Deadline: 27.11.2023 12:00

Name _____ **Effort in hours** _____

1. Connect Four (aka. Vier gewinnt)

The game *Connect Four* (called *Vier gewinnt* in German) is a strategy game for two players. It is played on a grid of six rows and seven columns. The players first choose a color (red or yellow) and then drop one disc at a time in turns from the top of the grid. The discs fall straight down and occupy the lowest available space of the column. The objective of the game is to connect four of your own discs to form a horizontal, vertical, or diagonal row. Figure 1 shows the grid in a final state and Figure 2 shows an exemplary sequence of 9 moves.

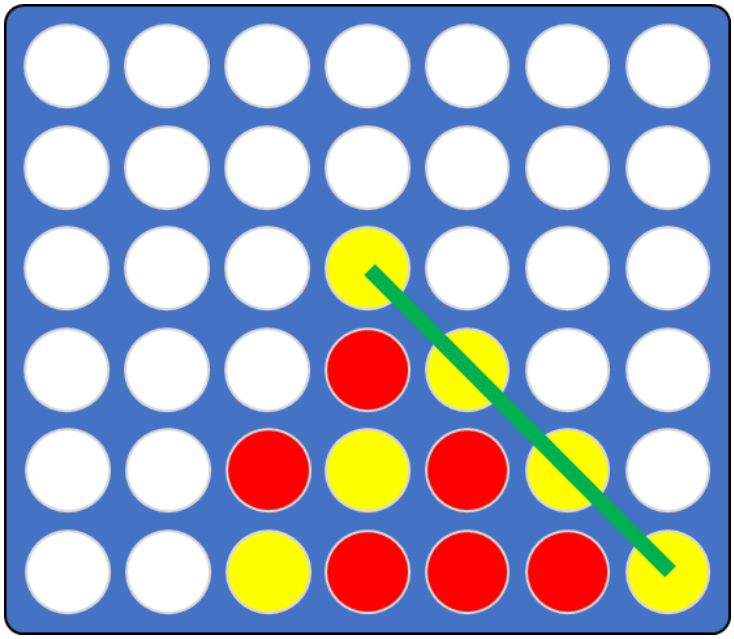

Figure 1: Yellow Player wins

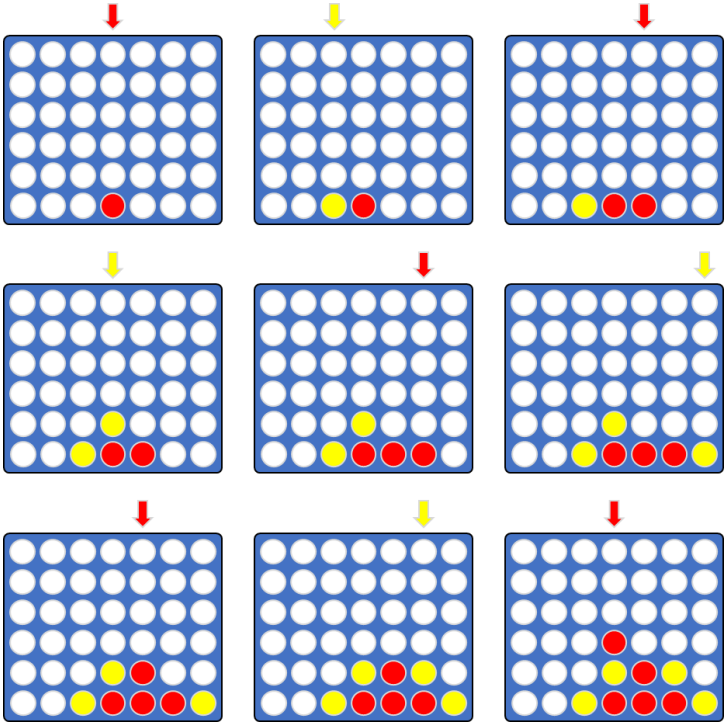

Figure 2: Exemplary Sequence of 9 moves

Your task is to implement a web application for the game, to test it with unit tests, and to set up a CI/CD pipeline to build, test, package, and deploy the application automatically. Thereby follow the following steps:

a) Start with the backend of the game by implementing a class *Board* which represents the grid and offers a *drop* method to drop a yellow or red disc into one of the columns. Implement another class *ConnectFour* which uses an instance of *Board* and implements the logic of the game. Keep the SOLID principles in mind in order to create well-structured and testable code.

b) Add appropriate unit tests to thoroughly test the functionality of both classes. Use test doubles (i.e., stubs, mocks, spies, etc.) where needed and refactor your code where necessary to improve its quality.

c) Implement a simple Java Servlet and a web application for the game where both players take turns (i.e., you do not have to implement an artificial player). The game can be reset at any time and otherwise it is executed until one of the players wins or it ends in a tie.

d) Set up a CI/CD pipeline using GitHub Actions to build, test, package, and deploy your application. Use a GitHub hosted runner to execute the build, test, and package step, and a self-hosted runner for deploying the application.