# **Sample Refactoring Documentation for Project “Minesweeper-4”**

Team “Minesweeper-4”

1. Redesigned the project structure:

* Extracted class in a separate file: **ScoreRecord.cs**.
* Renamed namespace from **mini4ki** to **Minesweeper**.
* Created classes with appropriate names to make the code testable: **ScoreBoard.cs**, **GameField.cs** and **Posision.cs**.
* Renamed main class from **MinesweeperMain** to **MinesweeperGame**.

1. Reformatted the source code:

* Removed unnecessary using statements.
* Removed all unneeded empty lines.
* Inserted empty lines between the methods.
* Formatted the curly braces **{** and **}** according to the best practices for the C# language.
* Put **{** and **}** after all conditionals and loops (when missing).
* Character casing: variables and fields made **camelCase**; types and methods made **PascalCase**.
* Formatted all other elements of the source code according to the best practices introduced in the course “High-Quality Programming Code”.

1. Extracted class **ScoreRecord** from the **Minesweeper** class and moved all related functionality to it.

* Specified its fields as private.
* Removed empty constructor.
* Rearranged the code to match the best practices introduced in the course e.g. first fields, than constructors, than properties, than methods, etc.
* Added “**this.**” when accessing the fields from the properties.
* Made all access to the fields through the properties.
* Introduced **ToString()** method.

1. Introduced class **ScoreBoard** and moved all related functionality in it.
2. Renamed variables:

* In class **Minesweeper: counter -> score**.
* In class **Minesweeper: bombed -> isGameOver**.
* In class **Minesweeper: flag -> isGameWon**.
* In class **Minesweeper: welcomeFlag -> isNewGame**.
* In class **Minesweeper: rowIndex -> row**.
* In class **Minesweeper: columnIndex -> col**.
* In class **Minesweeper: selectedCommand -> command**.
* In class **Minesweeper:** **MaxRevealedCells -> ScoreToWin**.
* In class **ScoreRecord**: **personName ->** **playerName**.
* In class **ScoreRecord**: **scorePoints ->** **playerScore**.
* In class **ScoreBoard**: **champions ->** **highScores**.

1. Introduced constants in the **GameField** class:

* **FieldRows** = 5.
* **FieldColumns** = 10.
* **BombsCount** = 15.

1. Moved **PrintScoreBoard(…)**’s logic from the main class to a **ToString()** override in the **ScoreBoard** class.
2. Moved **PrintBoard(…)**’s logic from the main class to a **ToString()** override in the **GameField** class.
3. Moved **CreateWhiteBoard()** and **CreateBombBoard()**’s logic from the main class to a **GenerateGameField()** method in the **GameField** class.
4. Moved **CalculateBombBoard(…)**’s logic from the main class to a **RevealField()** method in the **GameField** class.
5. Moved **CalculateHowManyBombs (…)**’s logic from the main class to a **RevealPosision(…)** method in the **GameField** class.
6. Removed **MakeAMove(…)** method from the main class and reassigned its job to **RevealPosision(…)** and **RevealField()**.
7. Extracted all game logic from the **Main()** method to a new class **Engine**. Encapsulated the data and made the new class a **Singleton**.
8. Made the fields **gameField** and **scoreBoard** static. Implemented lazy instantiation.
9. Added **ClassStructure** class diagram
10. Added **IScoreRecord** interface
11. Implemented **IScoreRecord** on **ScoreRecord** class
12. Performed property validation in **ScoreRecord** class
13. The following has been changed in **ScoreBoard** class:

* Separated part of the **AddScore()** logic in **SortEqualHighScores(…)**
* Added **Reset()** method (Re-instantiating the class on game restart is not needed anymore)
* Modified **if** statement on **line 55** (there is a comment)
* Implemented *Dependency Inversion*

1. Separated part of the logic of **Start()** in few methods in **Engine** class. *The class is still refactored.*
2. Separated the logic for counting surrounding bombs from **RevealPosition()** in new method **SurroundingBombCount()**.
3. Replaced the use of **Field.GetLength()** with the constants **FieldRows** and **FieldColumns**
4. Fixed logic error in **Reveal()** **rowIsInRange** and **colIsInRage** which was causing exceptions when entered number is greater by one then the maximum rows or columns in the field.
5. Implemented **Memento design pattern** for saving and restoring the game field.

* Added the following classes: **GameFieldMemento**, **GameFieldSave**.
* Added **Save()** and **Restore()** methods to the **GameField** class.
* Added **SaveCommand()** and **RestoreCommand()** methods to the **Engine**.
* Made **gameField** in **Engine** class non-static.
* Added **constructor overload** for the class **Position** that takes all the information for it to make deep-copying of the **Engine**’s **gameField** easier (the properties are currently read-only).

1. Created new method **ReadCommand()** which process the input data from the console. Moved all data checks from **Reveal()** to **ReadCommand()**. Extracted the switch from **Start()** into separate method **ExecuteCommand().**
2. Removed **Command** parameter from **Engine.**
3. Separated rendering logic from **Engine** to **Renderer**
4. Implemented Factory Method Pattern:

* **Creator**: Defines abstract object creation;
* **GameCreator**: Implements **Creator** with concrete types;

1. Added **IGameFieldSave** interface
2. Added the new method **SetNewField()** in **GameField** in order to avoid re-instantiating it (**GameField**) in **Engine**
3. Updated **ClassStructure.cd**
4. Structured files in folders (namespaces) by their respective type and functionality as follows:

* **ScoreBoard** and **ScoreRecord** in *Scoring*; **IScoreRecord** in *Contracts* subfolder;
* **GameFieldSave** and **GameFieldMemento** in *Saving*; **IGameFieldSave** in *Contracts* subfolder;
* **Renderer** in *Rendering*; **IRenderer** in *Contracts* subfolder;
* **Creator** and **GameCreator** in *GameFactory*;
* **ClassStructure.cd** in *StructureDiagrams*;

1. Extracted repeating code for adding a high score in the methods **GameOver()** and **GameWon()** in the class **Engine**. Named the new method – **RecordResult()**.
2. Added unit tests for the **ScoreBoard** and **ScoreRecord** in **ScoreTests** class.
3. Added unit tests for **Position** class.
4. Added unit tests for **GameField** class.
5. Added a console clearing in **RenderGameField()**. Added **RenderSaveDone()** method when saving. At game end, asks for a command instead of starting a new game – see method **GameOver()** in **Engine()**.
6. Extracted the logic for the commands in a separate class – **ControlManager()**, which implements the interface **ISaveControls**. This interface has a more base version called **IBaseControls**.
7. The **Creator** class now holds the Boolean parameters **IsNewGame, IsGameOver** and **IsGameOn**, as well as an instance of **GameField** which is to be used by everyone.
8. Moved all the newly added parameters (pt. 39) in **Creator** to a new separate class **GameStateManager**.
9. Separated user input functionality from **Engine** (check *UserInput* folder)
10. Added few new messages to **Renderer**
11. Added **IGameField** and **IScoreBoard** interfaces and changed the code to use them everywhere the classes were user.
12. Fixed a problem with saving where after restore the game could not get finished because it only ended when the score becomes 35 which is not possible after restore.
13. Did all the changes StyleCop pointed out and changed properties to look consistent throughout the code.
14. Removed namespace **Saving** and replaced it with **Field**. Moved all **GameField** related classes and interfaces to it.
15. Implemented Command pattern.

* Added **IRenderCommand** which executes different methods of a given **IRenderer** depending on the command that is given.
* Added **RendererCommand** which implements **IRendererCommand** to avoid repeating code in the specific commands. It is abstract.
* Added the following render commands: **RenderExitApplicationCommand**, **RenderMessageInvalidCommand**, **RenderRestoreSaveCommand**, **Render**-**SaveCommand**, **RenderScoreBoardCommand**, all of which inherit the **RenderCommand** class.