# **Task :Quick sort Explanation**

## The Step of Quick sort with explanation:

Data: 5, 10, 8, 7,6,4,3,12,14,2

Here, after inserting element in an array, **i** and **j** used as index to swap values and **end** is last index of the array. Initially, Pivot is last element of Array and start is first index of array. Initialize, j = start. Compare j index values with pivot. Then, j will increment by 1 each iteration.

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| **Steps** | **Explanation** |
| Step 1:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5  **↑**  **j** | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |     **↑**  **Pivot** | Pivot = 2  i = -1, j = 0  5 <= 2  Condition false |
| Step 2:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |     **↑**  **j**  **↑**  **Pivot** | i = -1, j = 1  10 <= 2  Condition false |
| Step 3:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |     **↑**  **j**  **↑**  **Pivot** | i = -1, j = 2  8 <= 2  Condition false |
| Step 4:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |     **↑**  **j**  **↑**  **Pivot** | i = -1, j = 3  7 <= 2  Condition false |
| Step 5:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |     **↑**  **j**  **↑**  **Pivot** | i = -1, j = 4  6 <= 2  Condition false |
| Step 6:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |     **↑**  **j**  **↑**  **Pivot** | i = -1, j = 5  4 <= 2  Condition false |
| Step 7:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |     **↑**  **j**  **↑**  **Pivot** | i = -1, j = 6  3 <= 2  Condition false |
| Step 8:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |     **↑**  **j**  **↑**  **Pivot** | i = -1, j = 7  12 <= 2  Condition false |
| Step 9:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |     **↑**  **j**  **↑**  **Pivot** | i = -1, j = 8  14 <= 2  Condition false |
| Step 10:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 5 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 2 |       Swapping | i + 1 = 0, end = 9  swapping values  5 and 2 |
| Step 11:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 5 |     **↑**  **i**  **↑**  **j**  **↑**  **Pivot** | Pivot = 5  i = 0, j = 1  10 <= 5  Condition false |
| Step 12:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 5 |     **↑**  **j**  **↑**  **i**  **↑**  **Pivot** | i = 0, j = 2  8 <= 5  Condition false |
| Step 13:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 5 |     **↑**  **j**  **↑**  **i**  **↑**  **Pivot** | i = 0, j = 3  7 <= 5  Condition false |
| Step 14:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 5 |     **↑**  **j**  **↑**  **i**  **↑**  **Pivot** | i = 0, j = 4  6 <= 5  Condition false |
| Step 15:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 5 |     **↑**  **j**  **↑**  **i**  **↑**  **Pivot** | i = 0, j = 5  4 <= 5  Condition true |
| Step 16:  Swapping     |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 5 |     **↑**  **i**  **↑**  **j**  **↑**  **Pivot**  After Swapping:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 4 | 8 | 7 | 6 | 10 | 3 | 12 | 14 | 5 |   **↑**  **Pivot**  **↑**  **j**  **↑**  **i** | i++  i = 1, j = 5  Swapping values  10 and 4 |
| Step 17:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 4 | 8 | 7 | 6 | 10 | 3 | 12 | 14 | 5 |     **↑**  **j**  **↑**  **i**  **↑**  **Pivot** | i = 1, j = 6  3 <= 5  Condition true |
| Step 18:  Swapping       |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 10 | 8 | 7 | 6 | 4 | 3 | 12 | 14 | 5 |     **↑**  **j**  **↑**  **i**  **↑**  **Pivot**  After Swapping:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 4 | 3 | 7 | 6 | 10 | 8 | 12 | 14 | 5 |   **↑**  **Pivot**  **↑**  **i**  **↑**  **j** | i++  i = 2, j = 6  Swapping values  8 and 3 |
| Step 19:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 4 | 3 | 7 | 6 | 10 | 8 | 12 | 14 | 5 |   **↑**  **j**  **↑**  **Pivot**  **↑**  **i** | i = 2, j = 7  12 <= 5  Condition false |
| Step 20:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 4 | 3 | 7 | 6 | 10 | 8 | 12 | 14 | 5 |   **↑**  **j**  **↑**  **Pivot**  **↑**  **i** | i = 2, j = 8  14 <= 5  Condition false |
| Step 21:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 4 | 3 | 7 | 6 | 10 | 8 | 12 | 14 | 5 |   Swapping | i + 1 = 3, end = 9  swapping values  7 and 5 |
| Step 22:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 4 | 3 | 5 | 6 | 10 | 8 | 12 | 14 | 7 |     **↑**  **j**  **↑**  **Pivot**  **↑**  **i** | Pivot = 3  i = 0, j = 1  4 <= 3  Condition false |
| Step 23:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 4 | 3 | 5 | 6 | 10 | 8 | 12 | 14 | 7 |       Swapping | i + 1 = 1, end = 2  swapping values  4 and 3 |
| Step 24:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 10 | 8 | 12 | 14 | 7 |   **↑**  **i**  **↑**  **j** | Pivot = 7  i = 3, j = 4  6 <= 7  Condition true |
| Step 25:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 10 | 8 | 12 | 14 | 7 |     **↑ ↑**  **i j**  **↑**  **Pivot** | i++  i = 4, j = 4  No swapping as i and j in same index |
| Step 26:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 10 | 8 | 12 | 14 | 7 |     **↑**  **i**  **↑**  **j**  **↑**  **Pivot** | i = 4, j = 5  10 <= 7  Condition false |
| Step 27:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 10 | 8 | 12 | 14 | 7 |     **↑**  **j**  **↑**  **i**  **↑**  **Pivot** | i = 4, j = 6  8 <= 7  Condition false |
| Step 28:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 10 | 8 | 12 | 14 | 7 |     **↑**  **j**  **↑**  **i**  **↑**  **Pivot** | i = 4, j = 7  12 <= 7  Condition false |
| Step 29:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 10 | 8 | 12 | 14 | 7 |     **↑**  **j**  **↑**  **i**  **↑**  **Pivot** | i = 4, j = 8  14 <= 7  Condition false |
| Step 30:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 10 | 8 | 12 | 14 | 7 |   Swapping | i + 1 = 5, end =9  swapping values  10 and 7 |
| Step 31:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 12 | 14  **↑**  **Pivot** | 10 |   **↑**  **j**  **↑**  **i** | Pivot = 10  i = 5, j = 6  7 <= 10  Condition true |
| Step 32:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 12 | 14  **↑**  **Pivot** | 10 |   **↑ ↑**  **i j** | i++  i = 6, j = 6  No swapping as i and j in same index |
| Step 33:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 12 | 14  **↑**  **Pivot** | 10 |   **↑**  **i**  **↑**  **j** | i = 6, j = 7  12 <= 10  Condition false |
| Step 34:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 12 | 14  **↑**  **Pivot** | 10 |   **↑**  **i**  **↑**  **j** | i = 6, j = 8  14 <= 10  Condition false |
| Step 35:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 12 | 14 | 10 |   Swapping | i + 1 = 7, end = 9  swapping values  12 and 10 |
| Step 36:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 14 | 12 |   **↑**  **j**  **↑**  **i**  **↑**  **Pivot** | Pivot = 12  i = 7, j = 8  14 <= 12  Condition false |
| Step 37:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 14 | 12 |   Swapping | i + 1 = 8, end = 9  swapping values  14 and 12 |
| Step 38:  Sorted Data:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 14 | 12 | |  |