Q3

a)

$T(n) = 5n^2 + 3n + 10$

if we take c=18, then

$T(n) <= 18n^2$

for all n>=1

Thus T(n) is $O(n^2)$

b)

$T(n) = 7n^2 + 22m^2 + 4nm + 10m + 200$

$O(T(n)) = O(n^2) + O(m^2) + O(nm) + O(m)$

According to additive property of big-Oh the result is the maximum term.

As **n>=m**

$n^2 >= m^2$ and $n^2 >= n*m$ and n>=m

Thus in both cases n>m or n==m, $O(n^2)$ will the max term

thus

$O(T(n)) = O(n^2)$

c)

First algorithm:

T(n) = n/3 + n/2 + 2*sqrt(n) + 3n

O(T(n)) = O(3n) = O(n)

Second Algorithm:

T(n) = n/2 * n + 10 * (n/2) + 100000

$= 0.5n^2 + 5n + 100000$

$O(T(n)) = O(n^2)$

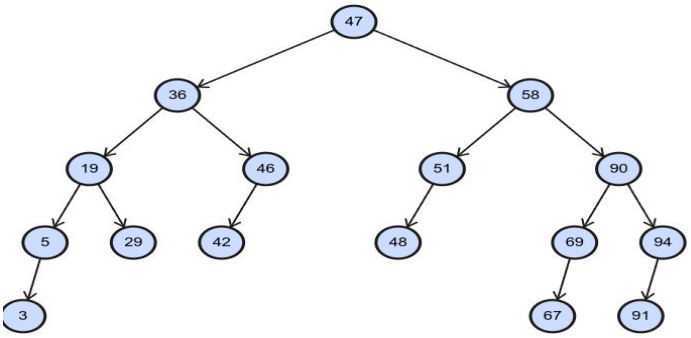
Q4

Hash Table after all insertion:

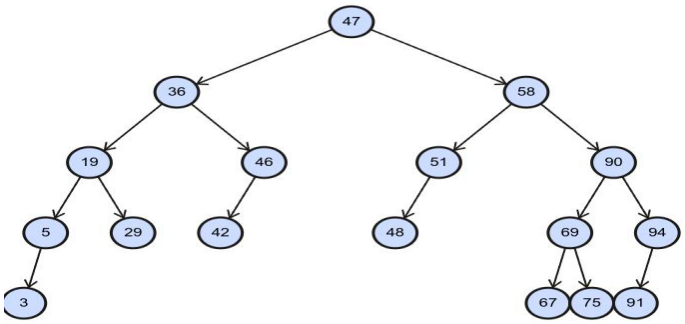
0	1	2	3	4	5	6	7	8	9	10	11	12
12	31	26		5	44	92	40	45	57	80	42	38

Q5

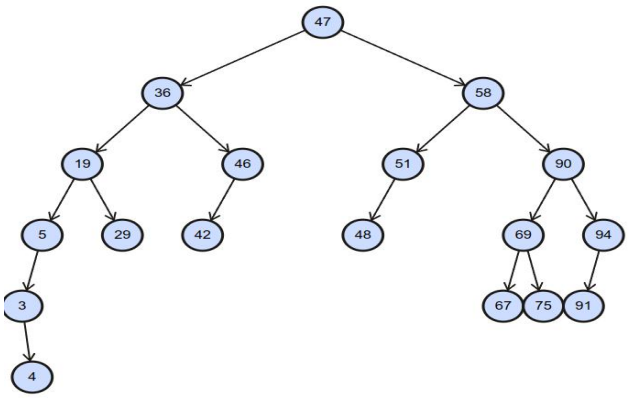
Insert 48



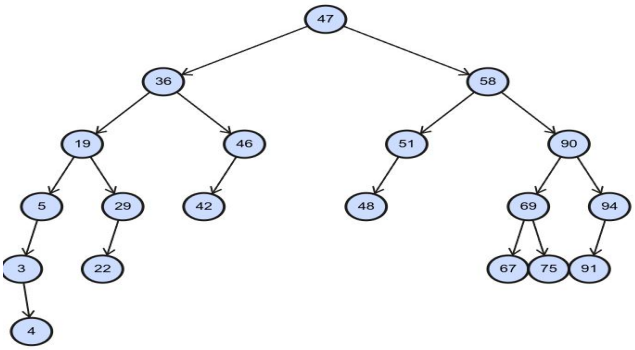
Insert 75



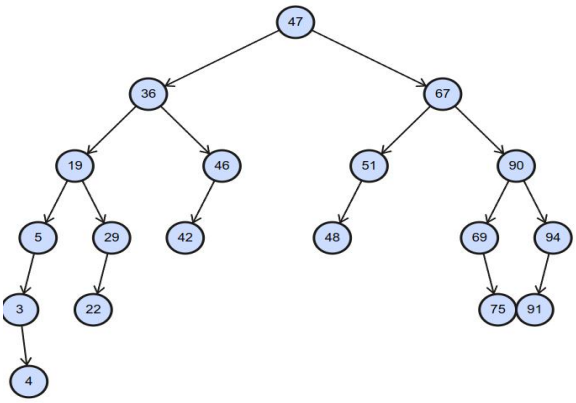
Insert 4



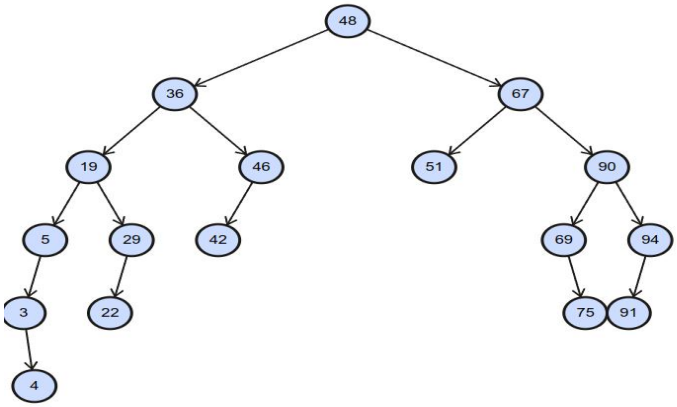
Insert 22



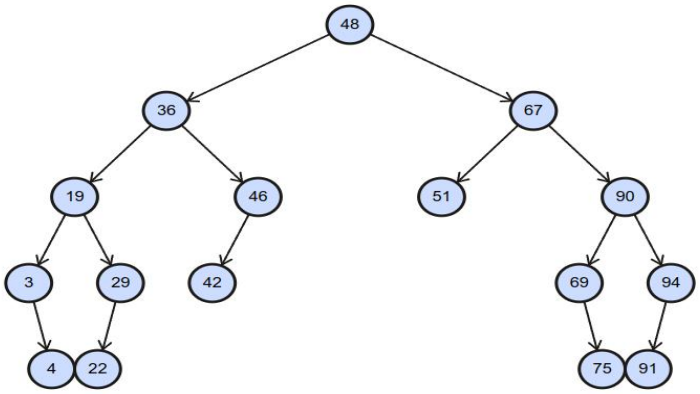
Delete 58



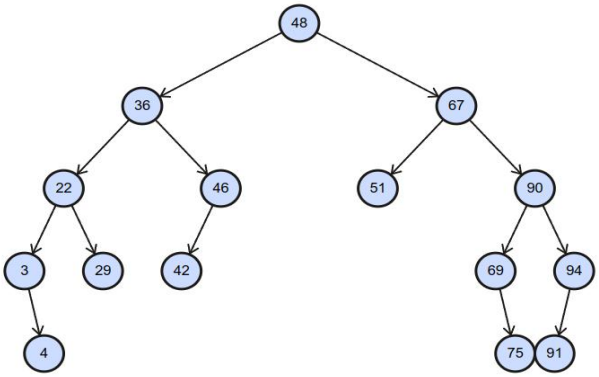
Delete 47



Delete 5



Delete 19



Q6

Inorder: 3 6 7 16 33 40 36 44 49 69 68 70 75 91 94 98
pre-order: 49 7 6 3 33 16 40 36 44 94 70 68 69 91 75 98
post-order: 3 6 16 36 44 40 33 7 69 68 75 91 70 98 94 49

Q7

Bubble Sort:

iteration 1: 7 9 3 8 5 10
iteration 2: 7 3 8 5 9 10
iteration 3: 3 7 5 8 9 10
iteration 4: 3 5 7 8 9 10

iteration 5: 3 5 7 8 9 10

Selection Sort:

iteration 1: 3 7 9 10 8 5
iteration 2: 3 5 9 10 8 7
iteration 3: 3 5 7 10 8 9
iteration 4: 3 5 7 8 10 9
iteration 5: 3 5 7 8 9 10

Insertion Sort:

iteration 1: 7 10 9 3 8 5
iteration 2: 7 9 10 3 8 5
iteration 3: 3 7 9 10 8 5
iteration 4: 3 7 8 9 10 5
iteration 5: 3 5 7 8 9 10

Q8

iteration 1: 1
iteration 2: 4 1
iteration 3: 5 1 4
iteration 4: 5 3 4 1
iteration 5: 5 3 4 1 2
iteration 6: 8 3 5 1 2 4
iteration 7: 9 3 8 1 2 4 5
iteration 8: 9 6 8 3 2 4 5 1
iteration 9: 9 7 8 6 2 4 5 1 3
iteration 10: 10 9 8 6 7 3 5 1 3 2

Q9

Insert 10
heap: 10
Insert 12
heap: 12 10
Insert 13
heap: 13 10 12
Insert 7
heap: 13 10 12 7
Insert 16
heap: 16 13 12 7 10
Insert 19
heap: 19 13 16 7 10 12

Insert 9

heap: 19 13 16 7 10 12 9

Insert 14:

heap: 19 14 16 13 10 12 9 7

Delete 19

heap: 16 14 12 13 10 7 9

Delete 16

heap: 14 13 12 9 10 7