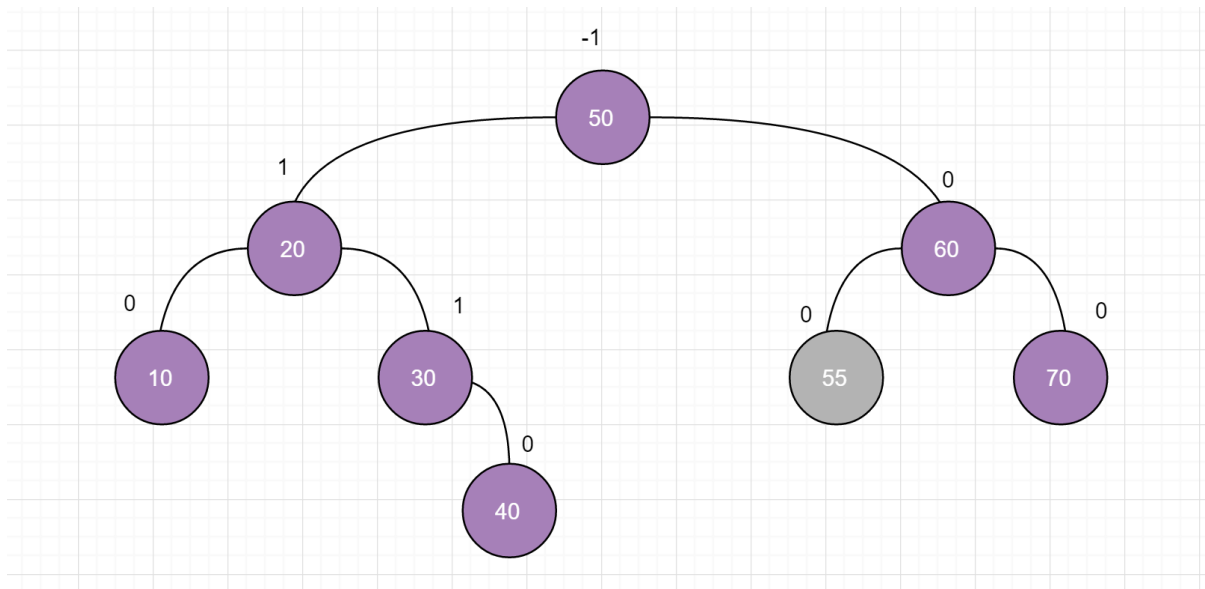


# HOMEWORK5

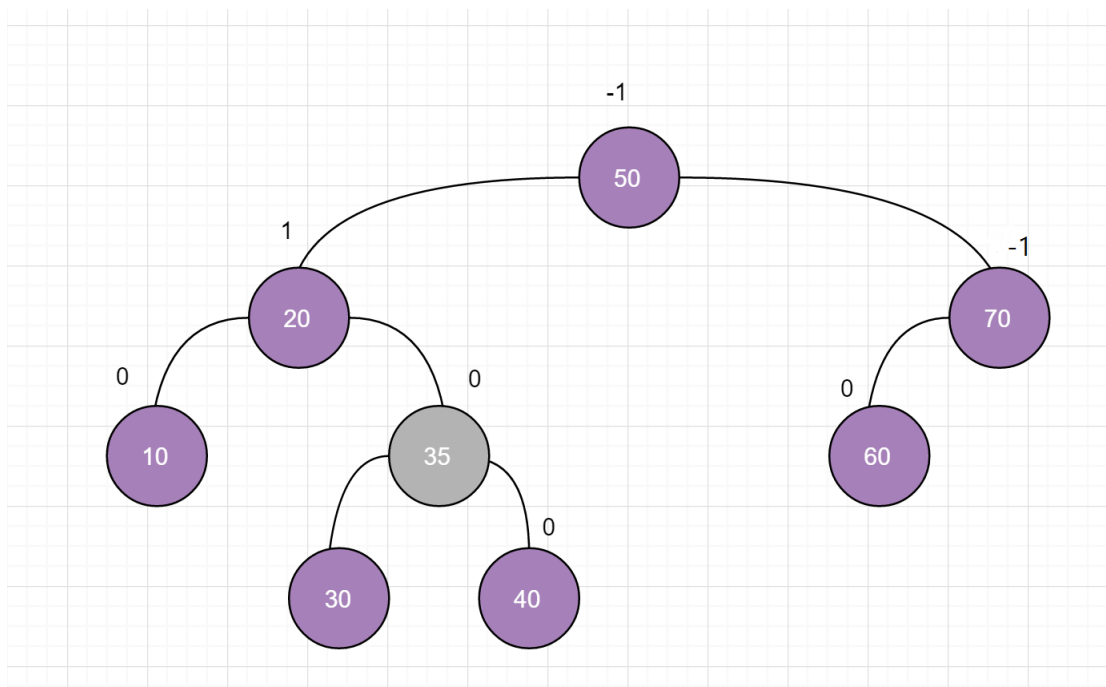
RAHAF ALOMAR – 435201926

## PROBLEM1:

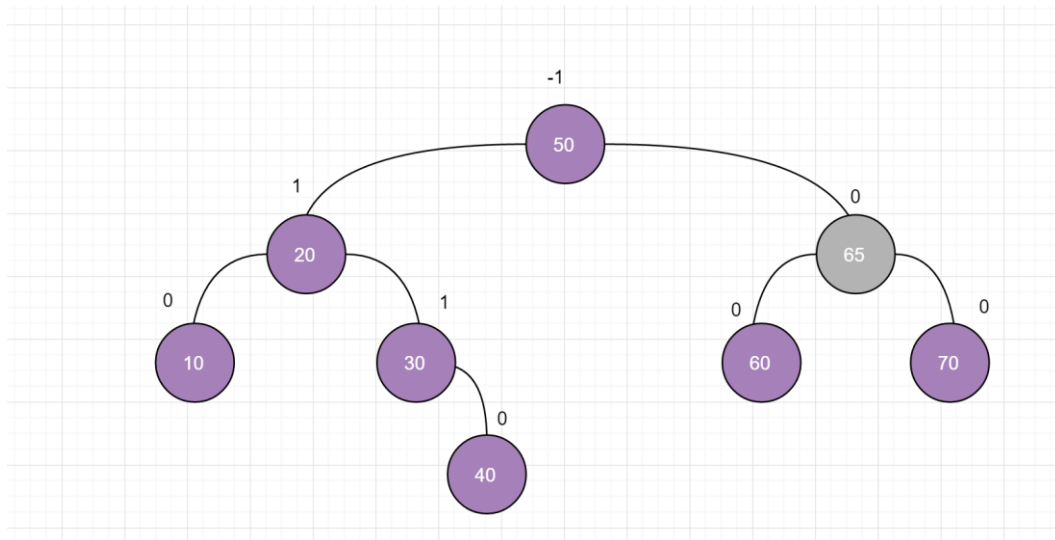
INSERT 55 (RIGHT ROTATION) :



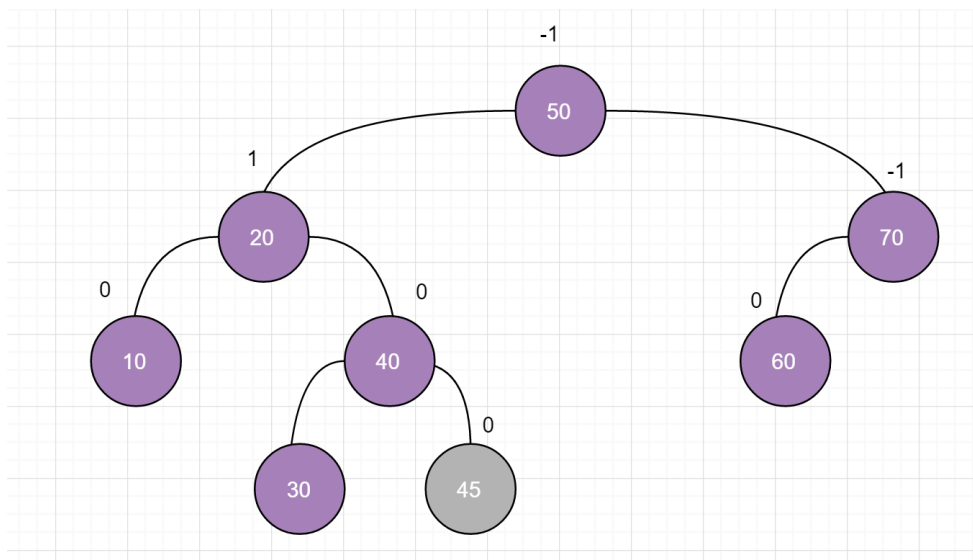
INSERT 35 (LEFT-RIGHT ROTATION) :



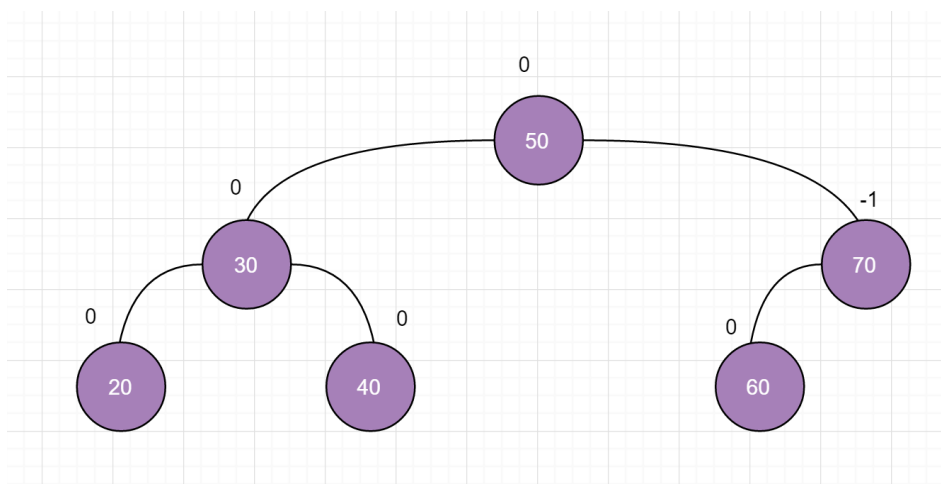
INSERT 65 (RIGHT-LEFT ROTATION):



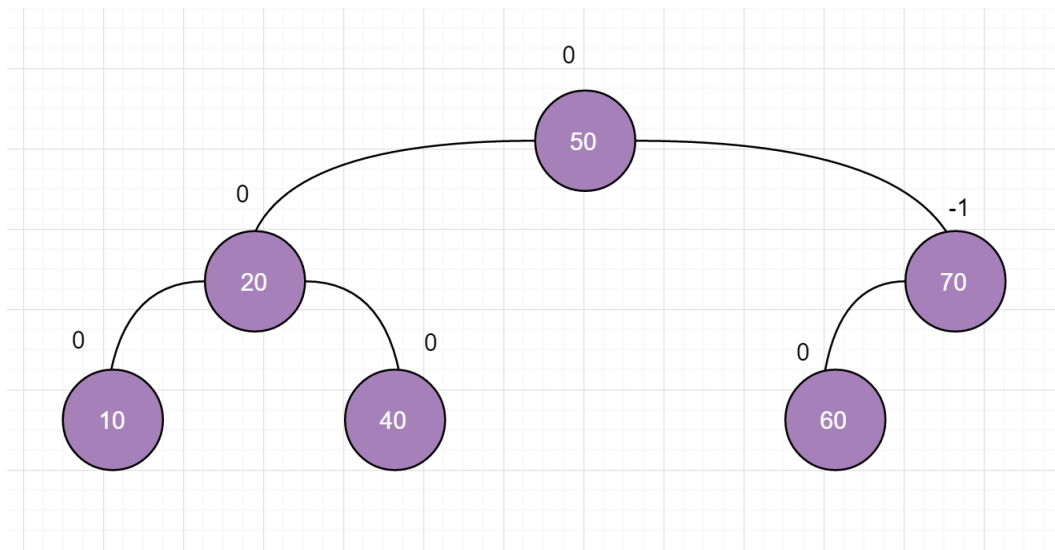
INSERT 45 (LEFT ROTATION):



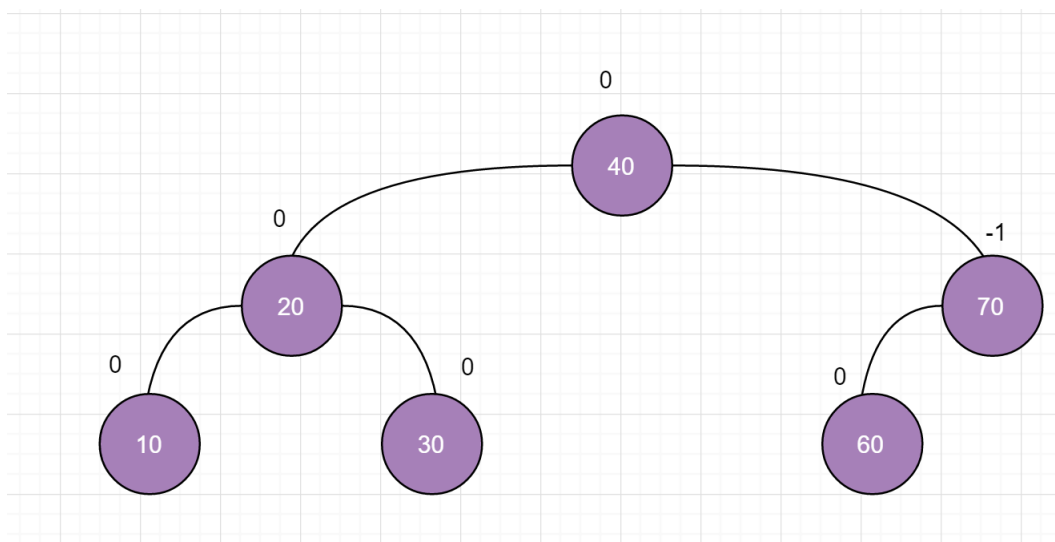
DELETE 10 (LEFT ROTATION):



DELETE 30 (NO ROTATION):



DELETE 50 (NO ROTATION):



PROBLEM 2:

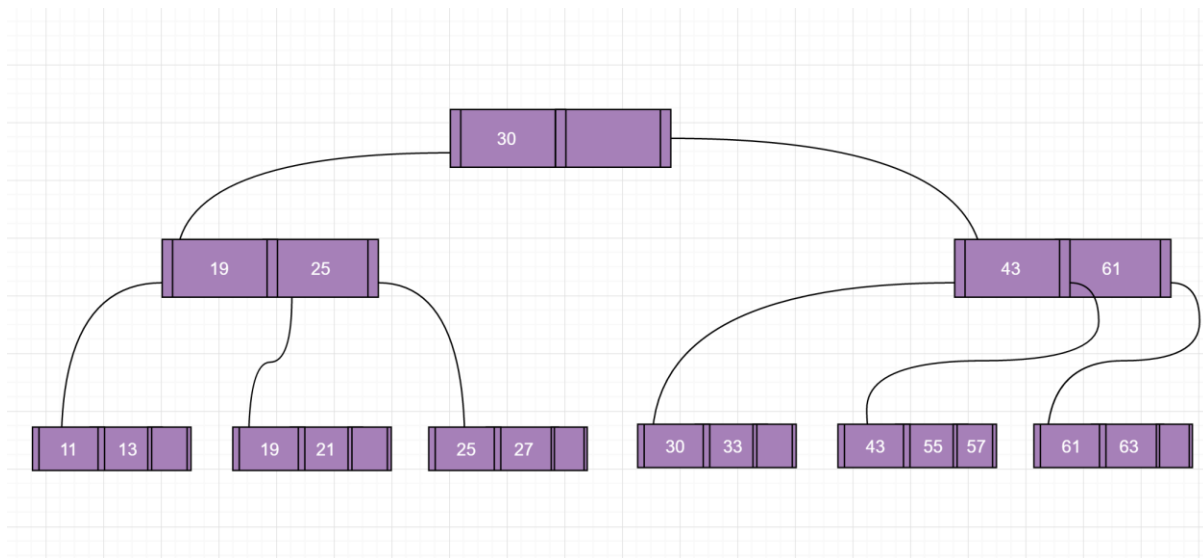
- A)  $BAL(A) = -1$  ,  $BAL(B) = 1$ .
- B)  $BAL(A) = 0$  ,  $BAL(B) = 0$  .
- c)  $BAL(A) = 1$  ,  $BAL(B) = 0$  ,  $BAL(C) = 0$  ,
- D)  $BAL(A) = 0$  ,  $BAL(B) = 0$  ,  $BAL(C) = 0$  ,

### PROBLEM 3:

INSERT 30:

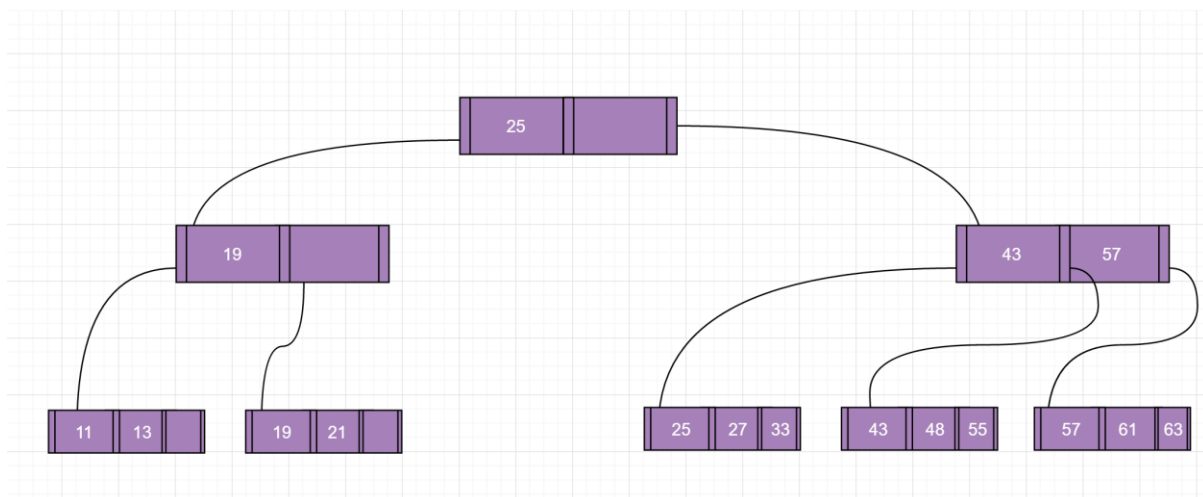
SPLIT – UPDATE KEY

TRANSFER – UPDATE KEY

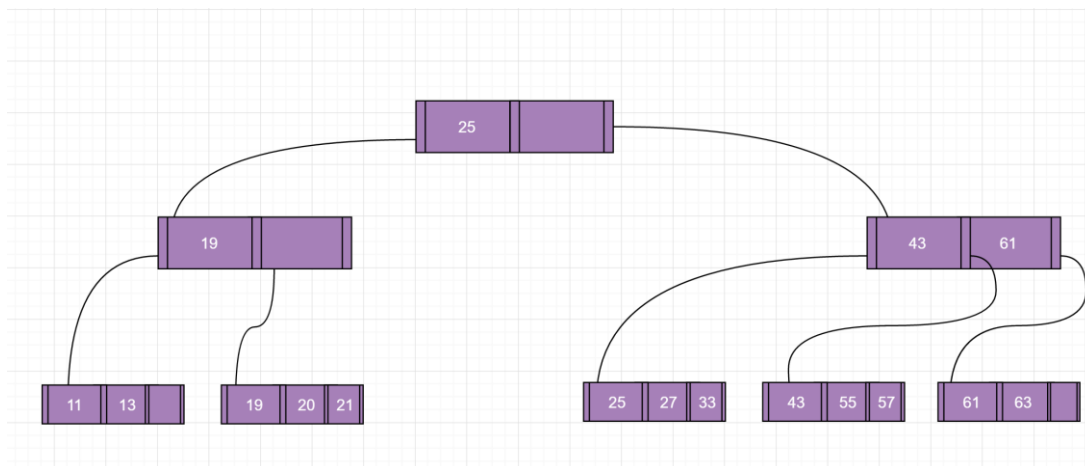


INSERT 48:

TRANSFER – UPDATE KEY

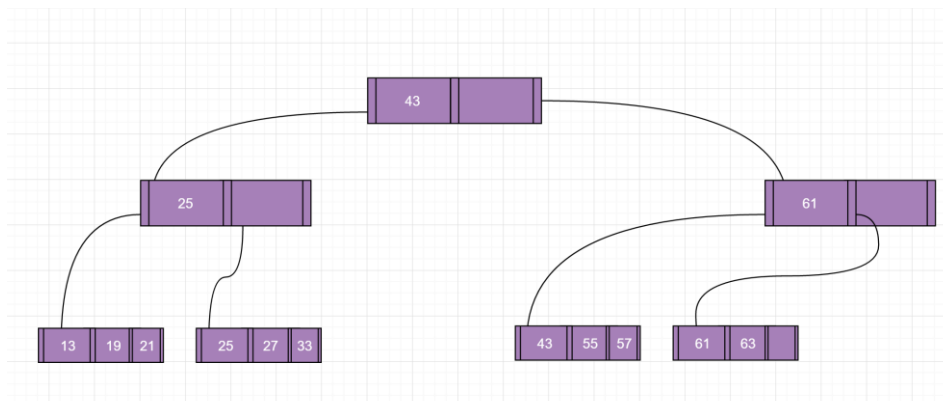


INSERT 20:

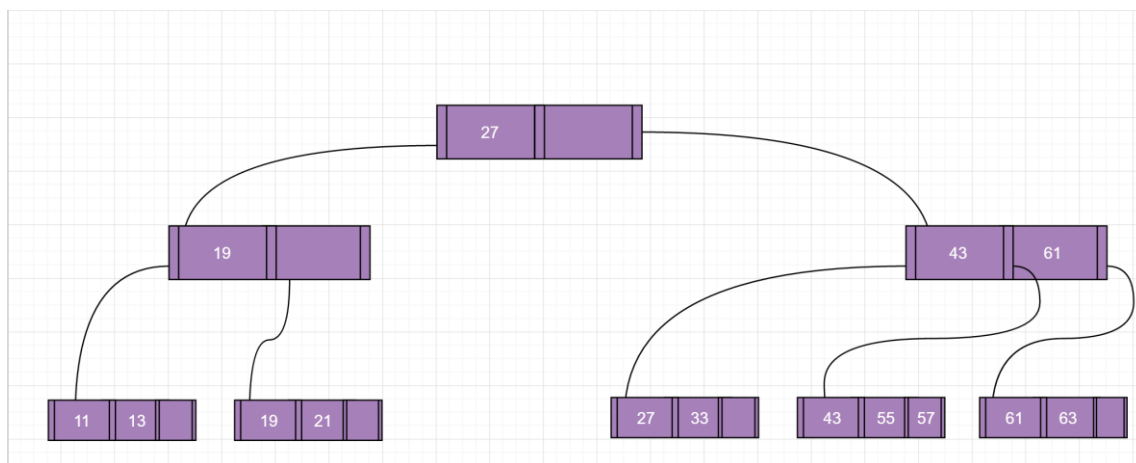


DELETE 11:

MERGE – BORROW – UPDATE KEY

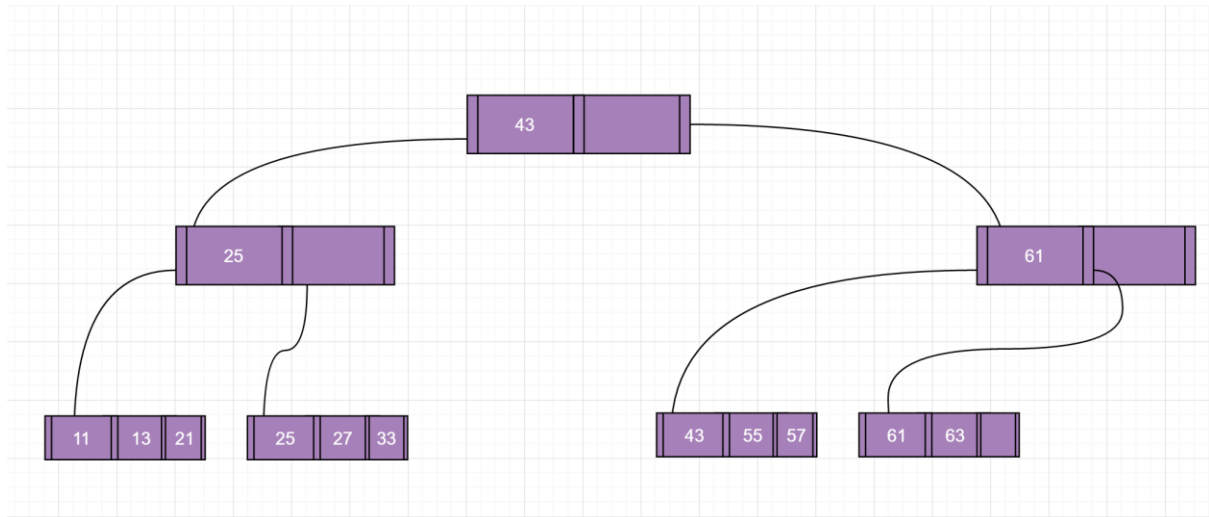


DELETE 25:



DELETE 19:

MERGE – BORROW – UPDATE KEY



PROBLEM 4:

4.1:

**407**    **1**                     $( 407 \% 100 ) \% 7 = 0$

**801**    **1**                     $( 801 \% 100 ) \% 7 = 1$

$) 815 \% 100 ) \% 7 = 1$

**814**    **2**                     $) 704 \% 100 ) \% 7 = 4$

**815**    **2**                     $) 814 \% 100 ) \% 7 = 0$

**704**    **1**                     $) 721 \% 100 ) \% 7 = 0$

**935**    **7**                     $) 935 \% 100 ) \% 7 = 0$

**701**    **4**

4.2:

815 → null

$$(4+0+7) \% 7 = 4$$

null

$$(8+0+1) \% 7 = 2$$

801 → null

$$) 8+1+5) \% 7 = 0$$

721 → 935 → null

$$) 7+0+4) \% 7 = 4$$

407 → 704 → null

$$) 8+1+4) \% 7 = 6$$

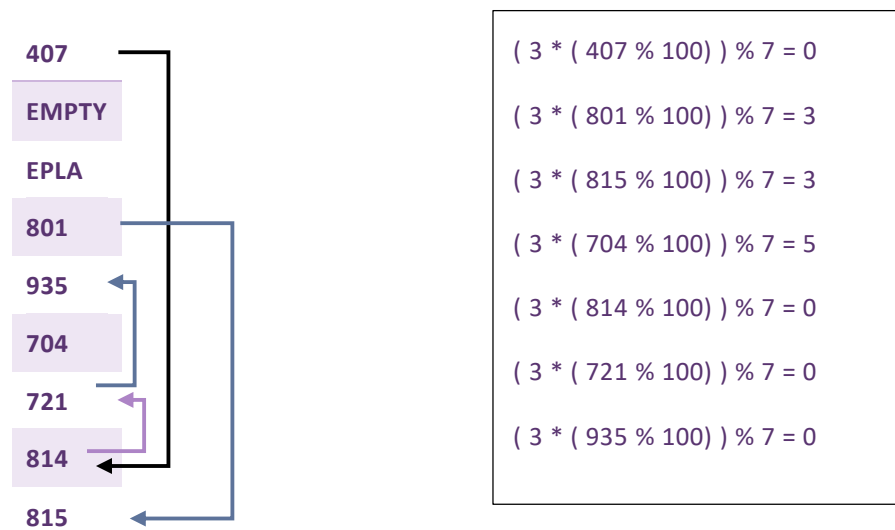
null

$$) 7+2+1) \% 7 = 3$$

814 → null

$$) 9+3+5) \% 7 = 3$$

4.3:



## PROBLEM 5:

<b>9</b>	<b>1</b>	$1 \% 9 = 1$
<b>1</b>	<b>1</b>	$6 \% 9 = 6$
<b>11</b>	<b>1</b>	$11 \% 9 = 2$
<b>3</b>	<b>1</b>	$14 \% 9 = 5$
<b>12</b>	<b>2</b>	$3 \% 9 = 3$
<b>14</b>	<b>1</b>	$12 \% 9 = 3$
<b>6</b>	<b>1</b>	$5 \% 9 = 5$
<b>5</b>	<b>3</b>	$28 \% 9 = 1$
<b>28</b>	<b>8</b>	$9 \% 9 = 0$

THE OVERALL NUMBER OF COLLISIONS IS:  $1 + 2 + 8 = 10$

3 NODES.