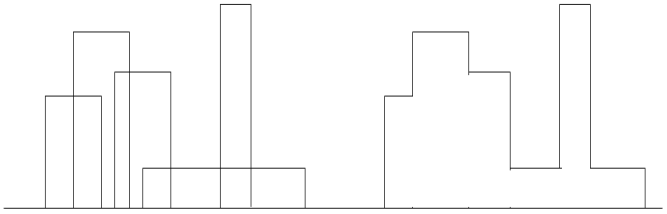
Skylines

You need to be alert to (usually minor) changes that may be made to the assignment statement or to the guidelines after the assignment is first put up. Refresh this frame and re-read the assignment carefully before you make your final submission.

Assignment statement

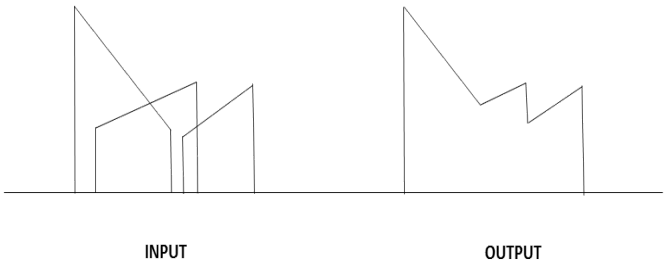
Given the exact location and shape information of n buildings which lie on a fixed horizontal line in a 2-dimensional city, design an algorithm that reports the skyline of these buildings, eliminating hidden lines. The problem may be understood from the figures below. You need to solve the problem in two cities A and B. Buildings in each city have a fixed characteristic as explained below.

1. City A remains sunny all year round. Each building is rectangular in shape and has a flat roof. A sample input and output is presented in the following figure. A building B_i is represented by a triple (l_i, r_i, h_i) where l_i and r_i represent the leftmost and rightmost x-coordinates of the building and h_i represents the height. The input is a list of triples - one per building. The output is a list of pairs (x-coordinate and height) arranged in ascending order of x-coordinates representing the skyline.



INPUT OUTPUT

2. City B remains cold all year round and suffers from snowfall. Each building now has a slant roof in order to prevent snow from accumulating. A sample input and output is presented in the following figure. A building B_i is represented by a quadruple (l_i, h_l, r_i, h_r) where l_i and r_i represent the leftmost and rightmost x-coordinates of the building and h_l and h_r represents the corresponding heights. The input is now a list of quadruples - one per building. The output is again a list of pairs (x-coordinate and height) arranged in ascending order of x-coordinates representing the skyline.



Input Specification

Your program should take as input the left-most, right-most x co-ordinates and a max height value. This gives a region.

Generating inputs

Also, the program takes as input an integer n and generates n building locations randomly within the defined region. Use a separate sorting routine to sort the buildings from left to right. The output of this function should be the input for your algorithms for skyline computation.

Submissibles

1. Efficient C programs, including peripheral routines for both assignment.
2. A report outlining the formulation of the mechanism to achieve both the solutions. Outline the divide step and conquer step for both the problems along with complete complexity analysis. The report should be written in latex.

Marking Guidelines

Assignment marking is to be done only **after** the deadline expires, as submissions gets blocked after the assignment is marked.

Programming the Divide and Conquer methods	**10 + 10**
General working	**5 + 5**
Report as per assignment statement	**10 + 10**
Total Marks	***50***
Bonus Marks for computing the convex hull of the skylines	***5***

Assignment submission

Use electronic submission via WBCM link

You should keep submitting your incomplete assignment from time to time after making some progress, as you can submit any number of times before the deadline expires.

Warning

Cases of copying will be dealt with seriously and severely, with recommendation to the

Dean to de-register the student from the course.