

2/11/22

① Infix $\rightarrow$ Postfix

② Queues (or line)

3 + 4 * 5
↑ ↑

PEMDAS
↓ ↓ ↓ ↓
paren exp mult add
div sub

Stack for operators. (+, -, *, /, (,), =, =)

Output: Postfix Expression

Rules

- ① If we get an operand (value), just place it in the expression.
- ② If we get an operator, pop off each operator with equal or greater precedence, until either we reach an open paren or the stack is empty. Place each of these popped items into the expression. Push our ~~*~~ operator onto stack

Output: 3 4 5 * +
└──────────┘

Stack
Operator

- ③ If we get an open paren, push onto stack
- ④ If we get a close paren, pop off everything on the stack until you hit an open, pop that off + stop. Each item popped off gets placed in the expression.
- ⑤ If stack not empty at end, pop off each item and place in expression.

Expr: $(3+4)*5$

Output: $3 \ 4 \ + \ 5 \ *$


~~*~~
~~*~~ *

Stack

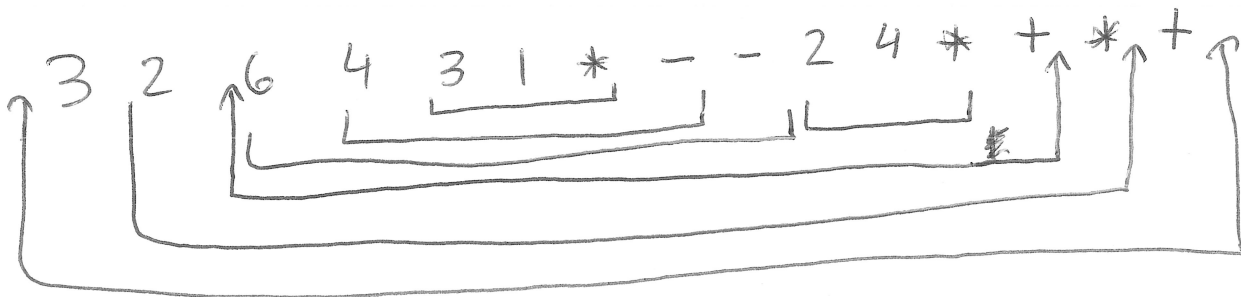
Complicated Example

$3 + 2 * (6 - (4 - 3 * 1) + 2 * 4)$

Output: $3 \ 2 \ 6 \ 4 \ 3 \ 1 \ * \ - \ - \ 2 \ 4 \ * \ + \ * \ +$
 $\quad \quad \quad * \ + \ * \ +$

~~*~~
~~*~~
~~*~~
~~*~~
~~*~~
~~*~~
~~*~~
~~*~~
~~*~~
~~*~~

Stack



Queues

Abstract Data Type

Stack - last in, first out (LIFO)

queue - first in, first out (FIFO)

↳ fair, first come, first served

Operations

enqueue - add to back of line

dequeue - remove from front of the line

front - returns front w/o removing it.

size - return # elems

empty - returns 1 iff queue is empty

full - returns 1 if no more capacity

① Linked List

② Array

trace

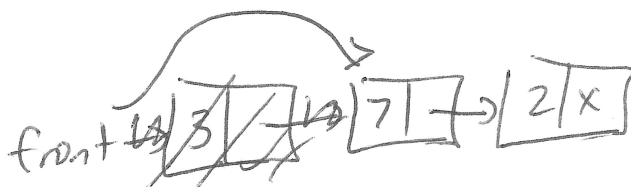
enqueue(3)

enqueue(7)

enqueue(2)

x = dequeue() → fast

x[3]

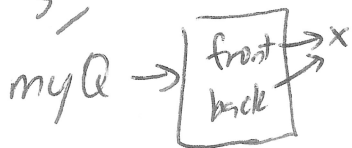


if many items in queue, enqueue would take a long time.

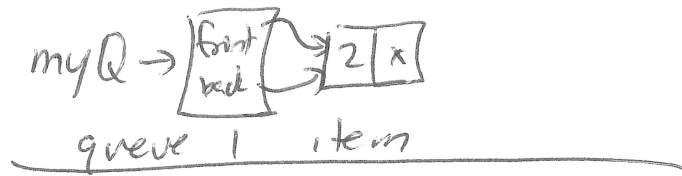
Extra - storage often times, can lead to speed ups in time.

Solution to long enqueue time: Store ptr to last node

```
struct queue {  
    struct node* front;  
    struct node* back;  
};
```



empty queue



insert 7



Sketch of enqueue code

```
node* newn = makeNode(newitem);  
myQ → back → next = newn;  
myQ → back = newn;
```