

C++ STL Containers Summary

1. Pairs

- Used to store two related values together.
- Syntax: `std::pair<int, string> p = {1, "Ali"};`
- Access elements using `p.first` and `p.second`.
- Commonly used in maps and other containers.

2. Sets

- Stores unique elements in sorted order.
- No duplicate values allowed.
- Syntax: `std::set<int> s;`
- Operations: `insert()`, `erase()`, `count()`, `find()`.
- Time complexity for insert/search: $O(\log n)$.

3. Multisets

- Allows duplicate elements, keeps sorted order.
- Syntax: `std::multiset<int> ms;`
- Operations: `insert()`, `erase()`, `count()`.

4. Unordered Sets

- Stores unique elements with no specific order.
- Faster average time complexity: $O(1)$.
- Syntax: `std::unordered_set<int> us;`
- No sorting guarantees.

5. Maps

- Stores key-value pairs with unique keys.
- Automatically sorted by key.
- Syntax: `std::map<string, int> m;`

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- Access value: `m["Ali"] = 20;`
- Operations: `insert()`, `erase()`, `count()`, `find()`.
- Time complexity for operations: $O(\log n)$.

6. Multimaps

- Allows duplicate keys in key-value pairs.
- Syntax: `std::multimap<string, int> mm;`

7. Unordered Maps

- Stores key-value pairs with unique keys.
- No specific order; uses hashing.
- Faster average time complexity: $O(1)$.
- Syntax: `std::unordered_map<string, int> um;`