Assignent 3.

1. Arman has a younger brother, Karim, who loves to watch cartoons. Karim was always scattering around the house and losing his DVDs with cartoons. Therefore, for his birthday, Arman gave his brother a long shelf so that Karim put his disks on it. So that there was order on the shelf, Arman asked Karim to follow a simple order:

    a. if there is not a single disk on the shelf, then Karim simply puts it down;
    b. if there is a disk, then Karim places the disk either to the right or to the left of those already placed disks;
    c. he picks up discs in the same way, that is, he removes only from the right or left edge.

And now Arman wants to know whether Karim followed his instructions or not.

Input Format

The first line contains an integer **N** (1 ≤ N ≤ 10000) - the number of operations performed by Karim. Further in N lines there is information about operations. Each operation of placing a disk on a shelf is described by a pair of numbers. The first of them (1 or 2) shows that the disk is placed from the left edge or from the right edge, respectively. The second integer (from 0 to 10000) indicates the disk number. The operation of removing a disk from a shelf is described by a single number 3 or 4, denoting the disk being removed from the left and right edges of the shelf, respectively.

Initially, the shelf is empty. It is guaranteed that the sequence of operations is correct, there are no commands to remove a disk from an empty shelf.

Output Format
Print its number for each operation of removing a disk from a shelf.

Input	Output
5 1 1 2 2 1 3 3 4	3 2
2 1 1 3	1

2. You are given an integer array prices where prices[i] is the price of the ith item in a shop. There is a special discount for items in the shop. If you buy the ith item, then you will receive a discount equivalent to prices[j] where j is the minimum index such that j > i and prices[j] <= prices[i]. Otherwise, you will not receive any discount at all.

Return an integer array answer where answer[i] is the final price you will pay for the ith item of the shop, considering the special discount.

Example 1:

Input: prices = [8,4,6,2,3]
Output: [4,2,4,2,3]
Explanation:
For item 0 with price[0]=8 you will receive a discount equivalent to prices[1]=4, therefore, the final price you will pay is 8 - 4 = 4.
For item 1 with price[1]=4 you will receive a discount equivalent to prices[3]=2, therefore, the final price you will pay is 4 - 2 = 2.
For item 2 with price[2]=6 you will receive a discount equivalent to prices[3]=2, therefore, the final price you will pay is 6 - 2 = 4.
For items 3 and 4 you will not receive any discount at all.

Example 1: Input prices = [8,4,6,2,3]	Output [4,2,4,2,3]
Explanation: For item 0 with price[0]=8 you will receive a discount equivalent to prices[1]=4, therefore, the final price you will pay is 8 - 4 = 4. For item 1 with price[1]=4 you will receive a discount equivalent to prices[3]=2, therefore, the final price you will pay is 4 - 2 = 2. For item 2 with price[2]=6 you will receive a discount equivalent to prices[3]=2, therefore, the final price you will pay is 6 - 2 = 4. For items 3 and 4 you will not receive any discount at all.	
Example 2: Input: prices = [1,2,3,4,5]	Output: [1,2,3,4,5]
Explanation: In this case, for all items, you will not receive any discount at all.	

3. Write a program to reverse a stack using recursion, without using any loop.

   Input: 9 1 3 5 7
   Output: 7 5 3 1 9

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

An input string is valid if:

Open brackets must be closed by the same type of brackets.
Open brackets must be closed in the correct order.
Every close bracket has a corresponding open bracket of the same type.

Sample Input1: s = "()"
Output1: true

Sample Input2: s = "()[]{}"
Output2: true

Sample Input3: s = "(]"
Output3: false

5. The Astana IT University askhana offers circular and square samsa at lunch break,
    referred to by numbers 0 and 1 respectively. All students stand in a queue. Each
    student either prefers square or circular samsas.

    The number of samsas in the ashana is equal to the number of students. The samsas
    are placed in a stack. At each step:

    If the student at the front of the queue prefers the samsa on the top of the stack,
    they will take it and leave the queue.
    Otherwise, they will leave it and go to the queue's end.
    This continues until none of the queue students want to take the top samsa and are
    thus unable to eat.

    You are given two integer arrays students and samsas where samsas[i] is the type of
    the ith samsa in the stack (i = 0 is the top of the stack) and students[j] is the
    preference of the jth student in the initial queue (j = 0 is the front of the queue).
    Return the number of students that are unable to eat.

    Sample Input1: students = [1,1,0,0], samsas = [0,1,0,1]
    Output1: 0

    Explanation:

    Front student leaves the top samsa and returns to the end of the line making
    students = [1,0,0,1].
    - Front student leaves the top samsa and returns to the end of the line making
    students = [0,0,1,1].
    - Front student takes the top samsa and leaves the line making students = [0,1,1] and
    samsas = [1,0,1].

- Front student leaves the top samsa and returns to the end of the line making students = [1,1,0].
- Front student takes the top samsa and leaves the line making students = [1,0] and samsas = [0,1].
- Front student leaves the top samsa and returns to the end of the line making students = [0,1].
- Front student takes the top samsa and leaves the line making students = [1] and samsas = [1].
- Front student takes the top samsa and leaves the line making students = [] and samsas = [].
Hence all students are able to eat.

Sample Input2: students = [1,1,1,0,0,1], sandwiches = [1,0,0,0,1,1]
Output2: 3

6. Implement the heapify method for building the min or max heap for your choice. Use https://www.cs.usfca.edu/~galles/visualization/Heap.html to see the explanation.