Stack

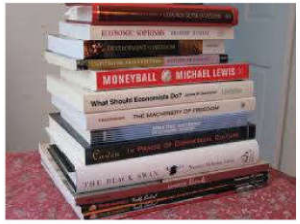
ITD62-124 Data Structure

Outline:

- Introduction
- Stack Operations
- Stack Implementation

Introduction:

- Stack is a linear data structure that can be accessed only at one of its ends for storing and retrieving data



Introduction:

- LIFO structure: Last in / First out
- the last element inserted is the first one to be removed
- What are some applications of stacks?
  - Program execution
  - Evaluating postfix expressions
  - Reverse the letters in a word

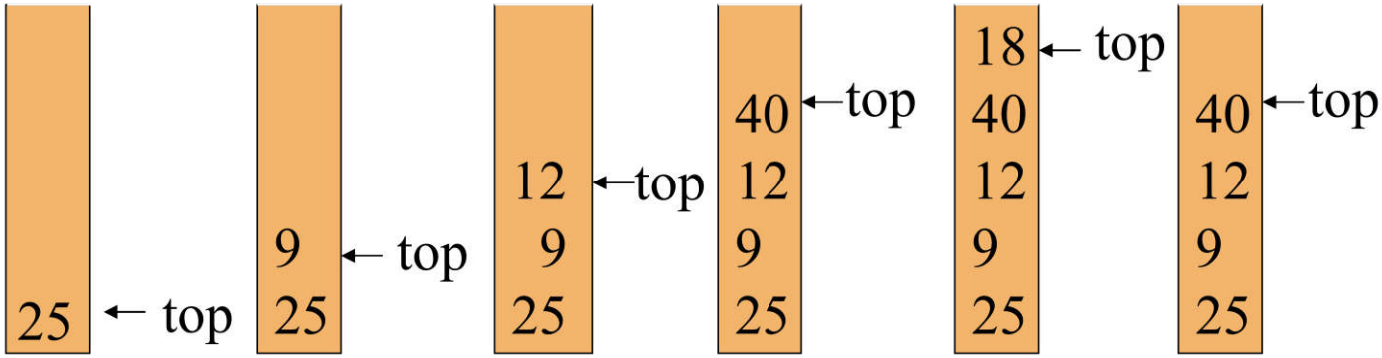
Introduction:

- Example:

  ((x*y)+a/(m*n)-p)*(q-c))

Introduction:

- LIFO structure: Last in / First out



Stack operation:

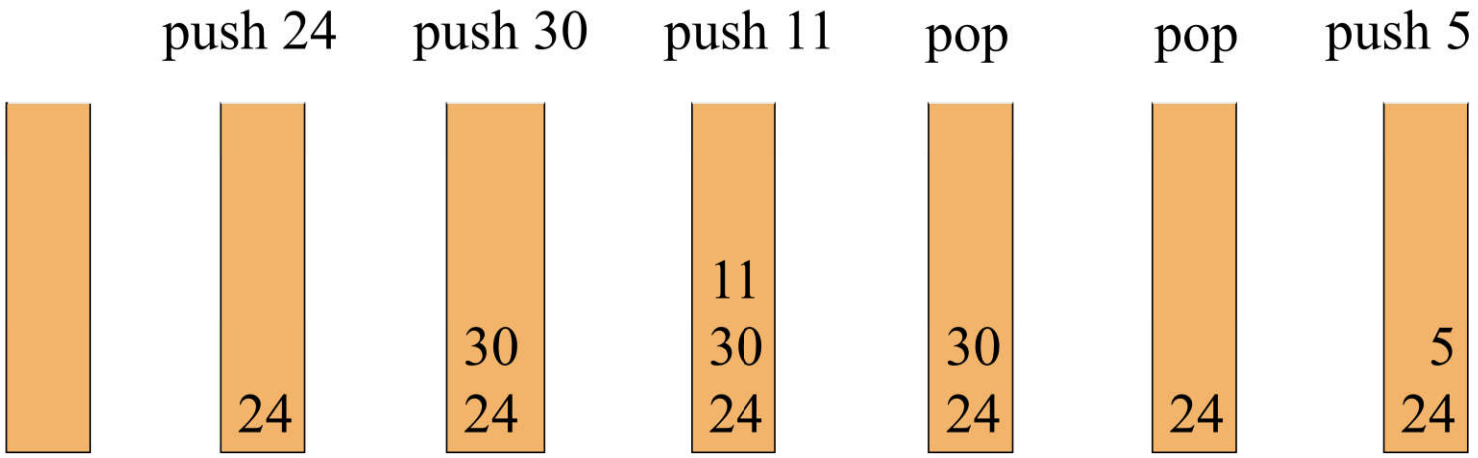
- create: create a stack
- push(*el*): put the element *el* on the top of the stack
- pop(): take the topmost element from the stack
- isEmpty(): check to see if the stack is empty

Stack operation:

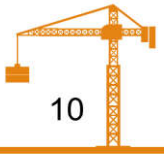
- isFull(): check to see if the stack is full
- size(): return the number of elements in the stack
- top(): return the topmost element in the stack without removing it

Stack operation:

- Example:



Stack implementation:



- Two ways to implement a stack:
  - Using an array
  - Using a linked list

Stack implementation:

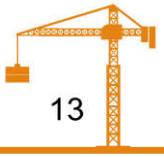
- Implementing a stack using an array
  - ✓the bottom of the stack is at data[0]
  - ✓the top of the stack is at data[numItems-1]
  - ✓push onto the stack at data[numItems]
  - ✓pop of the stack at data[numItems-1]

Stack implementation: Python

- Example: create a stack

```
myStack = [ ]*n
```


Stack implementation: Python



- Example: isEmpty( )

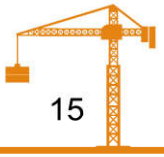
```
def isEmpty (myStack):
   if len(myStack) == 0:
      print('Stack is empty')
      return 1
  else:
     return 0
```


Stack implementation: Python

- Example: isFull( )

```
def isFull (myStack):
      if len(myStack)== n:
         print('Stack is full')
         return
      else:
         return 0
```


Stack implementation: Python

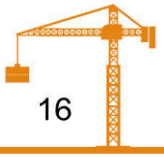


- Example: top( )

```
myStack[-1]

# to get the topmost item in the stack
```


Stack implementation: Python



- Example: push (item)

```
myStack.append(item)

# push the element on the top of the stack
```

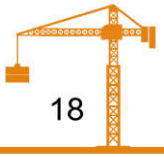

Stack implementation: Python

- Example: pop ( )

```
myStack.pop( )

# take the topmost element from the stack
```

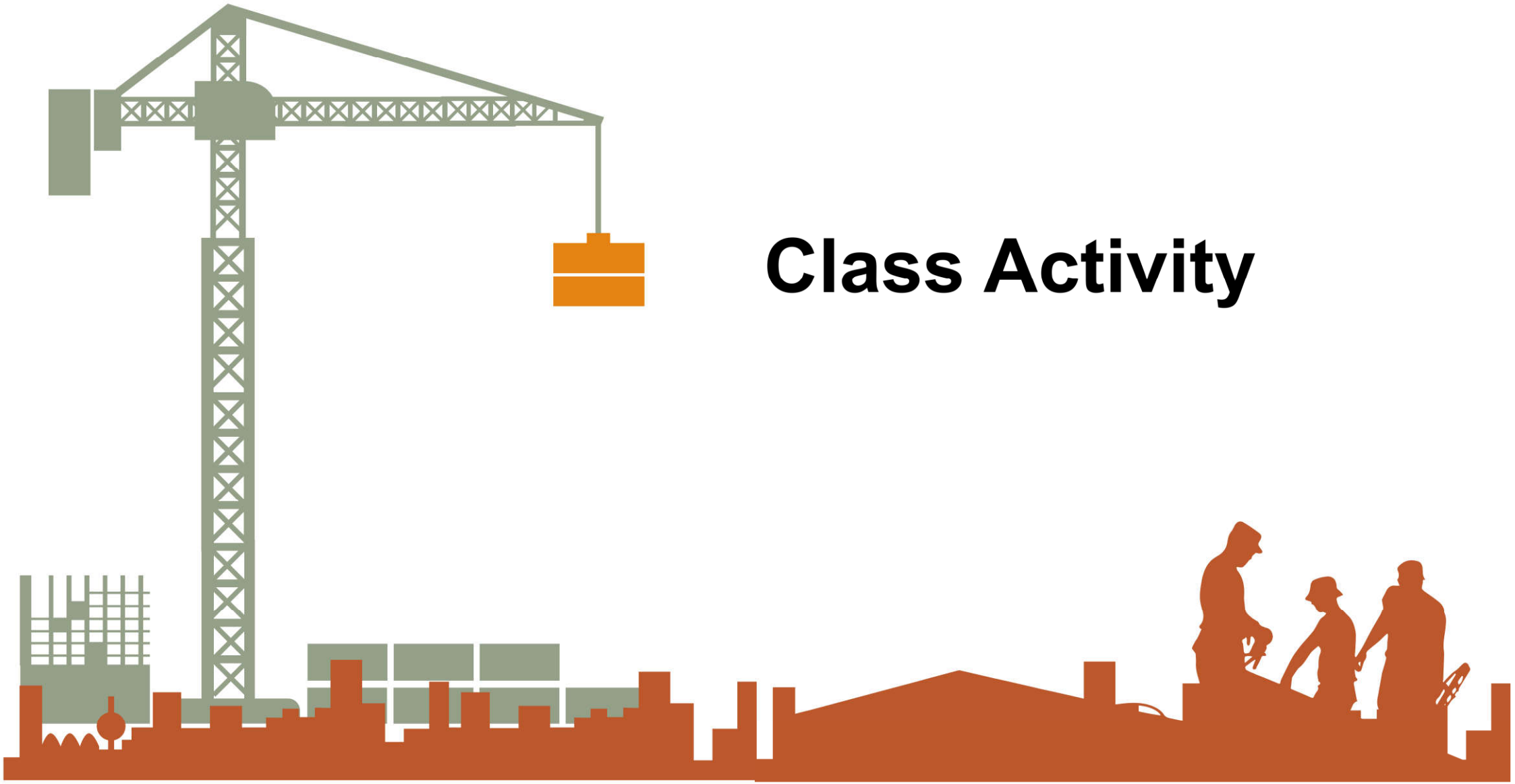

Stack implementation: Python



- Example:

```
len(myStack)

# return the number of elements in the stack
```

Class Activity

Question & Answer

Formative Assessment