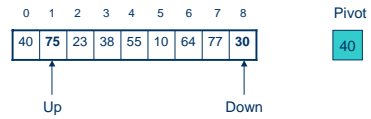
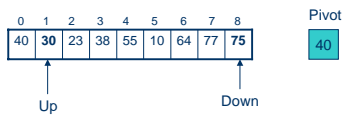


3. Repeat

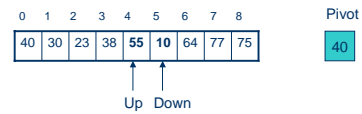
- Increment Up till Up is first element greater than pivot value
- Decrement Down till Down is first element less than or equal to pivot value
- If $Up < Down$, swap Up and Down until they cross each other



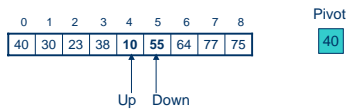
- $Up < Down$ so swap



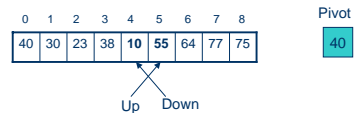
- Increment Up to first value greater than pivot and decrement Down to first value less than or equal to pivot



- Swap Up and Down



- Increment Up to value greater than pivot and decrement Down to value less than pivot



- Here Up and Down have crossed each other

Partition

- Swap the values in down and pivot

0	1	2	3	4	5	6	7	8
10	30	23	38	40	55	64	77	75

Down
↑
Pivot index

- The values on the left of pivot index are less than and the values on the right are greater than the pivot index 40

Partition

- Partitioning has taken place giving us two new sub-arrays

0	1	2	3	4	5	6	7	8
10	30	23	38	40	55	64	77	75

Up1 Down1 Up2 Down2
↑ ↑ ↑ ↑
Pivot index

Final sorted array

0	1	2	3	4	5	6	7	8
10	23	30	38	40	55	64	75	77

Positives of Quicksort & When to Use

- Fast sorting algorithm.
- Best choice if speed is the primary focus.
- Used best on medium to large lists.
- Also well used for massively repetitive sorting

Negatives of Quicksort and When NOT to Use

- Complexity of implementation.
- Massively recursive.
- Not good for semi-ordered lists.

Complexity

- Worst Case: $O(n^2)$ fig c
- Avg Case: $O(n \log n)$ fig a
- What Causes These Cases?
- $N/2$ -th greatest element.
- Random Pivot?

Comparison To Other Algorithms

- Bubble Sort
- Heapsort
- Mergesort
- Combsort

Applications

- Uniqueness Testing
- Deleting Duplicates
- Frequency Counting
- **Efficient Searching**

References

- <http://linux.wku.edu/~lamonml/algor/sort/quick.html>
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- <http://en.wikipedia.org/wiki/Quicksort>
- <http://yagqi.com/combsort/index.php>
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