

इतना मत गिरो कि उठने का यकीन टूट जाए,  
इतना उठो कि गिरने वाला भी सोच में पड़ जाए।



# Standard Template Library

STL is a collection of pre-built classes and functions

## Components of STL



### Containers

Hold and organize the data.



### Algorithms

Perform actions like sorting or searching on the data.



### Iterators

Helps go through the data in containers one by one.

## Container

Containers are the data structures used to store objects and data according to the requirement.

Containers can be further classified into 4 types:

1. Sequence Containers : Vector, Deque, List
2. Associative Containers : Set, MultiSet, Map, Multimap
3. Unordered Associated Containers : Unordered set, unordered Map,



## Algorithms

STL algorithms offer a wide range of functions to perform common operations on dat

`Sort()`

`reverse()`

`min_element()`

`max_element()`

`count()`

#include <iostream>

#include <bits/stdc++.h>

#include <string.h>

#include <stdio.h>

#  
#include <math.h>  
#include <stdlib.h>

## vector

header: #include <vector>

Syntax:

vector < data type > v

vector < data type > v( size )

vector < int > v( 5 )

capacity = 5

size() = 3



\* `v.push_back(data)`

(10)

(20)

(30)

(40)

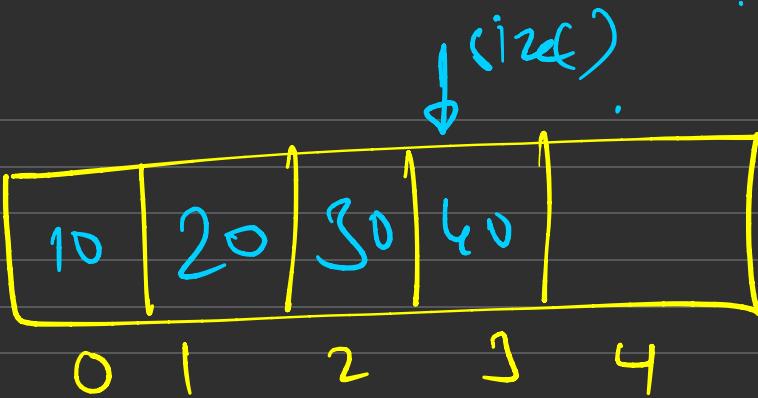
10

[10 | 20 ] [ 30 ]

\* `v.pop_back()` → Remove last element

\* `v.size()` → size of vector

\* `v.empty()` { T if empty  
F }



~~size = 0~~

2

pop-back

vector <int> v (5)

v.push-back(11)  
(20)

v (size) = 11

size++

Pairs

$\langle \text{Val}_1, \text{Val}_2 \rangle$   
 $\langle \text{Val}_2, \text{Val}_3 \rangle$

header = include < pair >

Syntax:

pair < dataT<sub>1</sub>, dataT<sub>2</sub> > p

p. first = dataT<sub>1</sub>

p. second = dataT<sub>2</sub>

pair < int, string > p[5]

(Roll, Name)

p[0].first = 1

p[0].second = "Umeshali"

7	8	9	10
0	1	2	3

p[1].first = 5

p[1].second = "Sanchita"

1, V	(5, S)	(2, E)		
0	1	2	3	4

p[2].first = 2

p[2].second = "Eshita"

(data, data)
--------------

8	9	0	9	10
---	---	---	---	----

```
for( i=0 ; i < p.size() ; i++ )
```

```
}
```

```
    cout << p(i). first
```

```
    cout << p(i). second
```

```
4
```

# Set

- mainly used to store data
- data is in sorted order (increasing)
- duplicate not allowed

# Unordered Set

- data can be in any order
- duplicate not allowed

Set

header = include <set>

Syntax :

set < dataType > s (increasing)

- `s.size()` → mainly gives no. of elements
  - `s.empty()` → Either Empty
- X —————
- `s.insert(data)` → Insert data in set

`s.insert(5)`

`s.insert(2)`

`s.insert(1)`

`s.insert(4)`

`s.insert(3)`

`s.insert(2)`

ignore

5
4
3
2
1

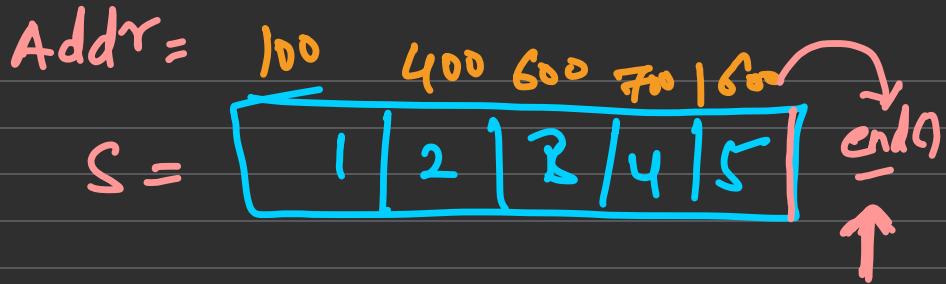
- Traversing set

```
for (auto i : s)  
    cout << i  
{
```

-  $s.\text{find}(\text{data})$

auto  $x = s.\text{find}(4)$

cout << (x)



auto  $y = s.\text{find}(20)$

if ( $y == s.\text{end}()$ )  
 Not found

else

## Multiset

- Allows duplicate
- sorted data

- `s.insert (val)`
  - `s.size()`
  - `s.empty()`
  - `s.find(val)`
- `{ end()`
- `{ Add`

```
for (auto i : s)  
cout << i
```

set <int> s  
multiset <int> ms  
unordered\_set <int> us

## Unordered Set

Map

## Unordered Map

Sort()

reverse()

count()

**accumulate()**

`min_element()`

max\_element()

... vector.cpp X

```
vector < int > v={10 , 20 , 30, 40, 50};  
cout << v.size() << endl ;
```

return 0;

int arr[] = { 1, 2, 3, 4 };

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\pranj\Downloads\ControlFlow.cpp> cd "c:\Users\pranj\Downloads\vector"  
5  
PS C:\Users\pranj\Downloads\ControlFlow.cpp>
```

RE  
int arr[-2]

```
C:\ Vector.cpp > @ main()
1 #include <iostream>
2 #include <vector>
3 using namespace std ;
4 int main ()
5 {
6     vector < int > v ;
7     v.push_back (10) ;
8     v.push_back (20) ;
9     v.push_back (30) ;
10    v.push_back (40) ;
11    v.push_back (50) ;
12    v.push_back (60) ;
13    cout << v[-1] ;
14 }
15 }
```

$$\text{Cap} = 10$$

10 | 20

10 | 20 | 30 | 40

10 | 20 | 30 | 40 | 50 | 60

0 1 2 3 4 5 C T

10 | 20 | 30 | 40 | 50 | 60

0 1 2 3 4 5

-1

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\pranj\Downloads\STL.cpp> cd "c:\Users\pranj\Downloads"
134229818
PS C:\Users\pranj\Downloads\STL.cpp>
```

40

```
1 #include <iostream>
2 #include <vector>
3 using namespace std ;
4 int main ()
5 {
6     vector < int > v ;
7     v.push_back (10) ;
8     v.push_back (20) ;
9     v.push_back (30) ;
10    v.push_back (40) ;
11    v.push_back (50) ;
12    v.push_back (60) ;
13    cout << v[10] ;
14 }
15 }
```

index = 20

```
1 #include <iostream>
2 #include <vector>
3 using namespace std ;
4 int main ()
5 {
6     vector < int > v ;
7     v.push_back (10) ;
8     v.push_back (20) ;
9     v.push_back (30) ;
10    v.push_back (40) ;
11    v.push_back (50) ;
12    v.push_back (60) ;
13    cout << v[10] ;
14 }
15 }
```

index = 10

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\pranj\Downloads\STL.cpp> cd "c:\Users\pranj\Downloads"
2
PS C:\Users\pranj\Downloads\STL.cpp>
```