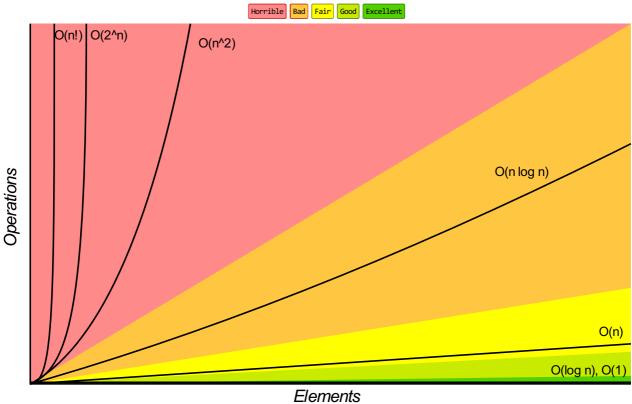
## **Know Thy Complexities!**

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## **Big-O Complexity Chart**



## **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)	0(1)	0(n)	0(n)	0(n)	0(n)
Stack	Θ(n)	Θ(n)	Θ(1)	Θ(1)	0(n)	0(n)	0(1)	0(1)	O(n)
Queue	Θ(n)	Θ(n)	Θ(1)	Θ(1)	0(n)	0(n)	0(1)	0(1)	O(n)
Singly-Linked List	Θ(n)	Θ(n)	Θ(1)	Θ(1)	0(n)	0(n)	0(1)	0(1)	O(n)
Doubly-Linked List	Θ(n)	Θ(n)	Θ(1)	Θ(1)	0(n)	0(n)	0(1)	0(1)	O(n)
Skip List	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	0(n)	0(n)	0(n)	0(n)	O(n log(n))
Hash Table	N/A	Θ(1)	Θ(1)	Θ(1)	N/A	0(n)	0(n)	0(n)	O(n)
Binary Search Tree	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	0(n)	0(n)	0(n)	0(n)	O(n)
Cartesian Tree	N/A	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	N/A	0(n)	0(n)	0(n)	O(n)
B-Tree	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	O(log(n))	O(log(n))	O(log(n))	O(log(n))	O(n)
R Black Tree	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	0(log(n))	O(log(n))	O(log(n))	O(log(n))	O(n)
Splay Tree	N/A	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	N/A	O(log(n))	O(log(n))	O(log(n))	O(n)
<b>AVL Tree</b>	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	0(log(n))	O(log(n))	O(log(n))	O(log(n))	<b>O(n)</b>
KD Tree	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	0(n)	0(n)	0(n)	0(n)	0(n)

## **Array Sorting Algorithms**

Algorithm	Time Co	mplexity	Space Complexity	
	Best	Average	Worst	Worst
Quicksort	$\Omega(n \log(n))$	$\theta(n \log(n))$	0(n^2)	0(log(n))
Mergesort	$\Omega(n \log(n))$	Θ(n log(n))	0(n log(n))	0(n)
Timsort	<u>Ω(n)</u>	Θ(n log(n))	0(n log(n))	0(n)
Heapsort	$\Omega(n \log(n))$	O(n log(n))	0(n log(n))	0(1)
Bubble Sort	<u>Ω(n)</u>	Θ(n^2)	0(n^2)	0(1)
Insertion Sort	<u>Ω(n)</u>	Θ(n^2)	0(n^2)	0(1)
Selection Sort	Ω(n^2)	Θ(n^2)	0(n^2)	0(1)
Tree Sort	$\Omega(n \log(n))$	Θ(n log(n))	0(n^2)	0(n)
Shell Sort	$\Omega(n \log(n))$	$\Theta(n(\log(n))^2)$	O(n(log(n))^2)	0(1)
Bucket Sort	$\Omega(n+k)$	Θ(n+k)	0(n^2)	0(n)
Radix Sort	$\Omega(nk)$	Θ(nk)	O(nk)	0(n+k)
Counting Sort	$\Omega(n+k)$	Θ(n+k)	0(n+k)	0(k)
Cubesort	<u>Ω(n)</u>	Θ(n log(n))	O(n log(n))	0(n)