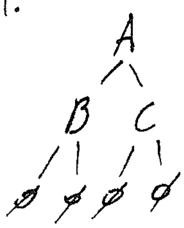
Example Trees

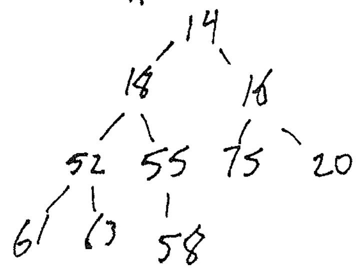
1.



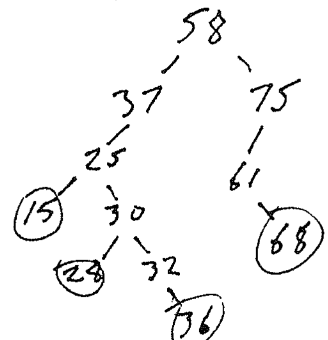
How many trees are here? (7)

2.

3.



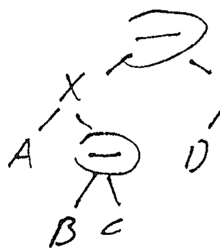
4.



leaves

path 37-32
37,25,30,32

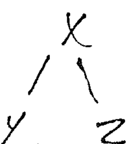
5.



element value = "−" at root(t)

element value = "−" at root(rightTree(leftTree(t)))

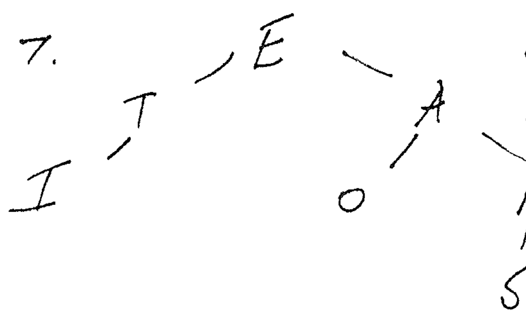
6.



parent

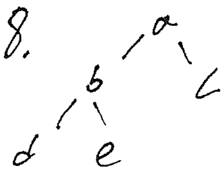
leftchild right child

7.

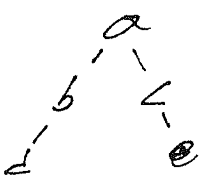


L0 height=3
L1
L2
L3

8.

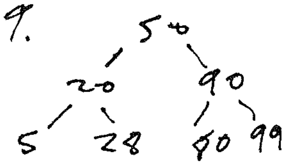


2-tree

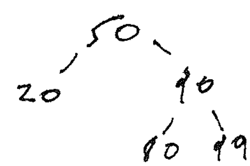


non two-tree

9.

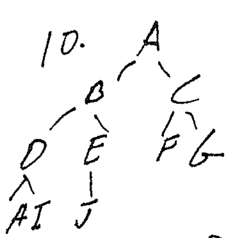


full



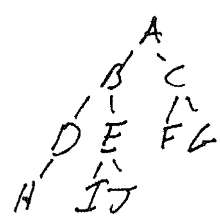
not full

10.



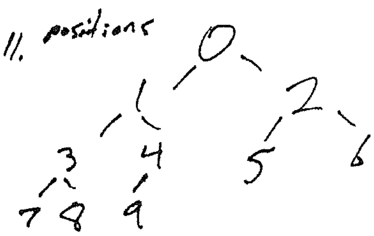
complete, not full

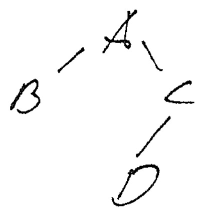
not full or complete



not full or complete

11. positions



12. 

$n(t) = 4$

t ision $\rightarrow$ $floor\left(\frac{4+1}{2}\right) = 2 = leaves(t)$

$\therefore$

t is a two tree? No!

instead

oxact vision $\rightarrow$ $\frac{4+1}{2.0} = 2.5 \geq leaves(t)$

True

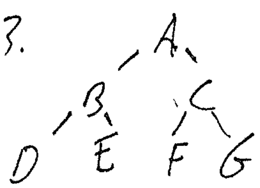
$\frac{n(t)+1}{2.0} <= 2^{height(t)}$

$height(t) = 2$

$\frac{4+1}{2.0} <= 2^2$

$2.5 \leq 4$

True

13. 

$n(t) = 7$

$leaves(t) = 4$

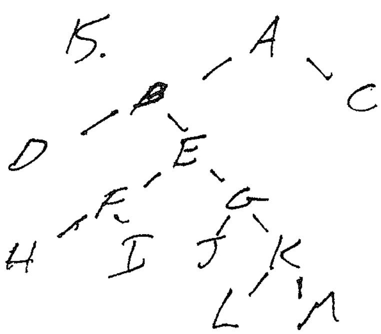
$height(t) = 2$

1,3) $4 = \frac{7+1}{2} = True$

;4) $\frac{7+1}{2} = 4 = 2^2 = True$

14. 

a chain

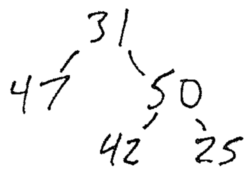
15. 

$2+4+4+4+5+5+1 = 25$

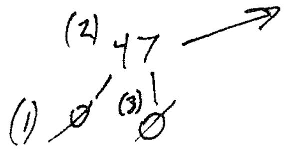
inOrder(t)

16. Tree t has n elements
Each element has 2 subtrees
∴ There will be 2n recursive calls for inOrder(t)
∴ O(n)

Tree t:

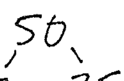


leftTree(t):



Back to where we were before
process root:
31

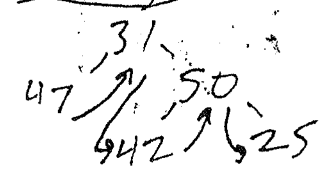
~~B~~ rightTree(t):



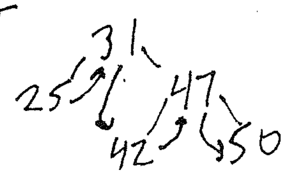
leftTree(rightTree(t))
42
root(rightTree(t))
50
rightTree(rightTree(t))
25

Output
47
31
42
50
25

processing order

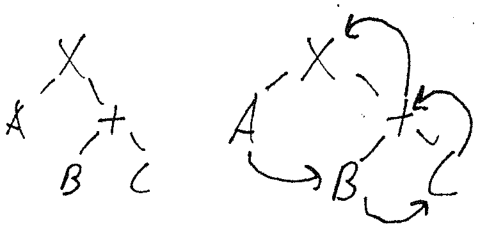


17. BST



Output
25
31
42
47
50

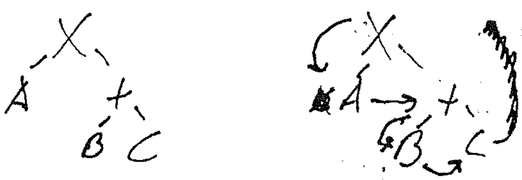
18. postOrder(t)
$O(n)$



Output

A
B
C
+
X

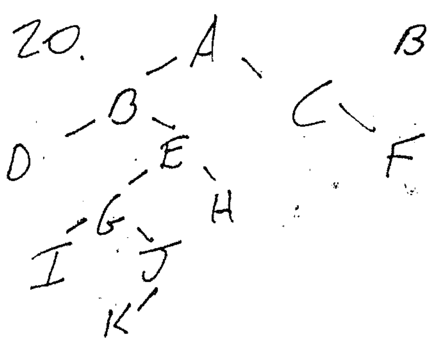
19. preOrder(t)
$O(n)$



Output

X
A
+
B
C

20.

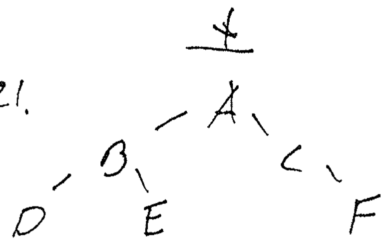


Breadth-First

Output

A
B
C
D
E
F
G
H
I
J
K

21.



steps are ordered in numbers
X = dequeue

tree 3 ← 2 queue 1

freeRootA ← X free root A

freeRootB 8 ← 7 X free root B 5

freeRoot C 13 ← 12 X free root C 6

freeRoot D 17 ← 16 X free root D 10

freeRoot E 20 ← 19 X free root E 11

freeRoot F 23 ← 22 X free root F 15

Output

A 4
B 9
C 14
D 18
E 21
F 24