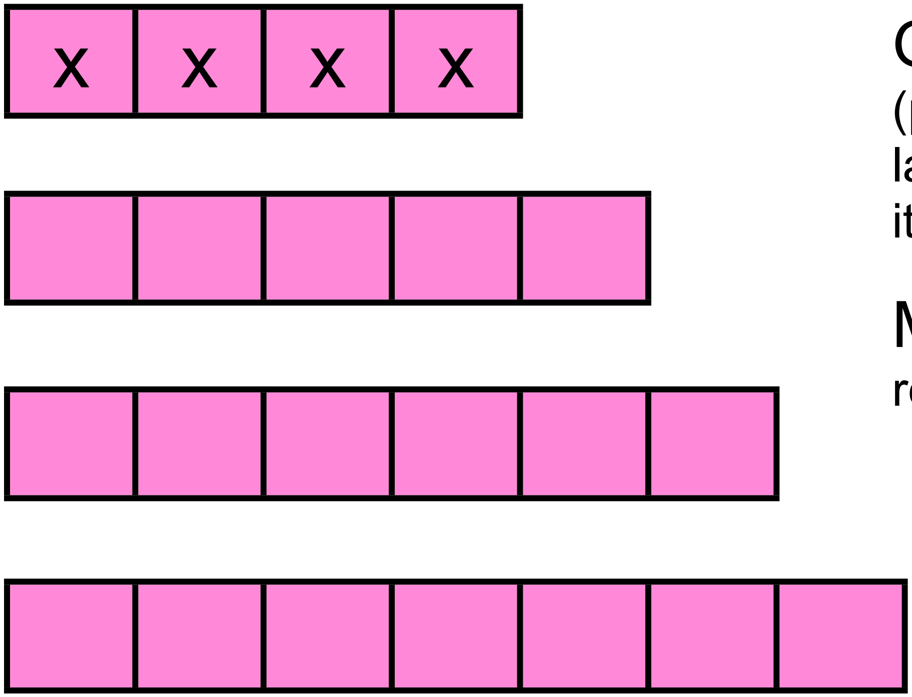
Announcements

MP3 available, due 2/22, 11:59p.

TODAY: array resizing schemes
ADT - Queues

Stack array based implementation: (what if array fills?)

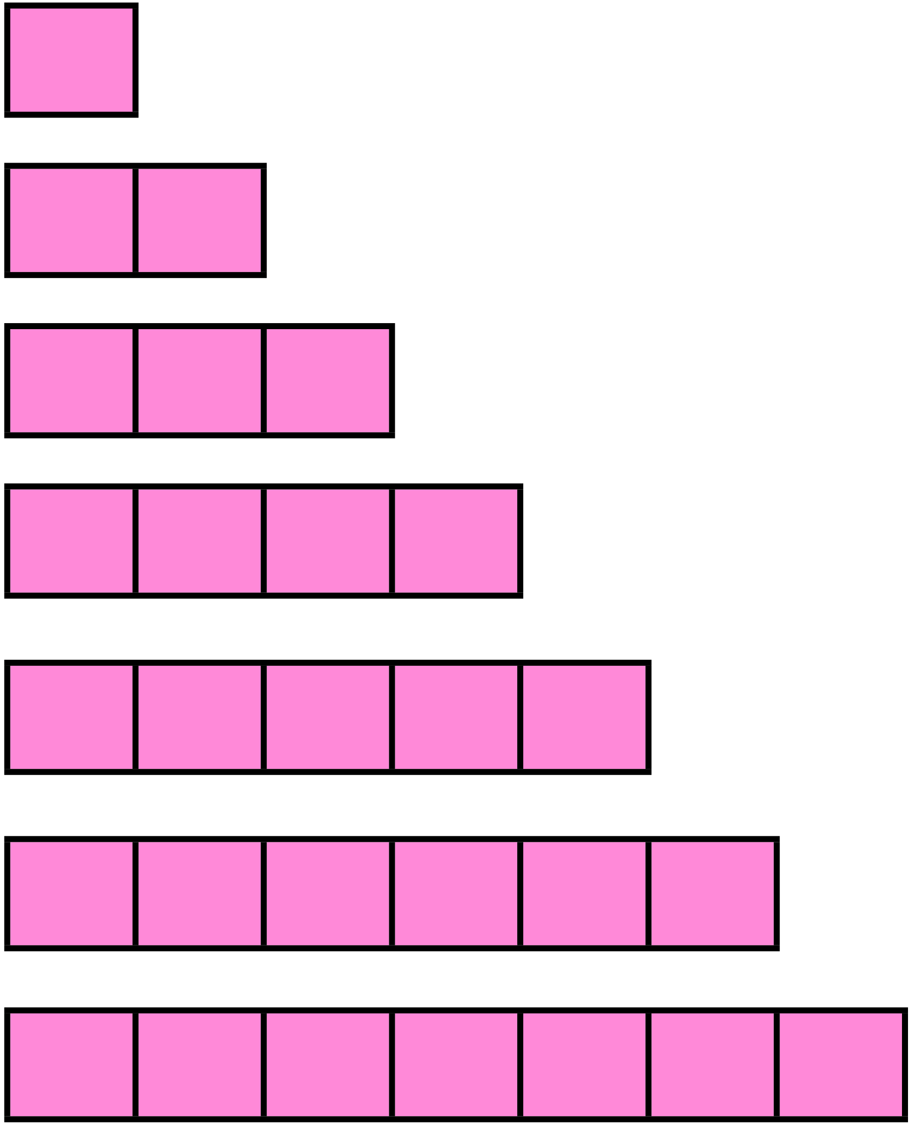
Analysis holds for array based implementations of Lists, Stacks, Queues, Heaps…



General Idea: upon an insert (push), if the array is full, create a larger space and copy the data into it.

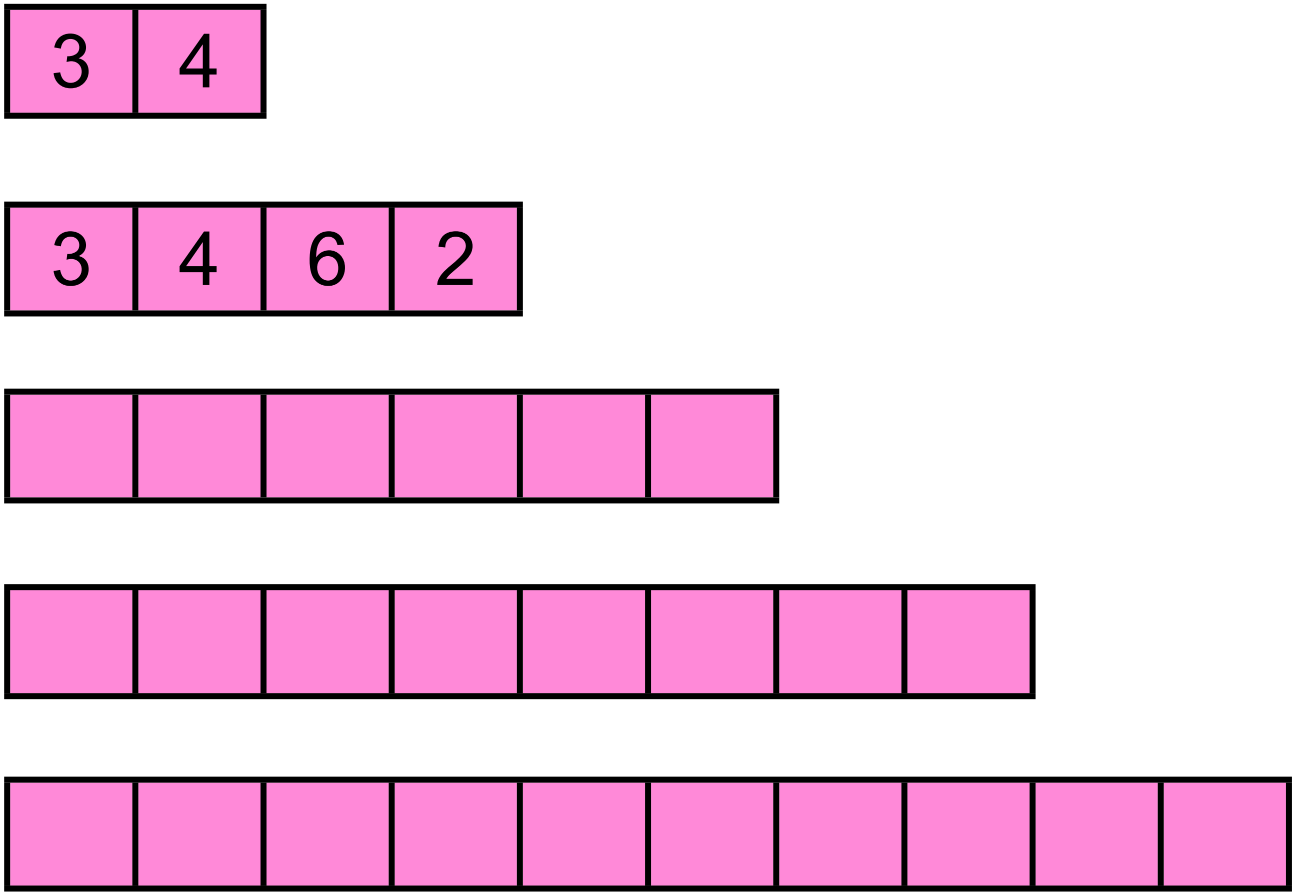
Main question: What's the resizing scheme? We examine 3.

Stack array based implementation: (what if array fills?)



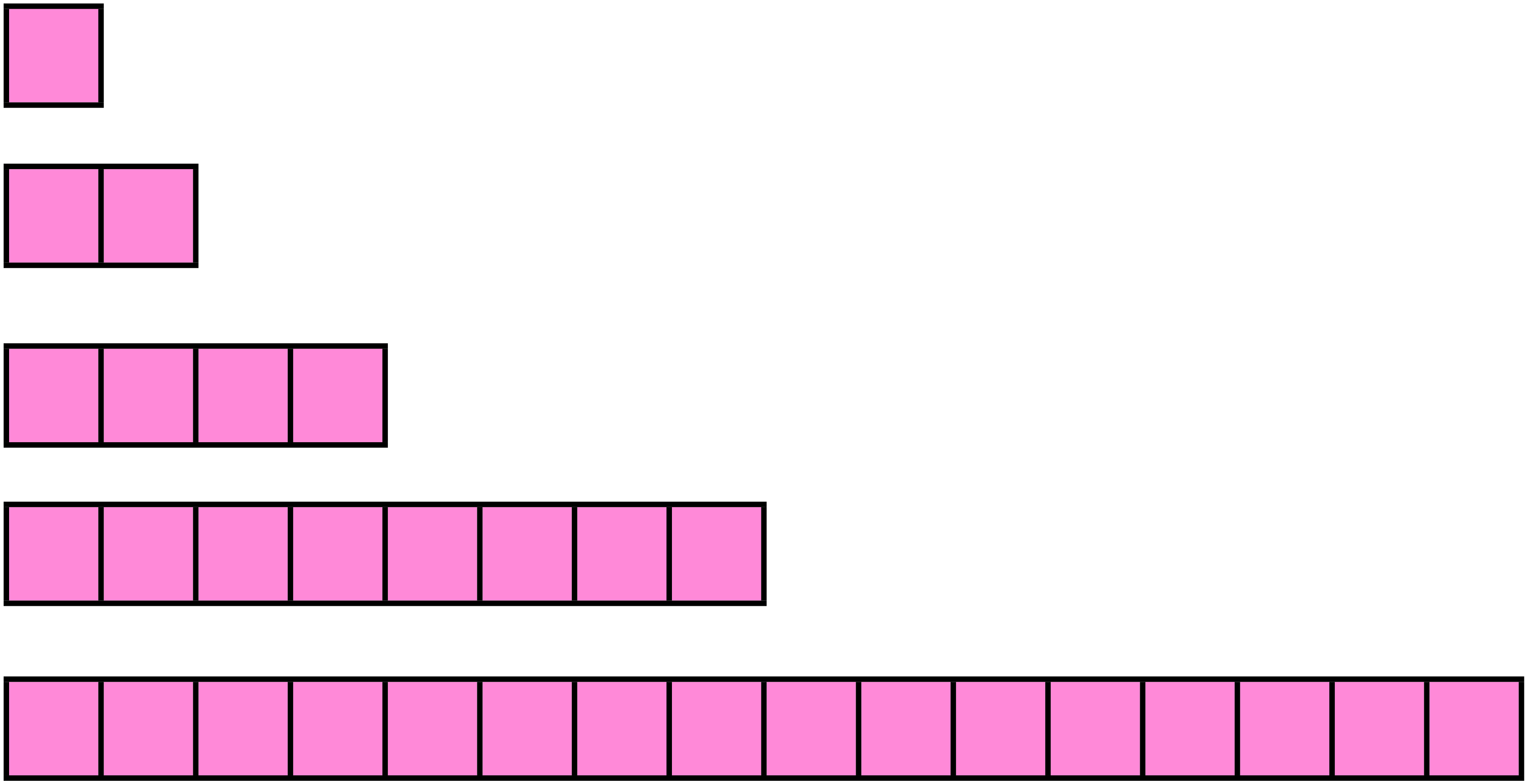
How does this scheme do on a sequence of n pushes?

Stack array based implementation: (what if array fills?)



How does this scheme do on a sequence of n pushes?

Stack array based implementation: (what if array fills?)



How does this scheme do on a sequence of n pushes?

Summary:

Linked list based implementation of a stack:

Constant time push and pop.

Array based implementation of a stack:

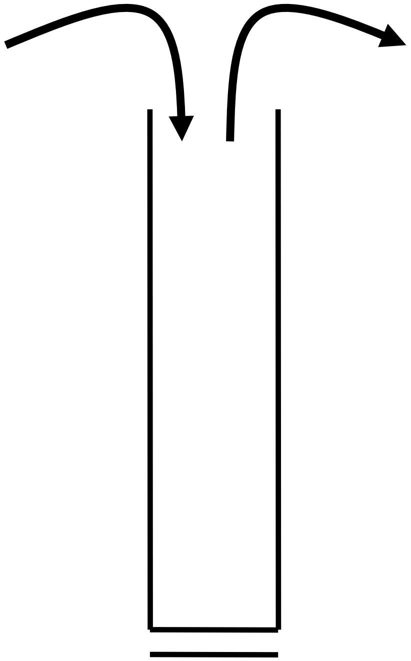
__________ time pop.

__________ time push if capacity exists,

Cost over O(n) pushes is ______ for an AVERAGE of __________ per push.

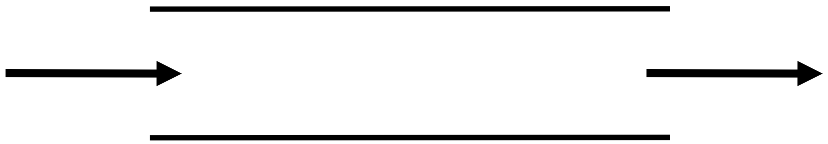
Why consider an array?

Queues:

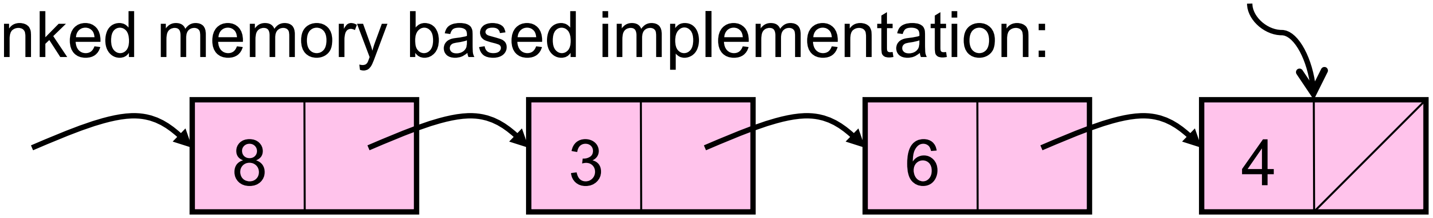


Queue ADT:

- enqueue
- dequeue
- isEmpty



Queue—linked memory based implementation:



```
template<class SIT>
class Queue {
public:
    // ctors dtor
    bool empty() const;
    void enqueue(const SIT & e);
    SIT dequeue();
private:
    struct queueNode {
        SIT data;
        queueNode * next;
    };
    queueNode * entry;
    queueNode * exit;
    int size;
};
```

Which pointer is “entry” and which is “exit”?

What is running time of enqueue?

What is running time of dequeue?

Queue array based implementation:

```
template<class SIT>
class Queue {
public:
    Queue();
    ~Queue(); // etc.
    bool empty() const;
    void enqueue(const SIT & e);
    SIT dequeue();
private:
    int capacity;
    int size;
    SIT * items;
    // some other stuff…
};
```

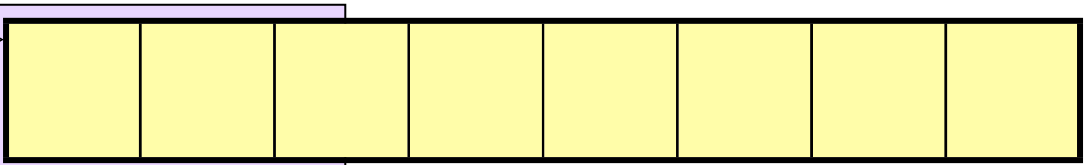
```
template<class SIT>
Queue<SIT>::Queue(){
    capacity = 8;
    size = 0;
    items = new SIT[capacity];
}
```

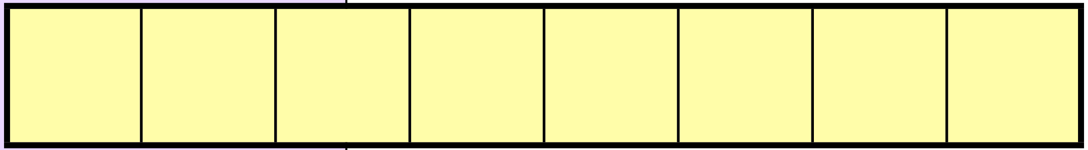
Queue array based implementation:

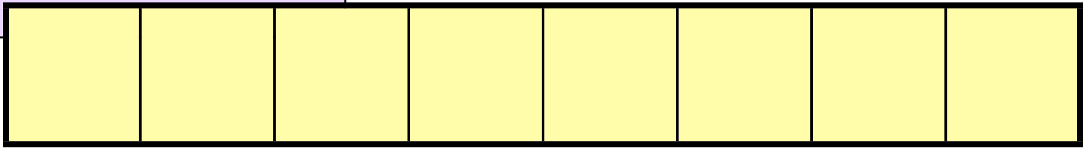
```
template<class SIT>
class Queue {
public:
    Queue();
    ~Queue(); // etc.
    bool empty() const;
    void enqueue(const SIT & e);
    SIT dequeue();
private:
    int capacity;
    int size;
    SIT * items;



};
```

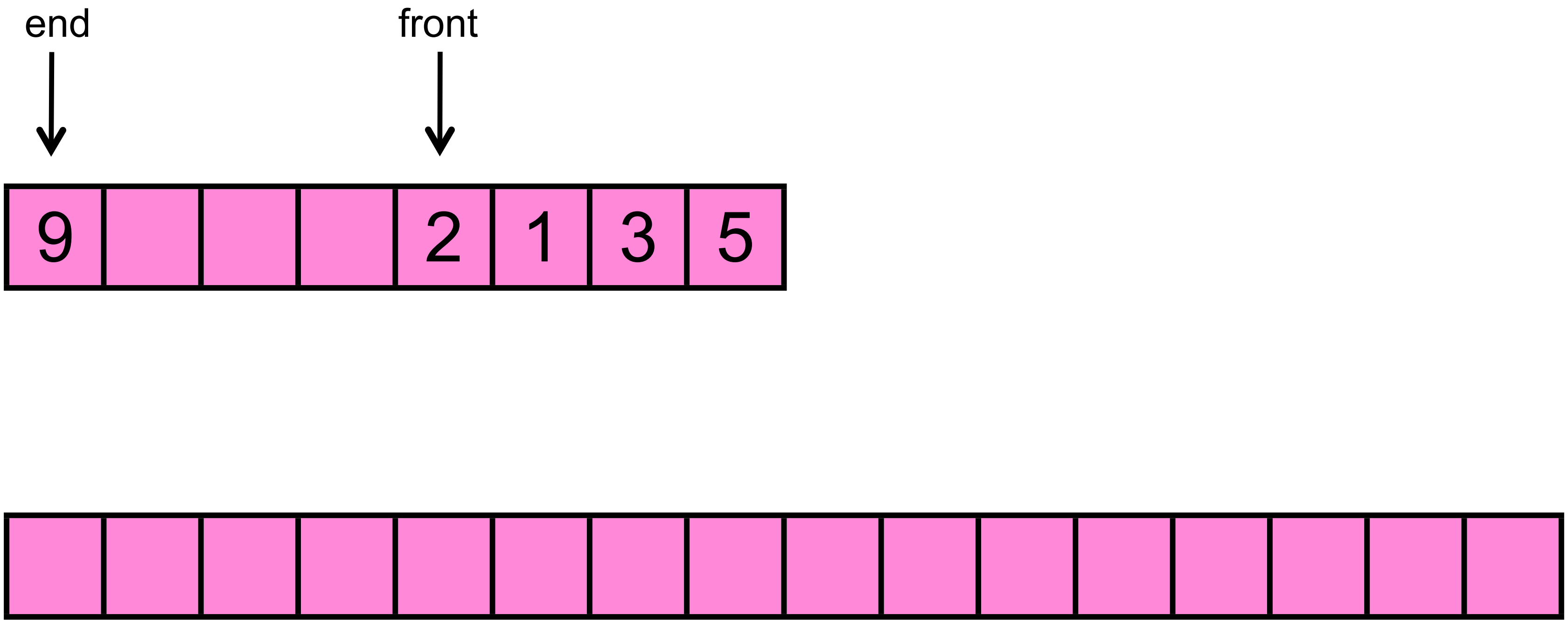






enqueue(3);
enqueue(8);
enqueue(4);
dequeue();
enqueue(7);
dequeue();
dequeue();
enqueue(2);
enqueue(1);
enqueue(3);
enqueue(5);
dequeue();
enqueue(9);

What if array fills?:



end

front

9				2	1	3	5

Another constrained access linear structure - Deque:

Deque ADT:

- pushFront
- pushRear
- popFront
- popRear