- `contains`
- `Set`
- `assertEquals`
- ...

Item 38: Respect the contract of hashCode

```
31 class FullName(  
32     ...  
33     var surname: String  
34 ) {  
35     override fun equals(other: Any?): Boolean = other is FullName &&  
36         other.name == name && other.surname == surname  
37 }
```

Class has 'equals()' defined but does not define 'hashCode()' more... (#F1)

```
val name1 = FullName("Marcin", "Moskała")  
val name2 = FullName("Marcin", "Moskała")  
print(name1 == name2) // true
```

```
val set = mutableSetOf<FullName>()  
set.add(name1)  
print(set.contains(name2)) // false
```

You cannot trust:

- Set
- Map
- ...

Item 38: Respect the contract of hashCode

```
class NameOk(val name: String) {
    override fun equals(o: Any?): Boolean = o is NameOk && o.name == name
    override fun hashCode(): Int = name.hashCode()
}
class NameNope(val name: String) {
    override fun equals(o: Any?): Boolean = o is NameNope && o.name == name
    override fun hashCode(): Int = 0
}

val okSet = List(10000) { NameOk("$it") }.toSet() // Equals used 0 times
val nopeSet = List(10000) { NameNope("$it") }.toSet() // Equals used 50116683 times

NameOk("9999") in properSet // Equals used 1 times
NameOk("Not there") in properSet // Equals used 0 times
NameNope("9999") in nopeSet // Equals used 4324 times
NameNope("Not there") in nopeSet // Equals used 10001 times
```

Item 16: Properties should represent state, not behavior

```
val Tree<Int>.sum: Int
  get() = when (this) {
    is Leaf -> value
    is Node -> left.sum + right.sum
  }
```



Item 16: Properties should represent state, not behavior

```
fun Tree<Int>.sum(): Int = when (this) {  
    is Leaf -> value  
    is Node -> left.sum() + right.sum()  
}
```

Item 16: Properties should represent state, not behavior

```
class UserIncorrect {  
    private var name: String = ""  
    fun getName() = name  
    fun setName(name: String) {  
        this.name = name  
    }  
}
```



Item 35: Use function types instead of interfaces to pass operations and actions

```
class CalendarView {  
    var onDateClicked: ((date: Date) -> Unit)? = null  
    var onPageChanged: ((date: Date) -> Unit)? = null  
}  
  
calendarView.onDateClicked = { /*...*/ }  
calendarView.onPageChanged = fun(date) { /*...*/ }  
calendarView.onDateClicked = DateHandler::onDateChanged  
calendarView.onPageChanged = handler::onPageChanged  
  
class OnDateClicked: (Date) -> Unit { /*...*/ }  
calendarView.onDateClicked = OnDateClicked()
```

Biggest sins of Kotlin developers:

- Hiding too much
- Choosing short over readable
- Disrespecting contracts



Hiding too much

Item 14: Specify the variable type when it is not clear

Item 4: Do not expose inferred types

Item 3: Eliminate platform types as soon as possible

Item 15: Consider referencing receiver explicitly

Item 41: Avoid member extensions

Choosing short over readable

Item 11: Design for readability

Item 13: Avoid returning or operating on Unit?

Item 12: Operator meaning should be consistent with its function name

Choosing short over readable

Item 27: Minimize elements visibility

Item 29: Respect abstraction contract

Item 28: Define contract with documentation

Item 37: Respect the contract of equals

Item 38: Respect the contract of hashCode

Item 16: Properties should represent state, not behavior

Item 35: Use function types instead of interfaces to pass operations and actions



Kotlin not-to-do list

WHAT YOU SHOULD AVOID DOING IN KOTLIN

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