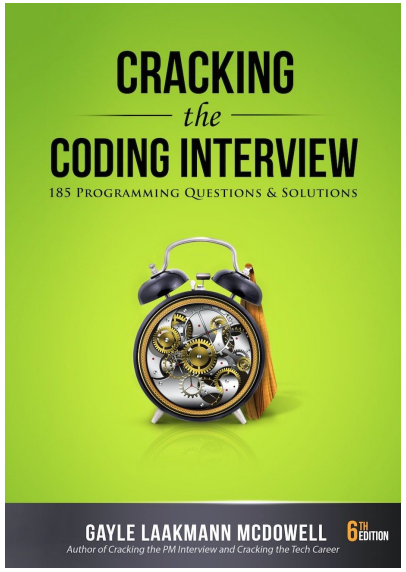
INTERVIEW PRACTICE STACK AND QUEUE

Problem Solving with Computers-II

Tips for Technical Interviews

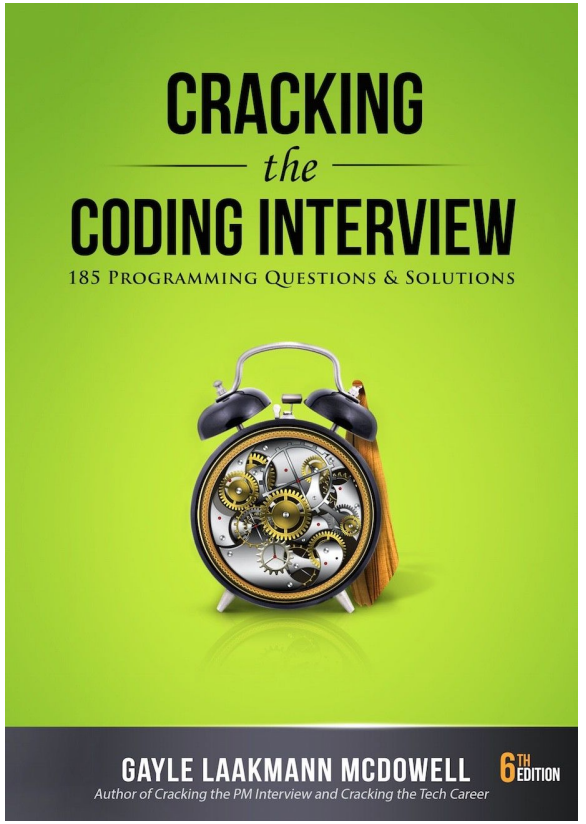


1. Listen carefully
2. Draw an example
3. State the brute force or a partially correct solution
    - then work to get at a better solution
4. Optimize:
    - Make time-space tradeoffs to optimize runtime
    - Precompute information: Reorganize the data e.g. by sorting
5. Solidify your understanding of your algo before diving into writing code.
6. Start coding!

Interview practice!

Write a ADT called minStack that provides the following methods

- push() // inserts an element to the “top” of the minStack
- pop() // removes the last element that was pushed on the stack
- top () // returns the last element that was pushed on the stack
- min() // returns the minimum value of the elements stored so far



minStack ADT: Draw/solve a small example! (2 min)

Think of the most straightforward approach (1 min)
Evaluate its performance (1 min)

Think of another approach and evaluate it (5 min)
Can you trade off space/memory for better runtime?

Pick the most promising approach and start coding! (10 min)

Can you think of other ways of solving the problem? (2 min)

Lab06: Evaluate a fully parenthesized infix expression

(4 * ((5 + 3.2) / 1.5)) // okay

(4 * ((5 + 3.2) / 1.5) // unbalanced parens - missing last ‘)’

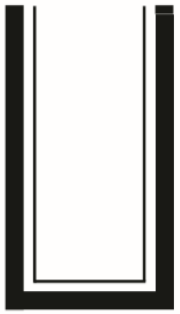
(4 * (5 + 3.2) / 1.5)) // unbalanced parens - missing one ‘(‘

4 * ((5 + 3.2) / 1.5) // not fully-parenthesized at ‘*’ operation

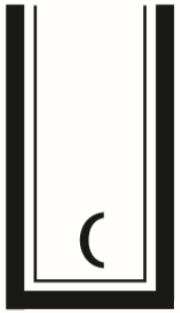
(4 * (5 + 3.2) / 1.5) // not fully-parenthesized at ‘/’ operation

Checking if the parenthesis are balanced

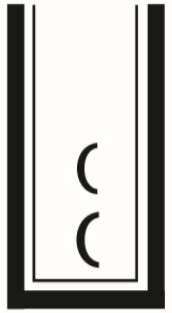
Initial
empty
stack



Read
and push
first (



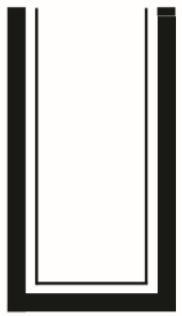
Read
and push
second (



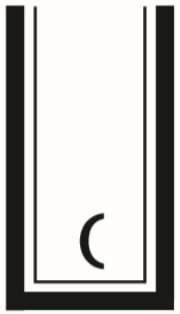
((2 * 2) + (8 + 4))

Checking if the parenthesis are balanced

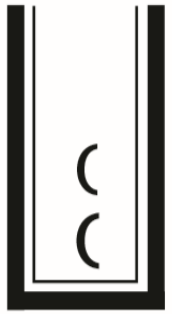
Initial empty stack



Read and push first (



Read and push second (



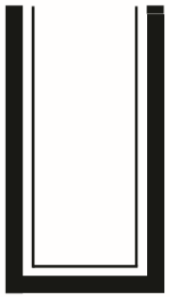
((2 * 2) + (8 + 4))

What should **be the next step after the first right parenthesis is encountered**?

A. Push the right parenthesis onto the stack
B. If the stack is not empty pop the next item on the top of the stack
C. Ignore the right parenthesis and continue checking the next character
D. None of the above

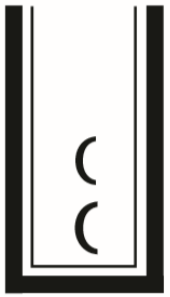
((2 * 2) + (8 + 4))

Initial empty stack

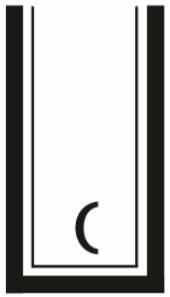


Read and push first (

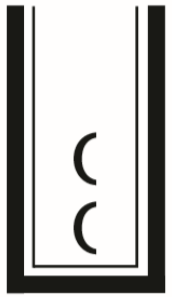
Read and push second (



Read first) and pop matching (

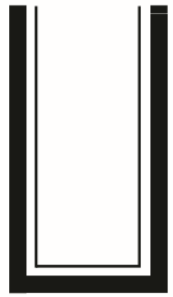


Read and push third (



Read second) and pop matching (

Read third) and pop the last (



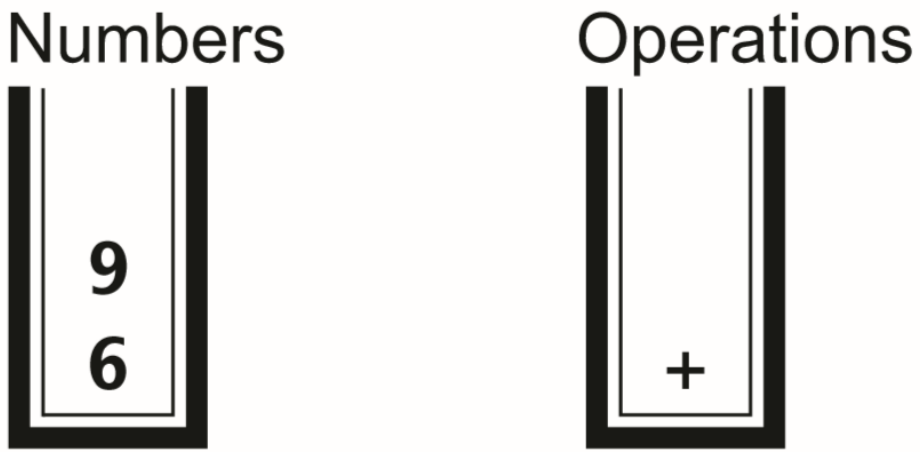
Evaluating a fully parenthesized infix expression

```
(((6 + 9)/3)*(6 - 4))
```

Evaluating a fully parenthesized infix expression

Characters read so far (shaded):

```
(((6 + 9) / 3) * (6 - 4))
```



Evaluating a fully parenthesized infix expression

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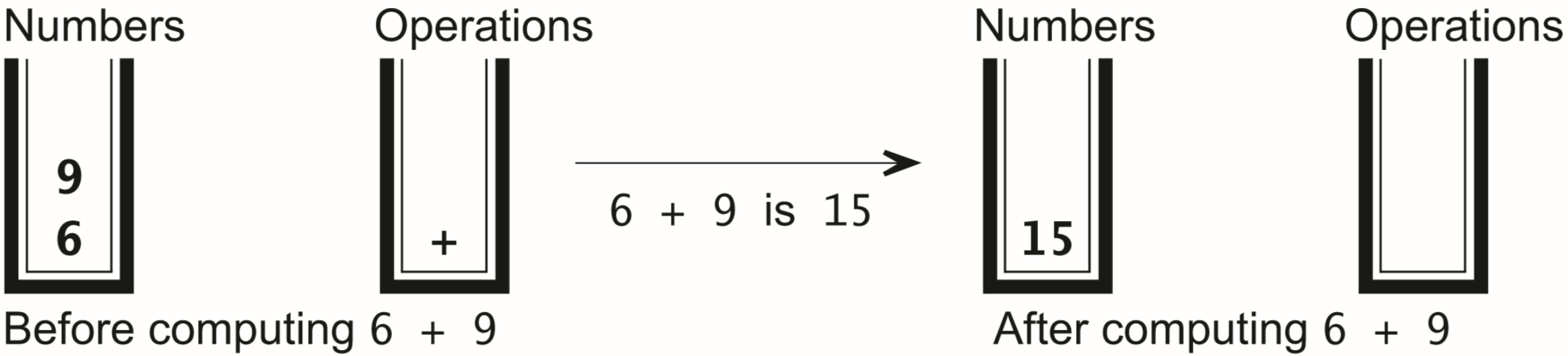
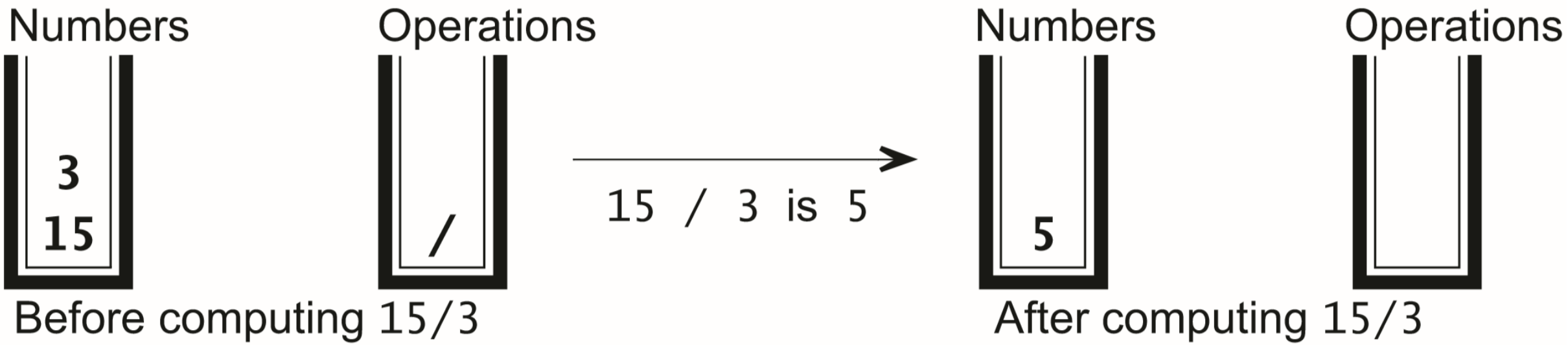
(((6 + 9) / 3) * (6 - 4))



Evaluating a fully parenthesized infix expression

Characters read so far (shaded):

(((6 + 9) / 3) * (6 - 4))



Notations for evaluating expression

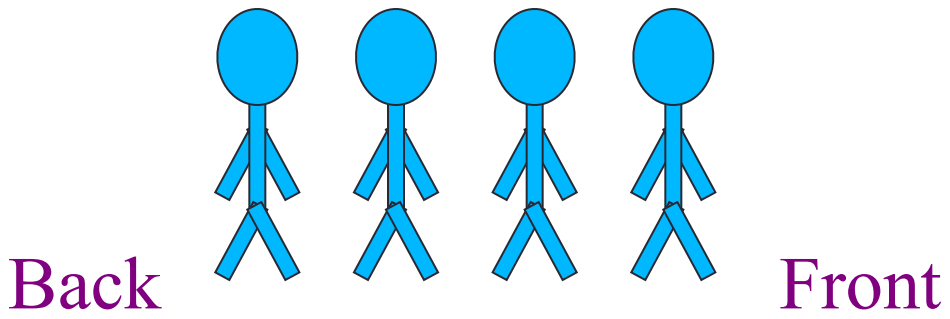
- Infix number operator number
- (Polish) Prefix operators precede the operands
- (Reverse Polish) Postfix operators come after the operands

Convert to postfix and evaluate

((6 + 9) / 3) * (6 - 4)

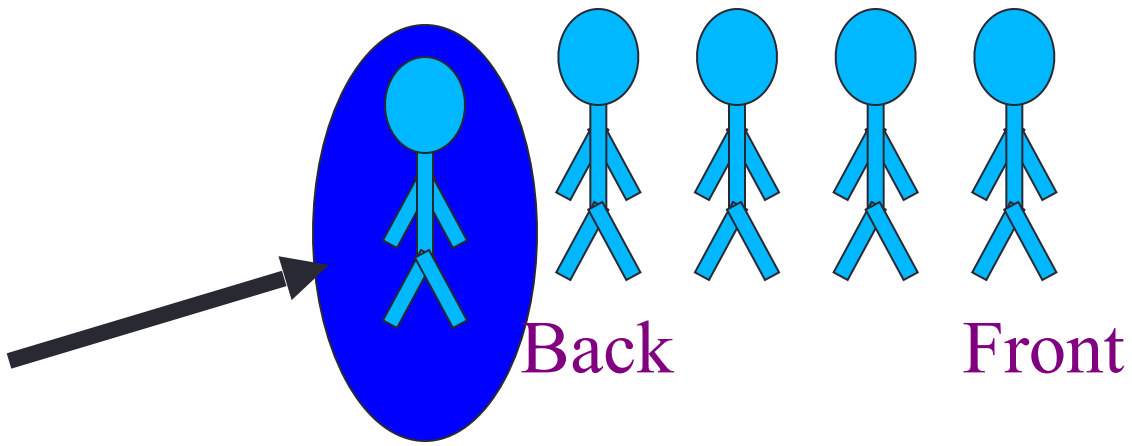
Queue Operations

- A queue is like a queue of people waiting to be serviced
- The queue has a **front** and a **back**.



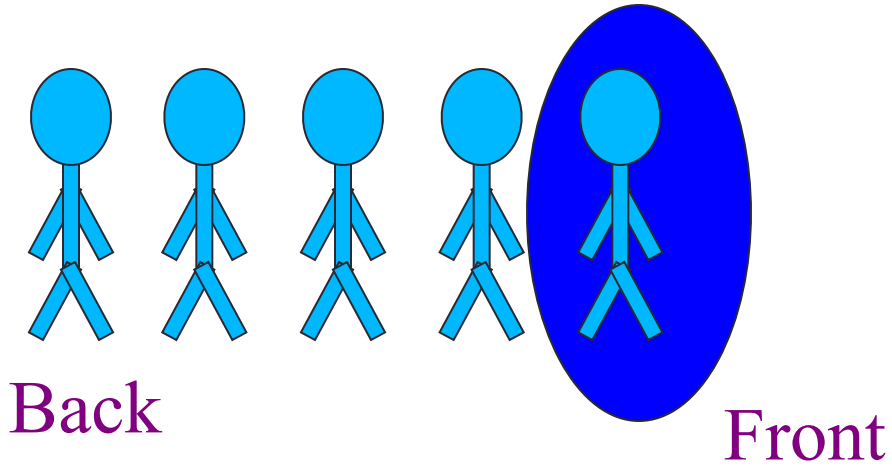
Queue Operations

- New people must enter the queue at the back. The C++ queue class calls this a **push**, although it is usually called an **enqueue** operation.



Queue Operations

- When an item is taken from the queue, it always comes from the front. The C++ queue calls this a **pop**, although it is usually called a **dequeue** operation.

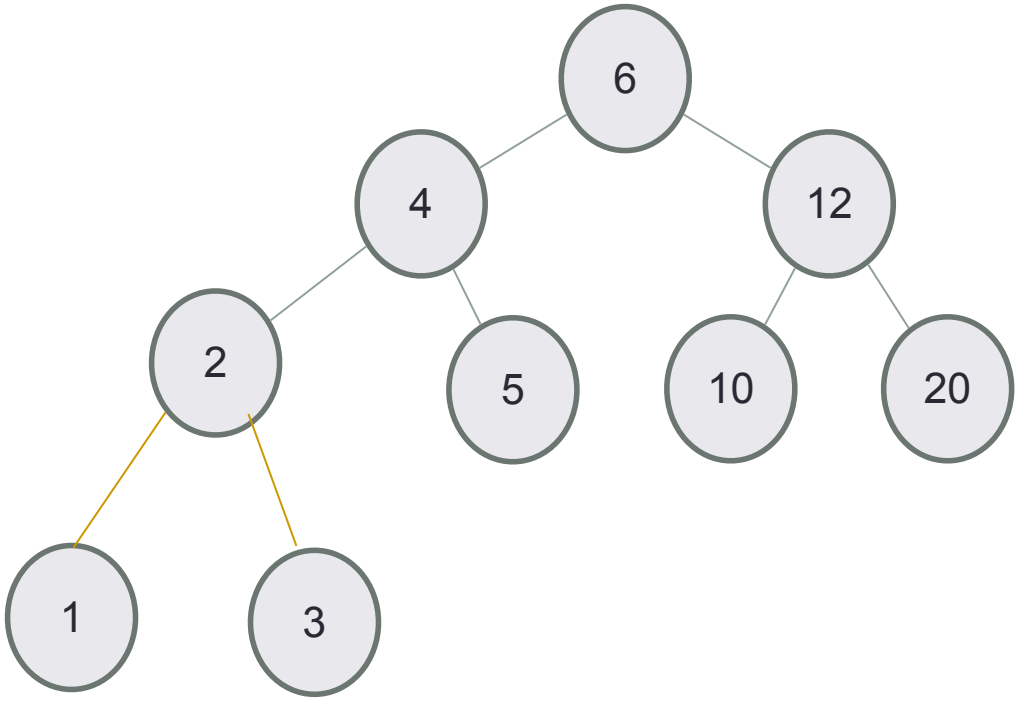


Queue class

- The C++ standard template library has a queue template class.
- The template parameter is the type of the items that can be put in the queue.

```
template <class Item>
class queue<Item>
{
public:
        queue( );
        void push(const Item& entry);
        void pop( );
        bool empty( ) const;
        Item front( ) const;
        …
```

Breadth first traversal



- Take an empty Queue.
- Start from the root, insert the root into the Queue.
- Now while Queue is not empty,
  - Extract the node from the Queue and insert all its children into the Queue.
  - Print the extracted node.