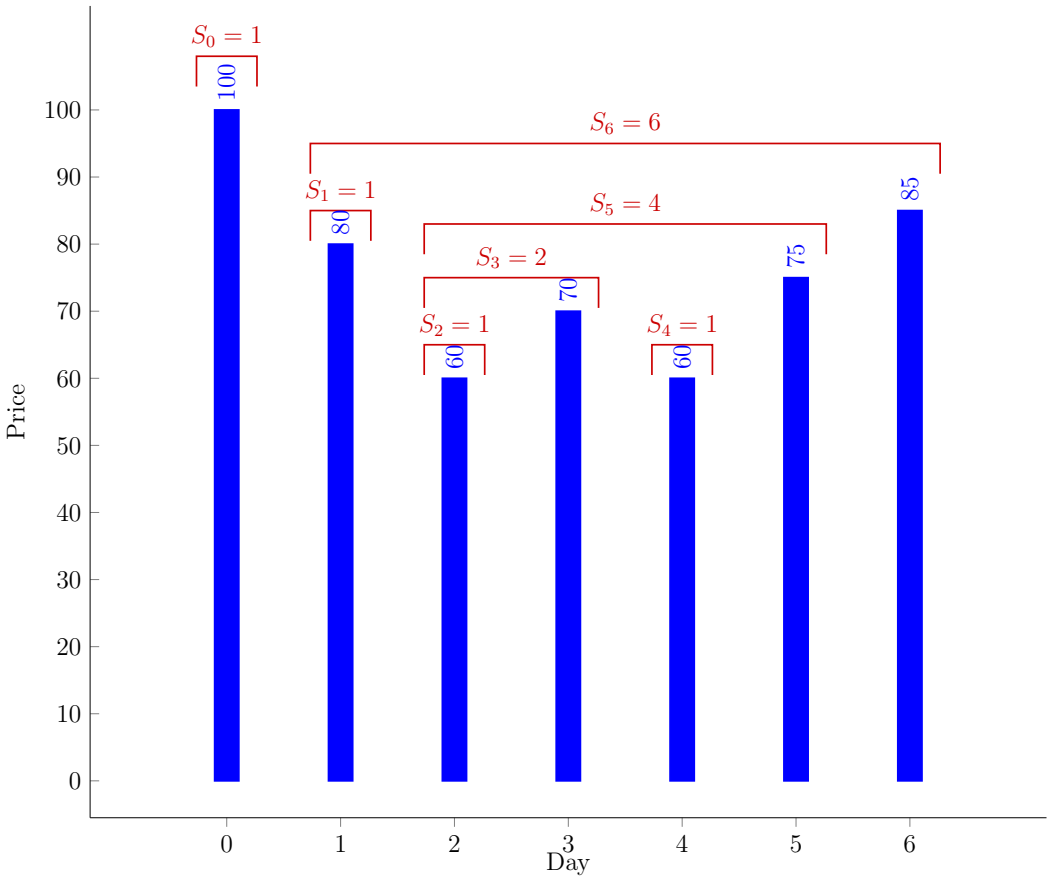
Indian Institute of technology, Guwahati
Department of Computer Science and Engineering
Data Structure Lab (CS210) Assignment: 2
Date: August 7, 2018 **Total Marks: 20**

Span of a stock on a given day is the maximum number of consecutive days on or before the given day for which the price of the stock is less than or equal to the price of stock on the given day. In other words, the span $S[i]$ of $X[i]$ is the maximum number of consecutive elements $X[j]$ immediately preceding $X[i]$ such that $X[j] \leq X[i]$, where $j \leq i$. We have given an array X of daily stocks for n consecutive days. We need to find stock span for each day.

1. Write a $O(n^2)$ algorithm to find out array S for a given array X. (6 Marks)
2. Write a $O(n)$ algorithm for the same using stack. (14 Marks)

For the array $X[\,] = \{100, 80, 60, 70, 60, 75, 85\}$, the output span array $S[\,] = \{1, 1, 2, 1, 4, 6\}$. For day 0 span is always 1. In example, notice that on day 1, the stock is 80 and there is no day prior to it where price was less than 80. Hence span for day 1 is 1 again. Span for each all days is shown in following figure.



Input Format: No of days (n) is given in line 1. In the next line, n stock values are given where i^{th} entry specifies the stock of day i.
Output Format: $< Day,\ Price,\ Span >$ tuple for each day.

Evaluation Guidelines:

- Full marks if both methods work for all test cases.
- 20% marks will be deducted for each test not running for each solution.
- 10% marks will be deducted for bad coding style. i.e., (1) code is not modular (2) code is not properly indented (3) code is not properly commented and (4) Variable and functions are not suitably named.
- If code is not working but most of code is written with correct logic, maximum 40% can be given based on TAs evaluation.
- TA will help you initially to get rid of segmentation fault and compilation error, etc. in your code. TA will not help you find out the solution of the assignment given.

Test Case 1:

INPUT:

7
60 60 70 75 80 85 100

OUTPUT:

Day	Price	Span
0	60	1
1	60	2
2	70	3
3	75	4
4	80	5
5	85	6
6	100	7

Test Case 2:

INPUT:

7
100 85 80 75 70 60 60

OUTPUT:

Day	Price	Span
0	100	1
1	85	1
2	80	1
3	75	1
4	70	1
5	60	1
6	60	2

Test Case 3:

INPUT:

7

30 40 100 50 60 90 100

OUTPUT:

Day	Price	Span
0	30	1
1	40	2
2	100	3
3	50	1
4	60	2
5	90	3
6	100	7

Test Case 4:

INPUT:

7

100 90 60 75 75 80 90

OUTPUT:

Day	Price	Span
0	100	1
1	90	1
2	60	1
3	75	2
4	75	3
5	80	4
6	90	6

Test Case 5:

INPUT:

7

60 70 50 90 80 70 85

OUTPUT:

Day	Price	Span
0	60	1
1	70	2
2	50	1
3	90	4
4	80	1
5	70	1
6	85	3