Red Black tree deletion

1-delete like BST if node has 2 children find Successor replace it with Successor delete Successor

2- if node has 1-0 child

- If red node just delete it .
- If black node with one red child so replace node with its child make child black

3-if node is double black node

what is double black node :

black node that has two black children null children or not null when deleted it will have double weight.

Six cases

1. **Case1 :the black node is the root and only node**
   Solution :
   - **just delete it and you will have empty tree .**
2. **Case2:Black node with black father and red sibling and sibling has both black children**
   Solution
   - Delete it
   - rotate sibling around parent
   - exchange color between parent and sibling
   - it became case 4 solve as case 4

3. **Case3: Black node with black father and black sibling both sibling's children are black**
   Solution
   - Delete it
   - change sibling color to red.
   - THIS CONVERT IT TO OTHER CASE MAY BE CASE 1 OR OTHER MAY PUSH PROBLEM UP

4. **Case4: Black node with red father and black sibling and sibling has both black children**
   solution
   - **delete it**
   - **exchange color between parent and sibling**

5. **Case5: Black node with black father and black sibling left child of sibling is red right child of sibling is black**
   SOLUTION :
   - Rotation and recoloring to convert it into case 6
     1. Rotate sibling's left child around sibling (right rotation)

2. Recolor : Sibling and its rotated child exchange colors.

- Solve it as case 6

6. Case6 : Black node with any father and black sibling right child of sibling is red (color of parent + color of left sibling's child not important)

solution

- **delete**
- **rotate sibling with parent**
- **recoloring**

  2) sibling right child black

  3) sibling left child and parent nochange