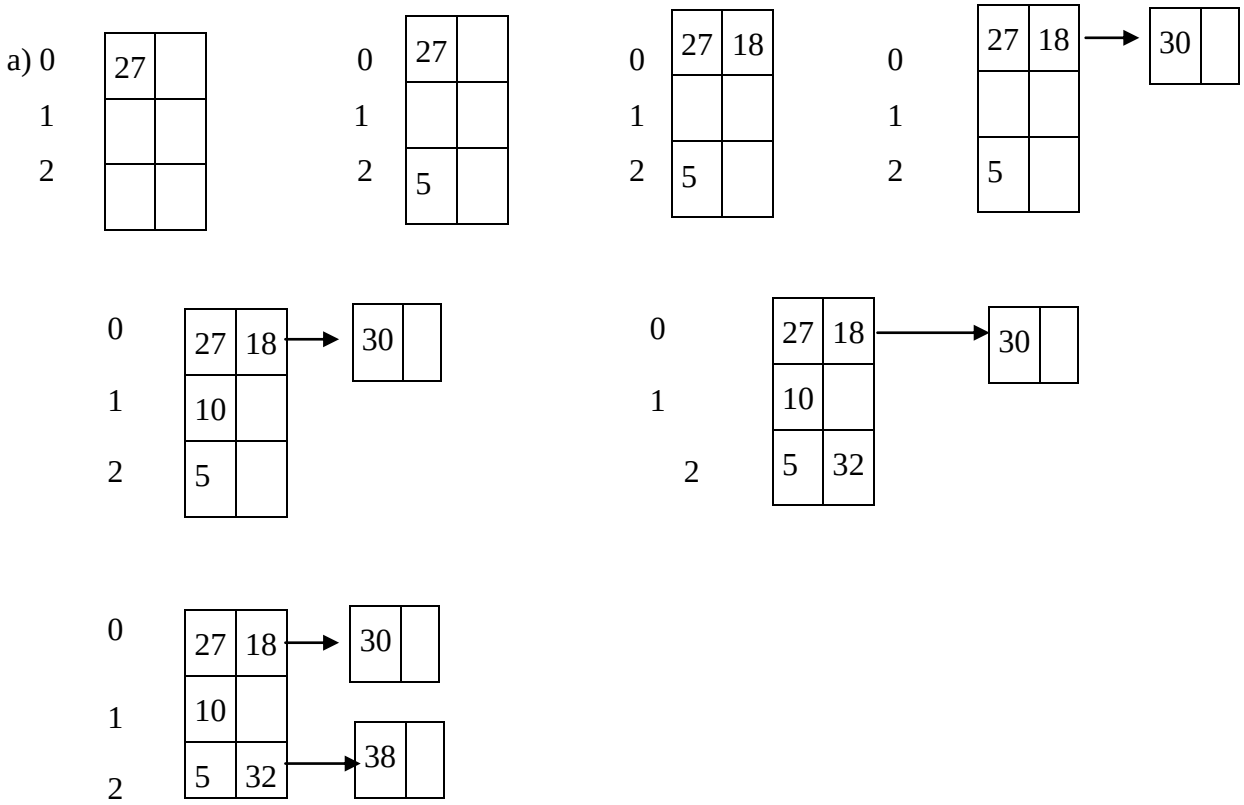
CS351: DATA ORGANIZATION AND MANAGEMENT - FALL 2011
HOMEWORK 3

1)

a)



27(mod 3) = 0 5(mod3) = 2 18(mod3) = 0

30(mod3) = 0 10(mod3) = 1 32(mod3) = 2

38(mod3) = 2

b) Two disk accesses are needed: it is not in the prime data area so we follow the link and it is in the first overflow bucket.

Time = (s+r+btt) + (s+r+ dtt) = 2x24.3 + 0.8 + 0.8 = 50.2 milliseconds

c) 1 disk access is needed to retrieve 3rd bucket which contains the records 5 and 32. So, another look is not necessary. As a result, 1 disk access is needed to retrieve the record 32.

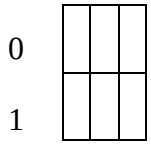
Time = (s+r+btt) = 24.3 + 0.8 = 25.1 milliseconds

d) There are 3 buckets in the prime data area. 2 of them have one overflow bucket additionally. For each of these two buckets, 2 disk accesses are needed for an unsuccessful search. The other bucket requires only 1 disk access for an unsuccessful search. Totally, there are 5 disk accesses and 3 buckets. Then, the average number of accesses for an unsuccessful search is 5/3 = 1.67

2) Table for mod(key, 17)

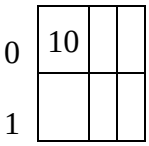
10	01010
20	00011
3	00011
7	00111
13	01101
14	01110
18	00001
21	00100
25	01000
16	10000
38	00100
30	01101
37	00011
35	00001
23	00110

Bkfr = 3 Desired Lf = 2/3



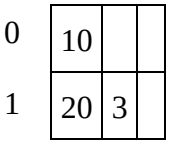
bv = 0, h = 1

Add 10



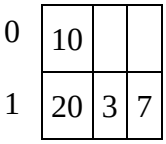
bv = 0, h = 1, 1/6 != Desired Lf

Add 20 , 3



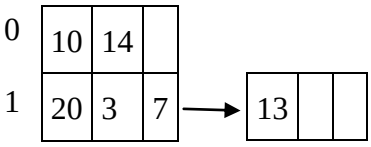
bv = 0, h = 1, 3/6 = 1/2 != Desired Lf

Add 7

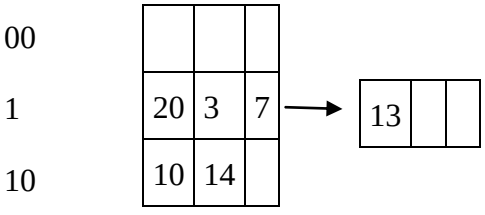


bv=0, h=1 4/6 = 2/3 = Desired Lf → Add 2 records and update

Add 13, 14



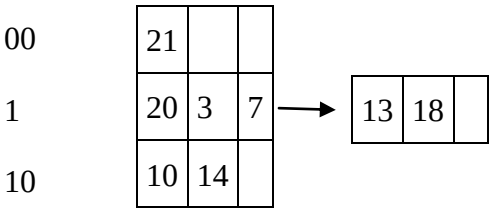
Update



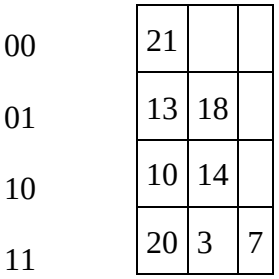
bv = 1 h = 1

6 / 9 = 2/3 = Desired Lf → Add 2 records and update

Add 18, 21



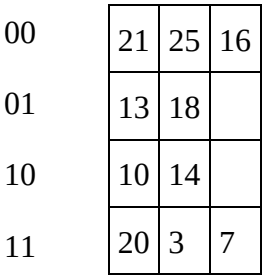
Update



bv = 2 , h = 1 → bv = 2^h → bv = 0, h = 2

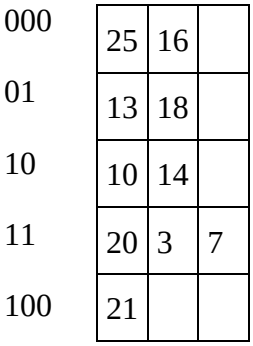
8 / 12 = 2/3 = Desired Lf → Add 2 records and update

Add 25, 16



bv = 0, h = 2

Update



bv = 1, h = 2 10/15 = 2/3 = Desired Lf → Add 2 records and update

Add 38, 30

000	25	16	
01	13	18	30
10	10	14	
11	20	3	7
100	21	38	

Update

000	25	16	
001	18		
10	10	14	
11	20	3	7
100	21	38	
101	13	30	

bv = 2, h = 2

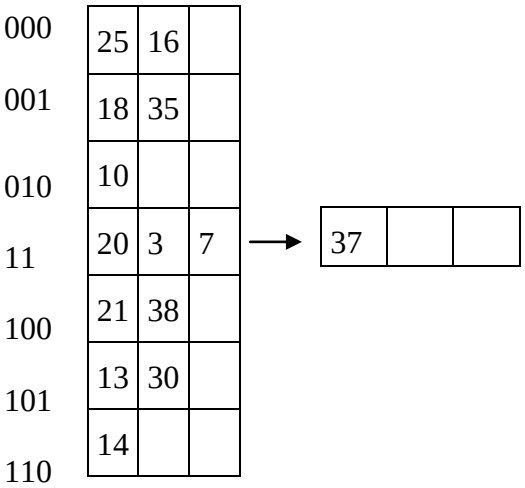
12/18 = 2/3 = Desired Lf → Add 2 records and update

Add 37, 35

000	25	16	
001	18	35	
10	10	14	
11	20	3	7
100	21	38	
101	13	30	

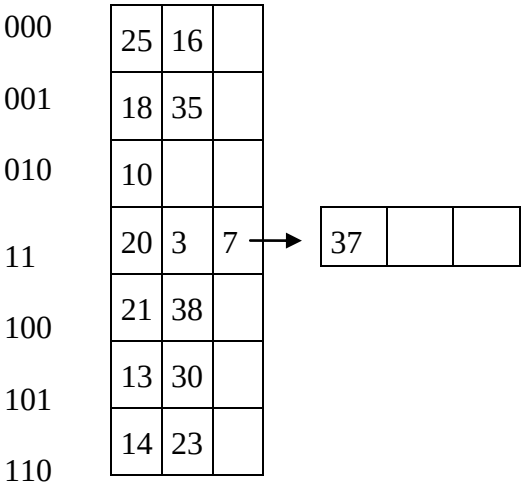
→ | 37 | | |

Update



bv = 3, h=2 14/21 = 2/3 = Desired Lf → Add 2 records and update

Add 23



bv = 3, h=2

Another record is necessary before an update operation.

3) a) 2^h – bv =13 blocks hashed at level h = 4

b) 2*bv = 6 blocks hashed at level h + 1 = 5

c) 10010 is the address of the last bucket of the file

d) 1111 is the address of the last bucket of the file hashed at h

e) mod(54,37) = 17 = 10001 b

0001 < bv → the following bit is taken which is 1

now the pseudo key equals to 10001 b.

The number of bucket which contains 54 is 10001.

4) a) 1024 – 200 = 824 blocks hashed at level h = 10

b) 200x2 = 400 blocks hashed at level h+1 = 5

c) 10011000111 is the address of the last bucket in the file.

d) 11111 11111 is the address of the last bucket of the file hashed at level 10.

e) mod(5178, 2039) = 1100 d = 10001001100 b

00010 01100 < bv , so the following bit is taken which is 1.

Then, the pseudo key is 10001001100.[1]

[1] Solutions are due to Sefa Şahin Koç (Övünç Sezer hw is used for double checkıing.