

Project 3: Prolog: Placing Rectangles

This project is to write a prolog program that solves a particular problem: placing boxes (rectangles) in a rectangular area so that they do not overlap each other and so that they are completely inside the specified area. The specific set of boxes to be placed will be specified by a fact in your prolog program like the following:

```
boxes([box(a, 1, 2), box(b, 1, 2), box(c, 2, 2)]).
```

The argument to `boxes` is a list of box structures, where `box(ID, W, H)` represents a box's unique ID and its width and height. The ID is a constant and the width and height are integers.

The area for placing the rectangles has its lower left corner at `(0, 0)`. Its height is given by facts in your program like

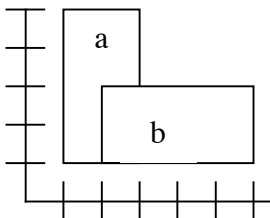
```
width(6).
height(5).
```

A solution is represented by a list of `placedBox` structures like this:

```
[placedBox(a, 1, 2, 1, 2), placedBox(b, 1, 2, 0, 2),
  placedBox(c, 2, 2, 0, 0)]
```

where `placedBox(ID, W, H, X, Y)` specifies the ID, width, and height and `X` and `Y` are the coordinates of the box's lower left corner. The list of `placedBoxes` should correspond one-for-one with the list of boxes that specify the problem.

Two boxes overlap if they overlap in both the `X` and `Y` coordinates. Box A and box B overlap in the `Y` coordinate if the top `Y` coordinate of either box is greater than the bottom `Y` coordinate of the other and less than or equal to the top `Y` coordinate of the other, or if the bottom `Y` of one is greater than or equal to the bottom `Y` of the other and strictly less than the top `Y` of the other. The `X` coordinate is similar. So in `[placedBox(a, 2, 4, 1, 1), placedBox(b, 4, 2, 2, 1)]`, boxes a and b overlap in `X` because b's left `X` coordinate, 2, is greater than or equal to a's left coordinate, 1, and less than a's right coordinate, 3. They overlap in `Y` because b's bottom coordinate, 1, is greater than or equal to the bottom `Y`, 1, of A and less than the top `Y`, 5, of a.



The program must find a solution via generate and test, The generator should generate a list of placed boxes that correspond to the boxes in the problem specification, with X and Y coordinates within the specified area and the tester should test for non-overlap and for all boxes being within the specified area.