CS 202 - HW04

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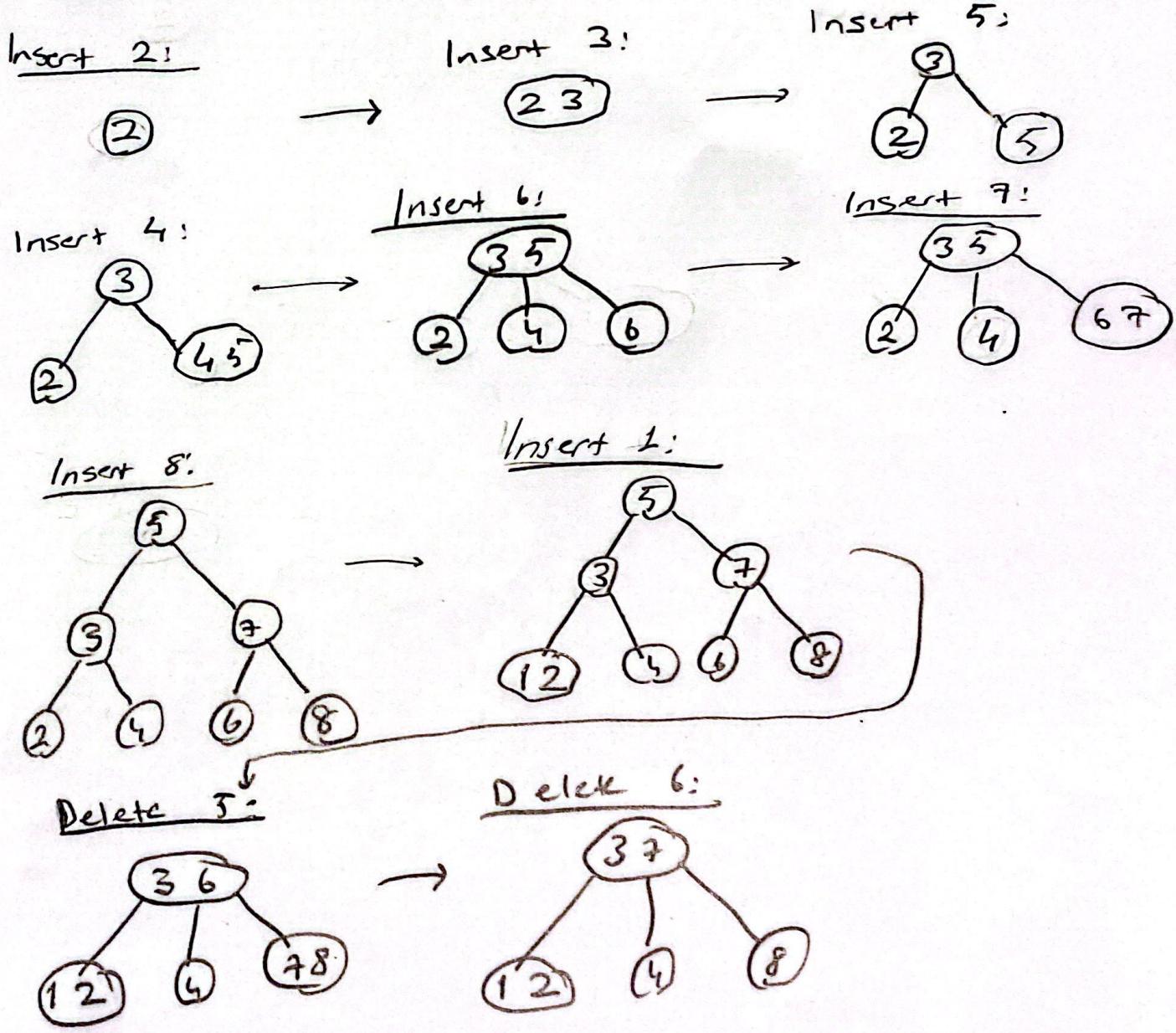
2200164
202 - 01

Question 1:

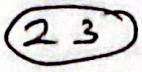
a) 2-3 Tree:



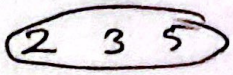
b) 2-3-4 Tree:

Insert 2:

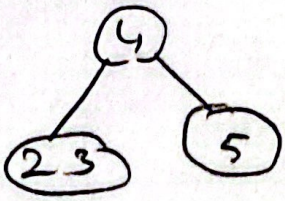
Insert 3:



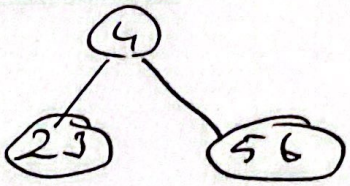
Insert 5:



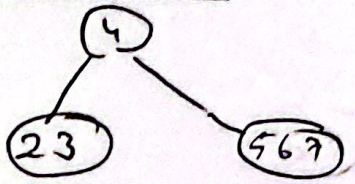
Insert 4:



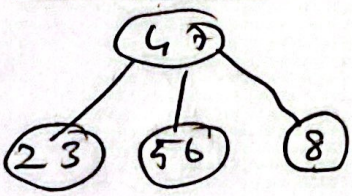
Insert 6:



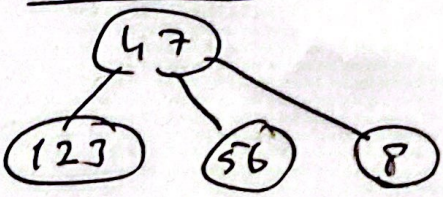
Insert 7:



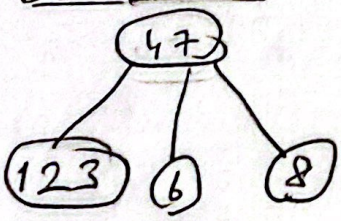
Insert 8:



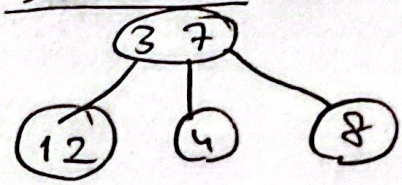
Insert 1:



Delete 5:



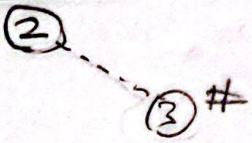
Delete 1:



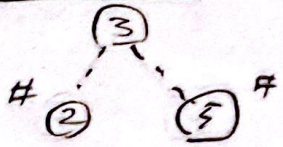
c) Red-Black Tree: Note that Red nodes are represented by #

Insert 2:

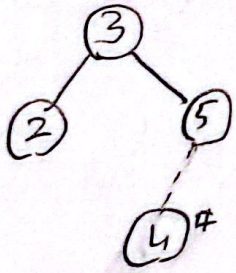
Insert 3:



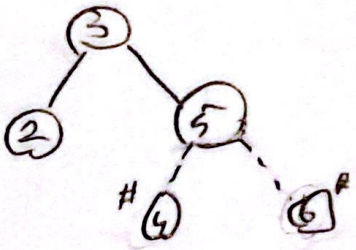
Insert 5:



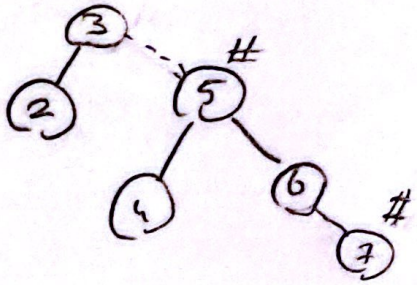
Insert 4:



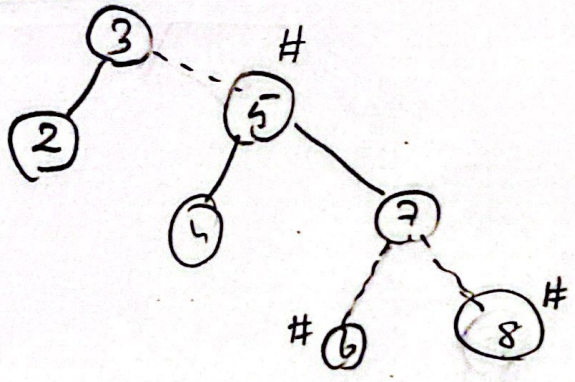
Insert 6:



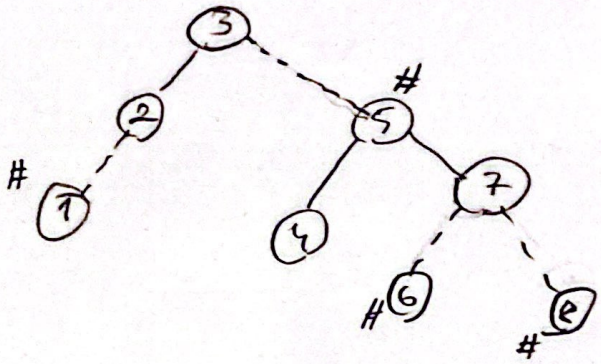
Insert 7:



Insert 8:



Insert 1:



Note that → Red pointers are shown with "- - -"

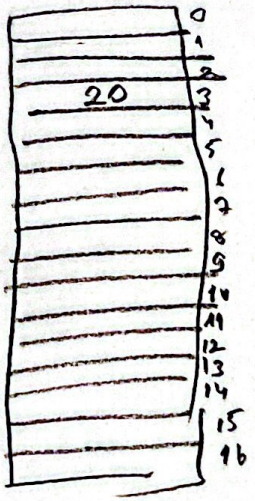
→ Black pointers are shown with " ——— "

QUESTION 2

a) Table size: 17

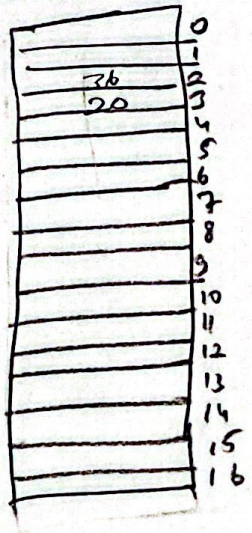
Step 1

20 mod 17 = 3



Step 2

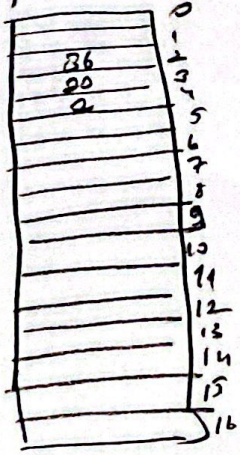
36 mod 17 = 2



Step 3

2 mod 17 = 2

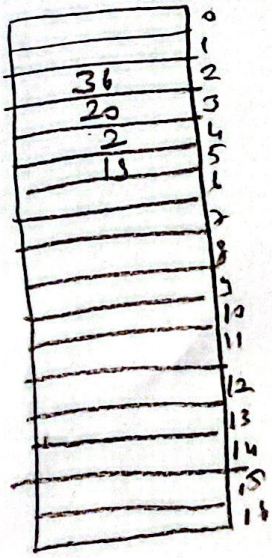
2+1, 2+2 = 4 mod 17 = 4



Step 4

19 mod 17 = 2

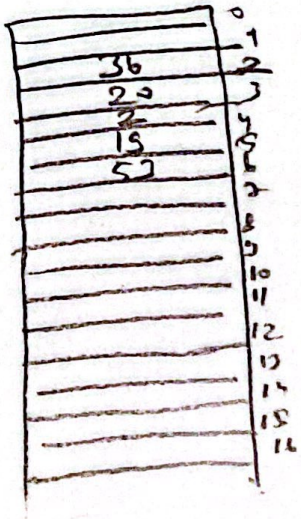
2+1, 2+2, 2+3 = 5 mod 17 = 5



Step 5

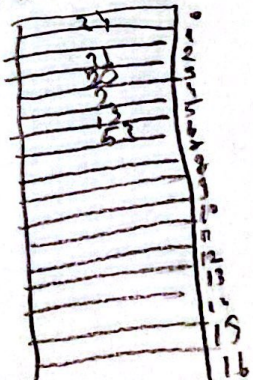
53 mod 17 = 2

2+1, 2+2, 2+3, 2+4 = 6 mod 17 = 6



Step 6

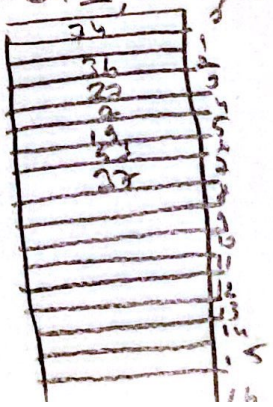
34 mod 17 = 0



Step 7

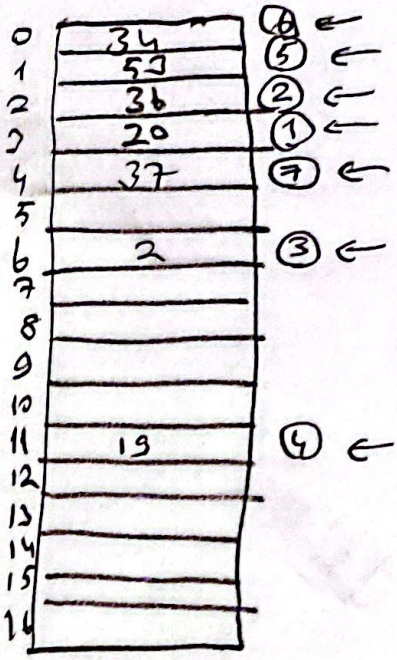
37 mod 17 = 3

3+1, 3+2, 3+3, 3+4 = 7,



b) open adressing with quadratic probing

Table size: 17



① 20 mod 17 = 3

② 36 mod 17 = 2

③ 2 mod 17 = 2

$2+1^2$, $2+2^2 = 6$ mod 17 = 6

④ 19 mod 17 = 2

$2+1^2$, $2+2^2$, $2+3^2 = 11$ mod 17

= 11

⑤ 53 mod 17 = 2

$2+1^2$, $2+2^2$, $2+3^2$, $2+4^2 = 18$ mod 17

= 1

⑥ 34 mod 17 = 0

⑦ 37 mod 17 = 3

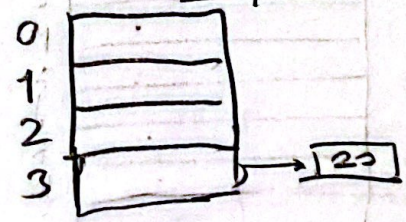
$3+1^2 = 4$ mod 17 = 4

c) Seperate Chaining

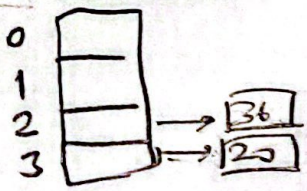
Table size 17. Values: 20, 36, 19, 53, 34, 37

for every value x mod 17 must be at most 3. Because of that for simplicity, 0, 1, 2, 3 table rows drawn there

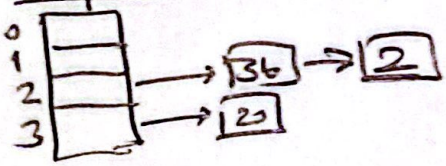
Step 1:



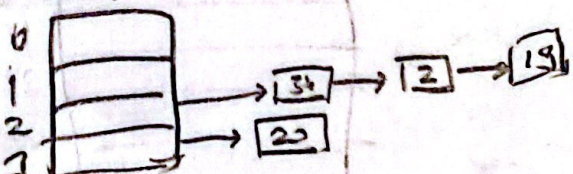
Step 2:



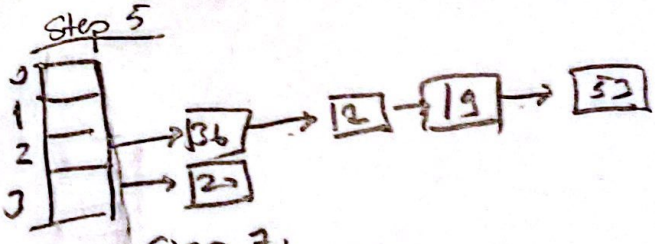
Step 3:



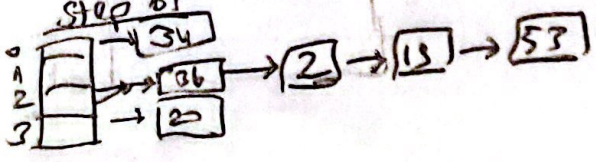
Step 4:



Step 5



Step 6:



Step 7: