## **Array Sorting Algorithms**

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

## **Common Data Structure Operations**

Data Structure	Time Complexity								Space Complexity
	Average				Worst				Worst
	Access	Search	Insertion	Deletion	Access	Search	Insertion	Deletion	
<u>Array</u>	Θ(1)	Θ(n)	Θ(n)	Θ(n)	0(1)	0(n)	0(n)	0(n)	0(n)
<u>Stack</u>	Θ(n)	Θ(n)	Θ(1)	Θ(1)	0(n)	0(n)	0(1)	0(1)	0(n)
<u>Queue</u>	Θ(n)	Θ(n)	Θ(1)	Θ(1)	0(n)	0(n)	0(1)	0(1)	0(n)
Singly-Linked List	Θ(n)	Θ(n)	Θ(1)	Θ(1)	0(n)	0(n)	0(1)	0(1)	0(n)
Doubly-Linked List	0(n)	Θ(n)	Θ(1)	Θ(1)	0(n)	0(n)	0(1)	0(1)	0(n)
Skip List	$\Theta(\log(n))$	Θ(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)	0(n)
Binary Search Tree	$\theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\theta(\log(n))$	0(n)	0(n)	0(n)	0(n)	0(n)
Cartesian Tree	N/A	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	N/A	0(n)	0(n)	0(n)	0(n)
<u>B-Tree</u>	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	0(log(n))	0(log(n))	O(log(n))	0(log(n))	0(n)
Red-Black Tree	$\Theta(\log(n))$	Θ(log(n))	$\Theta(\log(n))$	$\Theta(\log(n))$	O(log(n))	0(log(n))	O(log(n))	0(log(n))	0(n)
Splay Tree	N/A	$\Theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	N/A	0(log(n))	O(log(n))	0(log(n))	0(n)
AVL Tree	$\theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\theta(\log(n))$	O(log(n))	O(log(n))	O(log(n))	0(log(n))	0(n)
KD Tree	$\theta(\log(n))$	$\Theta(\log(n))$	$\Theta(\log(n))$	$\theta(\log(n))$	0(n)	0(n)	0(n)	0(n)	0(n)