

# Stacks, Queues, Deques

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## Stack

- object: a container that holds some elements
  - action: [constant-time] push (to the top), pop (from the top)
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- last-in-first-out (LIFO): 擠電梯， 洗盤子
  - very restricted data structure, but important for computers  
—will discuss some cases later

# A Simple Application: Parentheses Balancing

- in C, the following characters show up in pairs: (), [], {}, ""

good: {xxx (xxxxxx) xxxxx "xxxx" x }

bad: {xxx (xxxxxx } xxxxx "xxxx" x }

- the LISP programming language

(append (pow (\* (+ 3 5) 2) 4) 3)

how can we check parentheses balancing?

# Stack Solution to Parentheses Balancing

inner-most parentheses pair  $\implies$  top-most plate

'(: 堆盤子上去 ;)': 拿盤子下來

## Parentheses Balancing Algorithm

```
for each  $c$  in the input do  
  if  $c$  is a left character  
    push  $c$  to the stack  
  else if  $c$  is a right character  
    pop  $d$  from the stack and check if match  
  end if  
end for
```

many more sophisticated use in compiler design