CS 201R

Spring 2022

Deadline: Tuesday, February 22, 2022

Program 2 – Take it or leave it!

For our second program, we're going to implement a game; "**Make sure to use functions to implement the program."**

The game Take It Or Leave played with 16 cards, numbered 1-16. First, the cards are shuffled and placed face-down, so the numbers can't be seen. Then, the player draws from the deck one card at a time and turns the card face up to reveal the number.

The player now has two choices. A player may take the number, in which case it's added to the player's score, or the player can leave it, in which case it is lost forever. (Well, for this game.) The catch is that once a number is taken, the player cannot take any smaller number in the future. In other words, the numbers kept by the player must form an increasing sequence. Of course, the player must decide about taking or leaving before turning over the next card.

So when the player takes a number, any numbers remaining in the deck that are smaller than that number are effectively 'dead' and play no further part in the game. The kept cards are left face up, so the player can quickly tell what 'live' cards remain in the deck; no extraordinary memory feats are required.

The program should turn over the next card; if it's dead, this should be printed based on what's been chosen so far and the next card turned over. If the card is still live, the user should be asked if they want to take it or leave it. Whatever they choose, the game state is updated appropriately, and the game continues until all cards are turned over. At that point, the final Score should be printed, and the user should be asked if they want to play again.

**Programming & Development notes:**

* You can shuffle an array/vector by looking at each item in turn and swapping it with a randomly-chosen item.
* This details everything you need to write the program; some notes on playing the game are below.

**Playing the game:**

Your problem is to decide whether to take or leave the card you turn up, knowing what live cards remain in the deck, with the objective of maximizing your expected Score. For example, suppose there are three live cards left, the 7, 10, and 11, and the 11 is turned up. Should you take it or leave it? First, notice that the cards you have taken in the past are irrelevant to this decision. The Score you have made already won't change, whatever you decide. So, you need to maximize your Score from the three remaining live cards.

Now, if you take the 11, the 7 and 10 are dead, and you will score exactly 11. If you leave the 11, two things can happen. The next card you turn over might be the 7, and you can take it and be sure of also taking the 10, for a total score of 17. On the other hand, you might turn over the 10, and then the best you can do is to take it, killing the 7 and scoring a total of 10. Now, these two possibilities are equally likely, so your expected Score is their average, (17 + 10) / 2 = 13.5. This is better than the 11 you score if you take, so you should leave the 11.

**Output:**

Your program should play Take It or Leave It with the user, providing the following at each turn:

Current Score (in a single line), Dead Cards (sorted into increasing order, printed in a single line), Live cards(sorted into increasing order, printed in a single line), next card(in a single line).

A picture containing text

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