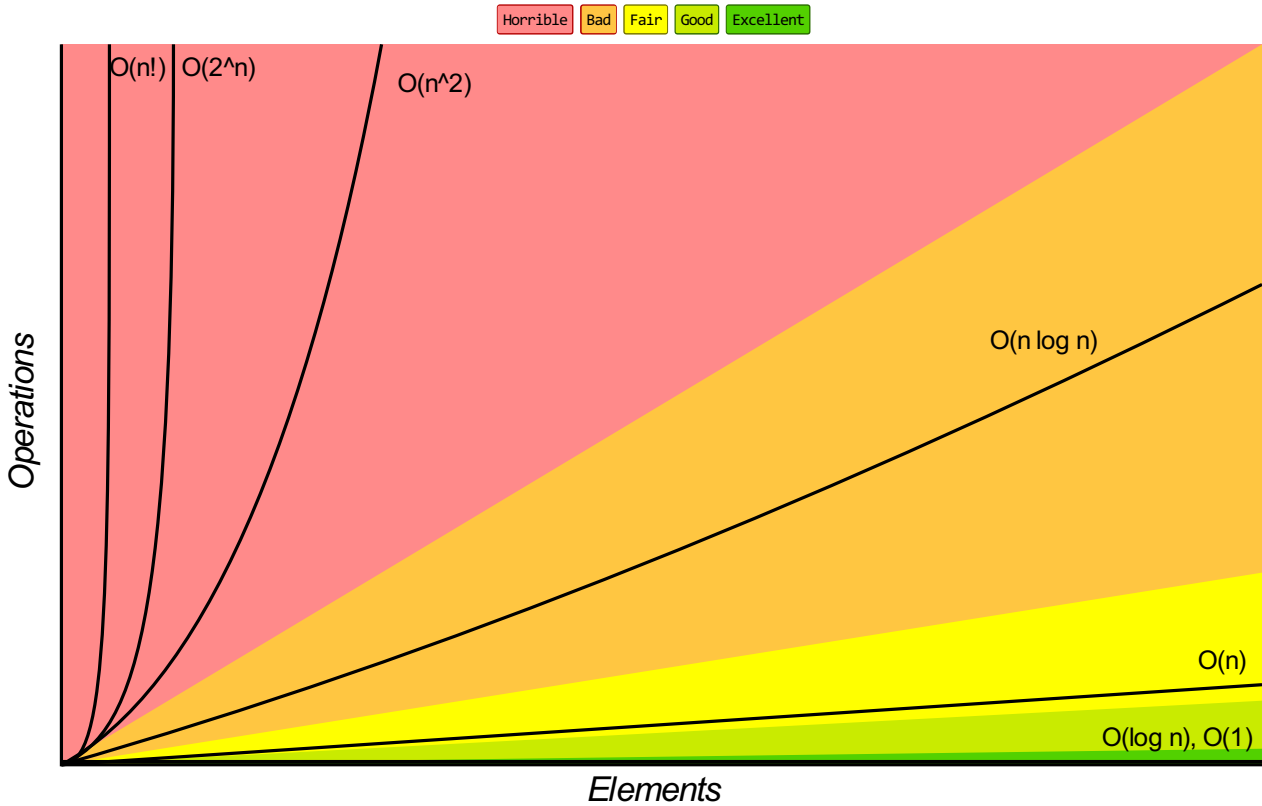


# Know Thy Complexities!

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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	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$
Stack	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$
Queue	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$
Singly-Linked List	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$
Doubly-Linked List	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$
Skip List	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n \log(n))$
Hash Table	N/A	$\theta(1)$	$\theta(1)$	$\theta(1)$	N/A	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$
Binary Search Tree	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$
Cartesian Tree	N/A	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	N/A	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$
B-Tree	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$
Red-Black Tree	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$
Splay Tree	N/A	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	N/A	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$
AVL Tree	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$
KD Tree	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$

## Array Sorting Algorithms

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