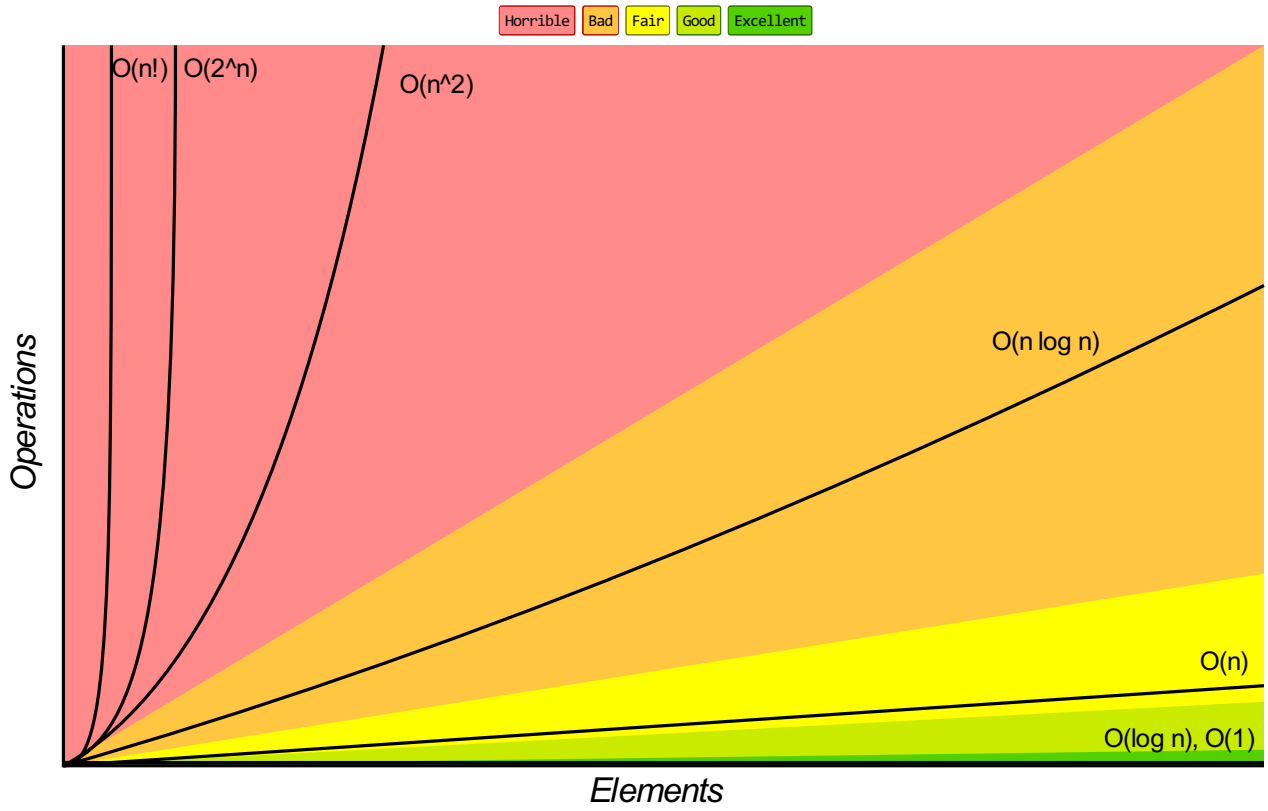
Know Thy Complexities!

www.bigocheatsheet.com

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)	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)

Array Sorting Algorithms

Algorithm	Time Complexity			Space Complexity	
	Best	Average	Worst	Worst	
Quicksort	Ω(n log(n))	Θ(n log(n))	O(n^2)	O(log(n))	in-place sort is not stable
Mergesort	Ω(n log(n))	Θ(n log(n))	O(n log(n))	O(n)	stable
Timsort	Ω(n)	Θ(n log(n))	O(n log(n))	O(n)	stable
Heapsort	Ω(n log(n))	Θ(n log(n))	O(n log(n))	O(1)	not stable
Bubble Sort	Ω(n)	Θ(n^2)	O(n^2)	O(1)	stable
Insertion Sort	Ω(n)	Θ(n^2)	O(n^2)	O(1)	stable
Selection Sort	Ω(n^2)	Θ(n^2)	O(n^2)	O(1)	not stable
Tree Sort	Ω(n log(n))	Θ(n log(n))	O(n^2)	O(n)	stable
Shell Sort	Ω(n log(n))	Θ(n(log(n))^2)	O(n(log(n))^2)	O(1)	not stable
Bucket Sort	Ω(n+k)	Θ(n+k)	O(n^2)	O(n)	stable
Radix Sort	Ω(nk)	Θ(nk)	O(nk)	O(n+k)	depends
Counting Sort	Ω(n+k)	Θ(n+k)	O(n+k)	O(k)	stable
Cubesort	Ω(n)	Θ(n log(n))	O(n log(n))	O(n)	stable