484 HW 3

#1

1. $\Pi_{Firstname}$ (Passengers $\bowtie$ Tickets $\bowtie$ ($\sigma_{Departure\ time < 12}$ (Flights)))

2. $\Pi_{Destination, PlaneID}$ (Flights) / $\Pi_{planeID}$ (Planes)

3. $\Pi_{FlightID}$ (Tickets $\bowtie$ ($\sigma_{FirstName = 'Isabella'}$ (Passengers)))

   - $\Pi_{FlightID}$ (Flights $\bowtie$ ($\sigma_{Airline = 'Delta'}$ (Planes)))

#2.

1. {id. name. GPA. major. school}. id → name. GPA. major. school GPA → major school → major name. major → id

   id is the key. anything can give id is candidate key. name. major → id name. school → name. major GPA. name → name. major.

   candidate keys : {id}. {name. major}. {name. school} {GPA. name}.

2. The relation is in 3NF since for dependencies in the form X → A: GPA → major, school → major name. major → id major is part of key (name. major) and id is superkey

3. The relation is not in BCNF because for dependencies GPA → major school → major major is not superkey and major is clearly not a subset of GPA nor school

4. GPA → major is violated with (3.8. English) ≠ (3.8 Astronomy) school → major is violated with (Engineering. CS) ≠ (Engineering. Aerospace).

#3

1. C BD is superkey. it qualities for both of them

2. B A is not superkey so not BCNF but A is part of AD and so for the 3NF

3. AC → F

$R_1 = \{A, C, F\}$ $R_2 = \{A, B, C, D, E\}$.

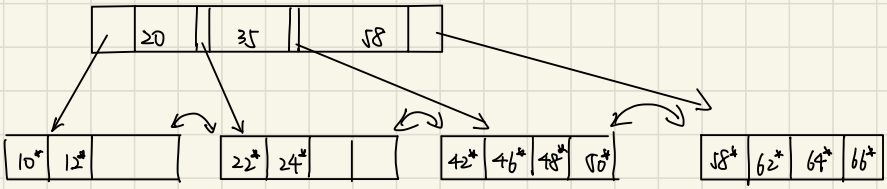
$F_1 = \{AC \rightarrow F\}$ $F_2 = \{A \rightarrow B,\ BD \rightarrow ACE\}$.

4. A $R_1 \cap R_2 = AC \Rightarrow R_1$

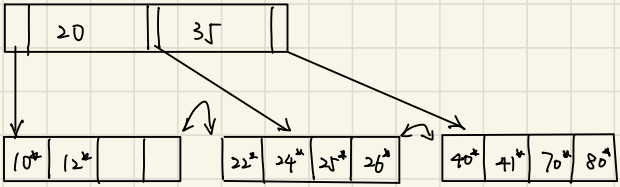
5. B. $DF \Rightarrow CE$ across 2 tables.

#4.

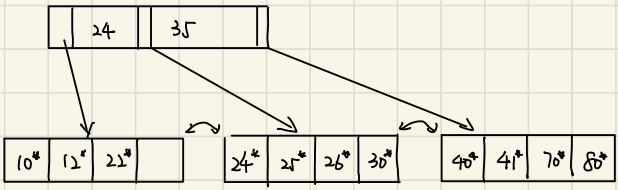
1. redistribute to the right.



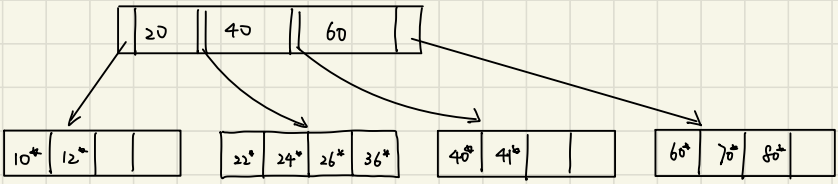
2. Insert 25*



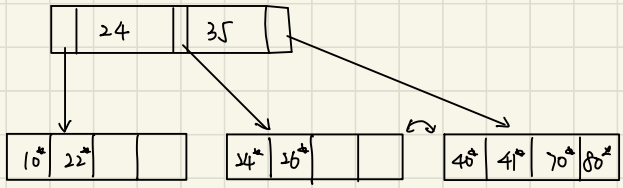
Insert 30* redistribute to left.



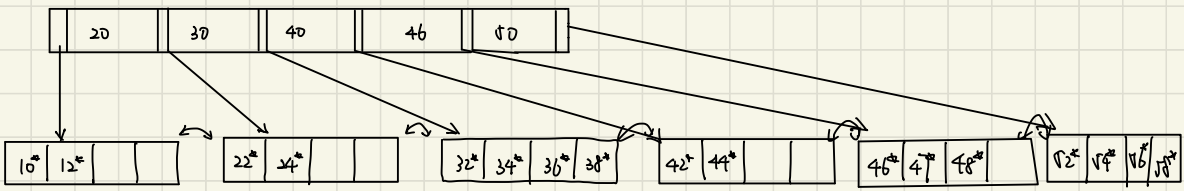
3. split



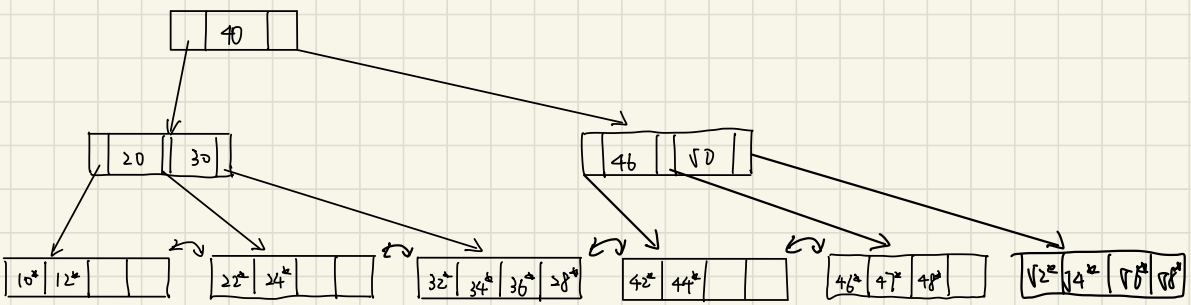
4 redistribute from the right



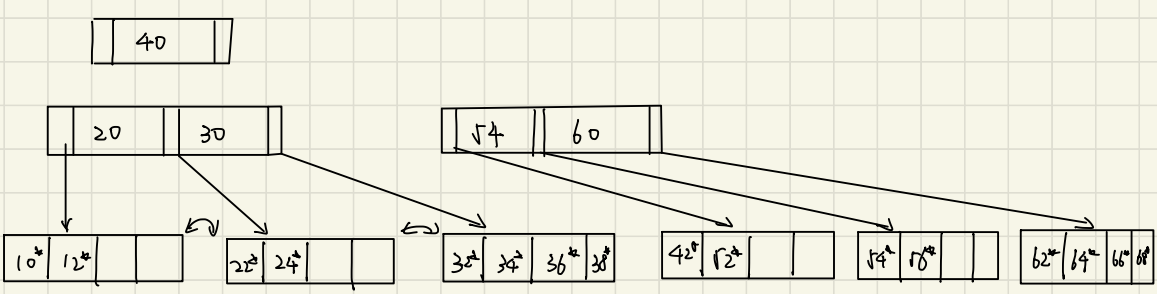
5. split.



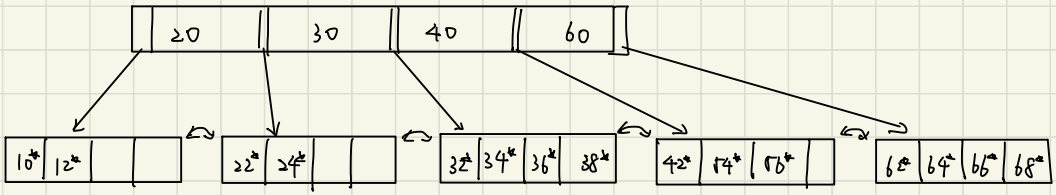
move 40 up



6. delete 44 redistribute from right.



delete 52 merge.



5.

1. N=2 having 4 buckets need to split twice and reaching level=1 need to trigger split when next = No-1 = 1

minimum insert will be insert 2 values to bucket of hash value = 1

splitting bucket for $h_0=0$ and bucket for $h_0=1$

① Insert 3. H_0

00 0

01 1 Next=1 → 11* 13* → 3*

10

② Insert 5 H_1 H_0

00 0 Next=0 [20*]

01 1 [13* 5*]

10

11 [ ]

[11* 3*]

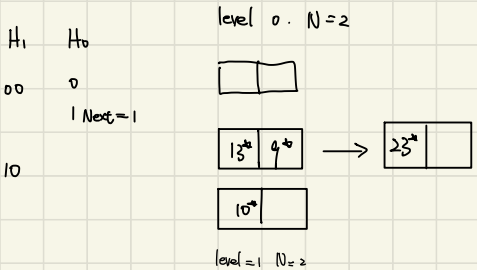
level 0. N=2

2.1 H_0 Next=0

0 [20* 22*]

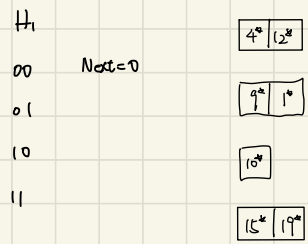
1 [11* 13*]

2.2

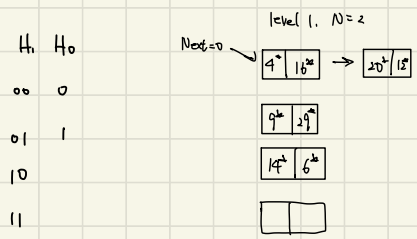

level 0. N=2
H1
H0
00
0
1 Next=1
10
13*
9*
23*
10*

level=1 N=2

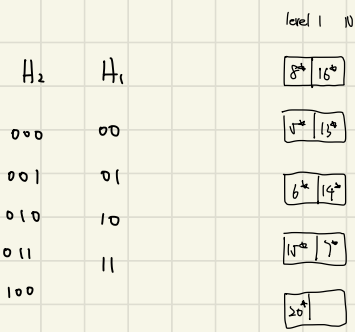
2.3.


H1
00
01
10
11
Next=0
4*
12*
9*
1*
10*
15*
19*

2.4


level 1. N=2
H1
H0
00
0
01
1
10
11
Next=0
9*
16*
20*
15*
9*
29*
14*
6*

2.5


level 1 N=2
H2
H1
000
00
001
01
010
10
011
11
100
8*
16*
5*
13*
6*
14*
15*
7*
20*