Bulls and Cows Project Refactoring Documentation

1. Redesigned the project structure

* Renamed the project to BullsAndCows
* Renamed the main class Program to BullsAndCowsTest

1. Reformatted the source code

* Removed all unneeded empty lines
* Inserted empty lines between the methods
* Split the lines containing several statements into several simple lines

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| private static void tryAddToScoreboard()  {  if (klasirane.Count < 5 || klasirane.ElementAt(4).Key > attempts) {  Console.WriteLine("Please enter your name for the top scoreboard: ");  string name = Console.ReadLine().Trim();  klasirane.Add(attempts, name);  if (klasirane.Count == 6)  klasirane.RemoveAt(5);  DisplayTop();  }  } |
| private static void AddToScoreboard()  {  if (scoreboard.Count < 5 || scoreboard.ElementAt(4).Key > attempts)  {  Console.WriteLine("Please enter your name for the top scoreboard: ");  string name = Console.ReadLine().Trim();  scoreboard.Add(attempts, name);  if (scoreboard.Count == 6)  {  scoreboard.RemoveAt(5);  }  DisplayTop();  }  } |

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| static void ProcessGuess(int guess)  {  if (guess == number)  {  ProcessWin();  }  else  {  string snum = number.ToString(), sguess = guess.ToString();  bool[] isBull = new bool[4];  int bulls = 0, cows = 0;  for (int i = 0; i < 4; i++)  if(isBull[i] = snum[i] == sguess[i]) bulls++;    int[] digs = new int[10];  for (int d = 0; d < 10; d++)  digs[d] = 0;  for (int i = 0; i < 4; i++)  if (!isBull[i])  digs[snum[i] - '0']++;  for (int i = 0; i < 4; i++)  {  if (!isBull[i])  {  if (digs[sguess[i] - '0'] > 0)  {  cows++;  digs[sguess[i] - '0']--;  }  }  }  Console.WriteLine("Wrong number! Bulls: {0}, Cows: {1}", bulls, cows);  attempts++;  }  } |
| static void ProcessGuess(int guess)  {  if (guess == number)  {  ProcessWin();  }  else  {  string snum = number.ToString(), sguess = guess.ToString();  bool[] isBull = new bool[4];  int bulls = 0, cows = 0;  for (int i = 0; i < 4; i++)  {  if (isBull[i] = snum[i] == sguess[i])  {  bulls++;  }  }  int[] digs = new int[10];  for (int d = 0; d < 10; d++)  {  digs[d] = 0;  }  for (int i = 0; i < 4; i++)  {  if (!isBull[i])  {  digs[snum[i] - '0']++;  }  }  for (int i = 0; i < 4; i++)  {  if (!isBull[i])  {  if (digs[sguess[i] - '0'] > 0)  {  cows++;  digs[sguess[i] - '0']--;  }  }  }  Console.WriteLine("\nWrong number! Bulls: {0}, Cows: {1}", bulls, cows);  attempts++;  }  }  }  DisplayTop();  }  } |

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| --- |
| static void Cheat() {  notCheated = false;  if (ch.Contains('X')) {  int i;  do i = rr.Next(0, 4);  while (ch[i] != 'X');  char[] cha = ch.ToCharArray();  cha[i] = number.ToString()[i];  ch = new string(cha);  }  Console.WriteLine("The number looks like {0}.", ch);  } |
| static void Cheat()  {  notCheated = false;  if (ch.Contains('X'))  {  int i;  do{  i = randomNumber.Next(0, 4);  }  while (ch[i] != 'X');  char[] cha = ch.ToCharArray();  cha[i] = number.ToString()[i];  ch = new string(cha);  }  Console.WriteLine("The number looks like {0}.", ch);  } |

1. Renamed variables and methods

* Rename the method **tryAddToScoreboard**() to **AddToScoreboard()**
* Rename the method **DisplayTop()** to **ShowScoreboard()**
* Rename the method

1. Introduced constants
2. Extracted methods

* Sepatate method **ReadAction()** to 2 new methods **ReadAction()** and **CommandExecution(Command command)**

1. Introduced **class Command** and create functionality in it.
2. Introduced **static** **class InterfaceMessages** and create functionality in it.
3. Moved the methods **AddToScoreboard()** and **ShowScoreoard()** from **Main()** method to separate **class Scoreboard**
4. Moved the method **Cheat()** form **Main()** method to separate **class Help**
5. Moved the method **StartNewGame()**, **ReadAction()**, **ProcessWin()**, **ProcessGuess()**, **IsValidGuessNumber()** to separate **class GameEngine**
6. Introduced **class NullPlayer**
7. Introduced **interface IPlayer**
8. Introduced **class Player**
9. Introduced **class Command**
10. Introduced **abstract** **class NumberGenerator**
11. Introduced **class RandomNumberGenerator**
12. Introduced **class NumbersComparer**