

# Assignment 1

## 1) General Instructions

- A. The assignment is meant to be done individually.
- B. The deadline for this assignment is 11:59 PM on Oct. 7, 2022.
- C. Academic dishonesty is unacceptable and will not be tolerated in this course.

### Question1

Using **IntelliJ** IDE to create your first project, under the package name you specified and print the following shape to the console

```
*
*  *
*  *  *
*  *  *  *
*  *  *  *  *
My Hello World
*  *  *  *  *
*  *  *  *
*  *  *
*  *
*
```

- Project name = HelloWorld
- Package name = com.example.HelloWorld
- Public class HelloWorld

### Create an artifact configuration for the JAR

- From the main menu, select **File | Project Structure** and click **Artifacts**.
- Click **+**, point to **JAR** and select **From modules with dependencies**.
- To the right of the **Main Class** field, click and select **HelloWorld (com.example)** in the dialog that opens.
  - IntelliJ IDEA creates the artifact configuration and shows its settings in the right-hand part of the **Project Structure** dialog.
- Apply the changes and close the dialog.

## Build the JAR artifact

- From the main menu, select **Build | Build Artifacts**.
- Point to **HelloWorld.jar** and select **Build**.
- If you now look at the **out/artifacts** folder, you'll find your JAR there.

Now send the project folder HelloWorld for evaluation.

## Question 2

Write a program that constantly takes two input integers and returns their division result ( $\text{num1}/\text{num2}$ ) and the remainder ( $\text{num1} \bmod \text{num2}$ ). For example, if  $\text{num1} = 5$  and  $\text{num2} = 2$ , division result is 2 and remainder is 1. Remember the divisor cannot be zero. Once it happened, your program should notify the user and terminates (you can use either if/else or try/catch for this)

```
Enter two integers for operation:
2
5
The division result is 0, the remainder is 2
Enter two integers for operation:
23
4
The division result is 5, the remainder is 3
Enter two integers for operation:
|
```

- Project name = Division
- Package name = com.example.Division
- Public class Division

## Create an artifact configuration for the JAR

- From the main menu, select **File | Project Structure** and click **Artifacts**.
- Click **+**, point to **JAR** and select **From modules with dependencies**.
- To the right of the **Main Class** field, click **+** and select **Division**
  - (**com.example**) in the dialog that opens.
  - IntelliJ IDEA creates the artifact configuration and shows its settings in the right-hand part of the **Project Structure** dialog.

- Apply the changes and close the dialog.

### Build the JAR artifact

- From the main menu, select **Build | Build Artifacts**.
- Point to **Division:jar** and select **Build**.
- If you now look at the **out/artifacts** folder, you'll find your JAR there.

Now send the project folder Division for evaluation.

### Question 3

Write a program that randomly generate scores(range from 0 to 100) for 100 students, prints the score of every student, and calculates the count of students who pass the exam( score above or equal 60).

```
The score of Student 90 is: 38
The score of Student 91 is: 57
The score of Student 92 is: 83
The score of Student 93 is: 30
The score of Student 94 is: 46
The score of Student 95 is: 85
The score of Student 96 is: 32
The score of Student 97 is: 75
The score of Student 98 is: 53
The score of Student 99 is: 14
The score of Student 100 is: 54
39 students pass the exam
Process finished with exit code 0
```

- Project name = Score
- Package name = com.example.Score
- Public class Score

### Create an artifact configuration for the JAR

- From the main menu, select **File | Project Structure** and click **Artifacts**.
- Click **+**, point to **JAR** and select **From modules with dependencies**.
- To the right of the **Main Class** field, click **+** and select **Score**
  - (**com.example**) in the dialog that opens.

- IntelliJ IDEA creates the artifact configuration and shows its settings in the right-hand part of the **Project Structure** dialog.
- Apply the changes and close the dialog.

### Build the JAR artifact

- From the main menu, select **Build | Build Artifacts**.
- Point to **Score:jar** and select **Build**.
- If you now look at the **out/artifacts** folder, you'll find your JAR there.

Now send the project folder **Score** for evaluation.

### Question 4.a

Given an unsorted array with a range from 0 to n-1, where n is the number of elements in the array.

- Assume arrays having the most two duplicates, please print out all duplicate numbers in the array. (requirement: time complexity  $O(n^2)$ , space complexity  $O(1)$ ). If you do not know how to calculate the complexity of algorithm, you can find the reference here: <https://www.baeldung.com/java-algorithm-complexity>

**Please read the array from file Q4a.txt**

Example: given: { 3, 4, 7, 0, 1, 1, 8, 9, 10, 0, 7, 9, 12}

The duplicated elements are : 0 1 7 9

- Project name = Duplicate
- Package name = com.example.Duplicate
- Public class Duplicate

### Create an artifact configuration for the JAR

- From the main menu, select **File | Project Structure** and click **Artifacts**.
- Click +, point to **JAR** and select **From modules with dependencies**.
- To the right of the **Main Class** field, click and select **Duplicate (com.example)** in the dialog that opens.
  - IntelliJ IDEA creates the artifact configuration and shows its settings in the right-hand part of the **Project Structure** dialog.
- Apply the changes and close the dialog.

### Build the JAR artifact

- From the main menu, select **Build | Build Artifacts**.
- Point to **Duplicate:jar** and select **Build**.
- If you now look at the **out/artifacts** folder, you'll find your JAR there.

Now send the project folder **Duplicate** for evaluation.

#### Question 4.b

- b. Assume arrays can have more than two duplicates, please print out all duplicate numbers in the array and how many times they appear in the array. (requirement: time complexity  $O(n)$ , space complexity  $O(n)$ )

**Please read the array from file Q4b.txt**

Example: given: { 3, 4, 7, 0, 0, 1, 1, 8, 9, 10, 0, 7, 9, 9, 9 12}

The duplicated elements are :

```
0 appear 3 times
1 appear 2 times
7 appear 2 times
9 appear 4 times
```

- Project name = MoreDuplicate
- Package name = com.example.MoreDuplicate
- Public class MoreDuplicate

#### Create an artifact configuration for the JAR

- From the main menu, select **File | Project Structure** and click **Artifacts**.
- Click +, point to **JAR** and select **From modules with dependencies**.
- To the right of the **Main Class** field, click and select **MoreDuplicate (com.example)** in the dialog that opens.
  - IntelliJ IDEA creates the artifact configuration and shows its settings in the right-hand part of the **Project Structure** dialog.
- Apply the changes and close the dialog.

#### Build the JAR artifact

- From the main menu, select **Build | Build Artifacts**.
- Point to **MoreDuplicate.jar** and select **Build**.
- If you now look at the **out/artifacts** folder, you'll find your JAR there.

Now send the project folder **MoreDuplicate** for evaluation.

#### Submission

1. Create a Hw1 root folder.
2. Store Jar and source code in the dedicated project folder with proper naming (i.e **MoreDuplicate** etc.) for each question
3. Put project folders under the root folder
4. Compress the root folder and submit it to Canvas.