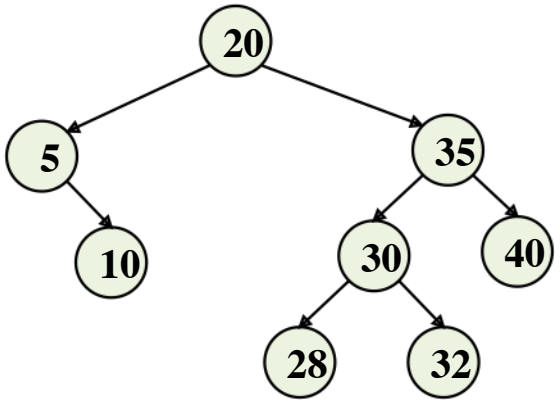
TL06

Live

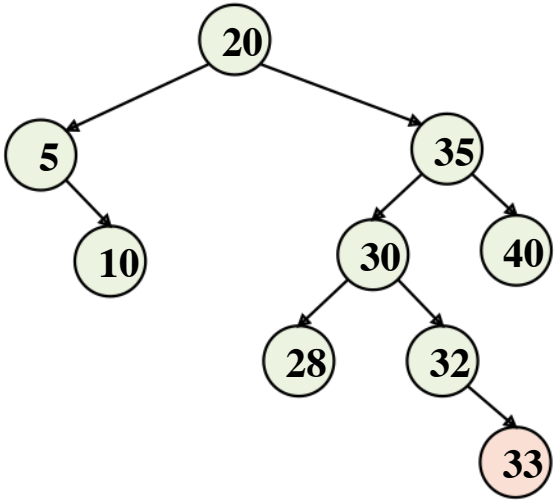
Q1

AVL Tree Insertion

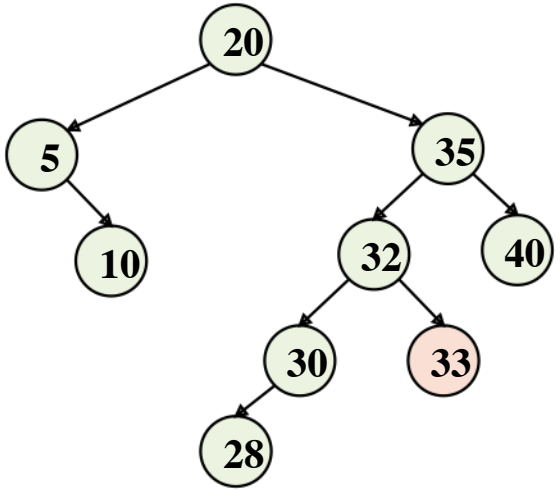
AVL – **Insert 33**



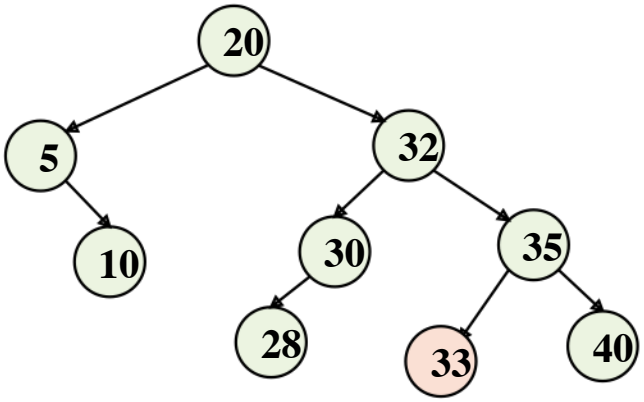
AVL – **Insert 33**



AVL – **Insert 33**



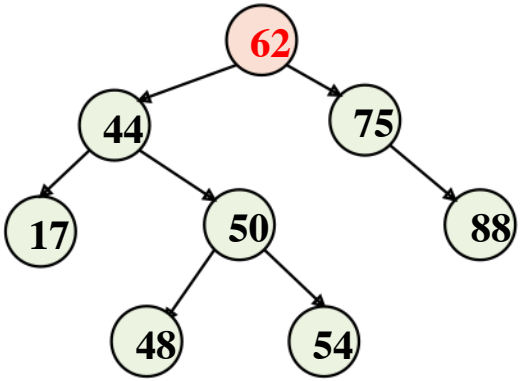
AVL – **Insert 33**



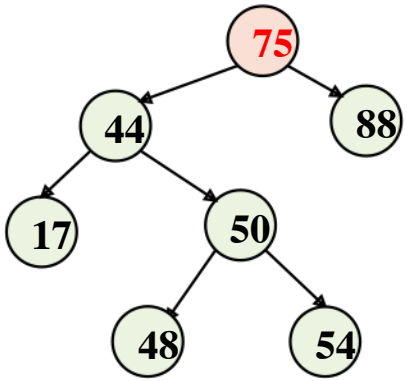
Q2

AVL Tree Deletion

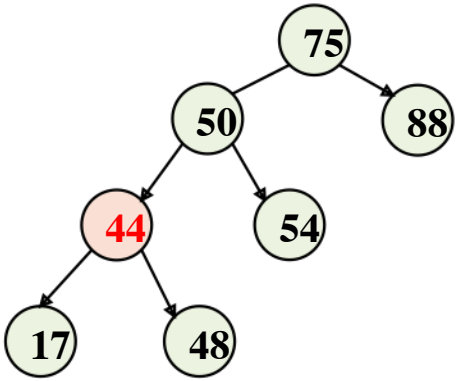
AVL – **Delete 62**



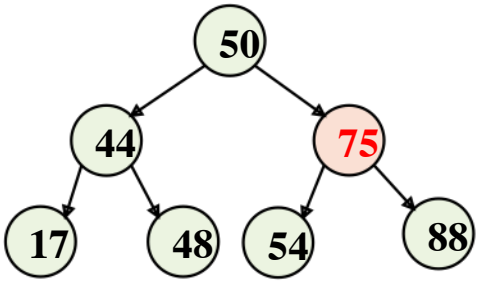
AVL – Delete 62



AVL – Delete 62



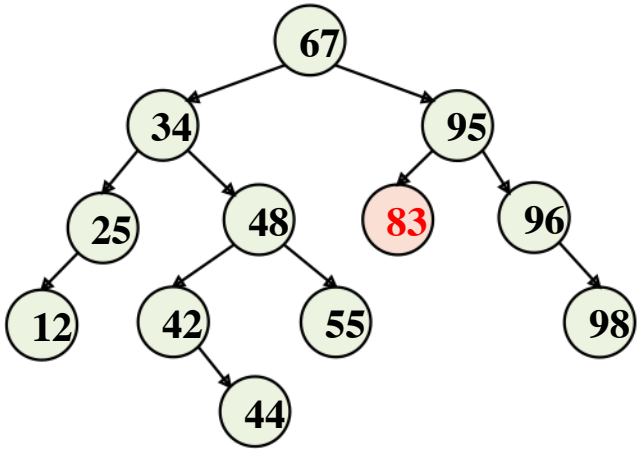
AVL – Delete 62



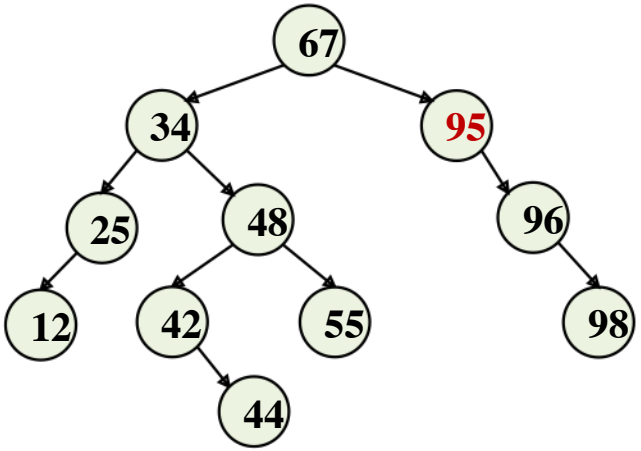
Q3

AVL Tree Deletion - General

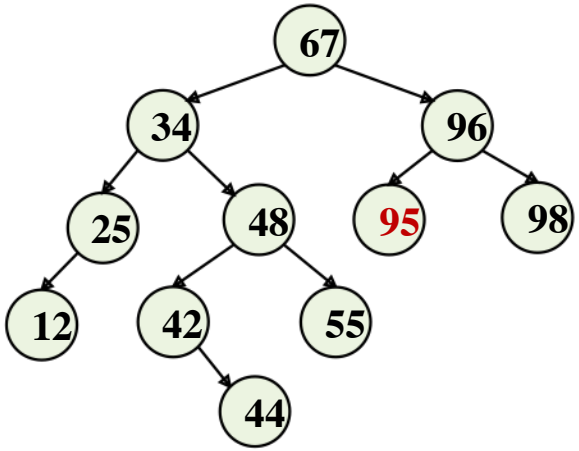
a. **Delete 83**



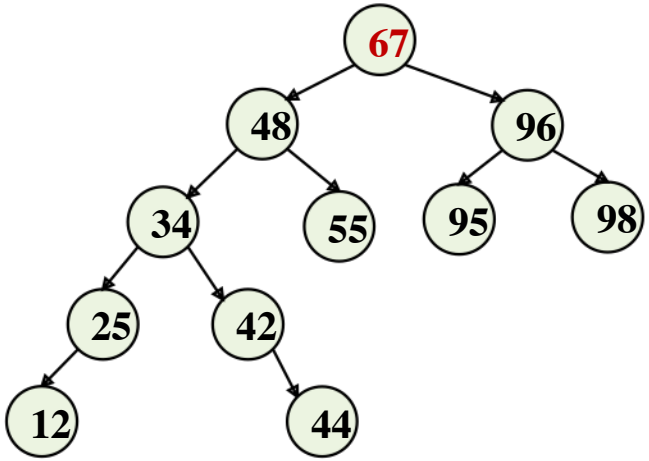
a. **Delete 83**



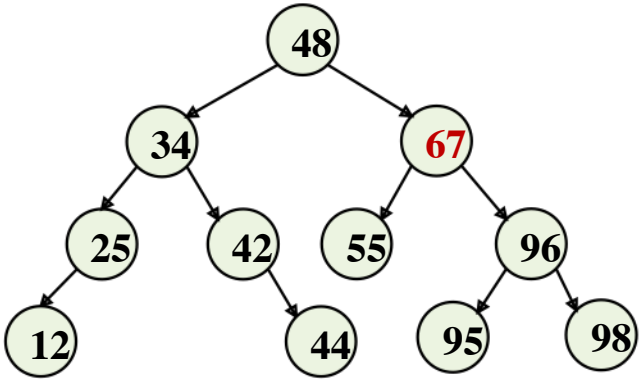
a. **Delete 83**



a. **Delete 83**

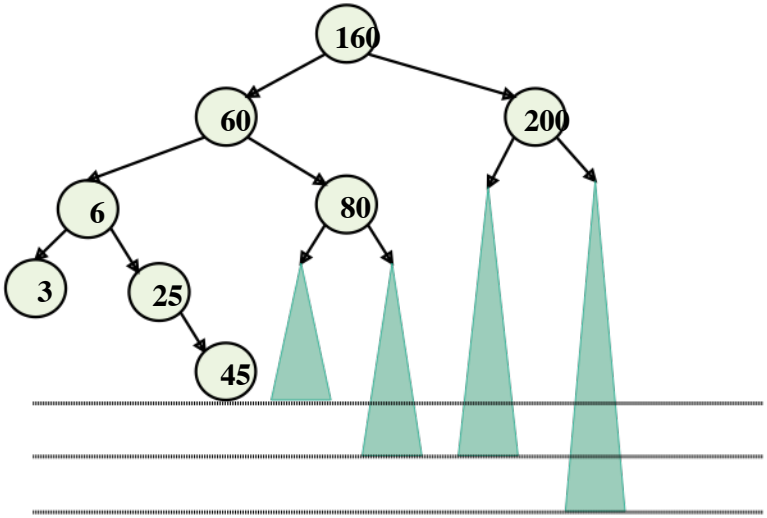


a. **Delete 83**



b. So, what's the **worst case**?

b. So, what's the **worst case**?



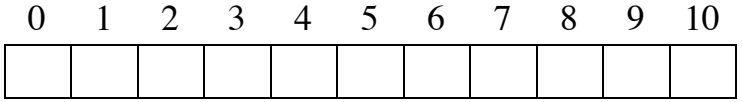
Q4

Hash Table – **Collision Resolution**

a. Separate Chaining

```
Hash( key )
= key % 11
```

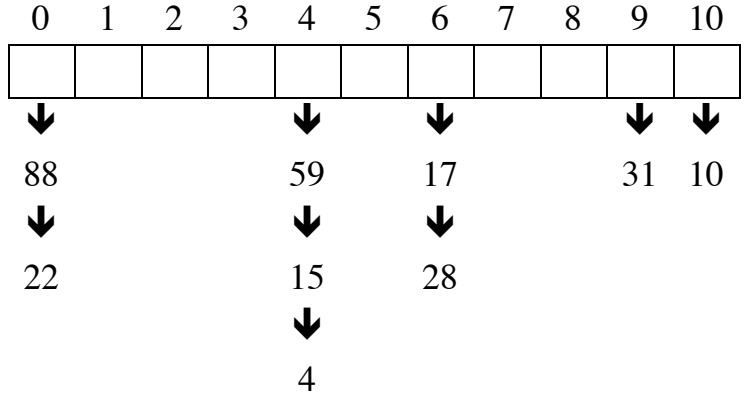
{ 10, 22, 31, 4, 15, 28, 17, 88, 59 }



a. Separate Chaining

```
Hash( key )
= key % 11
```

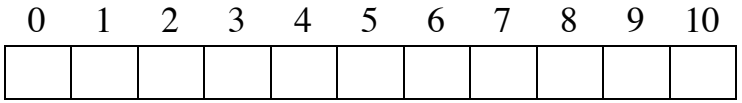
Delete(4),
Find(37)



b. Linear Probing

```
Hash( key )
= key % 11
```

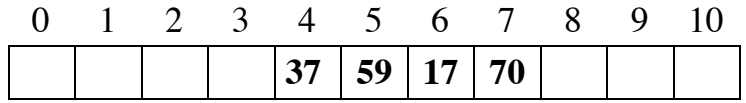
Insert(17), Insert(37), Insert(59), Insert(70)



b. Linear Probing

```
Hash( key )
= key % 11
```

Find(60), Delete(59), Find(70), Insert(16)



c. Quadratic Probing

```
Hash( key )
= key % 11
```

Insert(20), Insert(82), Insert(28),
Insert(93)

0	1	2	3	4	5	6	7	8	9	10
					82	**28**			**20**	

c. Quadratic Probing

```
Hash( key )
= key % 11
```

Find(51), Delete(82), Find(93), Insert(24),
Insert(68)

0	1	2	3	4	5	6	7	8	9	10
			93		**82**	**28**			**20**	

d. Double Hashing

```
Hash( key )
= key % 11

Hash2( key )
= 7 - key % 7
```

Insert(32), Insert(49), Insert(65), Insert(26)

0	1	2	3	4	5	6	7	8	9	10

d. Double Hashing

```
Hash( key )
= key % 11

Hash2( key )
= 7 - key % 7
```

Find(37), Delete(26),
Insert(98)

0	1	2	3	4	5	6	7	8	9	10
				65	**49**	**26**				**32**

Q5

Hash Function Analysis

c. Key = even # in 0 to 1,000,000
Uniform?

```
Hash( key )
= key % 100
```

d. Key = 0 to 1,000,000
Uniform?

```
Hash( key )
= key * 7 % 49
```

e. Key = 1 to 10,000
Uniform?

Lab Q1

AVL Tree – Insertion

[Submission]

- Only need to work on _balance(T) function
- This function checks the BF of T:
  - If skewed:
    - What case?
    - What rotation?
    - Update height
    - Return
  - Just return!

Lab Q2

AVL Tree - Deletion

- With _balance(), this is literally a one line problem…..
- Hint: Look at how insertion() is updated from BST to AVL Tree…..

Lab Q3

Hash Table?!!

Just the probe sequence

- i.e. simple calculation only!
- If written in small steps = ~3-4 lines
- If written in condense mode = 1 line ☺

- Note that ONLY part (c) needs to be **submitted!**