Middle East Technical University **Department of Computer Engineering**

CENG 305

Object Oriented Programming with Java

Spring 2019-2020

Homework 2

Due Date: 10th May 2020, 23:59, via ODTUCLASS

1. Objectives

This assignment aims to make you familiar the concepts of ARRAYS and ARRAY LISTS. You are expected to write java code for the following three problems.

2. Questions

1. A teacher wants to reward his best three students of each exam, displaying the students' names on a screen in front of the school. For that purpose, the teachers keeps an ***ArrayList<Student>.*** In the Exam class, implement methods:
public void addExamScore(String StudentName, double score),
public String nameOfBestStudent()
to record the scores and return the names of the best student with the largest score.

Write a program that prompts the teacher to enter all exam scores and names, adds them to a Exam object, and displays the best student's name.

2. Write a program that reads number of countries, then the countries' names, number of death people, number of recovered people and displays a bar chart of the ratio of recovered people and death people, using asterisks. Prompt the user for the captions and data values.

3. Write a program that plays tic-tac-toe. The tic-tac-toe game is played on a 3 × 3 grid as in the photo at right. The game is played by two players, who take turns. The first player marks moves with a circle, the second with a cross. The player who has formed a horizontal, vertical, or diagonal sequence of three marks wins. Your program should draw the game board, ask the user for the coordinates of the next mark, change the players after every successful move, and pronounce the winner.

3. Specifications

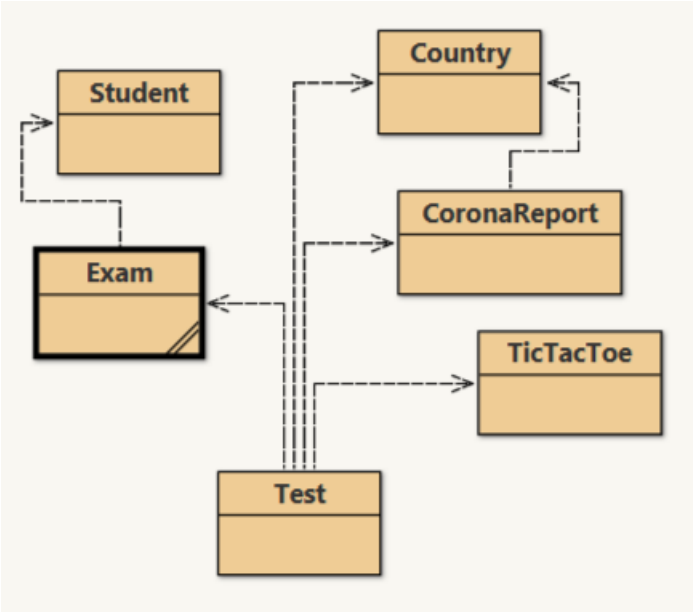
- **Programming Language:** You will use Java to implement the assignment. You should use BlueJ IDE to write and implement Java code. You can download it from www.bluej.org
- **The variables and functions must be used in the classes as it is indicated in the given UML diagrams above.You have to use private variables if it is indicated so. There is '-' sign at the beginning of variable or function if it is private and '+' for public.**
- **The descriptions for the functions are given in the table below.**
- **Sample runs for each question are indicated below figures.**
- Write documentation (javadoc) for your "classes", "methods" and "variables". Generate html documentation using javadoc. This documentation will affect 15 percent of your homework grade. You may want to check chapter 3.2.4 from the textbook (Big Java: Early Objects).

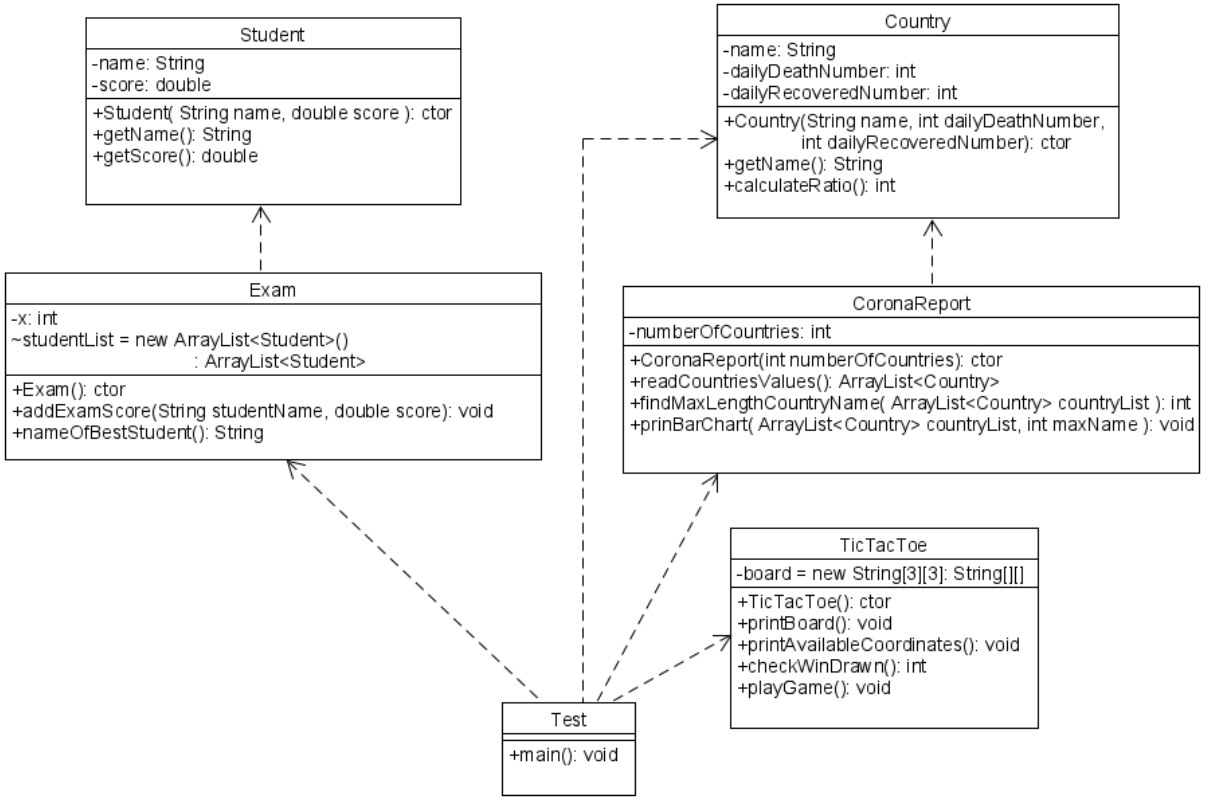
4. Regulations

1. **Submission type:** You will submit a zip file named as e1234567_ceng305_hw2.zip which includes all of your BlueJ project files and generated **javadoc** files. e1234567 should be your student identification number.
2. **Late submission:** In case of late submission your score will be calculated as follows:

   SCORE-(5*day*day)
3. **Cheating:** We have zero tolerance policy for cheating. People involved in cheating will be punished according to the university regulations. Your code will be compared with those of your friends both semantically and visually.
4. **No grouping:** The assignment has to be done individually.
5. **Communication:** You can use the 'discussion forum' on ODTUCLASS for your questions and share your ideas. Check the 'news forum' for announcements regulary. Also, you can contact with '***gozsari@metu.edu.tr***' for your problems or questions.
6. **Grading for hw2 is as follows:**
   a. Question 1: 25 points
   b. Question 2: 25 points
   c. Question 3: 35 points
   d. Javadoc files of your code: 15 points

Class	Function	Description
Student	public String getName()	Returns the name of the student
	public double getScore()	Returns the exam score of the student
Exam	public void addExamScore(String studentName, double score)	Takes the student name and exam score as arguments and adds the student to the array list of the students
	public String nameOfBestStudent()	Finds the maximum scoring student in the exam and returns the student name
Country	public String getName()	Returns the name of the country
	public int calculateRatio()	Calculates the ratio of daily Recovered Number and daily Death Number and returns the results
CoronaReport	public ArrayList<Country> readCountriesValues()	Reads country name, number of deaths, number of recovered people as an input from the user and forms country objects, records country objects to an array list of countries.
	public int findMaxLengthCountryName(ArrayList<Country> countryList)	As it can be seen from the output names of countries must be aligned to the right. Therefore, we need to find the maximum length of country names. Funtion takes the country list and find the maximum length of county names.
	public void prinBarChart(ArrayList<Country> countryList, int maxName)	Country list and maximum length of country names are the arguments. Function prints the bar char of the ratios which is calculated by the function " calculateRatio()".
TicTacToe	public void printBoard()	Prints the coordinates and current mode of the tic-tac-toe board
	public void printAvailableCoordinates()	Prints available coordinates on the board
	public int checkWinDrawn()	Checks if there is a win or drawn at each step. If the game is over returns -1 else returns 1.
	public void playGame()	The game continues till there is a win or drawn. Gets the coordinates of the place to be marked by the player as an input from the user. Marks the board accordingly and calls the check function (checkWinDrawn) at every step.


Country
Student
CoronaReport
Exam
TicTacToe
Test


Student
-name: String
-score: double
+Student(String name, double score): ctor
+getName(): String
+getScore(): double
Country
-name: String
-dailyDeathNumber: int
-dailyRecoveredNumber: int
+Country(String name, int dailyDeathNumber, int dailyRecoveredNumber): ctor
+getName(): String
+calculateRatio(): int
Exam
-x: int
~studentList = new ArrayList<Student>() : ArrayList<Student>
+Exam(): ctor
+addExamScore(String studentName, double score): void
+nameOfBestStudent(): String
CoronaReport
-numberOfCountries: int
+CoronaReport(int numberOfCountries): ctor
+readCountriesValues(): ArrayList<Country>
+findMaxLengthCountryName(ArrayList<Country> countryList): int
+prinBarChart(ArrayList<Country> countryList, int maxName): void
TicTacToe
-board = new String[3][3]: String[][]
+TicTacToe(): ctor
+printBoard(): void
+printAvailableCoordinates(): void
+checkWinDrawn(): int
+playGame(): void
Test
+main(): void

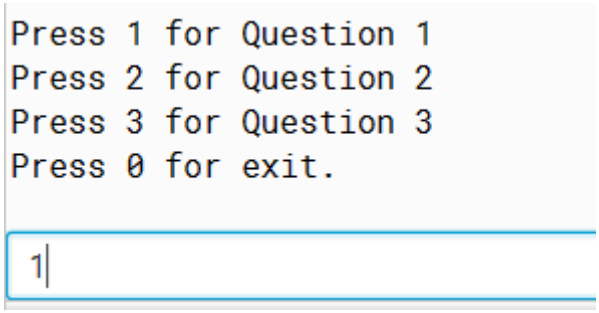


Figure 1: Question Menu

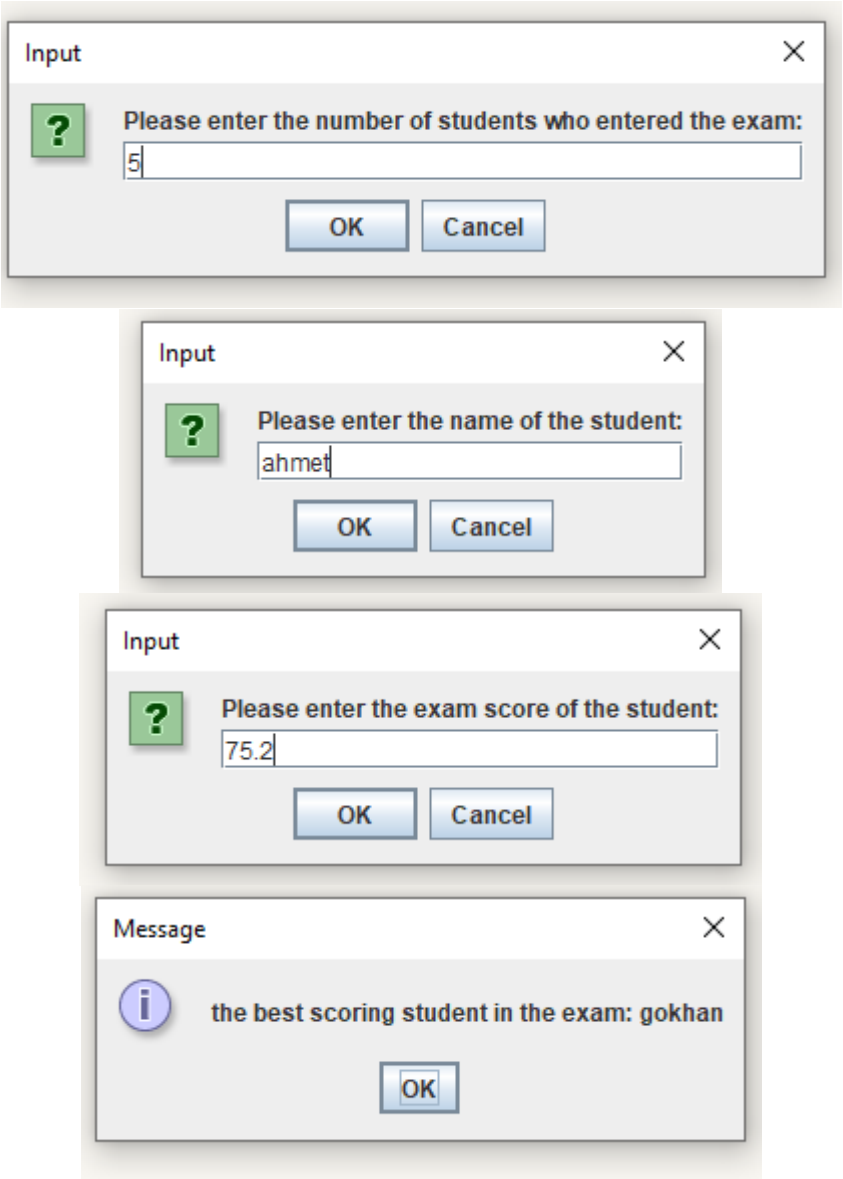


Figure 2: Sample run for question 1

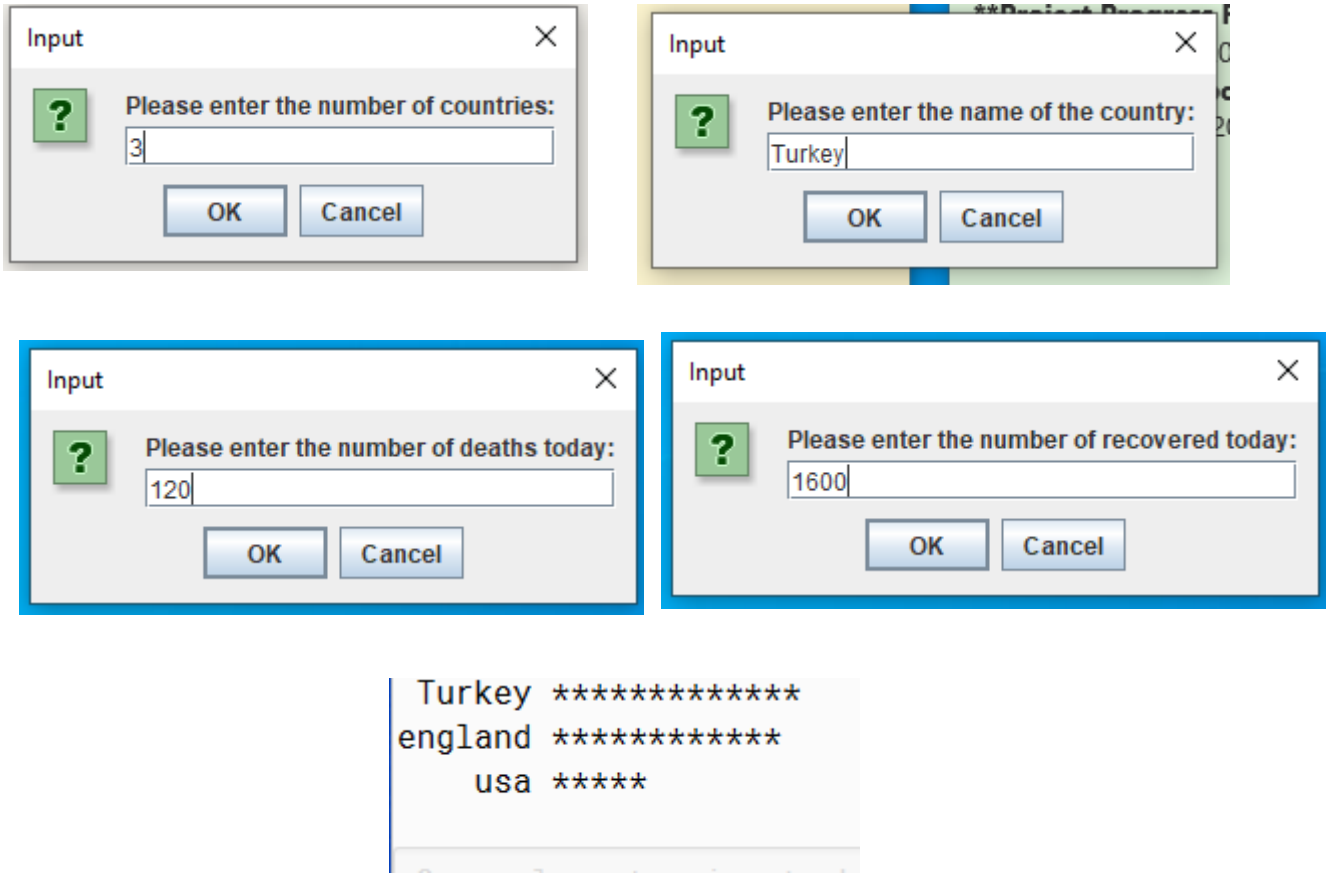
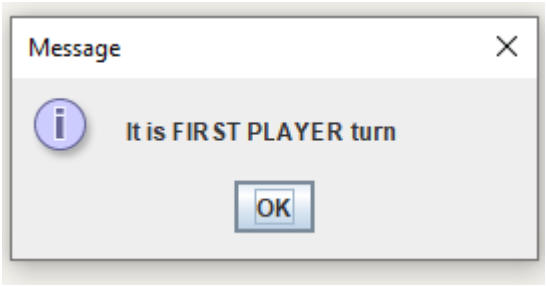
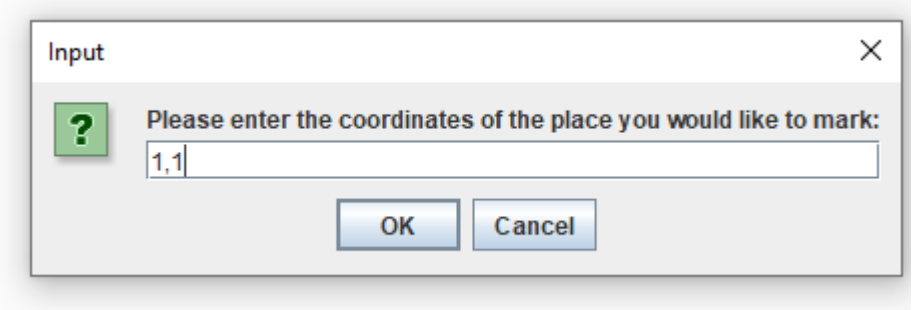


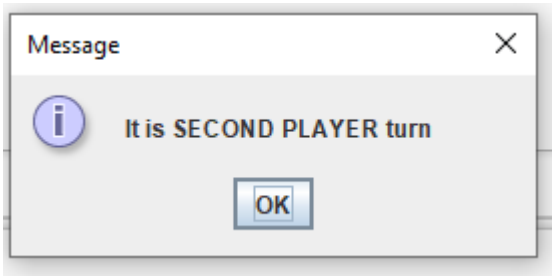
Figure 3: Sample run for question2

```
COORDINATES ON THE BOARD
(0,0)  (0,1)  (0,2)

(1,0)  (1,1)  (1,2)

(2,0)  (2,1)  (2,2)

CURRENT BOARD
-  -  -

-  -  -

-  -  -

AVAILABLE COORDINATES ON THE BOARD
(0,0), (0,1), (0,2), (1,0), (1,1), (1,2), (2,0), (2,1), (2,2),
```





```
COORDINATES ON THE BOARD
(0,0)  (0,1)  (0,2)

(1,0)  (1,1)  (1,2)

(2,0)  (2,1)  (2,2)

CURRENT BOARD
_  _  _

_  O  _

_  _  _

AVAILABLE COORDINATES ON THE BOARD
(0,0), (0,1), (0,2), (1,0), (1,2), (2,0), (2,1), (2,2),
```



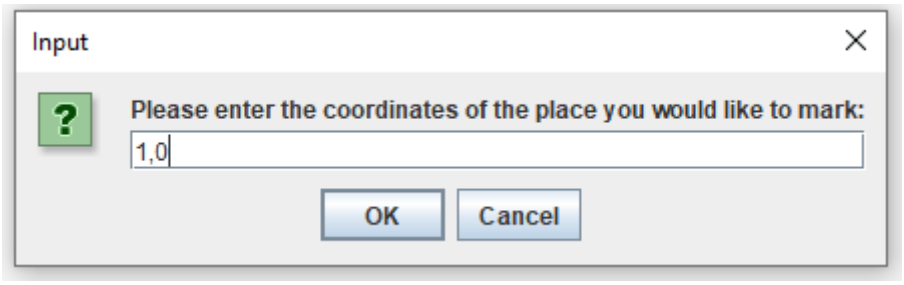


Figure 5 : Sample run for question 3

```
COORDINATES ON THE BOARD
(0,0)  (0,1)  (0,2)

(1,0)  (1,1)  (1,2)

(2,0)  (2,1)  (2,2)

CURRENT BOARD
_  _  _

X  O  _

_  _  _

AVAILABLE COORDINATES ON THE BOARD
(0,0), (0,1), (0,2), (1,2), (2,0), (2,1), (2,2),
```

Figure 6: Sample run for question 3

The game continues… First player puts O to (0,0), second player marks (1,2) and finally first player marks (2,2). Then the first player wins.

```
CURRENT BOARD
O  _  _

X  O  X

_  _  O
```

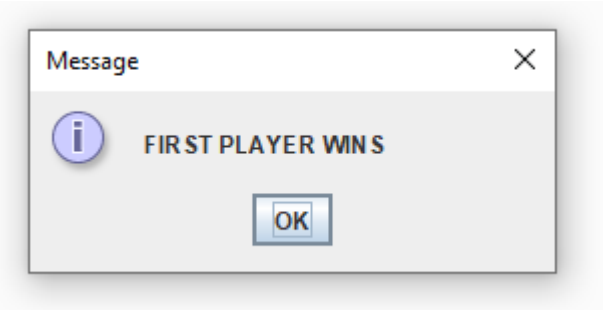


Figure 7: Sample run for question 3