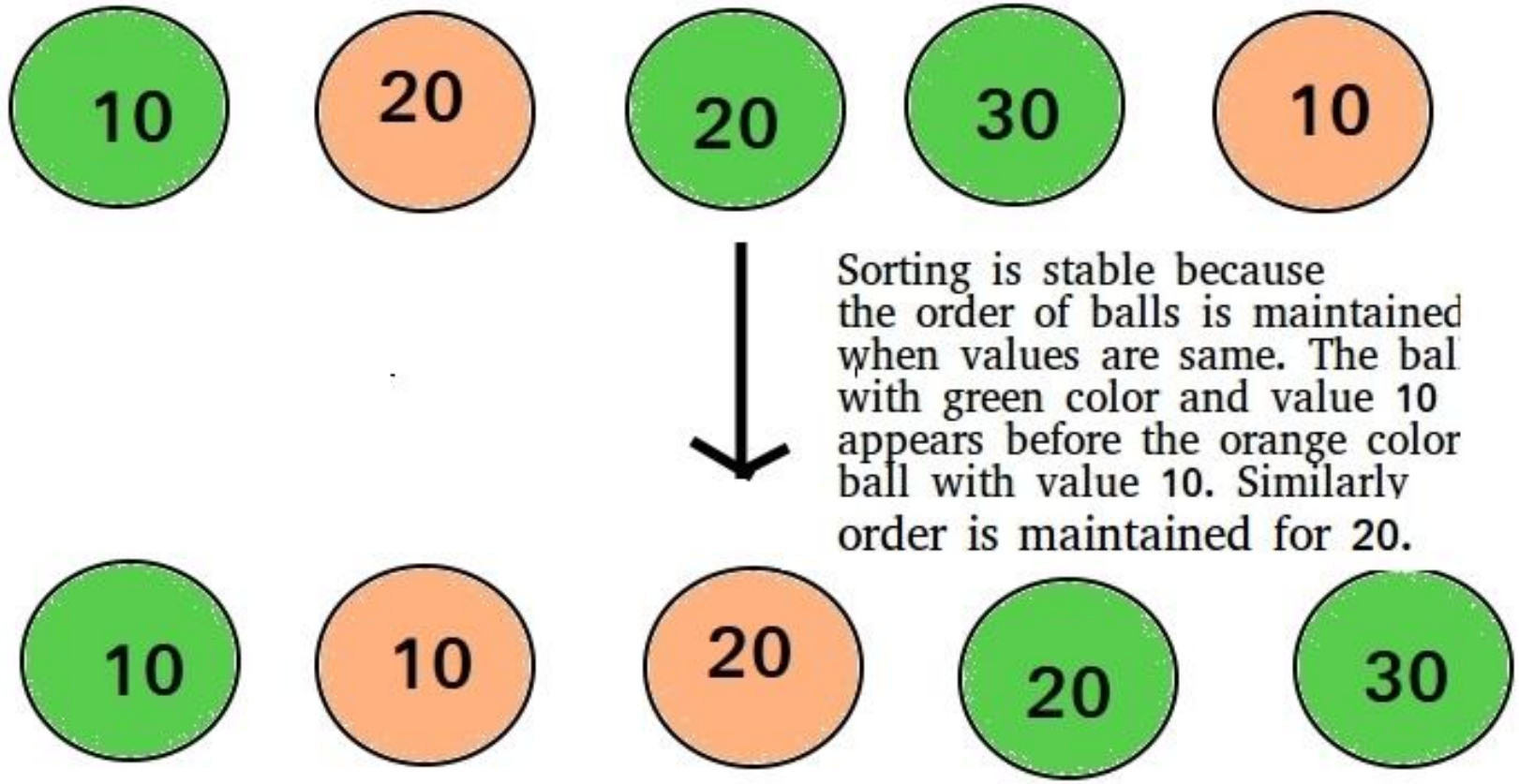
Stable Sort

- A sorting algorithm is stable if two objects with equal keys appear in same order in sorted output as they appear in input.



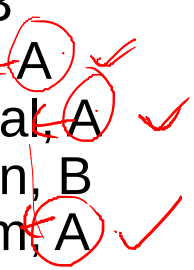
Stable Sort

- Stable sorting algorithms: Mergesort, Insertion sort, Bubble sort
- Can we make any sorting algorithm stable?

Stable Sort

- Consider the following dataset of Student Names and their respective class sections.
    - Danial, A
    - Ali, B
    - Karim, A
    - Eman, B
    - Bilal, A

- If we sort this data according to name only, then it is highly unlikely that the resulting dataset will be grouped according to sections as well.
    - Ali, B
    - Bilal, A
    - Danial, A
    - Eman, B
    - Karim, A



Stable Sort

- So we might have to sort again to obtain list of students section wise too. But in doing so, if the sorting algorithm is not stable, we might get a result like this
  - Danial, A
  - Karim, A
  - Bilal, A
  - Ali, B
  - Eman, B

unstable sort

If on the other hand we used a stable sorting algorithm, the result would be

- Bilal, A
- Danial, A
- Karim, A
- Ali, B
- Eman, B

stable sort

Comparison of Merge Sort and Quick Sort

- Mergesort
  - Stable
  - Not Inplace
  - It can be used for external sorting on disk
- Quicksort
  - Not Stable
  - Inplace, do not need extra memory
  - Quicksort exhibits good cache locality and this makes quicksort faster than merge sort (in many cases like in virtual memory environment).

External sorting