Documentation

The problem involves calculating the total area covered by two rectangles in a 2D plane. Each rectangle is defined by its bottom-left corner and its top-right corner. The coordinates of these corners are given as inputs. The goal is to compute the total area covered by both rectangles, taking into account the possibility of overlap between the two.

Key Considerations:

1. Rectangles in a 2D Plane:

- Each rectangle is aligned with the x and y axes. The bottom-left corner and the top-right corner define the limits of the rectangle.
- For the first rectangle, its bottom-left corner is at (ax1, ay1) and its top-right corner is at (ax2, ay2).
- For the second rectangle, its bottom-left corner is at (bx1, by1) and its top-right corner is at (bx2, by2).

2. Area Calculation:

- *To calculate the area of a rectangle, we use the formula:*

  [Area = Width * times]

  The width of a rectangle is the difference between the x-coordinates of its top-right and bottom-left corners, and the height is the difference between the y-coordinates of its top-right and bottom-left corners.

- Therefore, the area of the first rectangle is calculated as (ax2 - ax1) (ay2 - ay1) and the area of the second rectangle as (bx2 - bx1) (by2 - by1).

3. Overlap Detection:

- If the two rectangles overlap, there is an area common to both, and this overlapping area must be subtracted from the total to avoid double-counting.
- To compute the overlap, we first check the overlapping width and height.
- The overlapping width is determined by the maximum of the left sides and the minimum of the right sides of both rectangles. If the result is negative, it means there's no overlap in the x-axis.
- Similarly, the overlapping height is determined by the maximum of the bottom sides and the minimum of the top sides of both rectangles. If this value is negative, there is no overlap in the y-axis.
- The overlapping area is then computed as the product of the overlapping width and height.

4. Total Area:

- The total area covered by both rectangles is calculated as the sum of the areas of both rectangles minus the overlapping area. If there is no overlap, the overlapping area is zero.

5. Edge Cases:

- ***No overlap:*** If the rectangles are completely disjoint, the total area is simply the sum of their areas.
- ***Full overlap:*** If one rectangle is completely within the other, the overlapping area is equal to the area of the smaller rectangle.
- ***Partial overlap:*** The solution needs to correctly calculate the overlap, even if the rectangles intersect only partially.

By considering these factors, we can accurately determine the total area covered by the two rectangles while accounting for any overlap between them. This approach ensures that the result is computed efficiently in constant time, as the operations involved (calculating area and overlap) are straightforward arithmetic calculations.