**Test-Driven Development Exercise: Bowling Score Keeper**

The application’s requirements are divided into a set of user stories, which serve as your to-do list. You should be able to incrementally develop a complete solution without an upfront comprehension of all the game’s rules. Don’t read ahead, and handle the requirements one at a time in the order provided.

Only when a story is done, move on to the next one. A story is done when you are confident your program correctly implements all the functionality stipulated by the story’s requirement. This implies *all* of your test cases for that story and *all* of the test cases for the previous stories pass. You may need to tweak your solution as you progress towards more advanced requirements.

**1. Frame**

*Each turn of a bowling game is called a* ***frame****. 10 pins are arranged in each frame. The goal of the player is to knock down as many pins as possible in each frame. The player has two chances, or* ***throws****, to do so. The value of a throw is given by the number of pins knocked down in that throw.***Requirement:** Define a frame as composed of two throws. The first and second throws should bedistinguishable.

**Example:** [2, 4] is a frame with two throws, in which two pins were knocked down in the first throwand four pins were knocked down in the second.

**2. Frame Score**

*An ordinary frame’s score is the sum of its throws.*

**Requirement:** Compute the score of an ordinary frame.

**Examples:** The score of the frame [2, 6] is 8. The score of the frame [0, 9] is 9.

**3. Game**

*A single game consists of 10 frames.*

**Requirement:** Define a game, which consists of 10 frames.

**Example:** The sequence of frames [1, 5] [3, 6] [7, 2] [3, 6] [4, 4] [5, 3] [3, 3] [4, 5] [8, 1] [2, 6]represents a game. You will reuse this game from now on to represent different scenarios, modifying only a few frames each time.

**4. Game Score**

*The score of a bowling game is the sum of the individual scores of its frames.*

**Requirement:** Compute the score of a game.

**Example:** The score of the game [1, 5] [3, 6] [7, 2] [3, 6] [4, 4] [5, 3] [3, 3] [4, 5] [8, 1] [2, 6] is 81.

**5. Strike**

*A frame is called a* ***strike*** *if all 10 pins are knocked down in the first throw. In this case, there is no second throw. A strike frame can be written as [10, 0]. The score of a strike equals 10 plus the sum of the next two throws.*

**Requirement:** Recognize a strike frame. Compute the score of a strike. Compute the score of a gamecontaining a strike.

**Examples:** Suppose [10, 0] and [3, 6] are consecutive frames. Then the first frame is a strike and itsscore equals 10 + 3 + 6 = 19. The game [10, 0] [3, 6] [7, 2] [3, 6] [4, 4] [5, 3] [3, 3] [4, 5] [8, 1] [2, 6] has a score of 94.

**6. Spare**

*A frame is called a* ***spare*** *when all 10 pins are knocked down in two throws*. *The score of a spare frame is 10 plus the value of the first throw from the subsequent frame.*

**Requirement:** Recognize a spare frame. Compute the score of a spare. Compute the score of a gamecontaining a spare frame.

**Examples:** [1, 9], [4, 6], [7, 3] are all spares. If you have two frames [1, 9] and [3, 6] in a row, thespare frame’s score is 10 + 3 = 13. The game [1, 9] [3, 6] [7, 2] [3, 6] [4, 4] [5, 3] [3, 3] [4, 5] [8, 1] [2, 6] has a score of 88 (13 + 9 + 9 + 9 + 8 + 8 + 6 + 9 + 9 + 8).

**7. Strike and Spare**

*A strike can be followed by a spare. The strike’s score is not affected when this happens.* **Requirement:** Compute the score of a strike when it’s followed by a spare. Compute the score of agame with a spare following a strike.

**Examples:** In the sequence [10, 0] [4, 6] [7, 2], a strike is followed by a spare. In this case, the scoreof the strike is 10 + 4 + 6 = 20, and the score of the spare is 4 + 6 + 7 = 17. The game [10, 0] [4, 6] [7, 2] [3, 6] [4, 4] [5, 3] [3, 3] [4, 5] [8, 1] [2, 6] has a score of 103.

Congratulations, you are done!