Quiz 2

Section 2 (C0201, LEC2000, LEC2201)

Question 1

Consider a hash function that distributes keys uniformly. The hash table size is 20. After hashing of how many keys, will the probability that any new hashed key collides with an existing one, exceed 0.5?

$A)$ 5

$B)$ 10

$C)$ 20

$D)$ 40

Question 1

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$A)$ 5

$B)$ 10

$C)$ 20

$D)$ 40

Load factor: $\alpha = \frac{n}{m} = \frac{10}{20} = 0.5$

Question 2

To balance an AVL tree aftre an insertion, how many number of rotations is requiered in the worst case? What is the time complexity of a rotation?

A) Two rotations, $O(\log n)$

B) One rotation, $O(\log n)$

C) $O(\log n)$ rotations, $O(1)$

D) Two rotations, $O(1)$

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C) $O(\log n)$ rotations, $O(1)$

D) Two rotations, $O(1)$

After any insertion, a single or a double hashing would balance the tree, any rotation modifies constants and only two nodes' height would change, so the time complexity of a rotation is O(1).

Question 3

Suppose that each cell in a hash table of size m stores a Binary search tree instead of a linked list. What would be the worst case running time of search?

A) $O(1)$

B) $O(n)$

C) $O(\log n)$

D) $O(\sqrt{n})$

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C) $O(\log n)$

D) $O(\sqrt{n})$

The height of a BST is O(n) in the worst case.

Question 4

What is the minimum number of nodes in an AVL tree with the height of 3?

A) 6

B) 7

C) 8

D) 10

Question 4

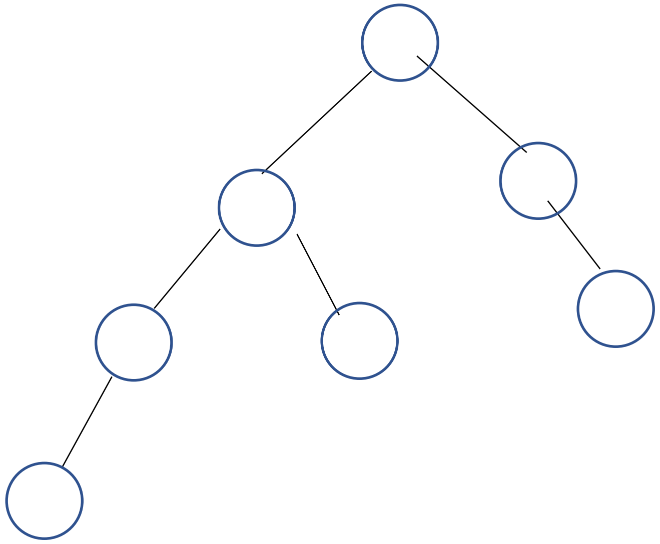
What is the minimum number of nodes in an AVL tree with the height of 3?

A) 4

B) 7

C) 10

D) 15



Question 5

What is the number of possible binary search trees that can be created with 3 items $a < b < c$?

A) There is only a unique BST

B) 3

C) 5

D) $2^3 = 8$

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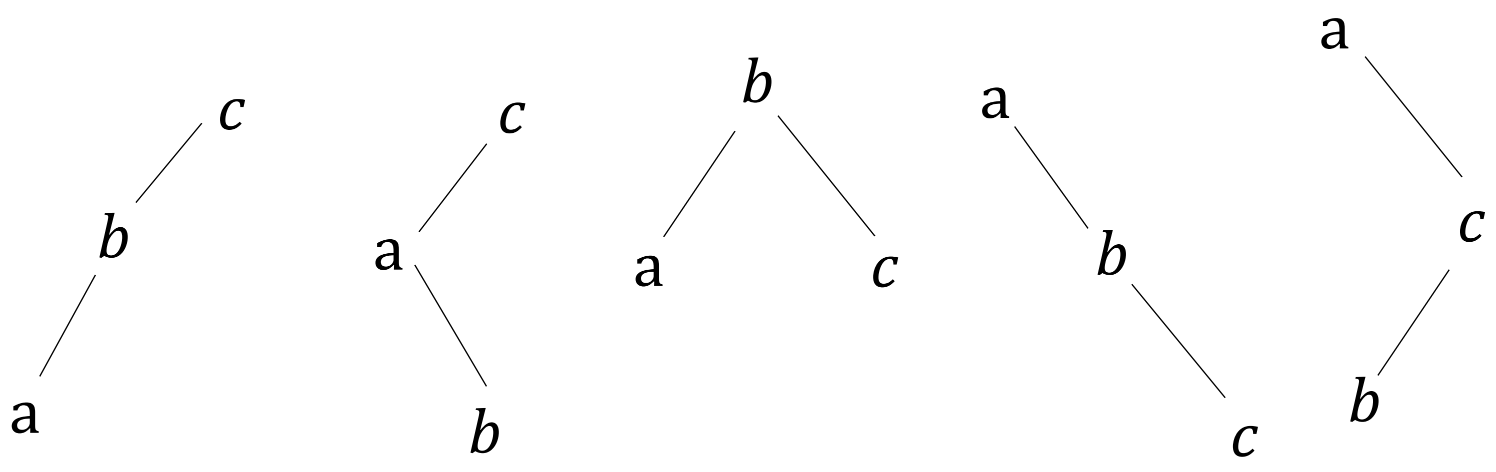


Question 6

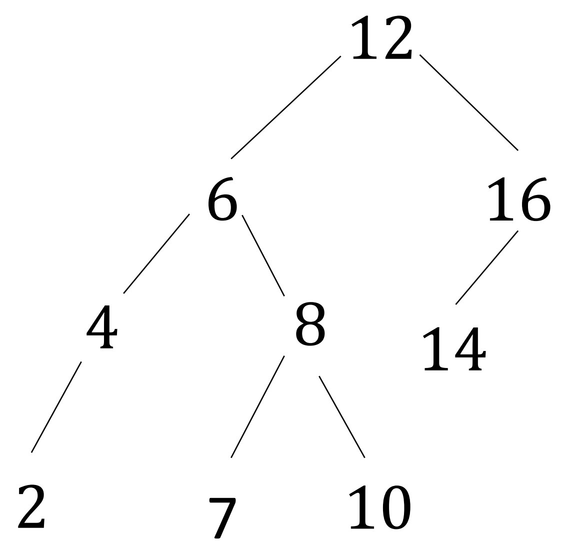
We want to insert 9 into the AVL tree shown below. What is the pivot node (or nodes) about which rotation should be performed to restore the AVL tree property after insertion?

A) 8

B) 12

C) 6 , 12

D) 6, 8



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A) 8

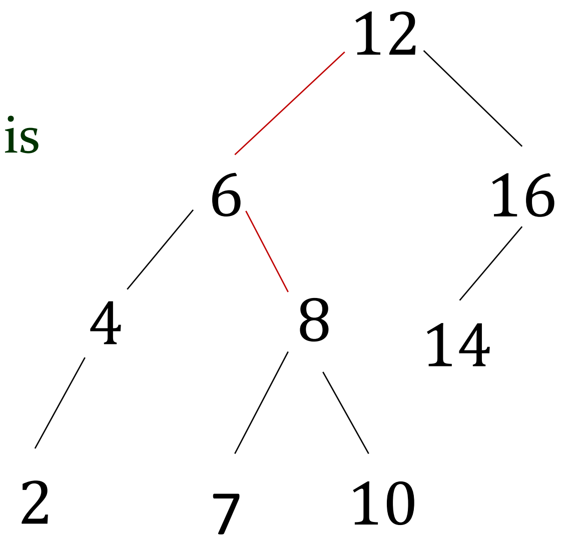
B) 12

C) 6 , 12

D) 6, 8

12 is the lowest node which is imbalanced.

It is left heavy, needs a right rotation but since 6 is also right heavy, it needs first to perform a left rotation on 6.



Question 7

Consider a hash table with chaining that contains 1000 elements. Let x_{100} is the 100^{th} element that is inserted in the table. What is the maximum number of elements need to be looked up for search x_{100}?

A) 1000

B) 101

C) 10

D) 901

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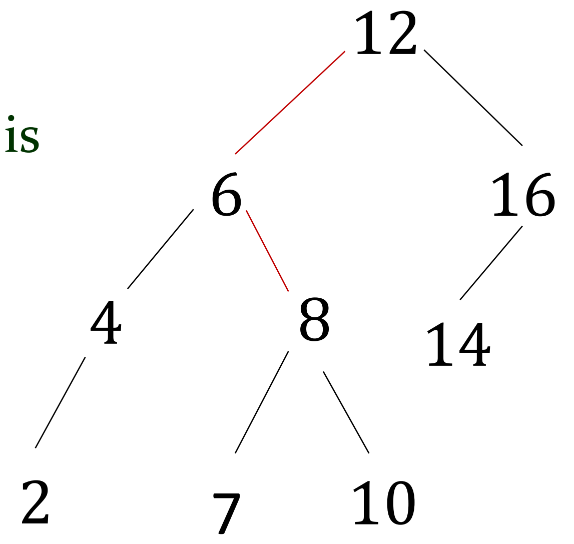

Question 8

Consider a hash table using the open addressing with linear probing collision resolution mechanism, with table size m = 7 and the hash function $h(k, i) = k + i \ (mod\ 7)$,

What is the possible order of insertion for the following table?

0	1	2	3	4	5	6
12					5	6

A) 5, 6, 12,

B) 12, 5, 6

C) 6, 5, 12

D) A, C

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12					5	6

A) $5, 6, 12,$

B) $12, 5, 6$

C) $6, 5, 12$

D) A, C

Question 9

What is the expected number of comparisons for unsuccessful search in a hash table of size 15 in which 30 keys are stored, assuming that the chaining collision resolution mechanism is used?

A) 30

B) 15

C) 2

D) 0.5

Question 9

What is the expected number of comparisons for unsuccessful search in a hash table of size 15 in which 30 keys are stored, assuming that the chaining collision resolution mechanism is used?

A) 30

B) 15

C) 2

D) 0.5

Load factor: $\alpha = \frac{n}{m} = \frac{30}{15} = 2$

Question 10

For a hash table with open addressing which has m slots, the number of maximum probe sequence is

$A)$ m for linear probing an $m!$ for quadratic probing

$B)$ m for linear probing an m^2 for quadratic probing

$C)$ $m!$ for linear probing, quadratic probing

$D)$ m for linear probing, quadratic probing

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$C)$ $m!$ for linear probing and quadratic probing

$D)$ m for linear probing and for quadratic probing