Problem 22: Sky Scraper

Difficulty: Hard

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Problem Background

Skyscrapers are the tallest man-made structures in the world; the tallest being Burj Khalifa in Dubai. They are expertly designed to stretch high into the sky and resist wind and seismic activity.

Problem Description

Your task, should you choose to accept it, is to build the tallest skyscraper possible from a set of bricks. But like any good construction project there are design requirements:

- You will be given a set of rectangular bricks of varying sizes. You can use each brick only once.
- You must stack them on top of one another to build the tallest structure possible.
- You can only stack a brick on top of another brick if the dimensions of the lower brick's top are greater than or equal to the base of the brick you are stacking on top.
- You can rotate the brick so that any of the sides can function as its base.
- Brick surfaces must stay parallel to the x, y, and z axes, so only 90 degree rotation is possible in any direction.

This problem is an example of an NP-complete type problem. What that means is that there is no slick algorithm that will cut your program's running time down. It also means that we promise to keep the judging input set small. In our testing, even 50 blocks made us go over the 2 minute run time allotted for problem submissions. The judging data will have a maximum of 25 blocks. The judging software will allow your program two minutes to run before timing out; if this occurs, your solution will be marked as incorrect, even if it would have eventually reached the correct answer. Good luck!

Sample Input

The first line of your program's input, received from the standard input channel, will contain a positive integer representing the number of test cases. Each test case will include:

- A positive number N representing the number of blocks.
- N lines, containing the description of a single block in the form LxWxH, where L is the block's length, W is the block's width, and H is the block's height.

```
2
4
1x2x3
2x2x4
5x4x1
2x1x2
5
7x7x7
6x6x6
40x40x1
5x5x5
4x4x4
```

Sample Output

Your program should print out the height of the tallest tower you can make with the blocks you were given.

```
12
40
```