

**Introduction to Basic Data Structures**

**List Built-in Functions:**

1. **Constructor**

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| **Name** | **Details** | **Time Complexity** |
| **list<type>myList;** | Construct a list with 0 elements. | O(1) |
| **list<type>myList(N);** | Construct a list with N elements and the value will be garbage. | O(N) |
| **list<type>myList(N,V);** | Construct a list with N elements and the value will be V. | O(N) |
| **list<type>myList(list2);** | Construct a list by copying another list list2. | O(N) |
| **list<type>myList(A,A+N);** | Construct a list by copying all elements from an array A of size N. | O(N) |
| **list<type>myList(v.begin(),v.end());** | Construct a list by copying all elements from a vector v. | O(N) |

1. **Capacity**

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| **Name** | **Details** | **Time Complexity** |
| **myList.size()** | Returns the size of the list. | O(1) |
| **myList.max\_size()** | Returns the maximum size that the list can hold. | O(1) |
| **myList.clear()** | Clears the list elements. | O(N) |
| **myList.empty()** | Return true/false if the list is empty or not. | O(1) |
| **myList.resize()** | Change the size of the list. | O(K); where K is the difference between new size and current size. |

1. **Modifiers**

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| **Name** | **Details** | **Time Complexity** |
| **myList= or myList.assign(list2.begin(),list2.end())** | Assign another list. | O(N) |
| **myList.push\_back()** | Add an element to the tail. | O(1) |
| **myList.push\_front()** | Add an element to the head. | O(1) |
| **myList.pop\_back()** | Delete the tail. | O(1) |
| **myList.pop\_front()** | Delete the head. | O(1) |
| **myList.insert()** | Insert elements at a specific position. | O(N+K); where K is the number of elements to be inserted. |
| **myList.erase()** | Delete elements from a specific position. | O(N+K); where K is the number of elements to be deleted. |
| **replace(myList.begin(),myList.end(),value,replace\_value)** | Replace all the value with replace\_value. Not under a list STL. | O(N) |
| **find(myList.begin(),myList.end(),V)** | Find the value V. Not under a list STL. | O(N) |

1. **Operations**

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| **Name** | **Details** | **Time Complexity** |
| **myList.remove(V)** | Remove the value V from the list. | O(N) |
| **myList.sort()** | Sort the list in ascending order. | O(NlogN) |
| **myList.sort(greater<type>())** | Sort the list in descending order | O(NlogN) |
| **myList.unique()** | Deletes the duplicate values from the list. You must sort the list first. | O(N), with sort O(NlogN) |
| **myList.reverse()** | Reverse the list. | O(N) |

1. **Element access**

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| **Name** | **Details** | **Time Complexity** |
| **myList.back()** | Access the tail element. | O(1) |
| **myList.front()** | Access the head element. | O(1) |
| **next(myList.begin(),i)** | Access the ith element | O(N) |

1. **Iterators**

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| **Name** | **Details** | **Time Complexity** |
| **myList.begin()** | Pointer to the first element. | O(1) |
| **myList.end()** | Pointer to the last element. | O(1) |