Data Structure

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Data Structure

(i) What is (and why) data structure?

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(ii) Common (simple) data structures:

(1) Variable, Pointer

(2) Linear data structures:

- Array, List (Singly-linked list, Doubly-linked list)
- Stack, Queue, Deque

(3) Trees

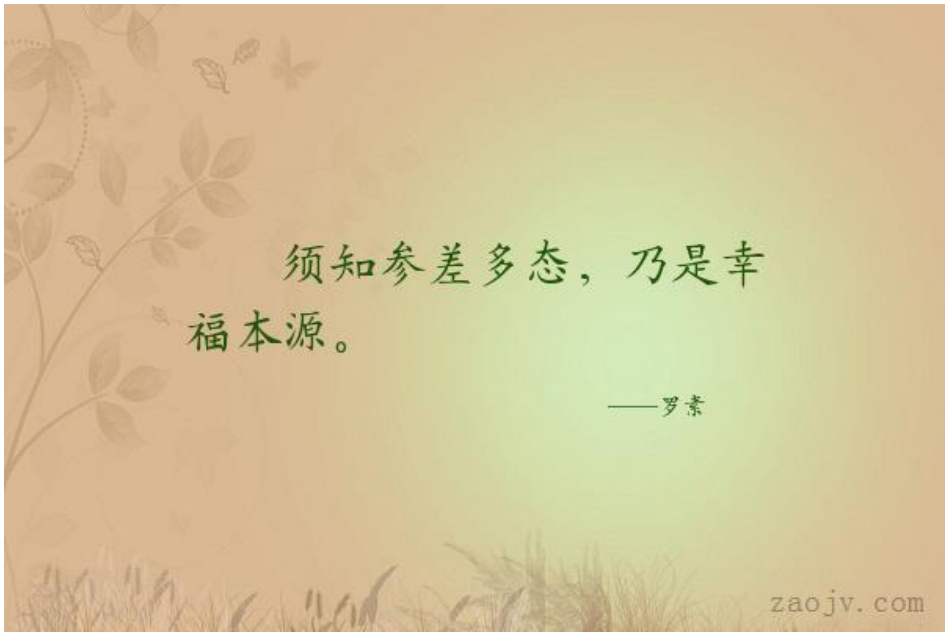
- Binary Search Tree (BST)
- ...

(4) Hashes

(5) Graphs

(6) ...

Why are there so many data structures?



Data Strcture *vs.* Data Type

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Data type: data + operations

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Example: Sequence of Data

OP: SEARCH, INSERT, DELETE

Array *vs.* List

Variable and Pointer

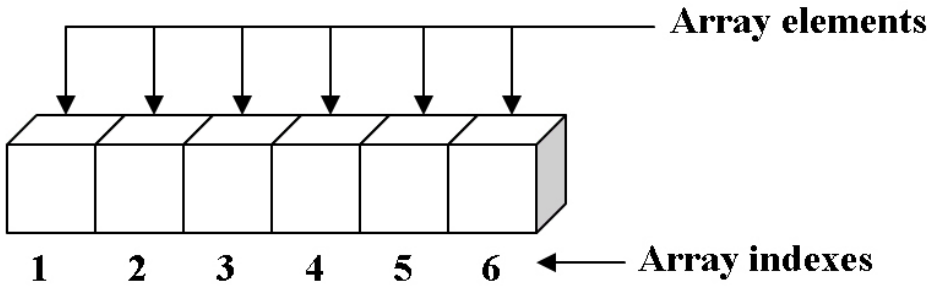
```
int x;
```

```
int *p = x;
```

swap

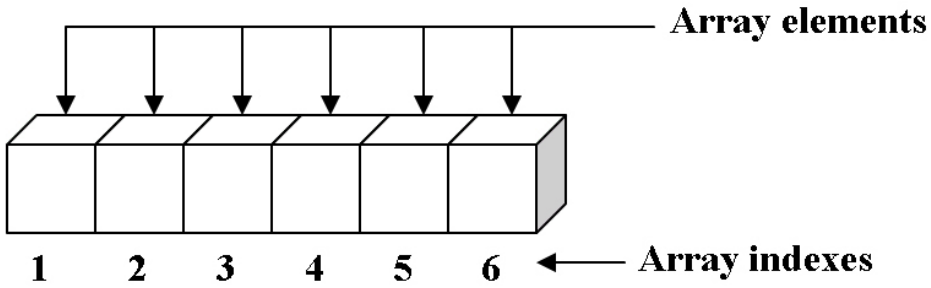
Array

Array: A sequence of contiguously stored elements.



One-dimensional array with six elements

Array: A sequence of contiguously stored elements.



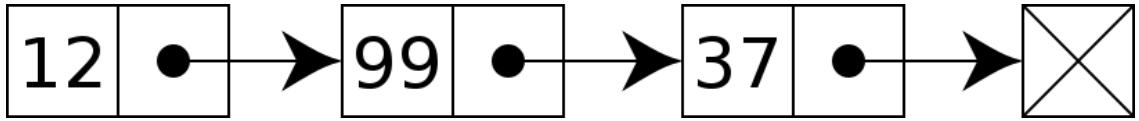
One-dimensional array with six elements

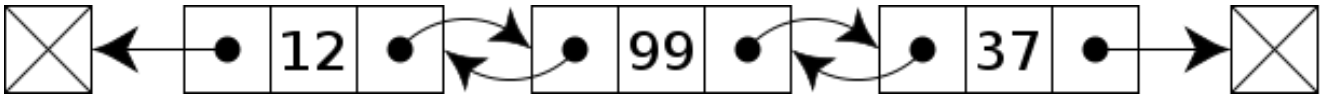
```
vector<int> array {1,5,7,9,10};

array[1] = 3;  // offset
array.insert(pos, val);  // moving elements
array.erase(pos)  // moving elements
```

2d array

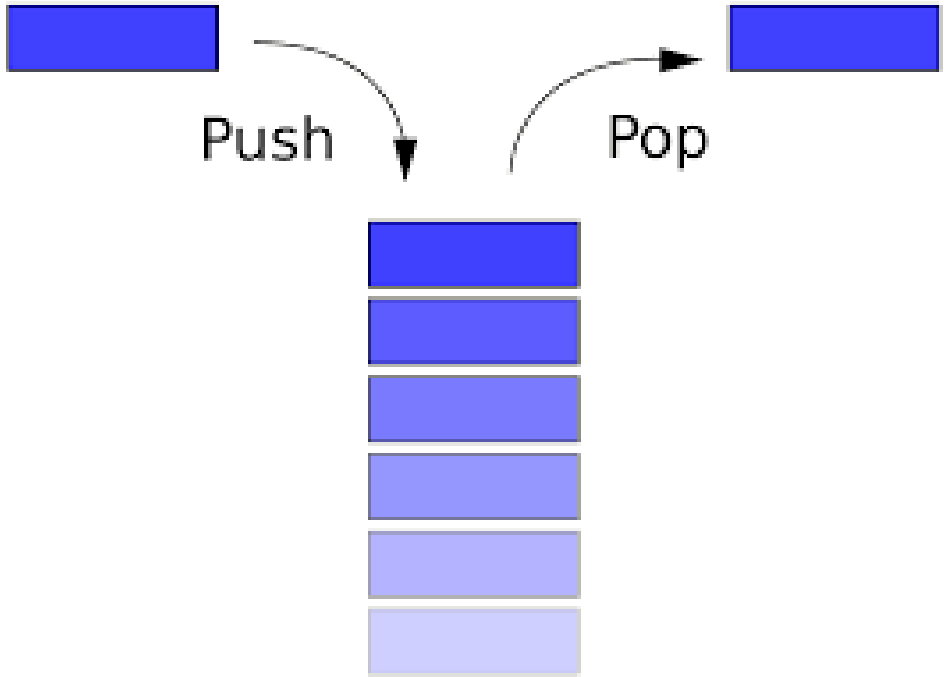
List


12
99
37


12
99
37

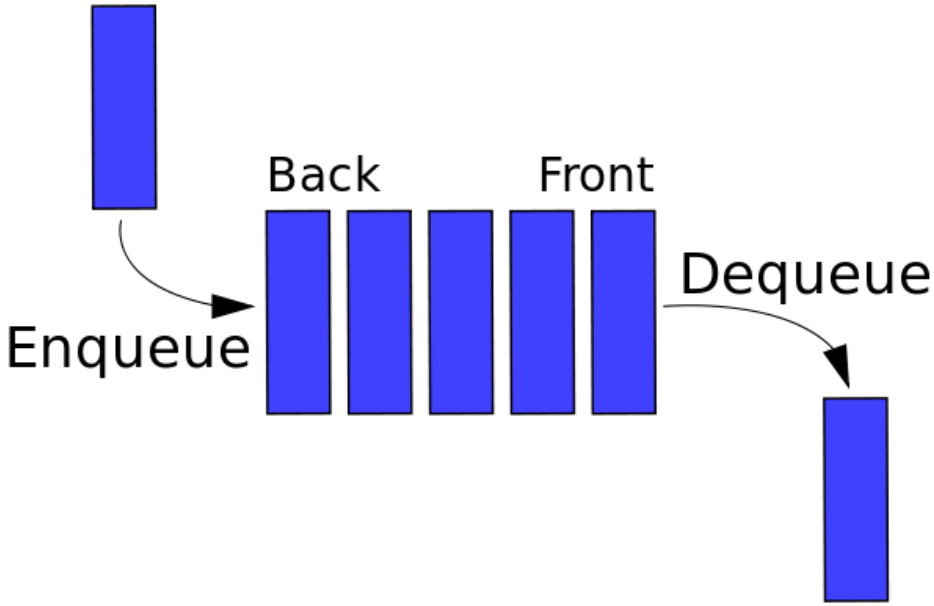
Josephus problem

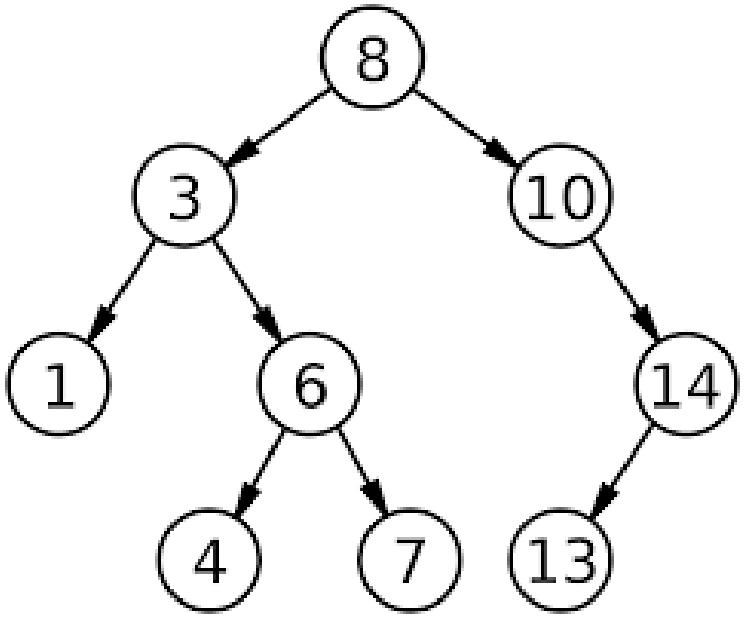
Stack


Push
Pop

brackets matching problem

Queue


Back
Front
Enqueue
Dequeue


8
3
10
1
6
14
4
7
13


Thank
You!