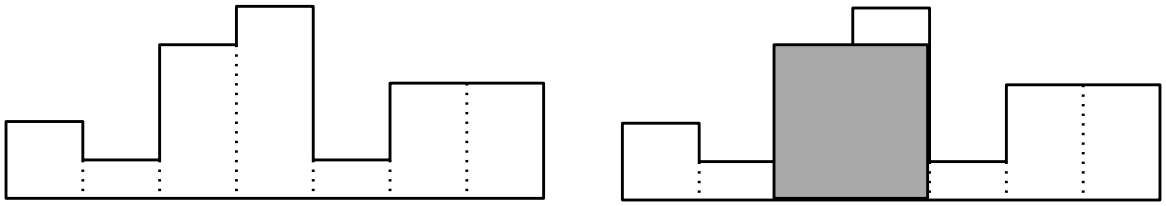
CO 203: Data Structures Lab Autumn 2017

Programming Assignment 4

Arindam Karmakar

1 Largest rectangle in a Histogram

A histogram is a polygon composed of a sequence of rectangles aligned at a common base line. The rectangles have equal widths but may have different heights. For example, the figure below shows the histogram that consists of rectangles with the heights 2, 1, 4, 5, 1, 3, 3, measured in units where 1 is the width of the rectangles:



Usually, histograms are used to represent discrete distributions, e.g., the frequencies of marks obtained in a class. Note that the order of the rectangles, i.e., their heights, is important. Calculate the area of the largest rectangle in a histogram that is aligned at the x-axis. The figure above shows the largest aligned rectangle for the depicted histogram.

1.1 Input Specification

The input contains a description of a histogram and starts with an integer n, denoting the number of rectangles it is composed of. Then follow n integers $h_1, h_2, \ldots, h_n$. These numbers denote the heights of the rectangles of the histogram in left-to-right order. The width of each rectangle is 1. Remember that this rectangle must be aligned at the common base line, i.e., the x-axis.

1.2 Output Specification

Give the coordinates of the top corners of the biggest rectangle and it's area. For the above example, the out put will be "TOP LEFT (2,2), TOP RIGHT (4,2), AREA 4".