

Common Data Structure Operations

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