

NCKU Programming Contest Training Course

Stack & Queue

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Stack

- A stack is an ordered list in which insertions and deletions are made at one end called the top.
- If we add the elements A, B, C, D, E to the stack, in that order, then E is the first element we delete from the stack
- A stack is also known as a **Last-In-First-Out (LIFO)** list.

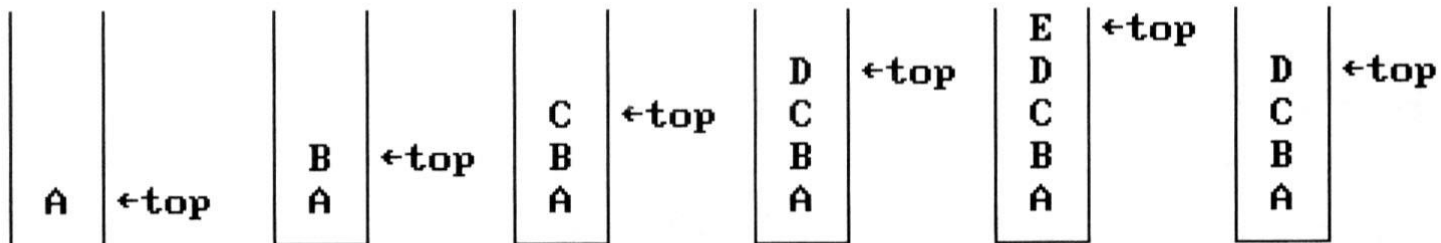
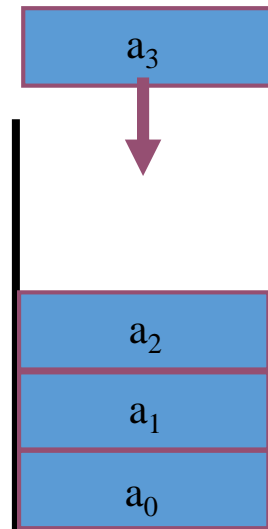


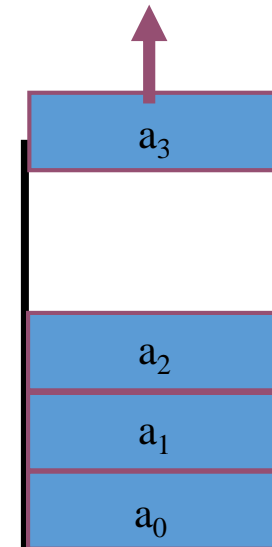
Figure 3.1: Inserting and deleting elements in a stack

Stack - STL

- STL - Standard Template Library
- 參考：<http://www.cplusplus.com/reference/stack/stack/>
- Member Function:
 - push
 - pop
 - top
 - empty
 - size



Push (Add)



Pop (Delete)

Stack

- Stack Usage in STL

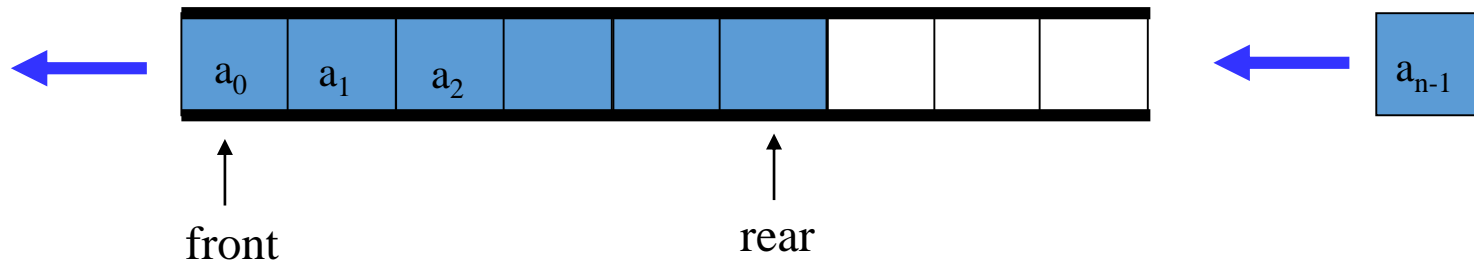
```
1  #include <stack>
2  #include <cstdio>
3  using namespace std;
4
5  int main()
6  {
7      stack<int> stk;
8      stk.push(1);
9      stk.push(2);
10     while (stk.empty() == false) {
11         printf("%d\n", stk.top());
12         stk.pop();
13     }
14 }
```

Practice

UVA 673 Parentheses Balance

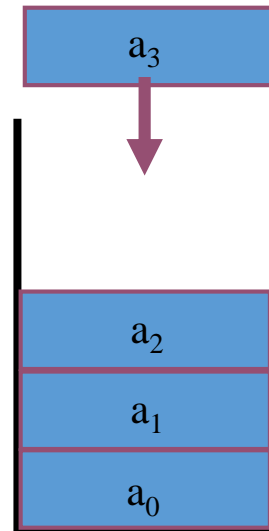
Queue

- A queue is an ordered list in which insertions and deletions are made at one end called the front.
- If we add the elements A, B, C, D, E to the stack, in that order, then A is the first element we delete from the queue.
- A queue is also known as a **First-In-First-Out (FIFO)** list.

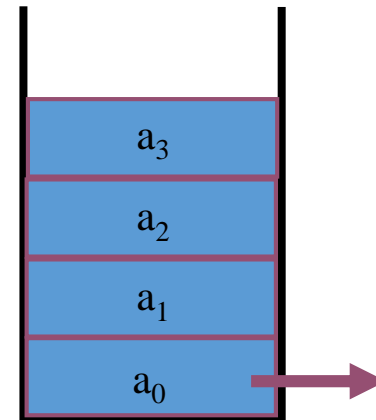


Queue - STL

- 參考：<http://www.cplusplus.com/reference/queue/queue/>
- Member Function:
 - push
 - pop
 - front
 - back
 - empty
 - size



Push (Add)



Pop (Delete)

Queue

- Queue Usage in STL

```
1  #include <queue>
2  #include <cstdio>
3  using namespace std;
4  int main()
5  {
6      queue<int> q;
7      q.push(1);
8      q.push(2);
9      while (!q.empty()) {
10         printf("%d\n", q.front());
11         q.pop();
12     }
13 }
```


Practice

UVA 11995
I Can Guess the Data Structure!

補充: Priority Queue

- Priority queues are a type of container adaptors, specifically designed such that its **first element** is always the **greatest** of the elements it contains.
- http://www.cplusplus.com/reference/queue/priority_queue/
- Member function
 - push
 - pop
 - top
 - empty
 - size

```
1  #include <queue>
2  #include <cstdio>
3  using namespace std;
4  int main()
5  {
6      priority_queue<int> pq;
7      pq.push(1);
8      pq.push(3);
9      pq.push(2);
10     printf("%d\n", pq.top());
11 }
12 // result: 3
```

Practice 2

POJ 3125 Printer Queue