Problem of the Week
Problem E
Search and Swap

Randi has a deck consisting of 10 cards. One side of each card is red and the other side of each card has one of the letters A, B, C, D, E, F, G, H, I, or J on it. Each letter occurs exactly once. The cards are shuffled and placed letter-side down on a table from left to right.

Every time Randi looks for a letter, she turns over cards one by one starting with the leftmost card and moving to the right. If a card does not have the letter she is looking for on it, Randi puts it back letter-side down in the same location and continues with the next card. If a card does have the letter she is looking for on it, Randi swaps the locations of this card and the card on its immediate left placing both cards letter-side down. One exception is when she finds the letter she is looking for on the leftmost card. In this case, Randi puts the card back letter-side down in the same location and no swap occurs. Either way, once Randi finds the letter she is looking for, she does not look at any more cards. Also, Randi never remembers the locations of any cards on the table.

For example, suppose Randi is asked to find the letter E and the cards were on the table as shown below.

Randi would look at each of the first 6 cards and return each of them, letter-side down, to the same place on the table. When she looked at the seventh card and found that it was the E, she would swap the location of the E and the I. So to locate the letter E, Randi looked at 7 cards and the resulting card ordering would be as follows.

To find another card, Randi must begin her search with the leftmost card. For example, If next she wanted to search for the F, she would look at the G and B and not change their locations. She would then look at the third card, see the F, and swap the locations of the third and second card. The resulting card ordering would be as follows.

After searching for the E and the F, Randi has looked at a total of $7 + 3 = 10$ cards.

If the ten cards begin in some unknown order and Randi searches for each of the ten letters exactly once, what is the maximum possible number of cards that Randi looks at?