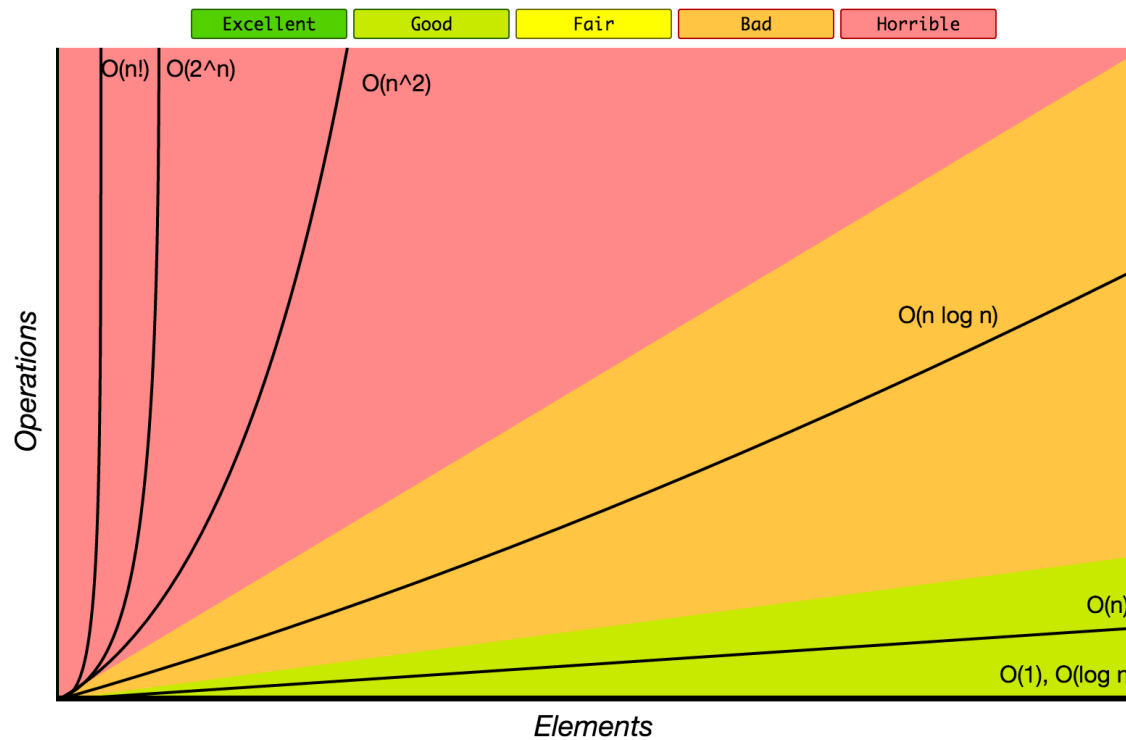


# Big-O Complexity Chart



## Common Data Structure Operations

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