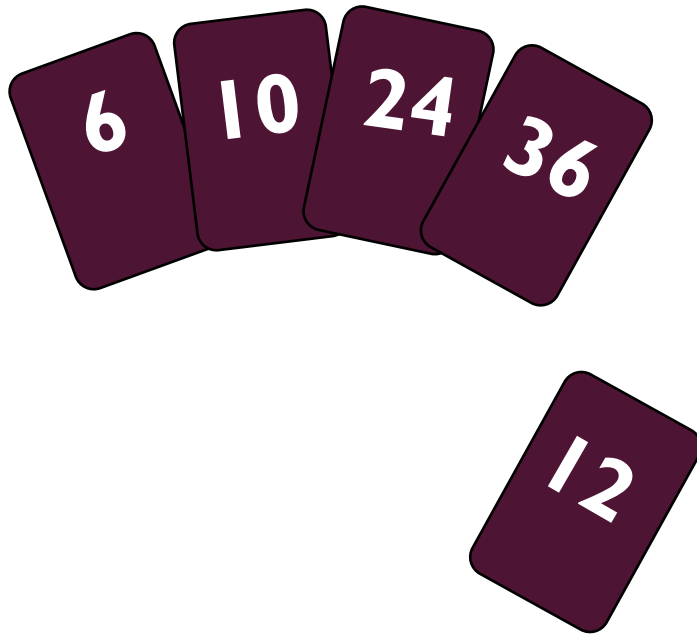# INSERTION SORT

PRESENTER: MUHAMMAD UMER

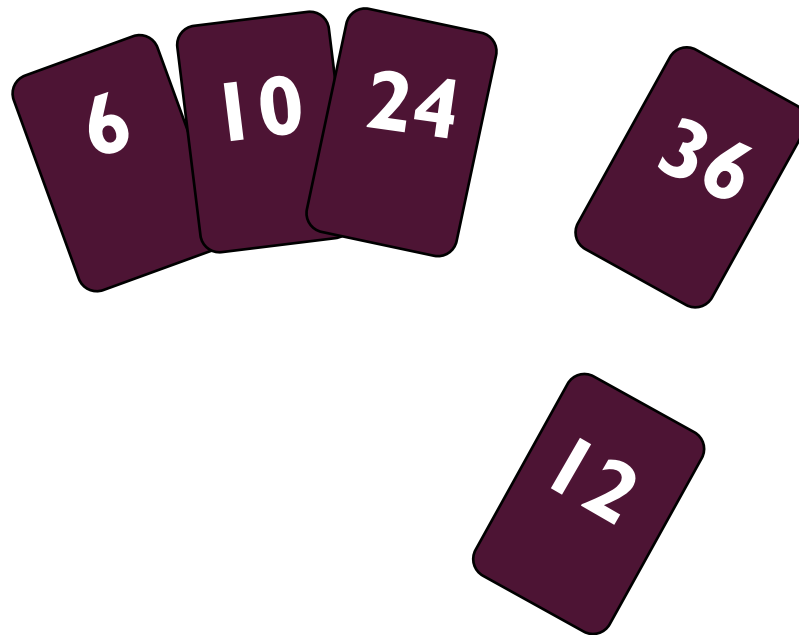*Idea:* like sorting a hand of playing cards

INSERTION SORT

- Idea: like sorting a hand of playing cards

  - Start with an empty left hand and the cards facing down on the table.

  - Remove one card at a time from the table, and insert it into the correct position in the left hand

    - compare it with each of the cards already in the hand, from right to left

  - The cards held in the left hand are sorted

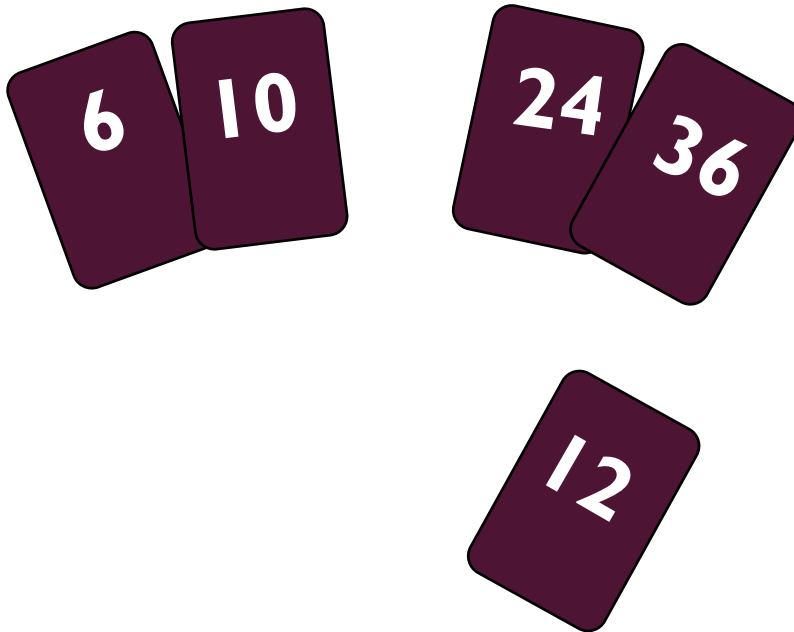   - these cards were originally the top cards of the pile on the table

INSERTION SORT

To insert 12, we need to make room for it by moving first 36 and then 24.

6   10   24   36

12

INSERTION SORT
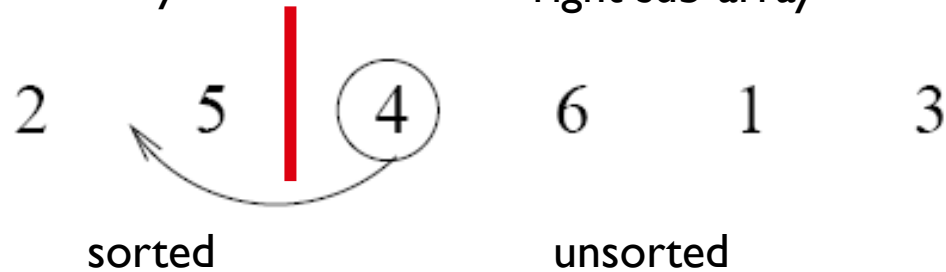
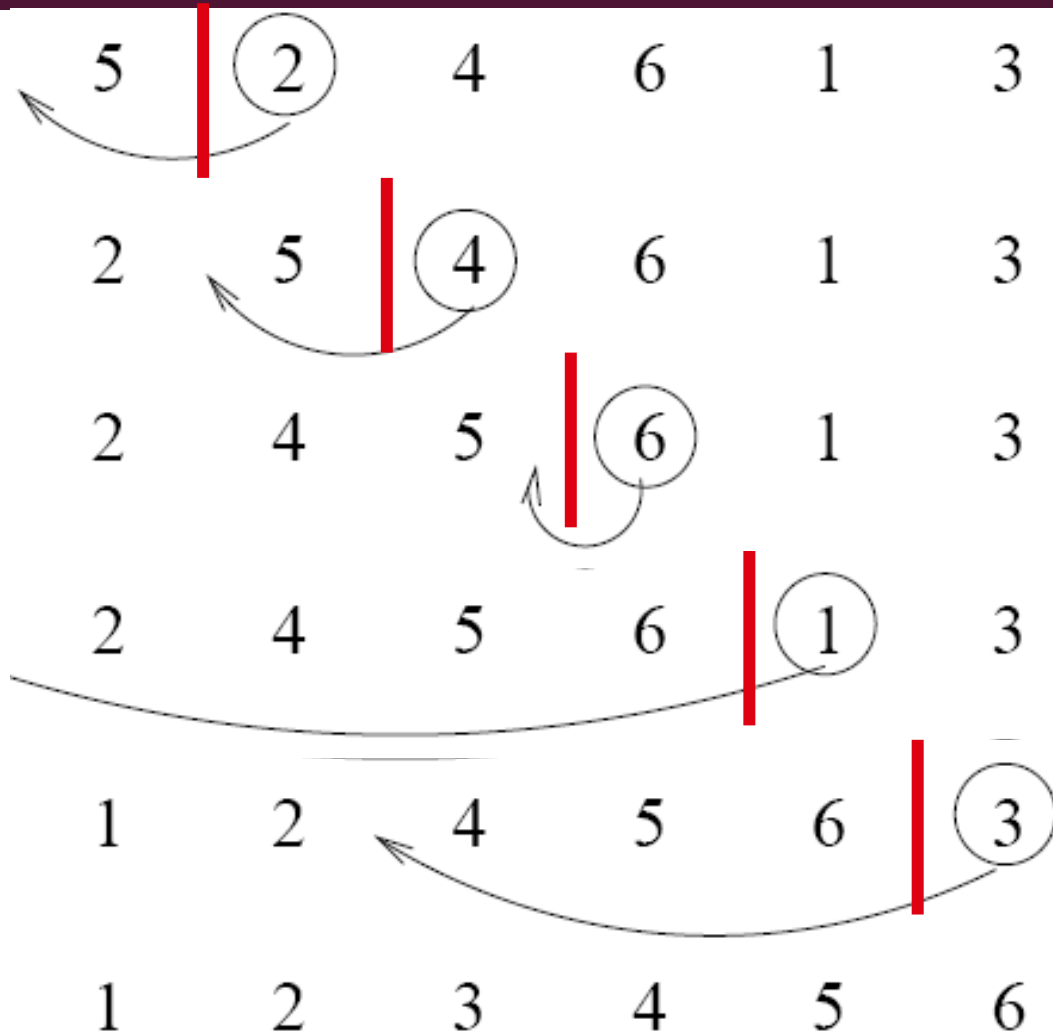# INSERTION SORT

INSERTION SORT

input array   **5   2   4   6   1   3**

at each iteration, the array is divided in two sub-arrays:

left sub-array   right sub-array

2   5 | (4)   6   1   3

sorted   unsorted

INSERTION SORT

5 | (2) 4   6   1   3

2 5 | (4) 6   1   3

2 4 5 | (6) 1   3

2 4 5 6 | (1) 3

1 2 4 5 6 | (3)

1 2 3 4 5 6

INSERTION-SORT

$$2 \quad 5 \quad 4 \quad 6 \quad 1 \quad 3$$

key

Alg.: INSERTION-SORT*(A)*

    for j = 2 **to** n

        key = A[j]

        // Insert A[j] into the sorted sequence A[1 . . j –1]
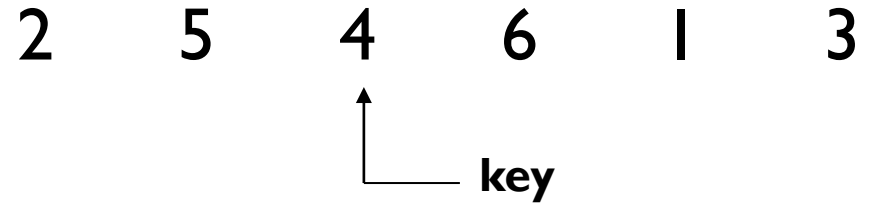
        i = j – 1

        while i > 0 and A[i] > key

            A[i + 1] = A[i]

            i = i – 1

      A[i + 1] = key

YOUR TASK

- Compare the Running time (Time Complexity) of Bubble Sort , Selection Sort and Insertion Sort Algorithms.

- Implement Insertion sort for sorting array into decreasing order.