

Competitive Programming Notebook

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1 Snippets

2 Template

3 Macros

4 Container Classes and Initialization

1. Vector:

(a) Class:

```
1  template < class T,  
2  class Alloc = allocator<T>> class vector;  
3
```

(b) Initialization:

- i. `vector<int> v`: Declares a vector of integers.
- ii. `vector<int> v(n)`: Declares a vector of integers of size `n`.
- iii. `vector<int> v(n, x)`: Declares a vector of integers of size `n`, with all elements initialized to `x`.
- iv. `vector<int> v = {1, 2, 3, 4}`: Declares a vector of integers with the elements 1, 2, 3 and 4.
- v. `vector<int> v {1, 2, 3, 4}`: Declares a vector of integers with the elements 1, 2, 3 and 4.

2. Set:

(a) Class:

```
1  template < class T,  
2  class Compare = less<T>,  
3  class Alloc = allocator<T>> class set;  
4
```

(b) Initialization:

- i. `set<int> s`: Declares a set of integers.
- ii. `set<int> s {1, 2, 3, 4}`: Declares a set of integers with the elements 1, 2, 3 and 4.
- iii. `set<int> s = {1, 2, 3, 4}`: Declares a set of integers with the elements 1, 2, 3 and 4.

5 Functions

Containers Functions

1. Vector:

2. Set:

- (a) `insert(x)`: Insert element `x` in the set. ej:

```
1  set<int> s;  
2  s.insert(5);  
3  // New value of s = {5}  
4
```

Note: Complexity of $O(\log_2 n)$.

- (b) `erase(x)`: Erase element `x` from the set. ej:

```
1  set<int> s ({5, 6, 7});  
2  s.erase(5);  
3  // New value of s = {6, 7}  
4
```

Note: Complexity of $O(\log_2 n)$.

- (c) `find(x)`: Find element `x` in the set. ej:

```
1  set<int> s;  
2  s.find(5);  
3  // Will return s.end() if x is not in the set  
4
```

Note: Complexity of $O(\log_2 n)$.

- (d) `lower_bound(x)`: Find the first element that is not less than `x`. ej:

```
1  set<int> s ({5, 6, 7});  
2  s.lower_bound(6);  
3  // Will return an iterator to the element 6  
4
```

Note: Complexity of $O(\log_2 n)$. **Note:** Uses Binary Search under the hood.

- (e) `upper_bound(x)`: Find the first element that is greater than `x`. ej:

```
1  set<int> s ({5, 6, 7});  
2  s.upper_bound(6);  
3  // Will return an iterator to the element 7  
4
```

Note: Complexity of $O(\log_2 n)$. **Note:** Uses Binary Search under the hood.

6 Data Structures

7 Greedy

8 Two Pointers

9 Search

Binary Search

Ternary Search

10 Sorting

11 Array and Range Sums

12 Dynamic Programming

13 Number Theory

14 Graph Theory