Competitive Programming Notebook

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1. **Vector:**
   (a) Class:

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

```

   (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:

```
template < class T,
class Compare = less<T>,
class Alloc = allocator<T>> class set;

```

   (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:

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

```

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

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

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

```

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

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

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

```

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

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

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

```

   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:

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

```

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