

# **SOFTENG 351: Assignment #3**

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**1****a)**

$$bfr = \lfloor \frac{512}{115} \rfloor = 4$$

$$\#Blocks = \lceil \frac{30000}{4} \rceil = 7500 \text{ blocks}$$

**b)****i.**

$$Size = 4 + 8 = 12 \text{ bytes}$$

**ii.**

$$bfr_{idx} = \lfloor \frac{512}{12} \rfloor = 42$$

**iii.**

$$\#IdxEntries = 7500 - \text{same as number of blocks}$$

$$b_{idx} = \lceil \frac{7500}{42} \rceil = 179 \text{ blocks}$$

**2****a)****i.**

$$\#LeafBlocks = \lceil \frac{1,000,000}{10} \rceil = 100,000 \text{ blocks}$$

$$\#Lvl\_1\_Blocks = \lceil \frac{100,000}{100} \rceil = 1,000$$

$$\#Lvl\_2\_Blocks = \lceil \frac{1,000}{100} \rceil = 10$$

$$\#Lvl\_3\_Blocks = \lceil \frac{10}{100} \rceil = 1$$

$$Total\_Blocks = 100,000 + 1,000 + 10 + 1 = 101,011 \text{ blocks}$$

ii.

$$\#I/O = h = 4$$

b)

i.

$$\#LeafBlocks = \lceil \frac{1,000,000}{10} \rceil = 100,000 \text{ blocks}$$

$$\#Lvl\_1\_Blocks = \lceil \frac{1,000,000}{100} \rceil = 10,000 - \text{as it is dense}$$

$$\#Lvl\_2\_Blocks = \lceil \frac{10,000}{100} \rceil = 100$$

$$\#Lvl\_3\_Blocks = \lceil \frac{100}{100} \rceil = 1$$

$$Total\_Blocks = 100,000 + 10,000 + 100 + 1 = 110,101 \text{ blocks}$$

ii.

$$\#I/O = h = 4$$

c)

i.

$$\#LeafBlocks = \lceil \frac{1,000,000}{7} \rceil = 142,858 \text{ blocks}$$

$$\#Lvl\_1\_Blocks = \lceil \frac{142,858}{70} \rceil = 2041$$

$$\#Lvl\_2\_Blocks = \lceil \frac{2,041}{70} \rceil = 30$$

$$\#Lvl\_3\_Blocks = \lceil \frac{30}{70} \rceil = 1$$

$$Total\_Blocks = 142,858 + 2,041 + 30 + 1 = 144,930 \text{ blocks}$$

ii.

$$\#I/O = h = 4$$

3

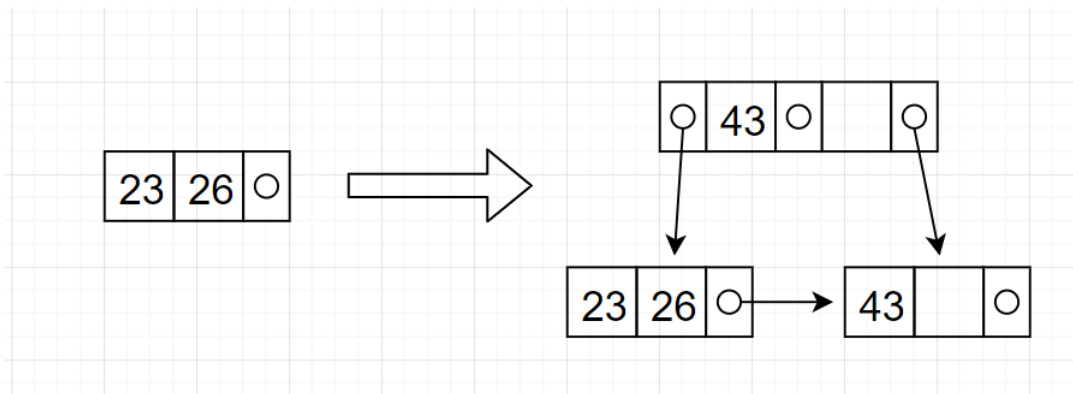


Figure 1: Before and after insertion of 43

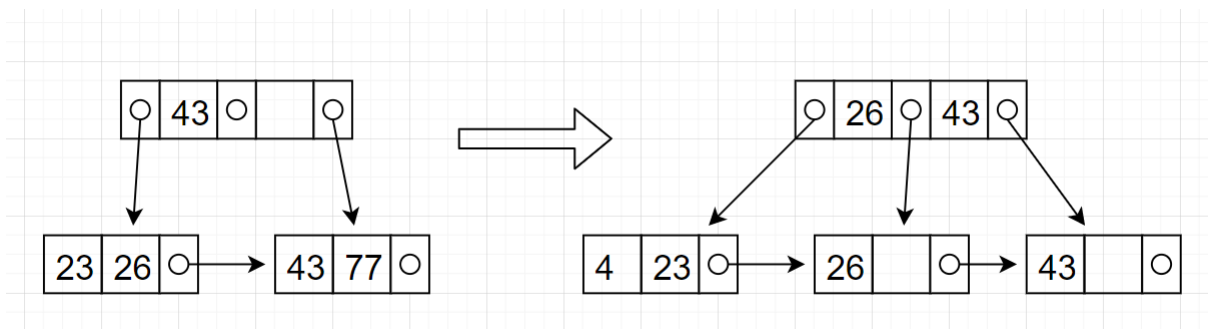


Figure 2: Before and after insertion of 4

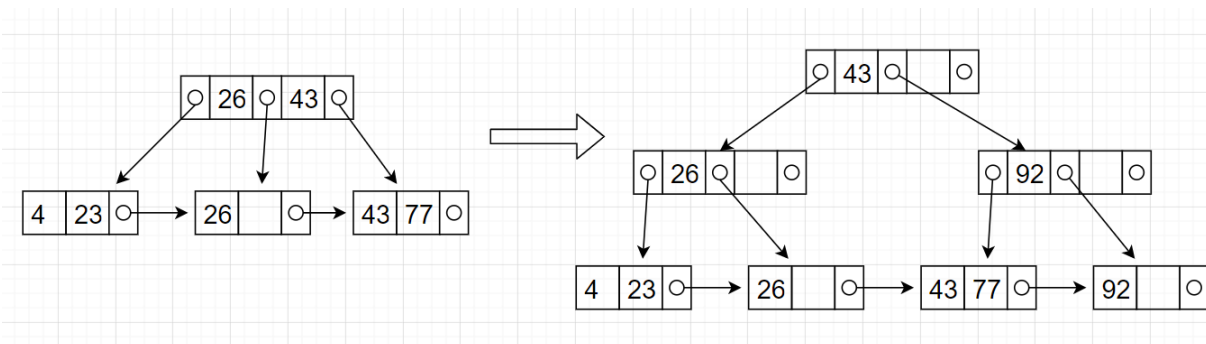


Figure 3: Before and after insertion of 92

4

K	h(K)
50	001
44	010
25	100
20	110
37	010
7	000
51	010
49	000
18	100
69	110

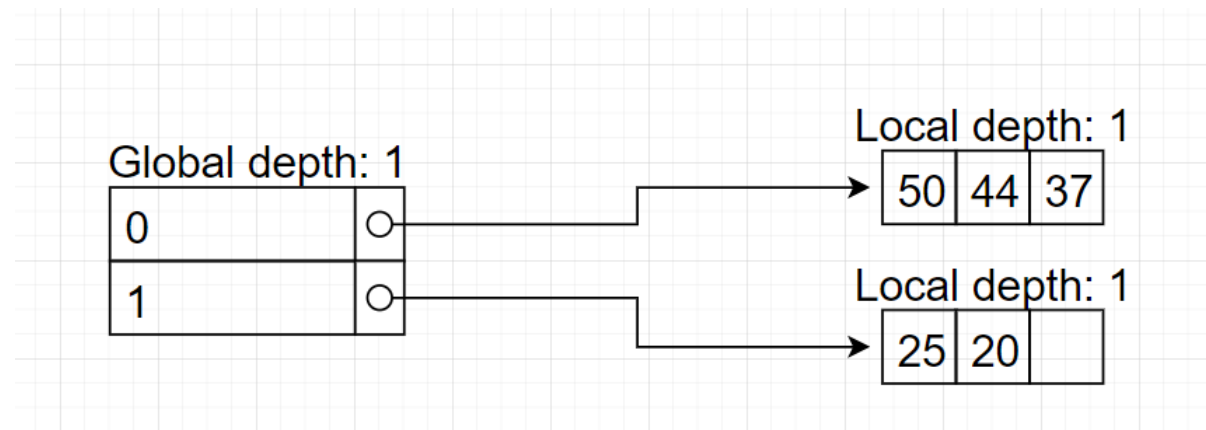


Figure 4: After insertion of 37

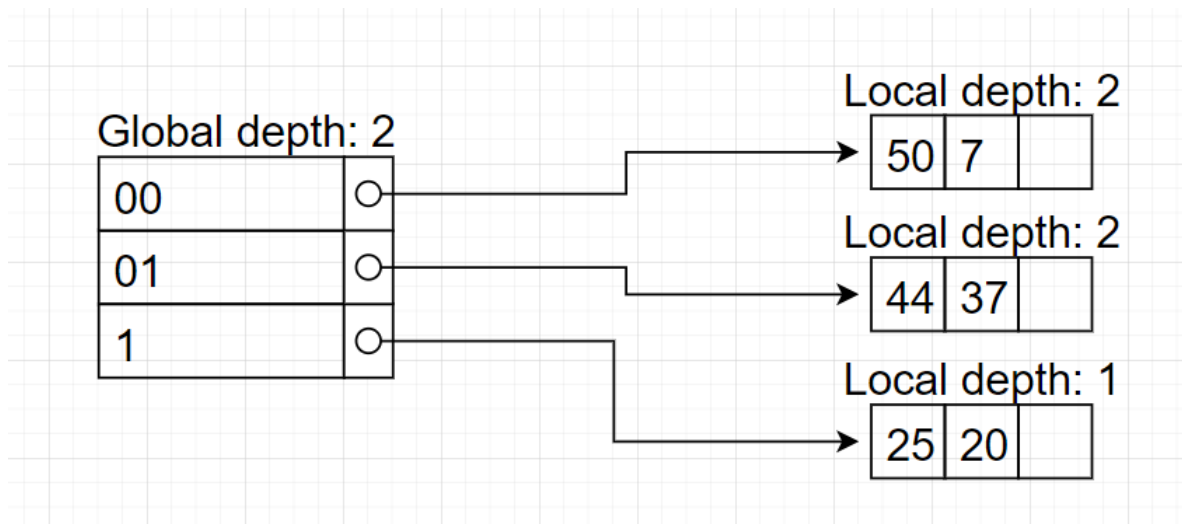


Figure 5: After insertion of 7

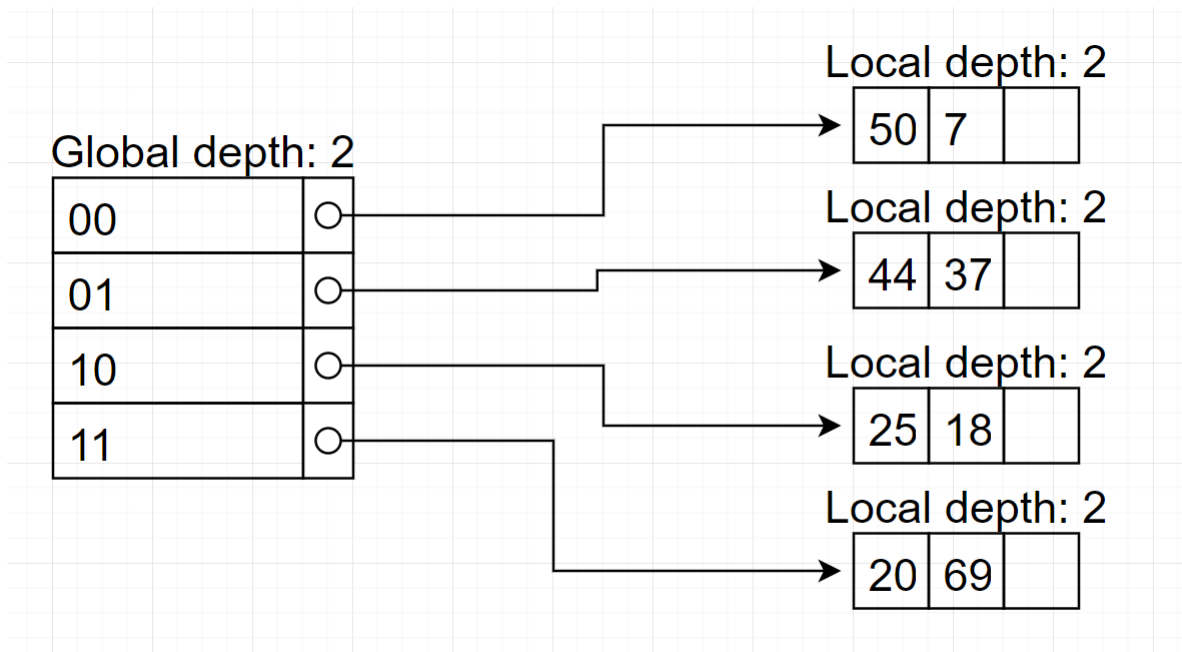


Figure 6: After insertion of 69