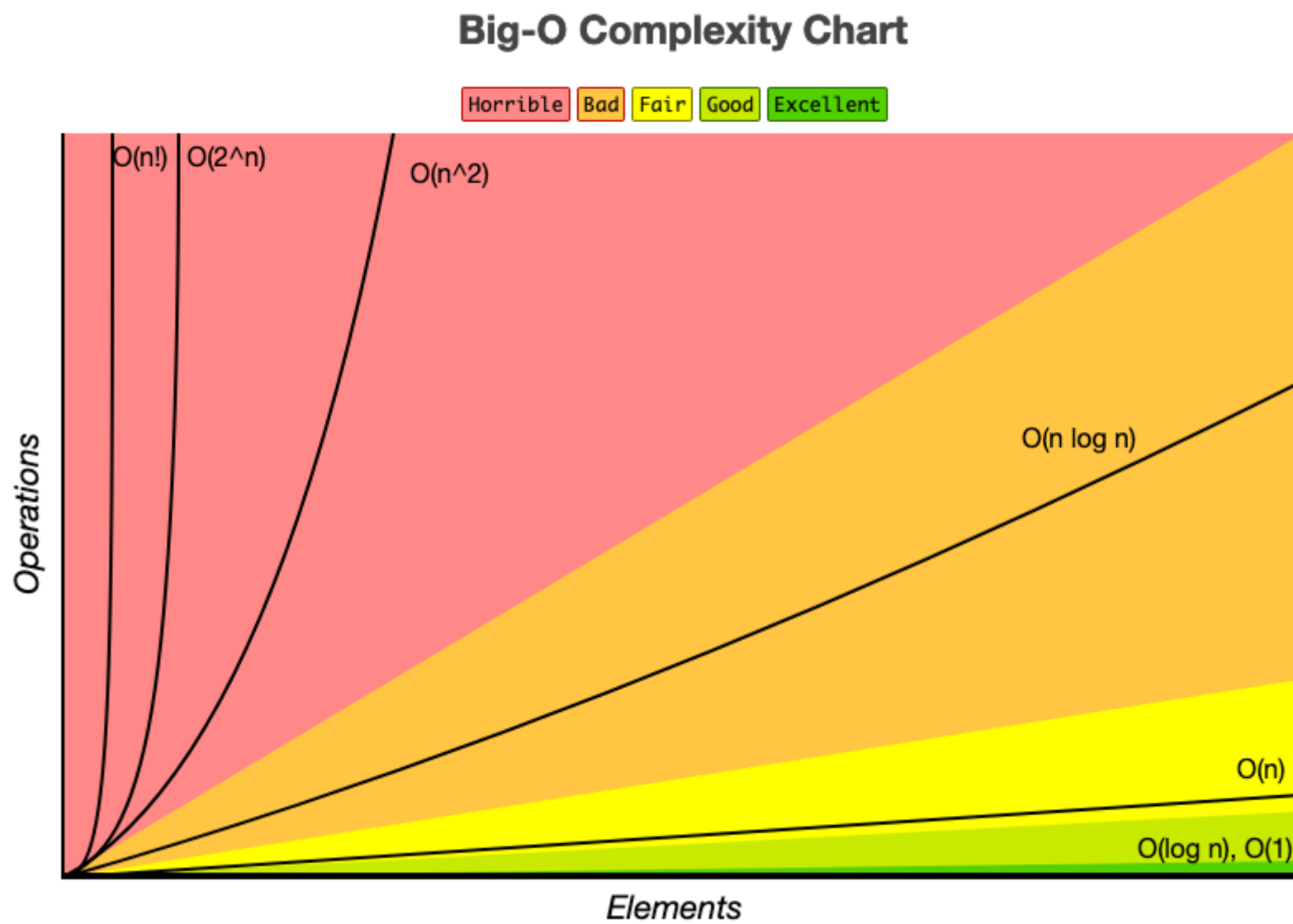PrepInsta

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# Time Complexities for Placements

August 17, 2020

Time Complexities for Algorithms-

Atleast 2 Questions from these will be asked in the Exam thus I will suggest you to Mug up these.

## Big-O Complexity Chart

| Horrible | Bad | Fair | Good | Excellent |

$O(n!)$   $O(2^n)$        $O(n^2)$

Operations

$O(n \log n)$

$O(n)$

$O(\log n), O(1)$

Elements

## Array Sorting Algorithms

| Algorithm | Time Complexity | | | Space Complexity |
|---|---|---|---|---|
| | Best | Average | Worst | Worst |
| Quicksort | $\Omega(n \log(n))$ | $\theta(n \log(n))$ | $O(n^2)$ | $O(\log(n))$ |
| Mergesort | $\Omega(n \log(n))$ | $\theta(n \log(n))$ | $O(n \log(n))$ | $O(n)$ |
| Timsort | $\Omega(n)$ | $\theta(n \log(n))$ | $O(n \log(n))$ | $O(n)$ |
| Heapsort | $\Omega(n \log(n))$ | $\theta(n \log(n))$ | $O(n \log(n))$ | $O(1)$ |
| Bubble Sort | $\Omega(n)$ | $\theta(n^2)$ | $O(n^2)$ | $O(1)$ |
| Insertion Sort | $\Omega(n)$ | $\theta(n^2)$ | $O(n^2)$ | $O(1)$ |
| Selection Sort | $\Omega(n^2)$ | $\theta(n^2)$ | $O(n^2)$ | $O(1)$ |
| Tree Sort | $\Omega(n \log(n))$ | $\theta(n \log(n))$ | $O(n^2)$ | $O(n)$ |
| Shell Sort | $\Omega(n \log(n))$ | $\theta(n(\log(n))^2)$ | $O(n(\log(n))^2)$ | $O(1)$ |
| Bucket Sort | $\Omega(n+k)$ | $\theta(n+k)$ | $O(n^2)$ | $O(n)$ |
| Radix Sort | $\Omega(nk)$ | $\theta(nk)$ | $O(nk)$ | $O(n+k)$ |
| Counting Sort | $\Omega(n+k)$ | $\theta(n+k)$ | $O(n+k)$ | $O(k)$ |
| Cubesort | $\Omega(n)$ | $\theta(n \log(n))$ | $O(n \log(n))$ | $O(n)$ |

## Common Data Structure Operations

| Data Structure | Time Complexity | | | | | | | | Space Complexity |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Average | | | | Worst | | | | Worst |
| | Access | Search | Insertion | Deletion | Access | Search | Insertion | Deletion | |
| Array | Θ(1) | Θ(n) | Θ(n) | Θ(n) | O(1) | O(n) | O(n) | O(n) | O(n) |
| Stack | Θ(n) | Θ(n) | Θ(1) | Θ(1) | O(n) | O(n) | O(1) | O(1) | O(n) |
| Queue | Θ(n) | Θ(n) | Θ(1) | Θ(1) | O(n) | O(n) | O(1) | O(1) | O(n) |
| Singly-Linked List | Θ(n) | Θ(n) | Θ(1) | Θ(1) | O(n) | O(n) | O(1) | O(1) | O(n) |
| Doubly-Linked List | Θ(n) | Θ(n) | Θ(1) | Θ(1) | O(n) | O(n) | O(1) | O(1) | O(n) |
| Skip List | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | O(n) | O(n) | O(n) | O(n) | O(n log(n)) |
| Hash Table | N/A | Θ(1) | Θ(1) | Θ(1) | N/A | O(n) | O(n) | O(n) | O(n) |
| Binary Search Tree | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | O(n) | O(n) | O(n) | O(n) | O(n) |
| Cartesian Tree | N/A | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | N/A | O(n) | O(n) | O(n) | O(n) |
| B-Tree | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(n) |
| Red-Black Tree | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(n) |
| Splay Tree | N/A | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | N/A | O(log(n)) | O(log(n)) | O(log(n)) | O(n) |
| AVL Tree | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) | O(n) |
| KD Tree | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | Θ(log(n)) | O(n) | O(n) | O(n) | O(n) | O(n) |

Will Suggest Mugging up till Binary Search Tree the later are optional and asked very very rarely.

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