CMPE 343 – Fall 2024-2025 – Course Project # 1

Topic: Fundamentals of Java Programming

Reviewers: Asst. Prof. Dr. İlktan Ar, Edin Koç, Göktuğ Ateş, Mehmet Kuzucu, Miray Köksal, Ozan Kutlar, and Tuna Zeyneloğlu.

> *You may discuss any part of the project with your classmates and related assistants (or anyone else) but all work for the project must be entirely your group. Any sharing or copying of part of projects will be considered cheating.*

Brief of Project and Important Dates

In the First Project of the CMPE343 course, you will develop a console application with Java (only one class with many methods) and generate documentation with JavaDoc tool. Your application must perform all the operations detailed under the Scenario-Objectives header. Each student will upload the Deliverables via learn.khas.edu.tr and join the presentations. Scenario-Objectives, Deliverables, Grading Formula, and Presentation details are in the following headers. Important dates for the First Project are:

- 15.October.2024 15:00-16:00 Kick-Off of project @ B-522.
- 1.November.2024 20:00 Due date for upload of deliverables.
- 4, 5, 11, 12 November 2024 Live Demo & QA @ B-311 & B-522.

Project Scenario-Objectives

When the user initiates the application through the command prompt, the program will display a welcome message using ASCII Art (https://en.wikipedia.org/wiki/ASCII_art), which includes the names of the team members. The user will then be prompted to select an operation from a menu. The <u>menu</u> will present the following options:

- [A] Statistical Information about an array,
- [B] Matrix Operations,
- [C] Text Encryption/Decryption,
- [D] Tic-tac-toe HotSeat,
- [E] Terminate.

The application should continue running unless the user chooses to terminate it. If an invalid option is selected, the user will be notified, and the menu will be re-displayed.

When the user selects option A, the console will be cleared, and the program will display the name of the operation. The user will then be prompted to input the size of the array, followed by the elements (as double values). The program will compute and display statistical information such as the median, arithmetic mean, geometric mean, and harmonic mean of the array. Once completed, the user will be prompted to return to the main menu. If an invalid data type is entered, the program will alert the user to correct it, but it will not terminate. The harmonic mean must be calculated using a <u>recursive method</u>. You should prefer an approach to find the median in even-sized vectors.

When the user selects option B, the screen will be cleared, and a submenu will appear, offering operations such as Transpose, Inverse, Matrix Multiplication, Element-wise Multiplication, and Return to the Main Menu. The user will first enter the dimensions of the matrix or matrices and then input the values for each matrix element. The program will compute and display the results of the chosen operation in a <u>formatted output</u>. After completing the

operation, the user will be prompted to return to the submenu. If an invalid data type is entered, the program will prompt the user to correct the input without terminating. It is important to note that <u>not all matrices are non-singular square matrices</u>, and this should be handled accordingly. You are not allowed to use predefined methods for matrix operations instead you will <u>code your own methods</u>.

When the user selects option C, the screen will be cleared, and a submenu will be displayed, listing operations such as Encryption, Decryption, and Return to the Main Menu. If the user selects Encryption or Decryption, they will be asked to provide an integer shift value within the range [-26, 26] and input the text to encrypt or decrypt. The program will use the <u>Caesar cipher encryption technique</u> (https://en.wikipedia.org/wiki/Caesar_cipher) to process the text. A shift value of zero indicates no encryption. Positive shift values will shift characters to the right during encryption and to the left during decryption. Negative shift values will shift characters to the left during encryption and to the right during decryption. If the shift value is outside the valid range, the program will display an error message and return to the submenu. Non-alphabetic characters (such as digits and spaces) should remain unchanged.
You should study java.lang.Character:
(https://docs.oracle.com/en/java/javase/23/docs/api/java.base/java/lang/Character.html)

Example
key: 5
message: This is nice!
encrypted message: Ymnx nx snhj!

key: 5
message: Ymnx nx snhj!
decrypted message: This is nice!

When the user selects option D, the screen will be cleared, and the board will be initialized to an empty state. The Tic-Tac-Toe game (https://en.wikipedia.org/wiki/Tic-tac-toe) will proceed in turns, with player X going first, followed by player O. The game will continue until a player wins or the board is full, resulting in a tie. After each move, the program will check for a winner. The program should restrict the players to valid moves (i.e., the cell must be unoccupied, and the input must be valid). If an invalid move is attempted, the player will be prompted to try again. At the end of the game, the program will display the final result (<u>X wins</u>, <u>O wins</u>, or a <u>tie</u>) along with the <u>total number of turns</u>.

Starting with this project, you are required to use **Javadoc** style comments. This allows for the automatic generation of HTML documentation for your code and is the standard for Java developers (https://docs.oracle.com/en/java/javase/23/javadoc/javadoc-tool.html). You should document your classes and methods with as many relevant tags as possible.

Your project should consist of a single source file (.java) that contains the main method and several public methods reflecting the various operations. Ensure that your code runs without errors before submission. The team will collaborate on the code using **GitHub**, and you will share your source code with the assigned assistant. <u>You must present your application to the assistant</u> to receive approval for participation in the live demo.

<u>Deliverables</u>

Each student will upload two files to the learn.khas.edu.tr via assignments tab:

- java source code of the project (GroupXX.java)
- zip file containing Javadoc documents related to your code (GroupXX.zip)

   Note that .java and .zip files within the group must be the same!

Grading Formula

We will use the below formula to form your score for Project 1:

$$YourScore = [w_1 \times (IndividualPerformance) + w_2 \times (GroupScore)]$$

while w_1 is 0.5, and w_2 is 0.5 for this project.

IndividualPerformance indicates your performance on the Live Demo & QA which ranges between 0 and 100.

GroupScore indicates the Completeness, Correctness, and Consistency of the uploaded files which ranges between 0 and 100.

Presentation Details

Each group member is required to participate in the presentation.

On the presentation day, the Leader of the group will download the submitted deliverables from learn system and will compile-run the code on his/her laptop.

Reviewers may interrupt the presentation at any point and ask other members to continue. Additionally, the reviewers will ask questions to each team member regarding the project's implementation, their individual contributions, and related course topics.

The presentation order for the groups will be determined by a face-to-face random assignment on October 22, 2024. The finalized order will be announced via learn.khas.edu.tr.

Please note that the presentation order for the second projects will be the reverse of the order used for the first projects.

Plagiarism

Plagiarism is taking and using another person's thoughts, ideas, writings, images, or music as your own, without acknowledging or giving appropriate references as to the source of those ideas and expressions. In the case of copyrighted work, plagiarism is illegal. Plagiarism on assignments is a serious offense and the student receives an immediate failing grade for the assignment and/or the class. There are no exceptions to this rule. You may also face additional, more severe disciplinary action. If you are in doubt about the definitions of plagiarism, consult your course instructors.