

Selection Sort

Sort'in One up at a time

1-player game

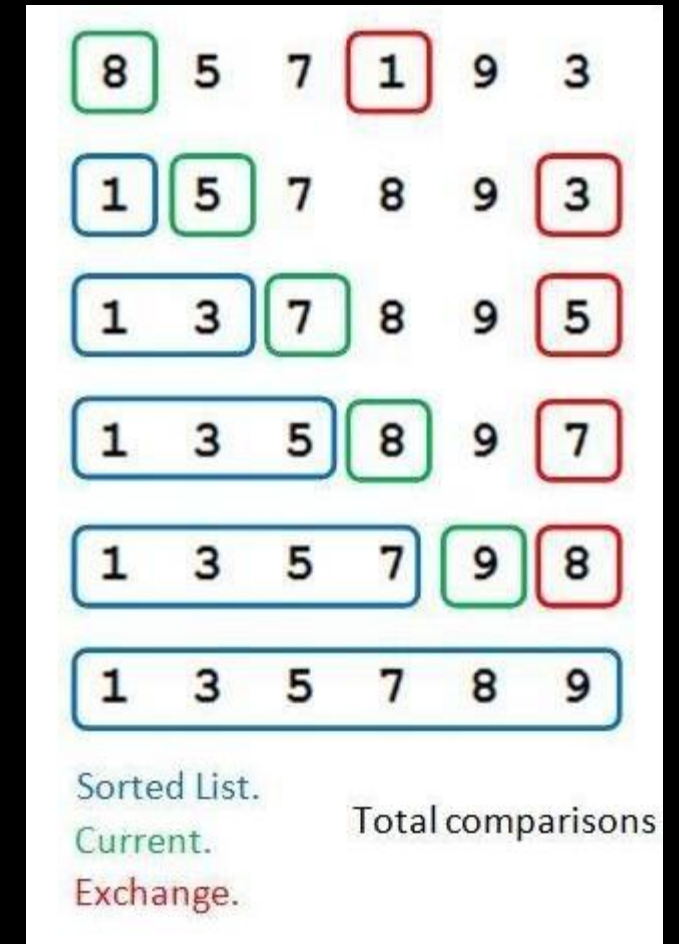
- **Objective: Sort the cards (in ascending order) only revealing one card at any time.**
- Rules:
- Player 1 (sorter)
- 5 Number cards lay out and faced down
- Sorter can choose **only 1 card to be faced up at any point in time.**
- Sorter can peek at the cards which are faced down, **one at a time.**
- Cards can only be swapped

What are some strategies?

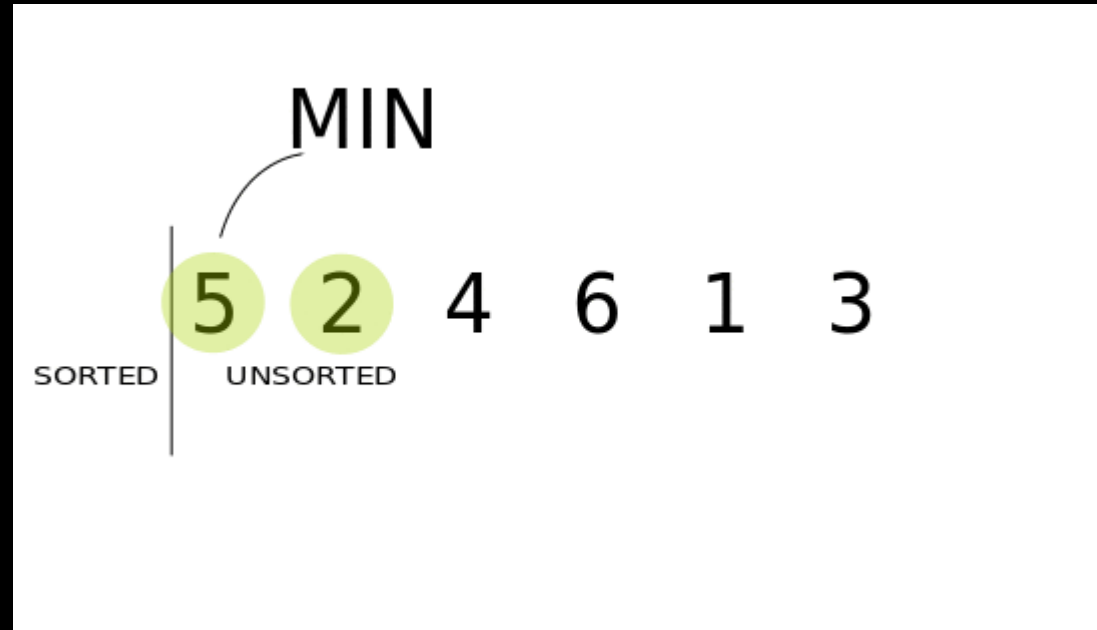
- Randomly choosing a card to face up (not systematic, and does not guarantee complete sorting)
- Systematically revealing the cards, one at a time (so which two to swap?)
- Others?

What is selection sort?

- Select the **smallest element** in the list and **swap** it with the **leftmost element**.
- Select the **smallest element** in the **remaining** list and **swap** it with the **second element**
- **Repeating** this whole process of finding the **smallest element** in the **unsorted section** of the list and swapping it with the first element of the unsorted section until all the elements are sorted.



Selection sort Animation



<https://codepumpkin.com/selection-sort-algorithms/>

Is selection sort in-place?

- What does it mean to be in-place?
- Selection sort:
 - Elements doing mutual swap within the list
 - List is mutated
 - No additional memory space needed to store list during sorting
 - YES – Selection sort is in-place

Is selection sort stable?

- What does it mean to be stable?
- Consider a case where there are repeated elements within an unsorted list.
- [3, 1, 4, 5, 3, 6, 2]
- Stable:
- [1, 2, 3, 3, 4, 5, 6] #relative position remains unchanged
- Unstable:
- [1, 2, 3, 3, 4, 5, 6] #swap occurs for elements with same value
- Stability: Depends on its implementation, not the type of sort used

Order of growth **selection sort**?

- Best case: $O(n^2)$
 - Sum of AP: $(n-1) + (n-2) + (n-3) + \dots + 1$
- Average case: $O(n^2)$
- Worse case: $O(n^2)$
 - List is arranged in a reversed manner
 - Swapping occurs at every step