Data Structures

Stack Homework #1

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Problem #1: Reverse an integer using stack

- Implement a method that takes a **non-negative** integer and reverses its digits using a **stack**
  - We can trivially convert the number to string and reverse it. Don't do that
- def reverse_num(int num)
  - Returns a reversed integer
- Input ⇒ Output
  - 1234 ⇒ 4321
  - 12345**0000** ⇒ 54321 [drop trailing zeros]

Problem #2: LeetCode 20 - Valid Parentheses

Given a string containing just the characters `'('`, `')'`, `'{'`, `'}'`, `'['` and `']'`, determine if the input string is valid.

An input string is valid if:

1. Open brackets must be closed by the same type of brackets.
2. Open brackets must be closed in the correct order.

Note that an empty string is also considered valid.

```
class Solution:
    def isValid(self, str):
        return ...
```

- Develop: **def** isValid(self, str)
  - Return true if it is a valid string
- Valid: (), ()(), ((())), {}{}, ((((())))), ([]), ()[]{}, {[]}
- Invalid: (], ()), (][), (], ([)]

Problem #3: LeetCode 1047 - Remove All Adjacent Duplicates In String

Given a string `S` of lowercase letters, a *duplicate removal* consists of choosing two adjacent and equal letters, and removing them.

We repeatedly make duplicate removals on S until we no longer can.

Return the final string after all such duplicate removals have been made. It is guaranteed the answer is unique.

```
class Solution:
    def removeDuplicates(self, str):
        return ... # a string
```

Example 1:

```
Input: "abbaca"
Output: "ca"
Explanation:
For example, in "abbaca" we could remove "bb" since the letters
are adjacent and equal, and this is the only possible move.  The
result of this move is that the string is "aaca", of which only
"aa" is possible, so the final string is "ca".
```

Problem #4: LeetCode 735 - Asteroid Collision

We are given an array `asteroids` of integers representing asteroids in a row.

For each asteroid, the absolute value represents its size, and the sign represents its direction (positive meaning right, negative meaning left). Each asteroid moves at the same speed.

Find out the state of the asteroids after all collisions. If two asteroids meet, the smaller one will explode. If both are the same size, both will explode. Two asteroids moving in the same direction will never meet.

Example 1:

```
Input:
asteroids = [5, 10, -5]
Output: [5, 10]
Explanation:
The 10 and -5 collide resulting in 10.  The 5 and 10 never
collide.
```

Example 2:

```
Input:
asteroids = [8, -8]
Output: []
Explanation:
The 8 and -8 collide exploding each other.
```

Example 3:

```
Input:
asteroids = [10, 2, -5]
Output: [10]
Explanation:
The 2 and -5 collide resulting in -5.  The 10 and -5 collide
resulting in 10.
```

Example 4:

```
Input:
asteroids = [-2, -1, 1, 2]
Output: [-2, -1, 1, 2]
Explanation:
The -2 and -1 are moving left, while the 1 and 2 are moving right.
Asteroids moving the same direction never meet, so no asteroids
will meet each other.
```

```python
class Solution(object):
    def asteroidCollision(self, asteroids):
        results = []
        return results
```

"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."