

RB-DELETE-FIXUP(T, x)

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1  while  $x \neq T.root$  and  $x.color == BLACK$ 
2      if  $x == x.p.left$                                 // is  $x$  a left child?
3           $w = x.p.right$                                 //  $w$  is  $x$ 's sibling
4          if  $w.color == RED$ 
5               $w.color = BLACK$ 
6               $x.p.color = RED$ 
7              LEFT-ROTATE( $T, x.p$ )
8               $w = x.p.right$ 
9          if  $w.left.color == BLACK$  and  $w.right.color == BLACK$ 
10              $w.color = RED$ 
11              $x = x.p$ 
12         else
13             if  $w.right.color == BLACK$ 
14                  $w.left.color = BLACK$ 
15                  $w.color = RED$ 
16                 RIGHT-ROTATE( $T, w$ )
17                  $w = x.p.right$ 
18                  $w.color = x.p.color$ 
19                  $x.p.color = BLACK$ 
20                  $w.right.color = BLACK$ 
21                 LEFT-ROTATE( $T, x.p$ )
22                  $x = T.root$ 
23     else // same as lines 3–22, but with “right” and “left” exchanged
24          $w = x.p.left$ 
25         if  $w.color == RED$ 
26              $w.color = BLACK$ 
27              $x.p.color = RED$ 
28             RIGHT-ROTATE( $T, x.p$ )
29              $w = x.p.left$ 
30         if  $w.right.color == BLACK$  and  $w.left.color == BLACK$ 
31              $w.color = RED$ 
32              $x = x.p$ 
33         else
34             if  $w.left.color == BLACK$ 
35                  $w.right.color = BLACK$ 
36                  $w.color = RED$ 
37                 LEFT-ROTATE( $T, w$ )
38                  $w = x.p.left$ 
39                  $w.color = x.p.color$ 
40                  $x.p.color = BLACK$ 
41                  $w.left.color = BLACK$ 
42                 RIGHT-ROTATE( $T, x.p$ )
43                  $x = T.root$ 
44      $x.color = BLACK$ 

```