SOFTENG 351: Assignment #3

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a)

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

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

b)

i.

$$Size = 4 + 8 = 12\,bytes$$

ii.

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

iii.

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

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

2

a)

i.

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

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

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

$$Total\_Blocks = 100,000 + 1,000 + 10 = 101,010\,blocks$$

ii.

$$\#I/O = h = 3$$

b)

i.

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

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

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

$Total\_Blocks = 100,000 + 10,000 + 100 = 110,100\,blocks$

ii.

$\#I/O = h = 3$

c)

i.

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

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

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

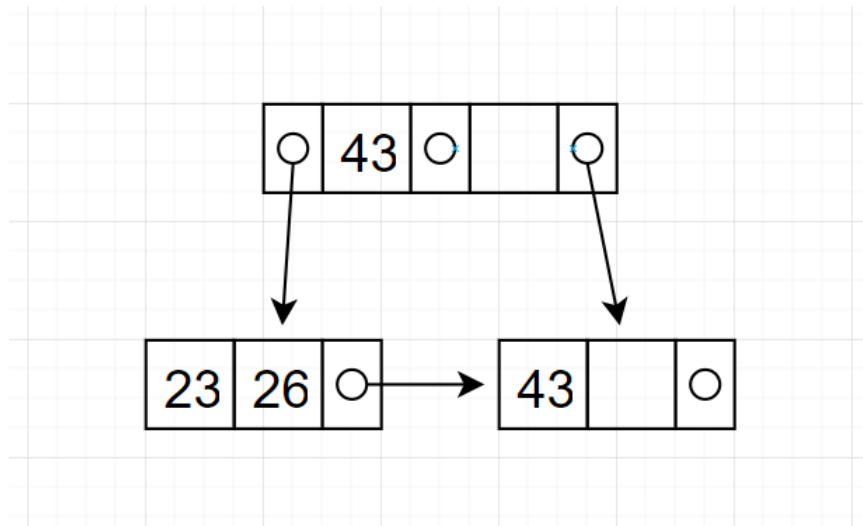$Total\_Blocks = 142,858 + 2,041 + 30 = 144,929\,blocks$
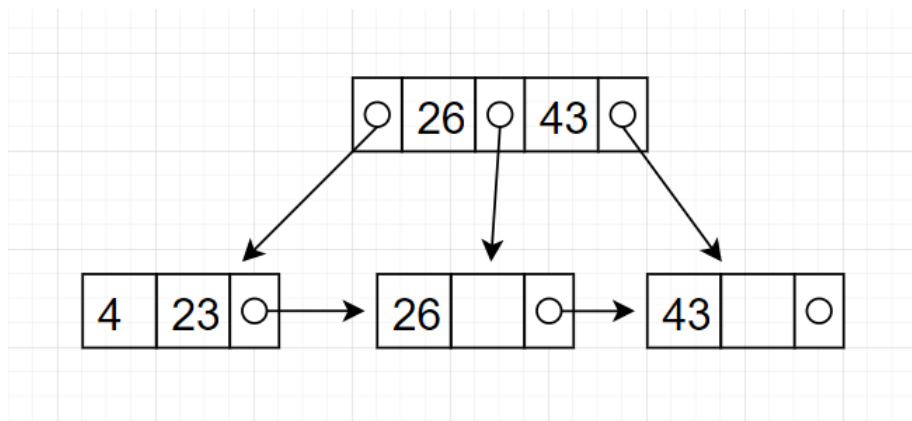
ii.

$\#I/O = h = 3$

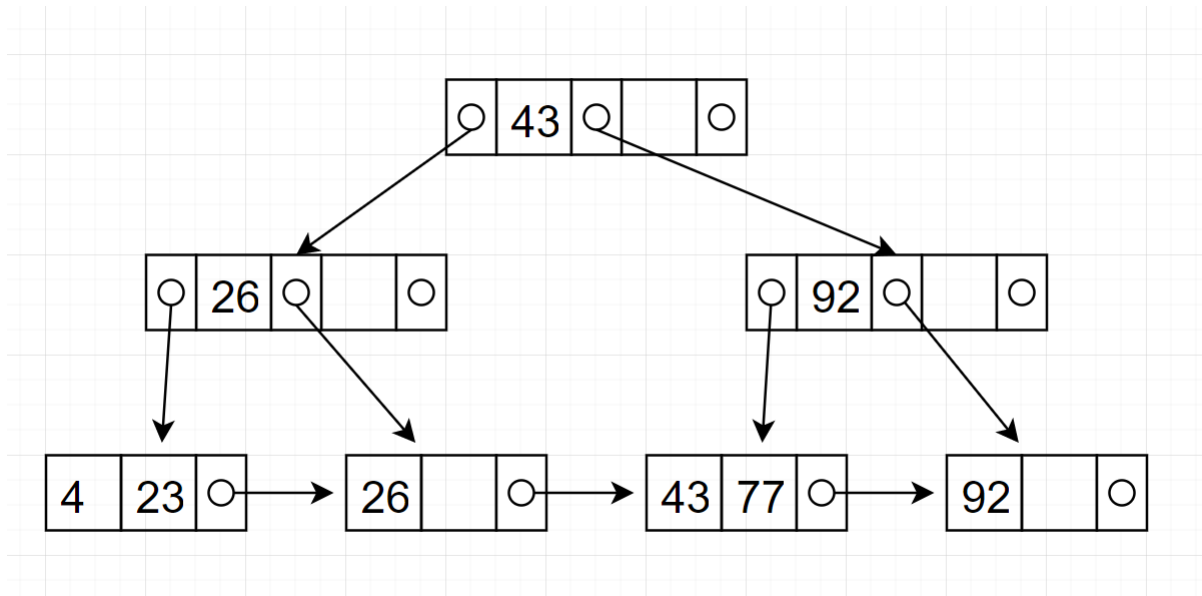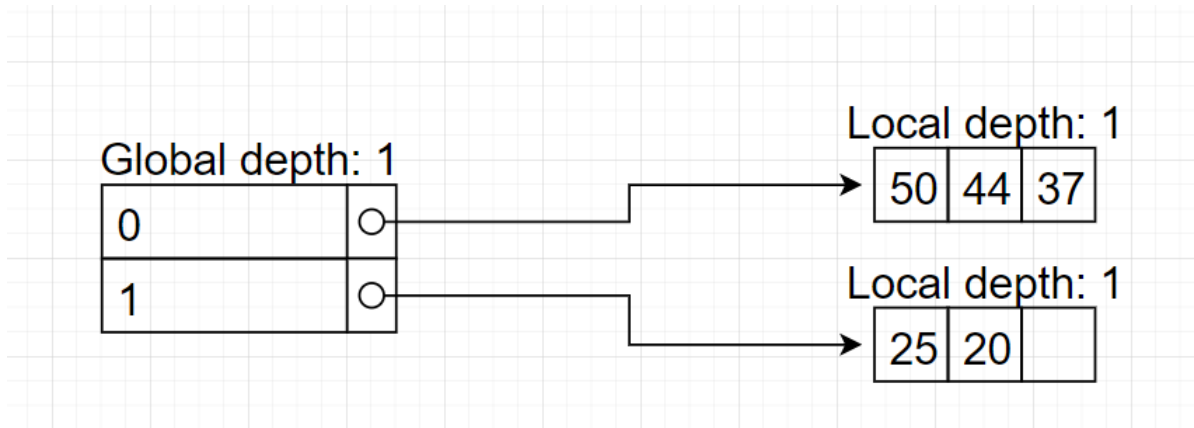Figure 1: After insertion of 43

Figure 2: After insertion of 4

Figure 3: After insertion of 92

3

4

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

Global depth: 1

0	○
1	○

Local depth: 1

50	44	37

Local depth: 1

25	20	

Figure 4: After insertion of 37

Global depth: 2

00	○
01	○
1	○

Local depth: 2

50	7	

Local depth: 2

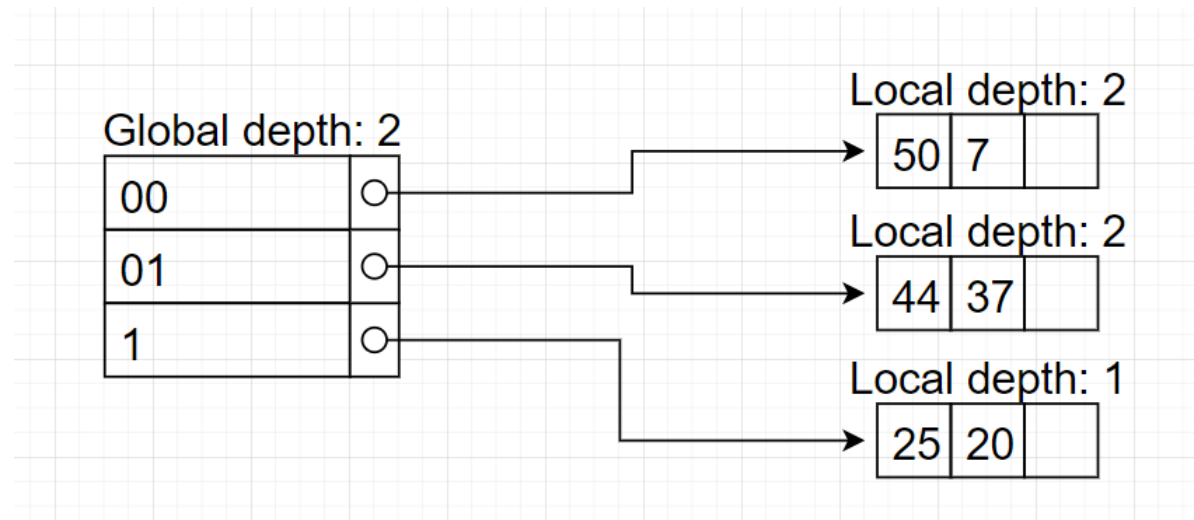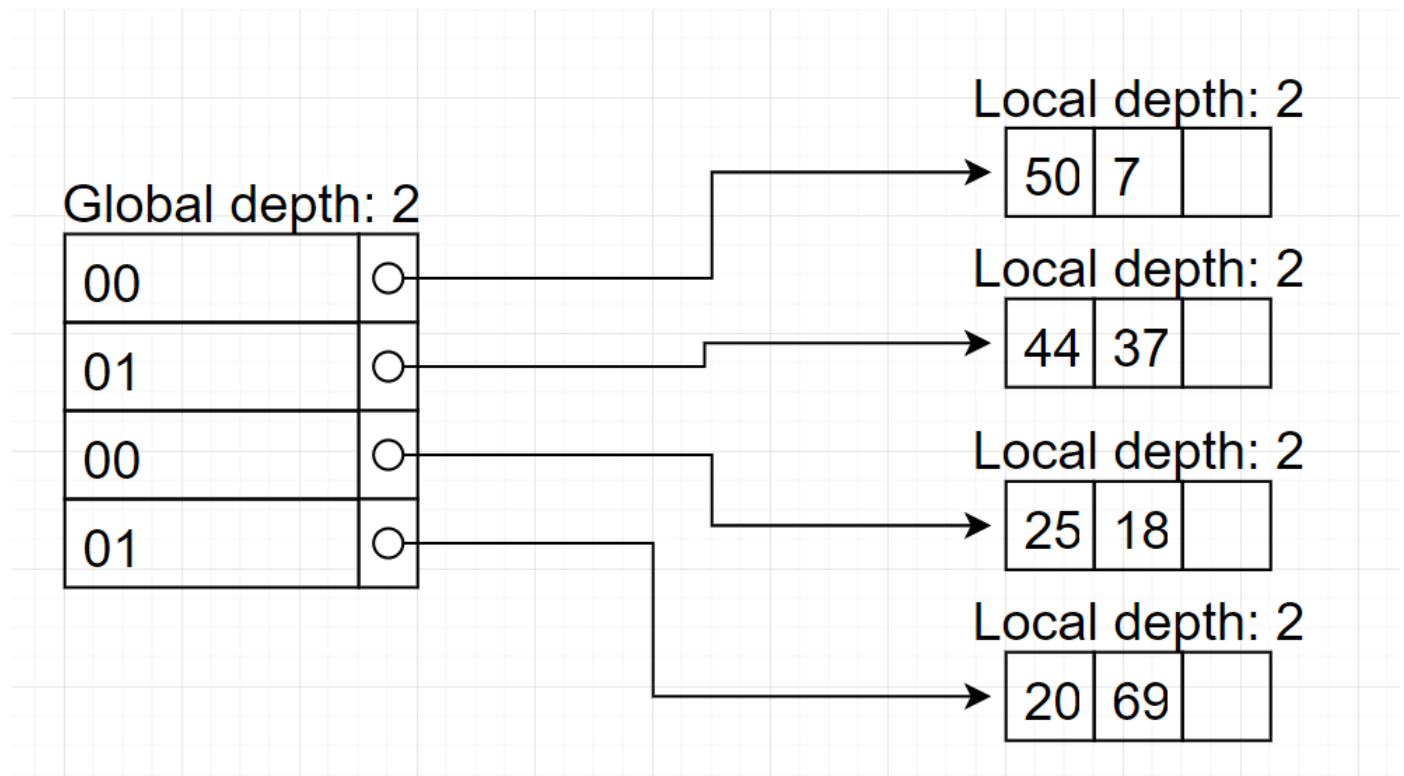| 44	37	

Local depth: 1

25	20	

Figure 5: After insertion of 7

Figure 6: After insertion of 69