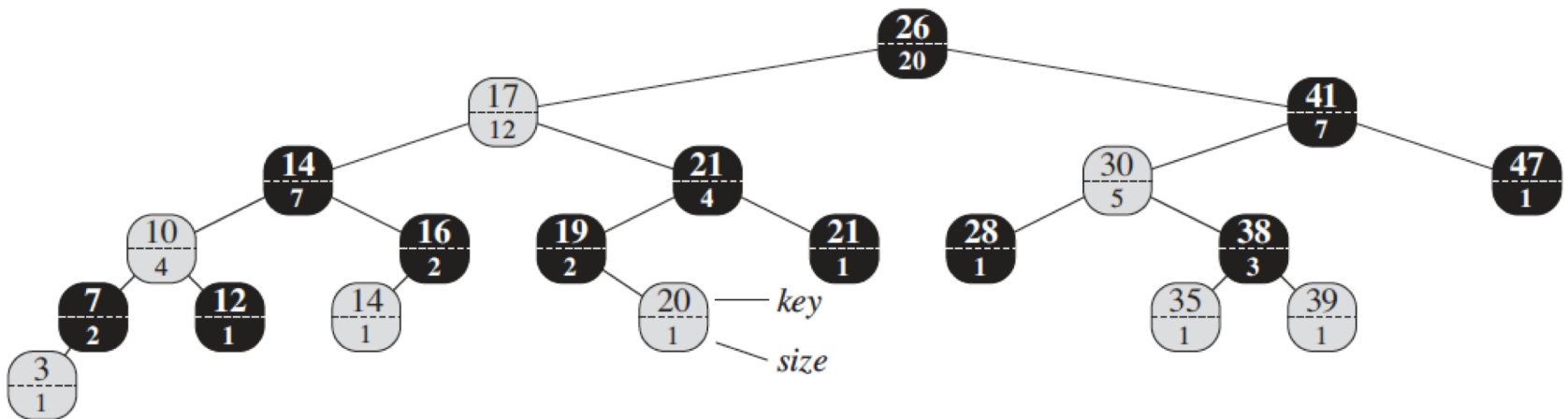


HW2. Order-Statistic Tree

Order-Statistic Tree



- Darkened node : black node
- Shaded node : red node

Retrieving an element with a given rank

OS-SELECT(x, i)

1 $r = x.\text{left.size} + 1$

2 **if** $i == r$

3 **return** x

4 **elseif** $i < r$

5 **return** OS-SELECT($x.\text{left}, i$)

6 **else return** OS-SELECT($x.\text{right}, i - r$)

- Returns a pointer to the node containing the i th smallest key in the subtree rooted at x .

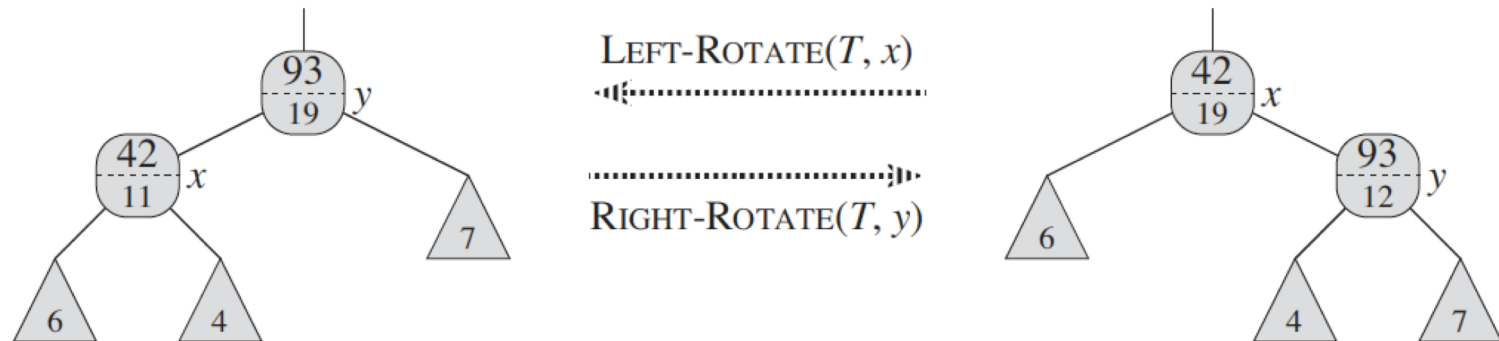
Determining the rank of an element

OS-RANK(T, x)

```
1   $r = x.left.size + 1$ 
2   $y = x$ 
3  while  $y \neq T.root$ 
4      if  $y == y.p.right$ 
5           $r = r + y.p.left.size + 1$ 
6       $y = y.p$ 
7  return  $r$ 
```

- Returns the position of x in the linear order determined by an in-order tree walk of T .

Maintaining subtree sizes



- Updating subtree sizes during rotations.



Thank you
