



College of Engineering, Construction & Living Sciences  
Bachelor of Information Technology  
IN721: Mobile Application Development  
Level 7, Credits 15  
**Practical 01: Kotlin**

## Assessment Overview

In this assessment, you will solve 15 coding problems using **Kotlin** in **IntelliJ IDEA**. This assessment is worth **2%** of the final mark in **IN721: Mobile Application Development**.

## Learning Outcomes

At the successful completion of this course, learners will be able to:

1. Implement & publish complete, non-trivial, industry-standard mobile applications following sound architectural & code-quality standards.
2. Identify relevant use cases for a mobile computing scenario & incorporate them into an effective user experience design.
3. Follow industry standard software engineering practice in the design of mobile applications.

## Assessment Table

Assessment Activity	Weighting	Learning Outcomes	Assessment Grading Scheme	Completion Requirements
Practical	20%	2, 3	CRA	Cumulative
Project	80%	1, 2, 3	CRA	Cumulative

## Conditions of Assessment

You will complete this assessment during your learner managed time, however, there will be availability during the teaching sessions to discuss the requirements & your progress of this assessment. This assessment will need to be completed by **Friday, 05 March 2021 at 5:00 PM**.

## Pass Criteria

This assessment is criterion-referenced (CRA) with a cumulative pass mark of **50%** over all assessments in **IN721: Mobile Application Development**.

## Authenticity

All parts of your submitted assessment must be completely your work & any references must be cited appropriately including, externally-sourced graphic elements. Provide your references in a **README.md** file. All media must be royalty free (or legally purchased) for educational use. Failure to do this will result in a mark of **zero** for this assessment.

## Policy on Submissions, Extensions, Resubmissions & Resits

The school's process concerning submissions, extensions, resubmissions & resits complies with **Otago Polytechnic** policies. Learners can view policies on the **Otago Polytechnic** website located at <https://www.op.ac.nz/about-us/governance-and-management/policies>.

## Submissions

You must submit all program files via **GitHub Classroom**. Here is the URL to the repository you will use for your submission – <https://classroom.github.com/a/VJIq7Ae0>. Checkout from the **main** branch to the **01-practical** branch by running the command - **git checkout 01-practical**. This branch will be your development branch for this assessment. Once you have completed this assessment, create a pull request & assign the **GitHub** user **grayson-orr** to a reviewer. **Do not** merge your own pull request. Late submissions will incur a **10% penalty per day**, rolling over at **5:00 PM**.

## Extensions

Familiarise yourself with the assessment due date. If you need an extension, contact the course lecturer before the due date. If you require more than a week's extension, a medical certificate or support letter from your manager may be needed.

## Resubmissions

Learners may be requested to resubmit an assessment following a rework of part/s of the original assessment. Resubmissions are to be completed within a negotiable short time frame & usually must be completed within the timing of the course to which the assessment relates. Resubmissions will be available to learners who have made a genuine attempt at the first assessment opportunity & achieved a **D grade (40-49%)**. The maximum grade awarded for resubmission will be **C-**.

## Resits

Resits & reassessments are not applicable in **IN721: Mobile Application Development**.

## Instructions - Learning Outcomes 2, 3

You have been provided a directory called **01-practical** containing 15 **Kotlin** files. In these files, write your solutions to the 15 problems below.

### Problem 1:

Calculate the average of the given **double array** & display the expected output.

```
fun main() {
    val nums = doubleArrayOf(45.3, 67.5, -45.6, 20.34, -33.0, 45.6)

    // Write your solution here

    // Expected output:
    // Average: 16.69
}
```

### Problem 2:

Write a function called **fizzBuzz** which accepts an **Int** parameter called **num**. If **num** is a multiple of three, return **Fizz**, if **num** is a multiple of five, return **Buzz** & if **num** is a multiple of three & five, return **FizzBuzz**. Call the **fizzBuzz** function in the **main** function to display the expected output.

```
// Write your fizzBuzz function here

fun main() {
    for (i in 1..15 step 2) {
        // Write your solution here
    }

    // Expected output:
    // 1
    // Fizz
    // Buzz
    // 7
    // Fizz
    // 11
    // 13
    // FizzBuzz
}
```

### Problem 3:

You have been given two **mutable lists** containing the lecturer's favourite programming languages. Use the following hints to display the expected output:

- Add a specified element to the end of a list.
- Add all elements of a specified collection to the end of a list.
- If present, remove a specified element from a collection.

```
fun main() {
    val progLangsOne: MutableList<String> = mutableListOf("C#", "JavaScript", "Kotlin", "Python")
    val progLangsTwo: MutableList<String> = mutableListOf("C++", "Go", "Java", "Swift")

    // Write your solution here

    // Expected output:
    // [C#, JavaScript, Kotlin, Python, Prolog, C++, Java, Swift]
}
```

**Resource:** [Kotlin Collections - Mutable List](#)

### Problem 4:

You have been given a **mutable map** containing three soft drinks & their prices. Use the following hints to display the expected output:

- Change the price of Coca-Cola to 2.50.
- Calculate the total price of all soft drinks.

```
fun main() {  
    val softDrinks: MutableMap<String, Double>  
        = mutableMapOf("Coca-Cola" to 2.00, "Fanta" to 0.90, "Sprite" to 1.10)  
  
    // Write your solution here  
  
    // Expected output:  
    // Total price: $4.50  
}
```

### Problem 5:

You have been given two **mutable sets** containing two lecturer's course codes. Use the following hints to display the expected output:

- Return a set containing all elements that are contained by both collections.
- Return a set containing all distinct elements from both collections.

```
fun main() {  
    val courseCodesOne: MutableSet<String> = mutableSetOf("IN607", "IN721", "IN728", "IN732")  
    val courseCodesTwo: MutableSet<String> = mutableSetOf("IN512", "IN607", "IN728", "IN732")  
  
    // Write your solution here  
  
    // Expected output:  
    // [IN607, IN728, IN732]  
    // [IN607, IN721, IN728, IN732, IN512]  
}
```

**Resource:** [Kotlin Collections Documentation - Mutable Set](#)

### Problem 6:

Write two classes called **SoftwareDeveloper** & **Manager** which inherit from the given **Employee** class. The **SoftwareDeveloper** class has one additional class property called **favProgLang** of type **String**. The **Manager** class also has one additional class property called **employees** of type **MutableList<Employee>** & three functions which add, remove & display all managed employees.

Use the three **SoftwareDeveloper** objects & **Manager** object in the **main** function to display the expected output.

```
open class Employee(var id: Int, val firstName: String, val lastName: String, val salary: Int) {  
    override fun toString() = "${firstName} ${lastName}"  
}  
  
// Write your SoftwareDeveloper class here  
  
// Write your Manager class here
```

```
fun main() {
    val sftDevOne = SoftwareDeveloper(1, "Bert", "Watts", 100000, "Cobol")
    val sftDevTwo = SoftwareDeveloper(2, "Sara", "Cain", 75000, "Perl")
    val sftDevThree = SoftwareDeveloper(3, "Samantha", "Baker", 75000, "PHP")
    val manager = Manager(4, "Owen", "James", 150000, mutableListOf(sftDevOne, sftDevTwo))

    // Write your solution here

    // Expected output:
    // Sara Cain
    // Samantha Baker
}
```

### Problem 7:

You have been given a class called **Stack** of type **String**. Use the **Stack** object in the **main** function to display the expected output.

```
class Stack<String>() {
    private val els = mutableListOf<String>()
    fun push(el: String) = els.add(el)
    fun peek(): String = els.last()
    fun pop(): String = els.removeAt(els.size - 1)
    fun isEmpty() = els.isEmpty()
    fun size() = els.size
    override fun toString() = "Stack[${els.joinToString()}]"
}

fun main() {
    val stack: Stack<String> = Stack()
    stack.push("Django")
    stack.push("Laravel")
    stack.push("Ruby on Rails")
    stack.push("Spring")

    // Write your solution here

    // Expected output:
    // Stack[Django, Laravel, Ruby on Rails]
    // Ruby on Rails is at the top of the stack
    // There are 3 item(s) in the stack
}
```

### Problem 8:

You have been given a class called **Stack** of type **String**. Use the **Stack** object in the **main** function & the **readLine** function to reverse the user's input.

```
class Stack<String>() {
    private val els = mutableListOf<String>()
    fun push(el: String) = els.add(el)
    fun peek(): String = els.last()
    fun pop(): String = els.removeAt(els.size - 1)
    fun isEmpty() = els.isEmpty()
    fun size() = els.size
}
```

```
        override fun toString() = "Stack[${els.joinToString()}]"
    }

    fun main() {
        val stack: Stack<String> = Stack()

        // Write your solution here

        // Expected output:
        // Enter some text: John Doe
        // eoD nhoJ
    }
```

**Resource:** [Kotlin IO Documentation - readLine](#)

### Problem 9:

You have been given a class called **Stack** of type **Int**. Use the **Stack** object in the **main** function & the **readLine** function to convert the user's input into binary.

```
class Stack<Int>() {
    private val els = mutableListOf<Int>()
    fun push(el: Int) = els.add(el)
    fun peek(): Int = els.last()
    fun pop(): Int = els.removeAt(els.size - 1)
    fun isEmpty() = els.isEmpty()
    fun size() = els.size
    override fun toString() = "Stack[${els.joinToString()}]"
}

fun main() {
    val stack: Stack<Int> = Stack()

    // Write your solution here

    // Expected output:
    // Enter a number: 50
    // 110010
}
```

### Problem 10:

You have been given a class called **Stack** of type **Char** & an incomplete function called **isBalanced** which accepts a **String** parameter **sequence**. Given a **sequence** containing only parentheses, curly brackets & square brackets, determine if **sequence** is valid.

```
class Stack<Char>() {
    private val els = mutableListOf<Char>()
    fun push(el: Char) = els.add(el)
    fun peek(): Char = els.last()
    fun pop(): Char = els.removeAt(els.size - 1)
    fun isEmpty() = els.isEmpty()
    fun size() = els.size
    override fun toString() = "Stack[${els.joinToString()}]"
}
```

```
fun isBalanced(sequence: String): Boolean {
    val stack: Stack<Char> = Stack()
    val map = mapOf(
        '(' to ')', ')' to '(',
        '[' to ']', ']' to '[',
        '{' to '}', '}' to '{'
    )

    // Write your solution here
}

fun main() {
    // Expected output:
    println(isBalanced("{([])}")) // true
    println(isBalanced("{([)])") // false
}
```

**sequence** is valid if:

- Open bracket must be closed by the same bracket type.
- Open bracket must be closed in the correct order.

```
// Example 1
Input: sequence = "()"
Output: true

// Example 2
Input: sequence = "() [] {}"
Output: true

// Example 3
Input: sequence = "{}"
Output: false

// Example 4
Input: sequence = "{[]}"
Output: false
```

**Resource:** [HackerRank YouTube Video - Balanced Parentheses](#)

### Problem 11:

You have been given a 5x5 grid or a **2D array** of zeros. Use the appropriate construct(s)/range(es) to access the items in the grid, i.e., zeros & replace them with Xs.

```
fun main() {
    var seating = arrayOf<Array<Any>>()
    for (i in 0..4) {
        var seat = arrayOf<Any>()
        for (j in 0..4) {
            seat += 0
        }
        seating += seat
    }

    // Write your solution here
}
```

```
    for (seat in seating) {
        for (value in seat) {
            print("$value ")
        }
        println()
    }

    // Expected output:
    // 0 0 0 0 X
    // 0 0 0 0 0
    // X X X 0 X
    // 0 0 0 0 0
    // 0 0 0 0 X
}
```

### Problem 12:

In the expected output below, the staircase is of size three. Its base & height are both equal to **numOfSteps**. Also, it is drawn using the hash symbol. Write the logic in the **generateSteps** function in order to display the expected output.

```
fun generateSteps(numOfSteps: Int): MutableList<String> {
    val stepSeq = mutableListOf<String>()

    // Write your solution here

    return stepSeq
}

fun main() {
    for (step in generateSteps(3)) {
        // Expected output:
        println(step) // #
                        // ##
                        // ###
    }
}
```

### Problem 13:

You have been given a function called **defangAddress** which accepts a **String** parameter **address**. This function returns a defanged version of **address**. A defanged address replaces every period "." with "[".]. Write the logic in the **defangAddress** function in order to display the expected output.

```
fun defangAddress(address: String): String {
    var defangedAddr = ""

    // Write your solution here

    return defangedAddr
}

fun main() {
    // Expected output:
    println(defangAddress("255.100.50.0")) // 255[.]100[.]50[.]0
}
```



### Problem 14:

You have been given an incomplete function called **isPerfectNumber** which accepts an **Int** parameter **num**. If **num** is a perfect number, return **true**, otherwise return **false**.

```
// Example 1
Input: num = 6
Output: true

// Example 2
Input: num = 2
Output: false

fun isPerfectNumber(num: Int): Boolean {
    // Write your solution here
}

fun main() {
    // Expected output:
    println(isPerfectNumber(5)) // false
    println(isPerfectNumber(6)) // true
}
```

**Resource:** [Wikipedia Article - Perfect Number](#)

### Problem 15:

You have been given an incomplete function called **removeDuplicates** which accepts an **IntArray** parameter **nums**. Given a sorted **integer array**, remove the duplicates such that each element occurs only once & return the new length of the **array**.

```
fun removeDuplicates(nums: IntArray): Int {
    // Write your solution here
}

fun main() {
    // Expected output:
    println(removeDuplicates(intArrayOf(0, 0, 1, 1, 2, 2, 3, 3, 4))) // 5
}
```