

# Stacks and Queues

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## Stack

- object: a container that holds some elements
- action: push (to the top), pop (from the top)
  
- 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

## Stack Solution to Parentheses Balancing

```
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  
    if  $c$  does not match  $d$   
      return WRONG  
    end if  
  end if  
end for  
return RIGHT
```

{xxx (xxxxxx) xxxxx "xxxx" x }

many more sophisticated use in compiler design