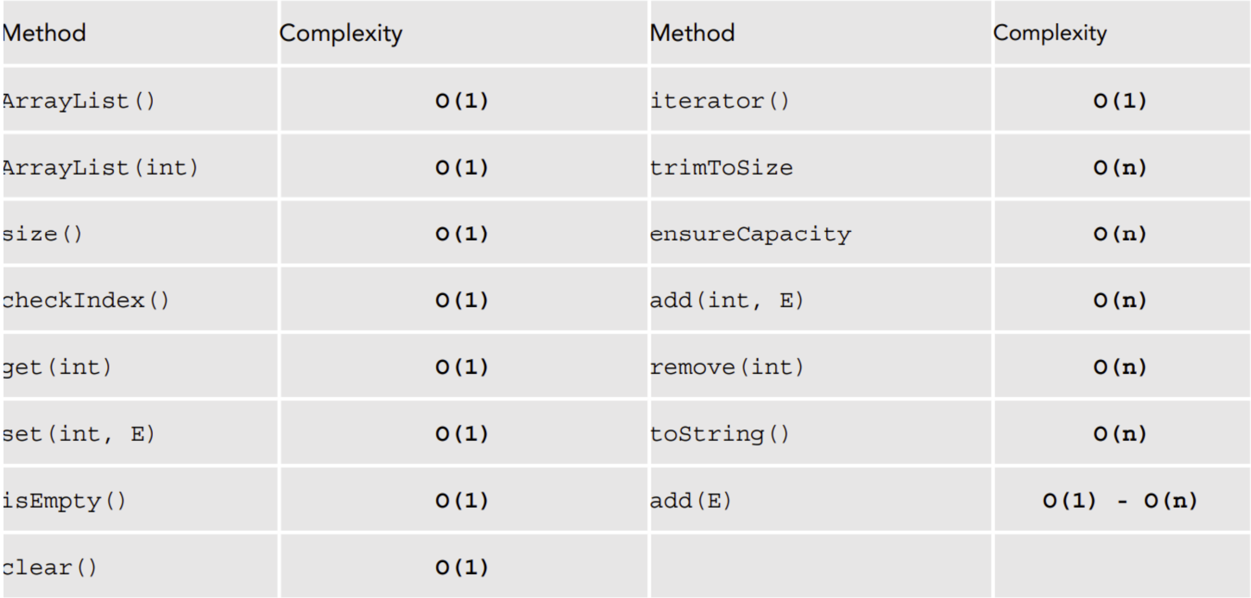
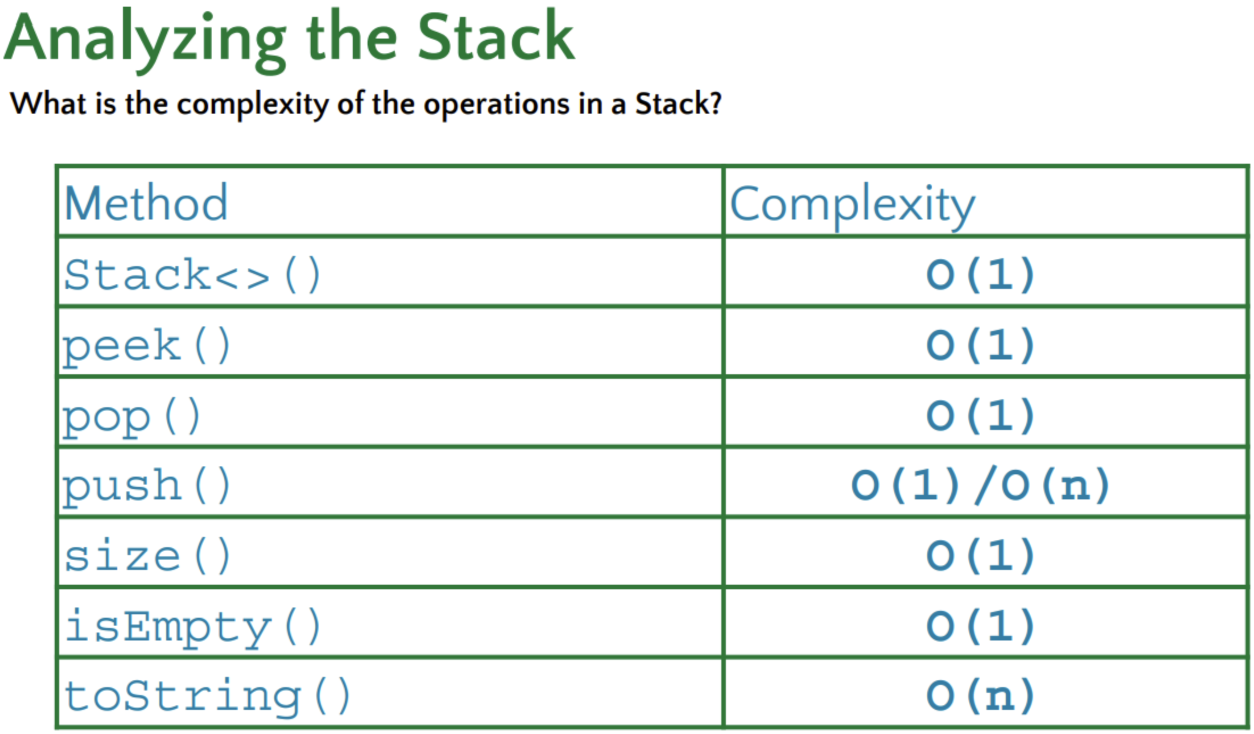
Arraylist complexity



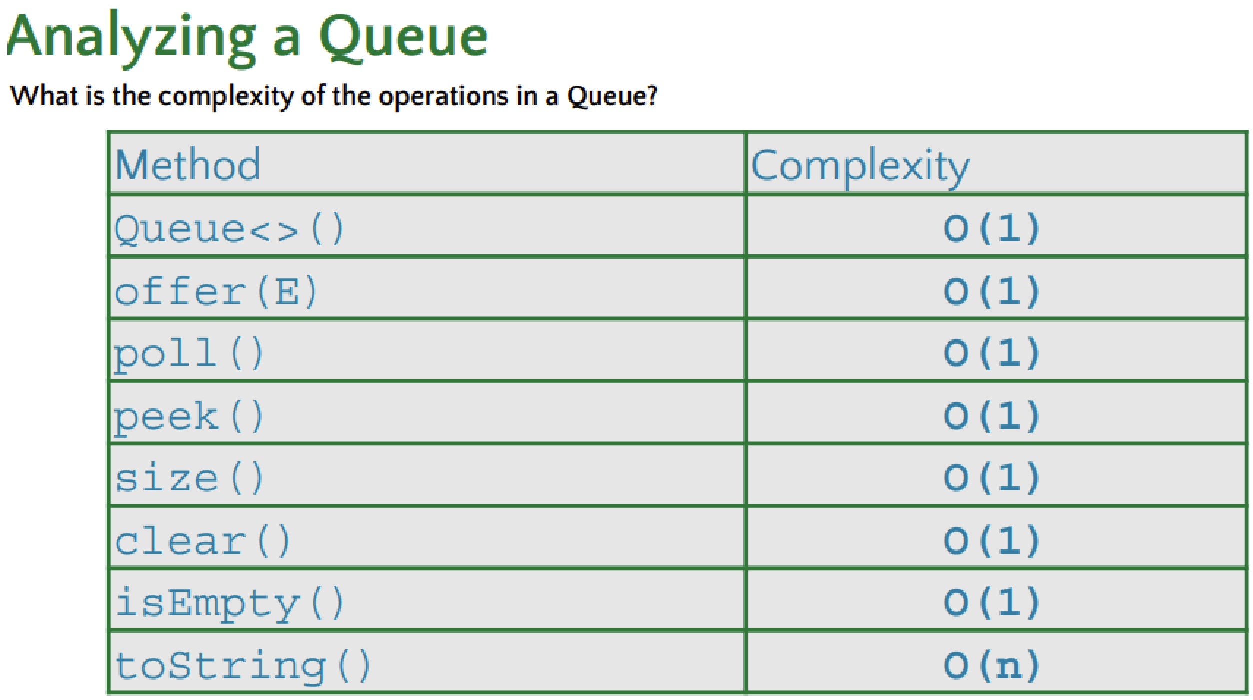
| Method | Complexity | Method | Complexity |
|---|---|---|---|
| ArrayList() | O(1) | iterator() | O(1) |
| ArrayList(int) | O(1) | trimToSize | O(n) |
| size() | O(1) | ensureCapacity | O(n) |
| checkIndex() | O(1) | add(int, E) | O(n) |
| get(int) | O(1) | remove(int) | O(n) |
| set(int, E) | O(1) | toString() | O(n) |
| isEmpty() | O(1) | add(E) | O(1) - O(n) |
| clear() | O(1) | | |



# Analyzing the Stack

What is the complexity of the operations in a Stack?

| Method | Complexity |
|---|---|
| Stack<>() | O(1) |
| peek() | O(1) |
| pop() | O(1) |
| push() | O(1)/O(n) |
| size() | O(1) |
| isEmpty() | O(1) |
| toString() | O(n) |

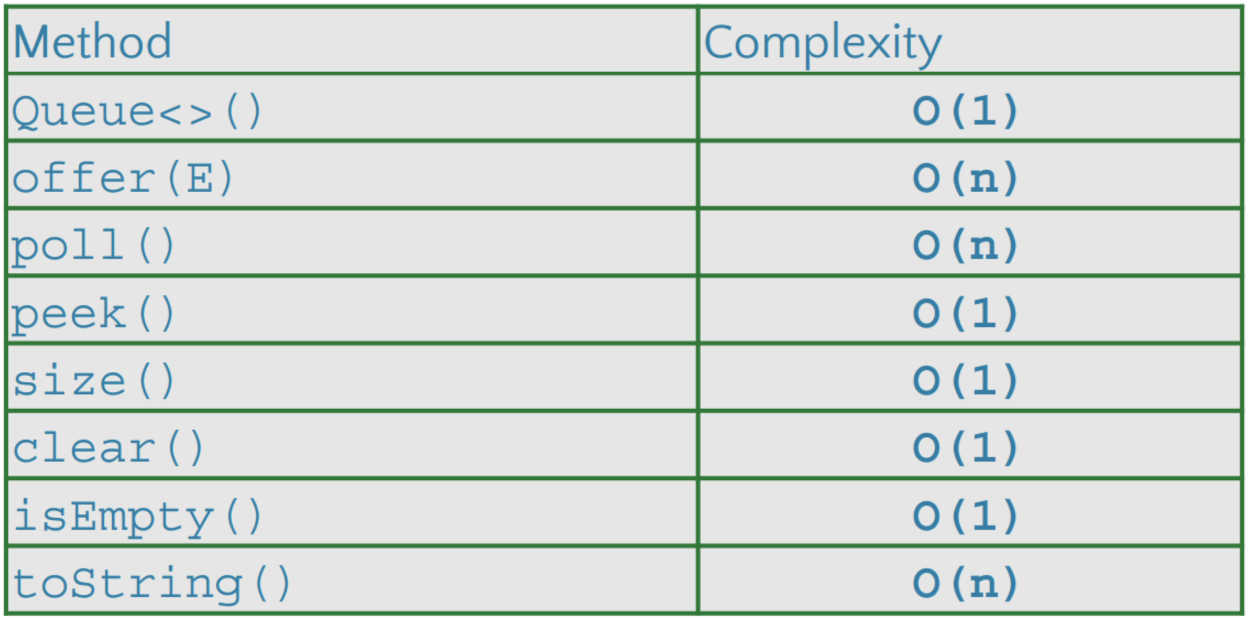


# Analyzing a Queue

What is the complexity of the operations in a Queue?

| Method | Complexity |
|---|---|
| `Queue<>()` | `O(1)` |
| `offer(E)` | `O(1)` |
| `poll()` | `O(1)` |
| `peek()` | `O(1)` |
| `size()` | `O(1)` |
| `clear()` | `O(1)` |
| `isEmpty()` | `O(1)` |
| `toString()` | `O(n)` |

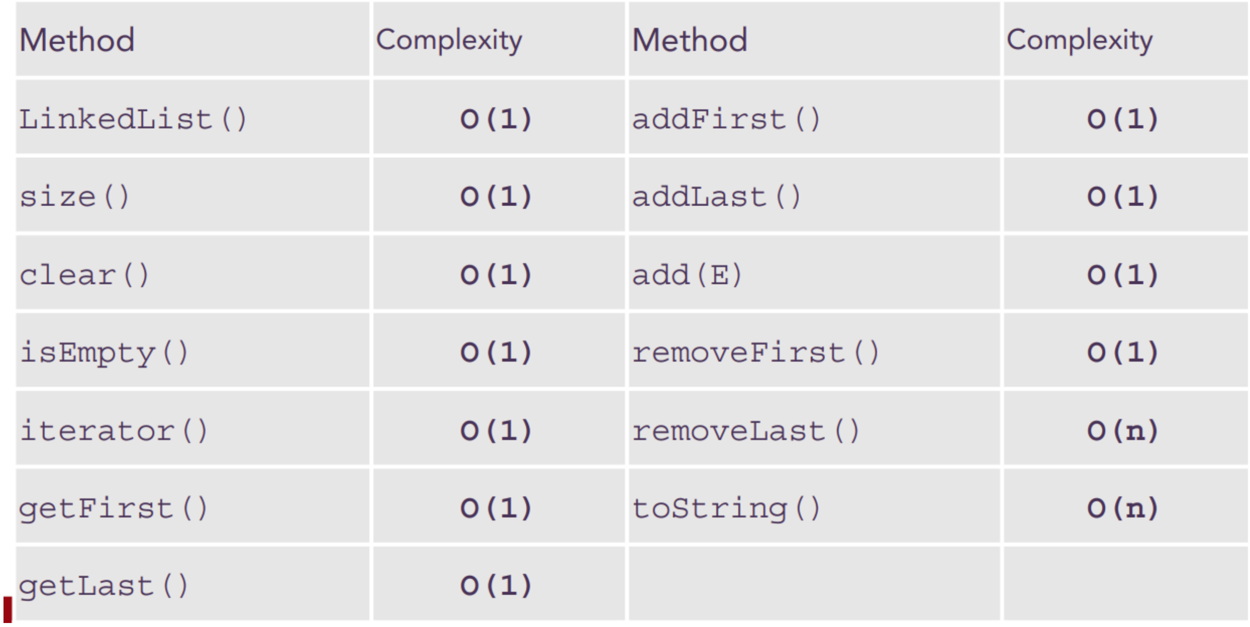
Priority Queue



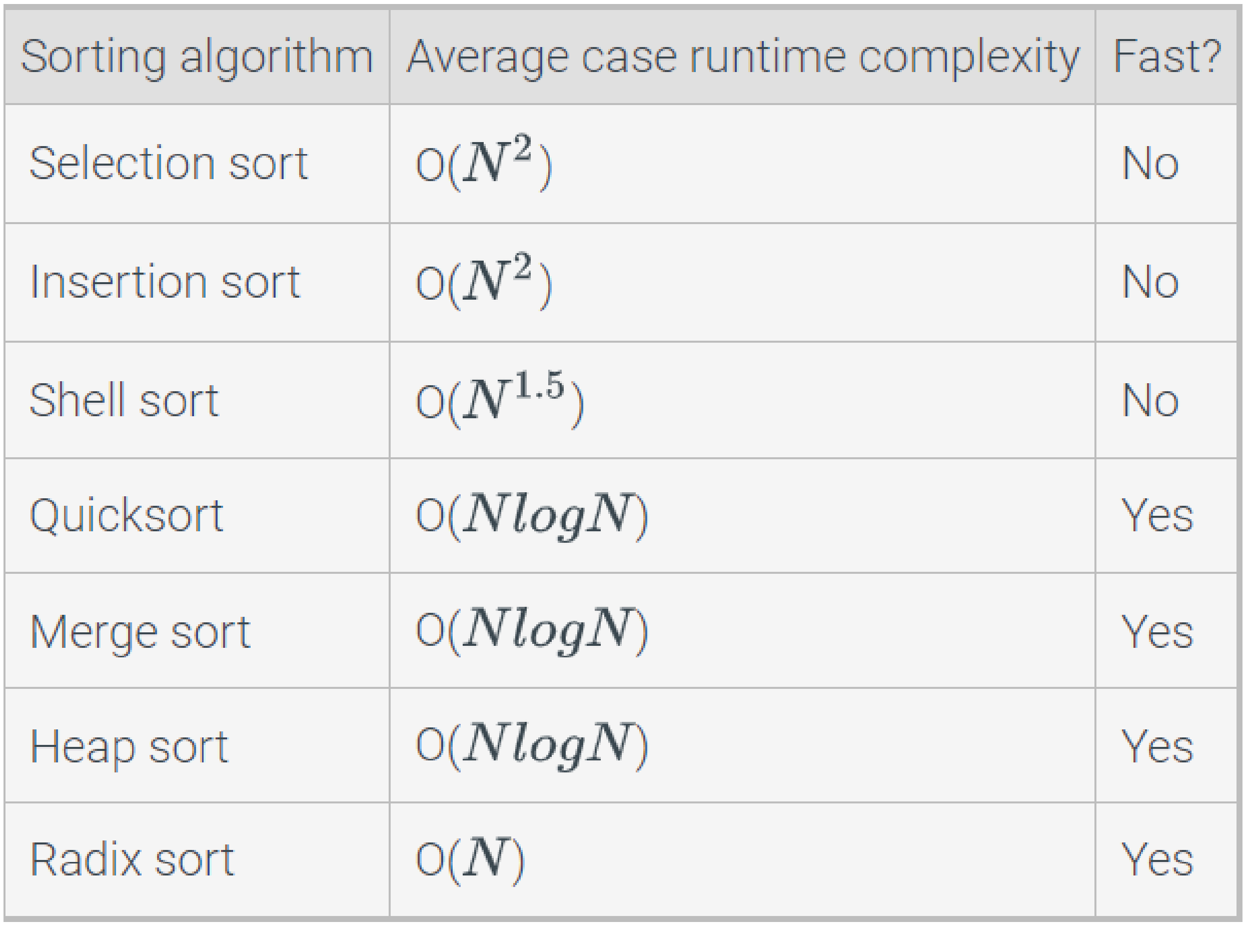
| Method | Complexity |
|---|---|
| `Queue<>()` | `O(1)` |
| `offer(E)` | `O(n)` |
| `poll()` | `O(n)` |
| `peek()` | `O(1)` |
| `size()` | `O(1)` |
| `clear()` | `O(1)` |
| `isEmpty()` | `O(1)` |
| `toString()` | `O(n)` |

# Analyzing the LinkedList

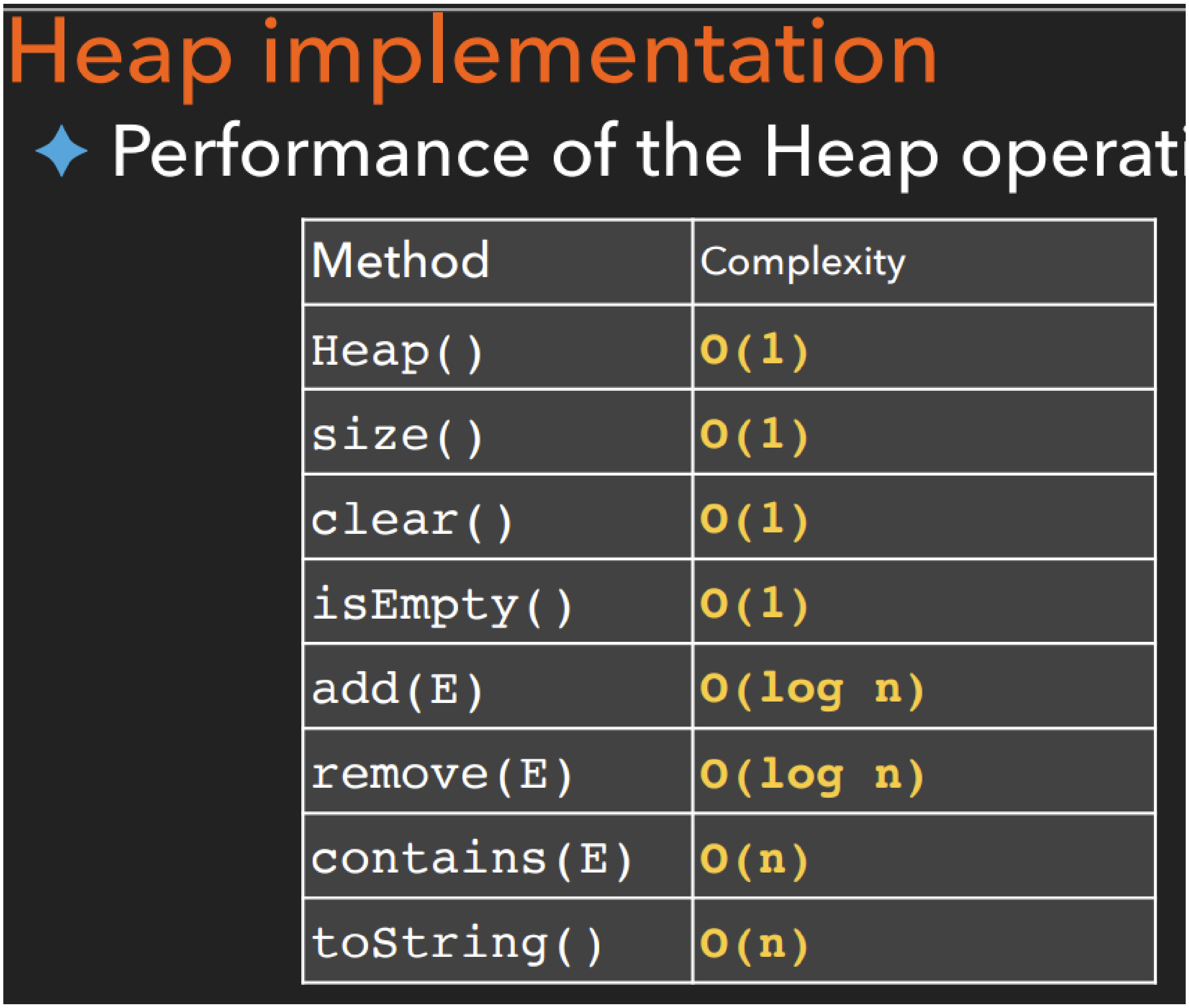
**What is the complexity of the operations in the LinkedList?**



| Method | Complexity | Method | Complexity |
|---|---|---|---|
| `LinkedList()` | `O(1)` | `addFirst()` | `O(1)` |
| `size()` | `O(1)` | `addLast()` | `O(1)` |
| `clear()` | `O(1)` | `add(E)` | `O(1)` |
| `isEmpty()` | `O(1)` | `removeFirst()` | `O(1)` |
| `iterator()` | `O(1)` | `removeLast()` | `O(n)` |
| `getFirst()` | `O(1)` | `toString()` | `O(n)` |
| `getLast()` | `O(1)` | | |



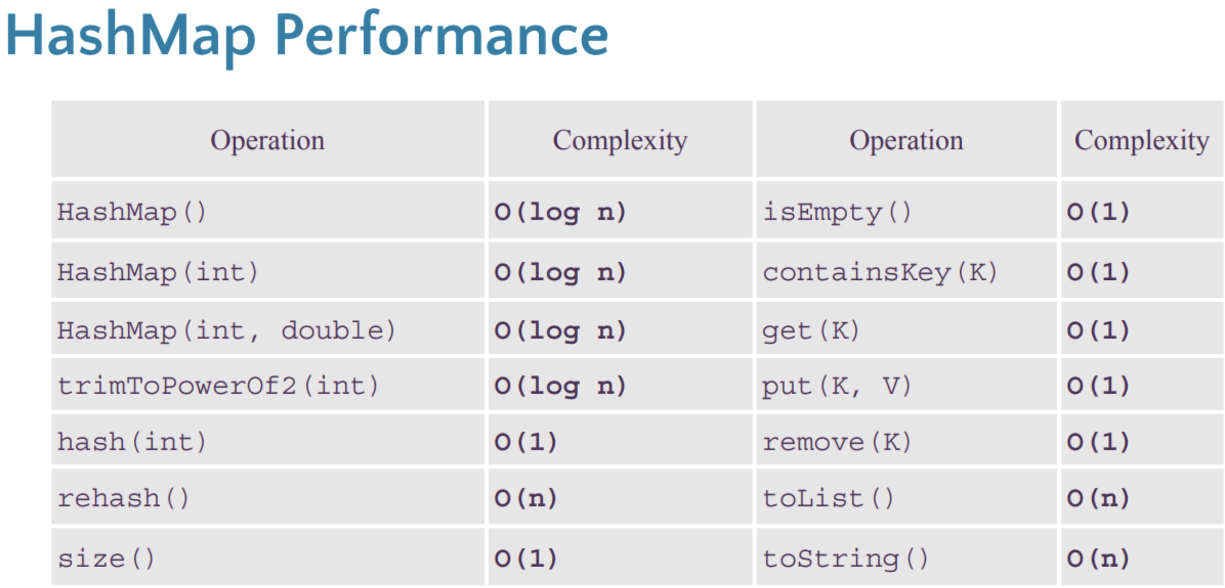
| Sorting algorithm | Average case runtime complexity | Fast? |
|---|---|---|
| Selection sort | O($N^2$) | No |
| Insertion sort | O($N^2$) | No |
| Shell sort | O($N^{1.5}$) | No |
| Quicksort | O($NlogN$) | Yes |
| Merge sort | O($NlogN$) | Yes |
| Heap sort | O($NlogN$) | Yes |
| Radix sort | O($N$) | Yes |



# Heap implementation

- Performance of the Heap operati

| Method | Complexity |
|---|---|
| Heap() | O(1) |
| size() | O(1) |
| clear() | O(1) |
| isEmpty() | O(1) |
| add(E) | O(log n) |
| remove(E) | O(log n) |
| contains(E) | O(n) |
| toString() | O(n) |



## HashMap Performance

| Operation | Complexity | Operation | Complexity |
|---|---|---|---|
| HashMap() | O(log n) | isEmpty() | O(1) |
| HashMap(int) | O(log n) | containsKey(K) | O(1) |
| HashMap(int, double) | O(log n) | get(K) | O(1) |
| trimToPowerOf2(int) | O(log n) | put(K, V) | O(1) |
| hash(int) | O(1) | remove(K) | O(1) |
| rehash() | O(n) | toList() | O(n) |
| size() | O(1) | toString() | O(n) |