

# Big O Sheet

Data Structure								
	Average				Worst			
	Indexing	Search	Insertion	Deletion	Indexing	Search	Insertion	Deletion
Basic Array	$O(1)$	$O(n)$	-	-	$O(1)$	$O(n)$	-	-
Dynamic Array	$O(1)$	$O(n)$	$O(n)$	$O(n)$	$O(1)$	$O(n)$	$O(n)$	$O(n)$
Single-Linked List	$O(n)$	$O(n)$	$O(1)$	$O(1)$	$O(n)$	$O(n)$	$O(1)$	$O(1)$
Double-Linked List	$O(n)$	$O(n)$	$O(1)$	$O(1)$	$O(n)$	$O(n)$	$O(1)$	$O(1)$
Stack	-	$O(n)$	$O(1)$	$O(1)$	-	$O(n)$	$O(1)$	$O(1)$
Queue	-	$O(n)$	$O(1)$	$O(1)$	-	$O(n)$	$O(1)$	$O(1)$
Hash Table	-	$O(1)$	$O(1)$	$O(1)$	-	$O(n)$	$O(n)$	$O(n)$
Binary Search Tree	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(n)$	$O(n)$	$O(n)$	$O(n)$
B-Tree	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$
Red-Black Tree	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$
Splay Tree	-	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	-	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$
AVL Tree	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$	$O(\log(n))$

Searching Algorithms			
Algorithm	Time		Space
	Average	Worst	Worst
Depth First Search (DFS)	-	$O( E  +  V )$	$O( V )$
Breadth First Search (BFS)	-	$O( E  +  V )$	$O( V )$
Binary Search	$O(\log(n))$	$O(\log(n))$	$O(1)$
Linear Search	$O(n)$	$O(n)$	$O(1)$

Sorting Algorithms				
Algorithm	Time			Auxiliary Space
	Best	Average	Worst	Worst
Bubble Sort	$O(n)$	$O(n^2)$	$O(n^2)$	$O(1)$
Insertion Sort	$O(n)$	$O(n^2)$	$O(n^2)$	$O(1)$
Selection Sort	$O(n^2)$	$O(n^2)$	$O(n^2)$	$O(1)$
Merge Sort	$O(n \log(n))$	$O(n \log(n))$	$O(n \log(n))$	$O(n)$
Quick Sort	$O(n \log(n))$	$O(n \log(n))$	$O(n^2)$	$O(\log(n))$
Heap Sort	$O(n \log(n))$	$O(n \log(n))$	$O(n \log(n))$	$O(1)$
Shell Sort	$O(n \log(n))$	$O(n^{1.25})$	$O(n^{(3/2)})$	$O(1)$
Radix Sort	$O(nk)$	$O(nk)$	$O(nk)$	$O(n+k)$