Announcements

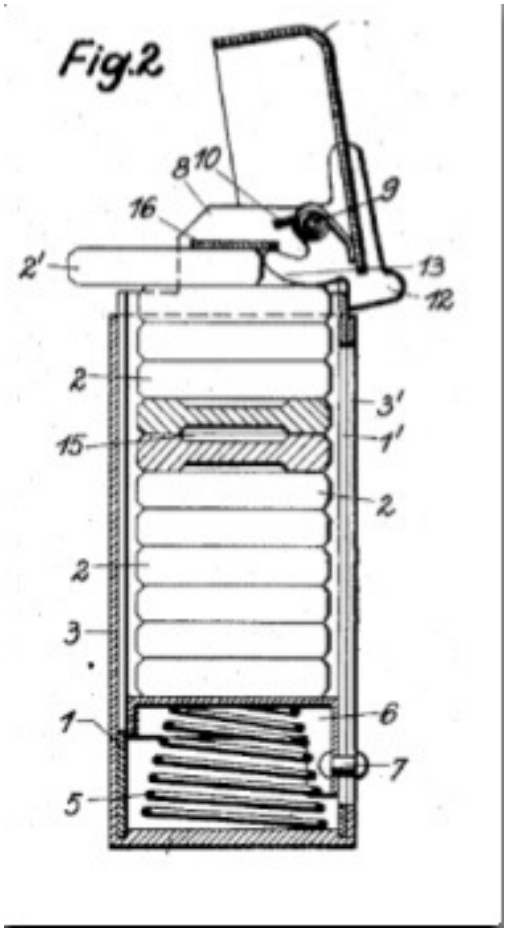
MP3 available, due 2/24, 11:59p.

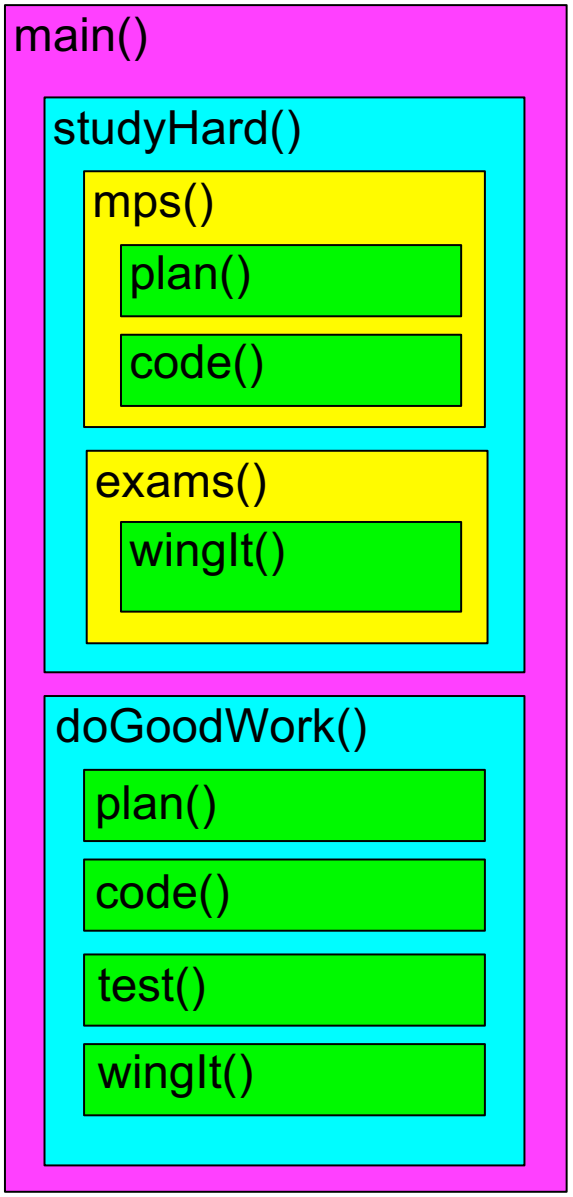
Exam3: 2/26-2/28

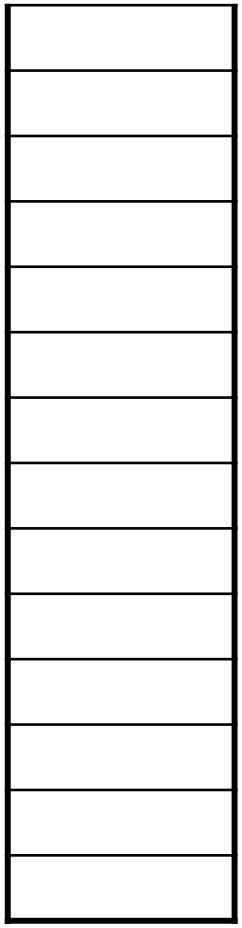
Summary – running times for List functions:

	SLL	Array
Insert/Remove at front:	O(1)	O(1)
Insert after *given* location:	O(1)	O(1)
Remove at *given* location:	O(1) hack	O(n) shift
Insert at *arbitrary* location:	O(1)	O(n) shift
Remove at *arbitrary* location:	O(n) find	O(n) shift

Stacks:







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Stack ADT:

```
template<class SIT>
class Stack {
public:
    Stack();
    ~Stack(); // also copy
    constructor, assignment op
    bool empty() const;
    void push(const SIT & e);
    SIT pop();
private:
        ?

};
```

push(3)

push(8)

push(4)

pop()

pop()

push(6)

pop()

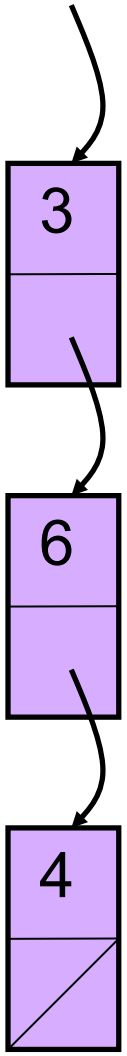
push(2)

pop()

pop()

Stack linked memory implementation:

```
template<class SIT>
class Stack {
public:
    Stack();
    ~Stack(); // etc.
    bool empty() const;
    void push(const SIT & e);
    SIT pop();
private:
    struct stackNode {
        SIT data;
        stackNode * next;
    };
    stackNode * top;
    int size;
};
```




```
template<class SIT>
SIT Stack<SIT>::pop(){




}
```

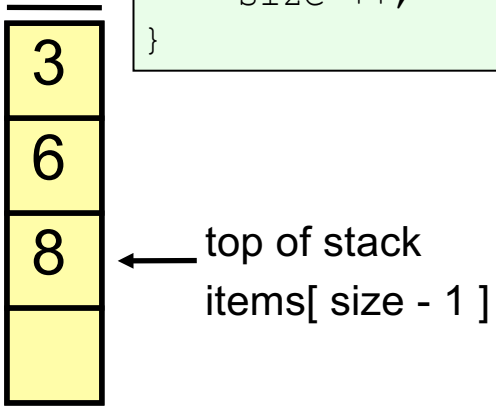
```
template<class SIT>
void Stack<SIT>::push(const SIT & d){
stackNode * newNode = new stackNode(d);
newNode->next = top;
top = newNode;
}
```

Stack array based implementation:

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

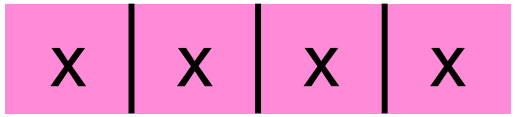
```
template<class SIT>
Stack<SIT>::Stack(){
    capacity = 4;
    size = 0;
    items = new SIT[capacity];
}
```

```
template<class SIT>
void Stack<SIT>::push(const SIT & e){
    if (size >= capacity) {
      // grow array somehow
    }
    items[size] = e;
    size ++;
}
```



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

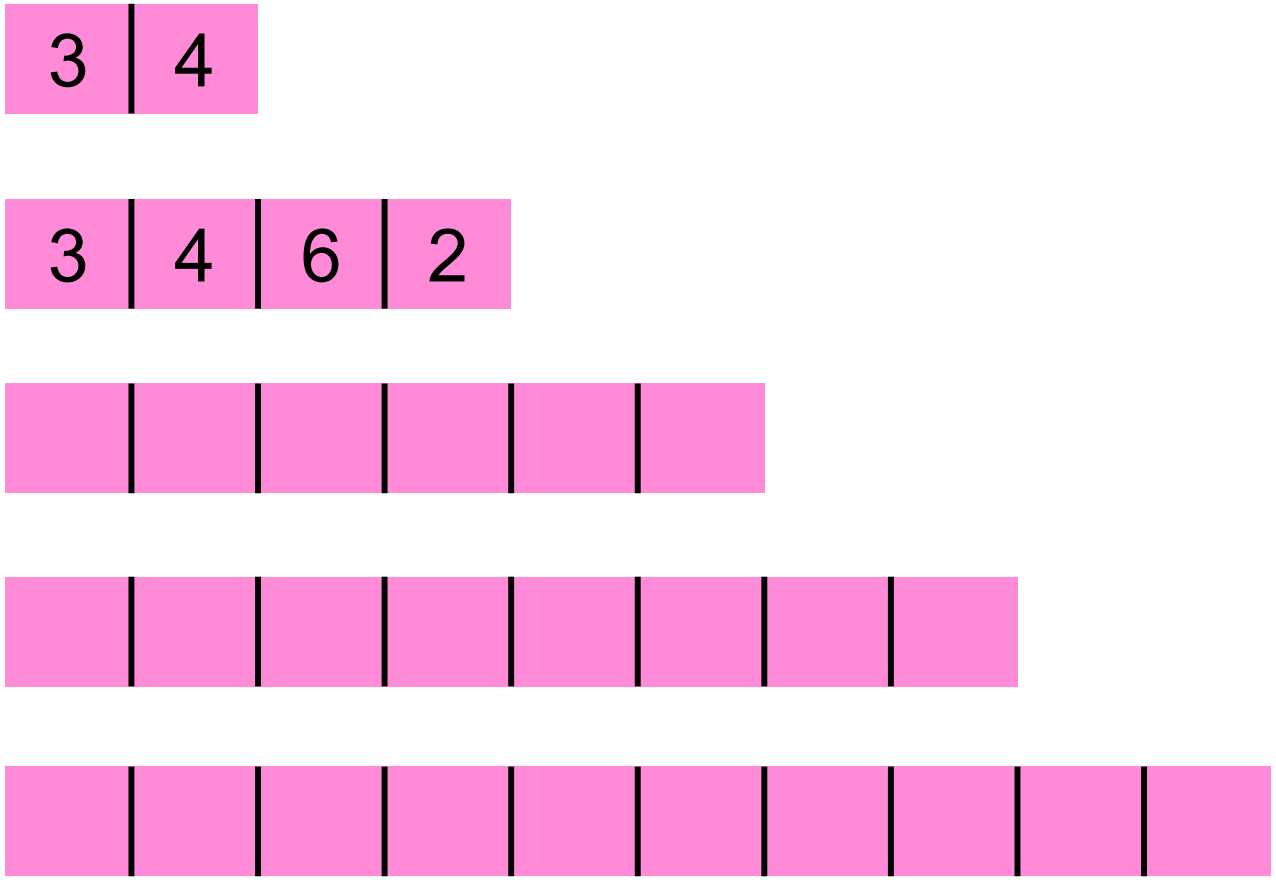
Analysis holds for array based implementations of Lists, Stacks, Queues, Heaps…



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

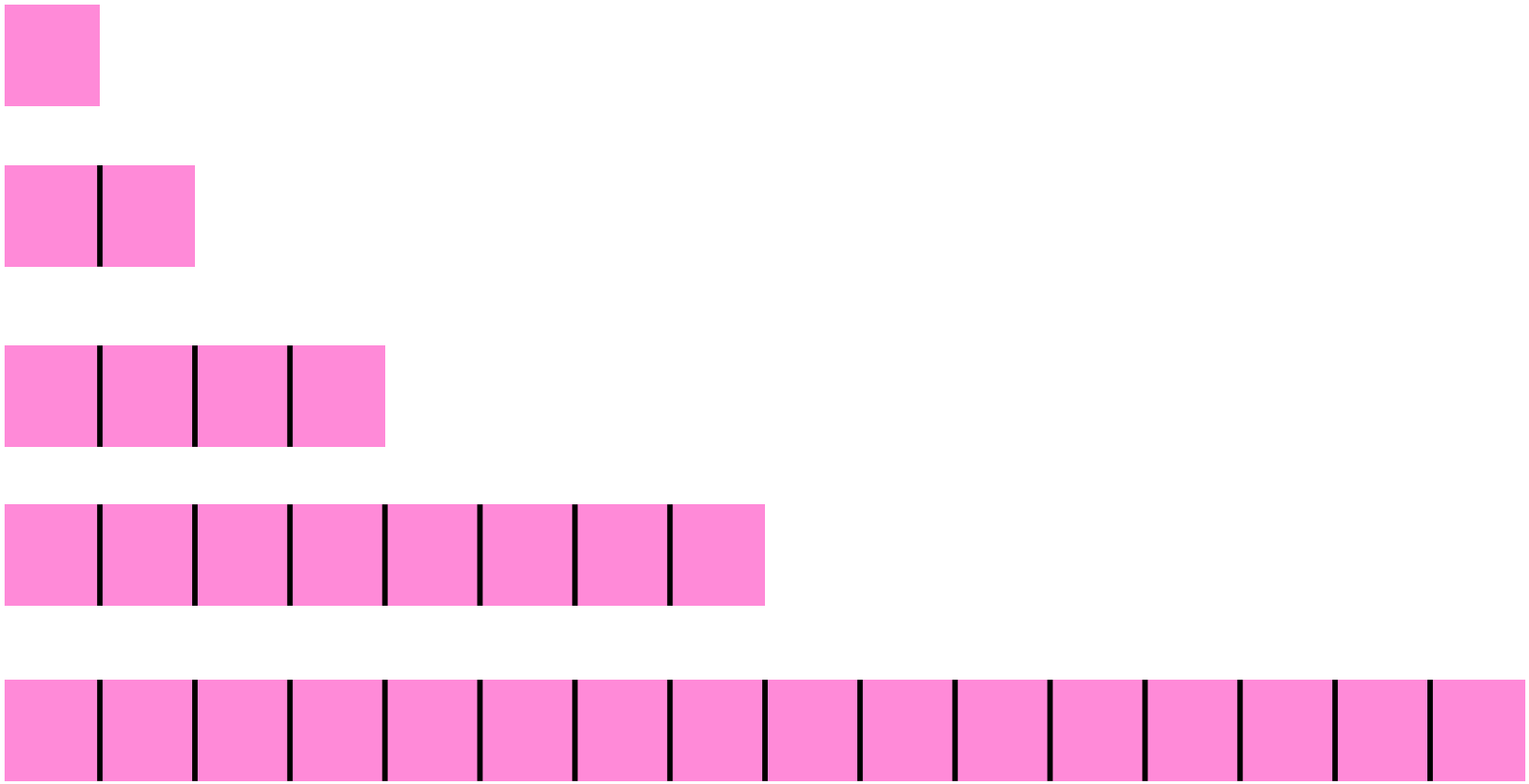
Main question: What's the resizing scheme? We examine 2.

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?