

Reminder Exam 1
Monday Sept 29th in-class

```
class node
{
public:
    int f1;
    node *f2;
}
```

node * p = new node;
*p 5264:

f1	f2
----	----

$p \rightarrow f1 = 20;$
 $(*p).f1 = 20;$

$p \rightarrow$

f1	f2
	Ø

 $p \rightarrow f2 = \text{NULL};$

$p \rightarrow$

f1	f2

 \rightarrow

f1	f2
30	4

 $*(p \rightarrow f2)$

$p \rightarrow f2 \rightarrow f1 = 30;$
 $*(p \rightarrow f2) \rightarrow f1 = 30;$

① Need to be able compute $T(n)$ for small piece of code

② Bounding of $T(n)$
 $T(n) = O(g(n))$

$$= \Omega(g(n))$$

$$= \Theta(g(n))$$

③ properties of O , Ω , Θ

④ understood what big O means

⑤ understood implications about order of growth with respect to n vs time

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

$$n = \underline{\underline{100}} \quad \text{time} = 2 \text{ sec}$$

$$n = 300$$

$$T\left(\frac{300}{100}\right) = \left(\frac{300}{100}\right)^2$$

$$= \downarrow \times 2 \text{ sec}$$

$$n = 100$$

$$T(100) = 100^2$$

$$= \underline{\underline{10,000}} \quad 2 \text{ sec}$$

$$T(300) = 300^2$$

$$= 90,000 \quad 18 \text{ sec}$$

⑥ basic math

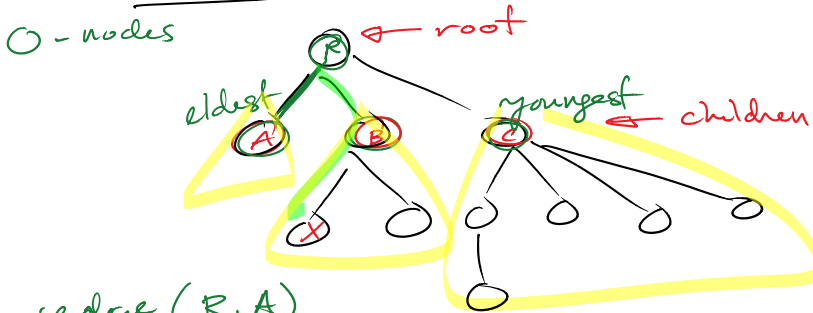
$$\sum c$$

$$\sum i$$

$$\sum i^2$$

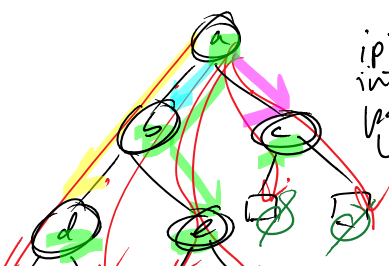
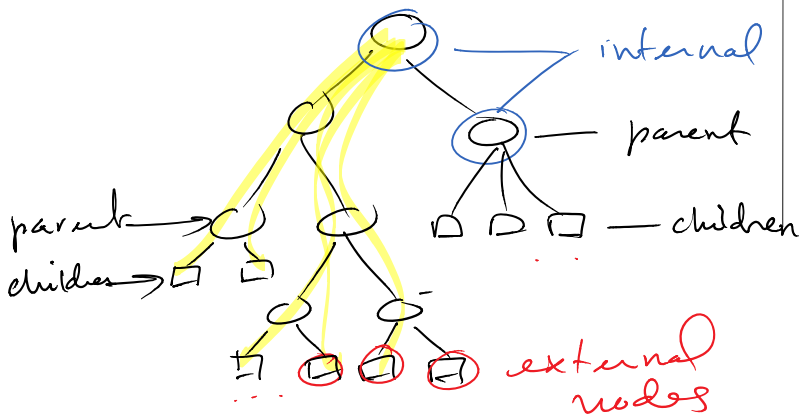
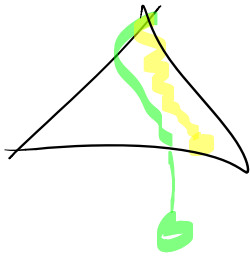
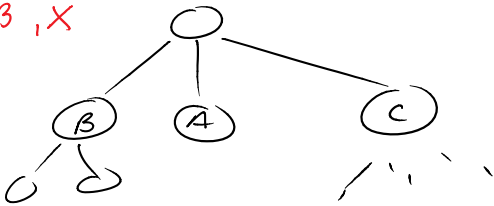
Trees

General Tree



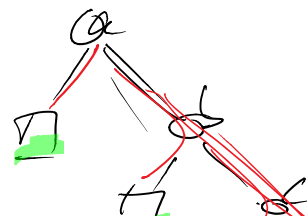
edge (R, A)

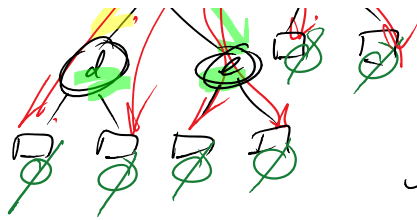
path R, B, X



ipl a, b, d, e (3)
internal path length 6
2 + 1 + 2 + 1 =

$$\text{avg ipl} = \frac{6}{5} = 1.2$$





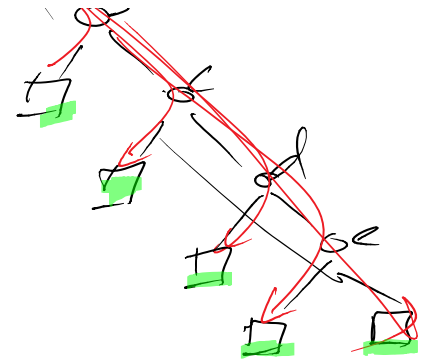
$$\text{avg } ipl = \frac{6}{5} = 1.2$$

epi
external
path length

$$epi = 3 + 3 + 3 + 3 + 2 + 2 = 16$$

$$\text{avg } epi = \frac{16}{6} = 2.6$$

Y1



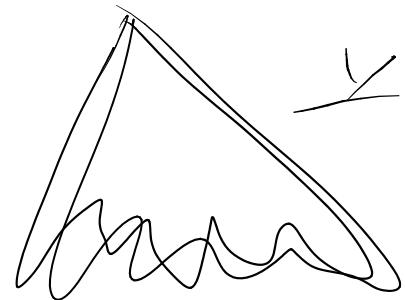
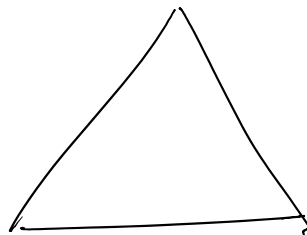
$$ipl = 1 + 2 + 3 + 4$$

$$\text{avg } ipl = \frac{10}{5} = 2$$

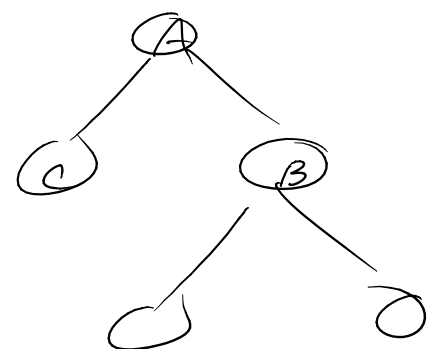
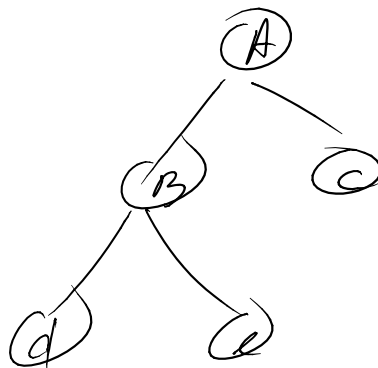
$$epi = 1 + 2 + 3 + 4 + 5 + 5$$

$$= 20$$

$$\text{avg } epi = \frac{20}{6} = 3.3$$

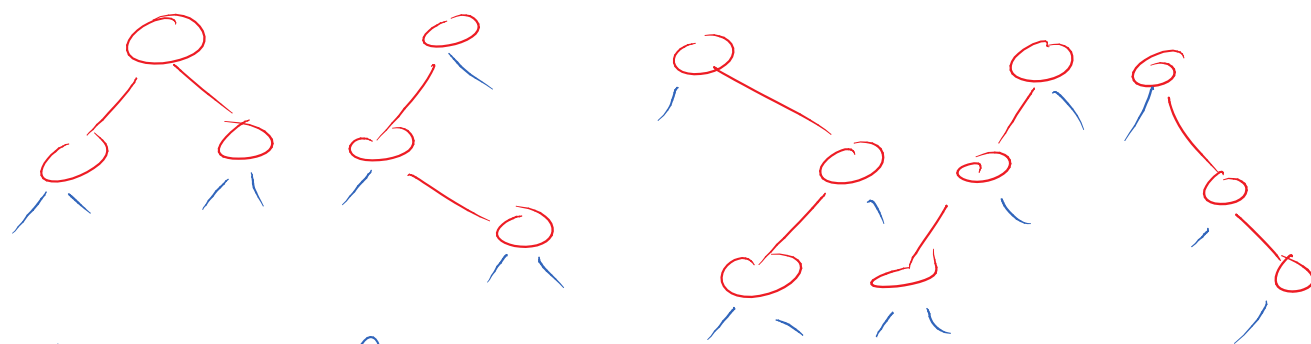
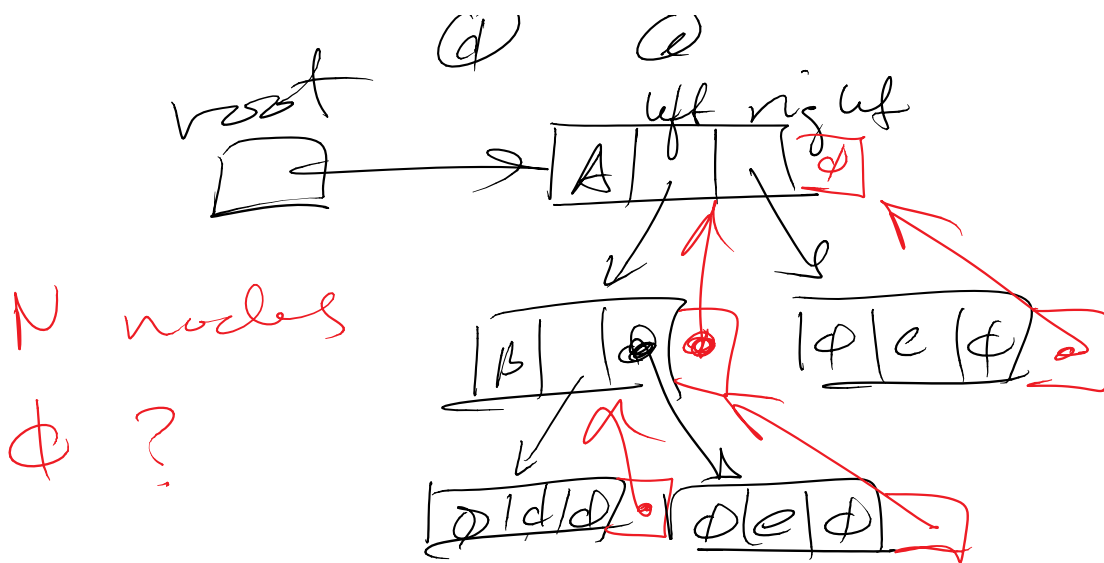


Ordered Binary Tree



1.1.1.1

1.1.1.1



n nodes
 $n+1$ null