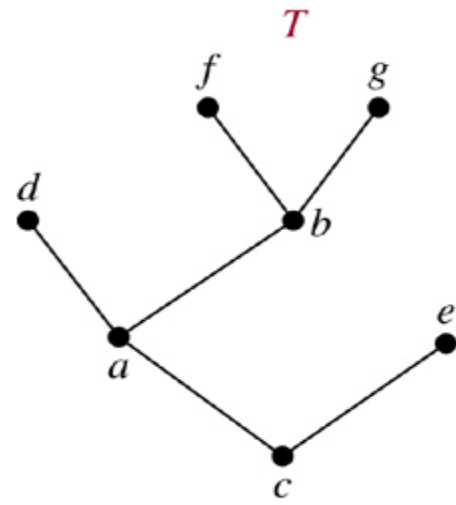
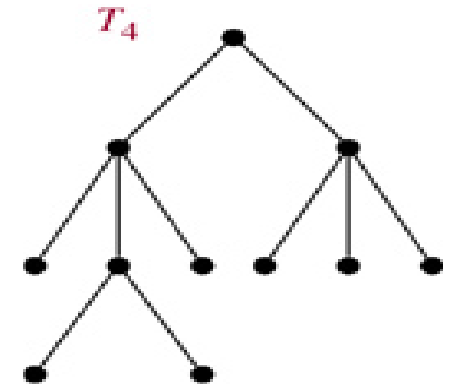


1. Draw T with b as root of tree.



2. Is T_4 2-ary, 3-ary, or neither?

3. What is the height of T_4 ?

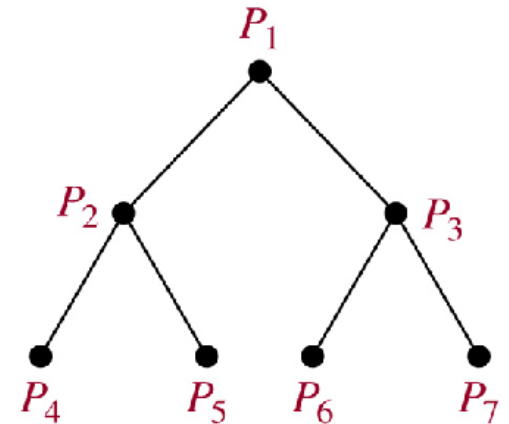


4. What is the left child of P_2 ?

5. What is the right child of P_4 ?

6. What is the sibling of P_2 ?

7. What is the parent of P_2 ?



8. Is the tree a binary search tree?
9. Where should 63 be added to the tree?
10. Where should 32 be added to the tree?

procedure *insertion*(T : binary search tree, x : item)

$v :=$ root of T

while $v \neq \text{null}$ **and** $\text{label}(v) \neq x$

if $x < \text{label}(v)$ **then**

if left child of $v \neq \text{null}$ **then** $v :=$ left child of v

else add *new vertex* as left child of v

$v := \text{null}$

else if right child of $v \neq \text{null}$ **then** $v :=$ right child of v

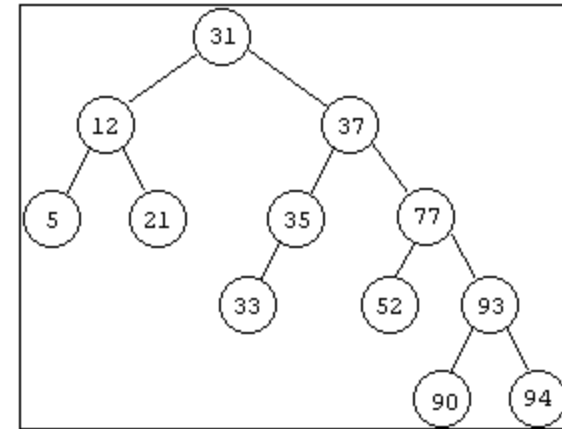
else add *new vertex* as right child of v

$v := \text{null}$

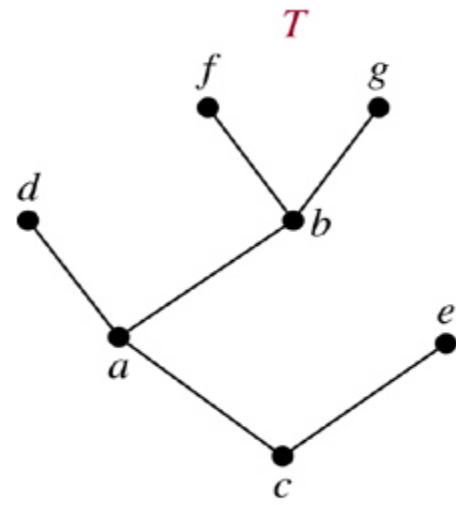
if root of $T = \text{null}$ **then** add a vertex v to tree and label it with x

else if v is null or $\text{label}(v) \neq x$

then label new vertex with x and let v be the new vertex

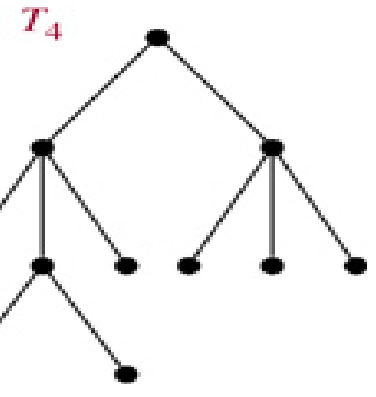


1. Draw T with b as root of tree.



2. Is T_4 2-ary, 3-ary, or neither? 3-ary

Is T_4 full? No



3. What is the height of T_4 ?

3

4. What is the left child of P_2 ?

P_4

5. What is the right child of P_4 ?

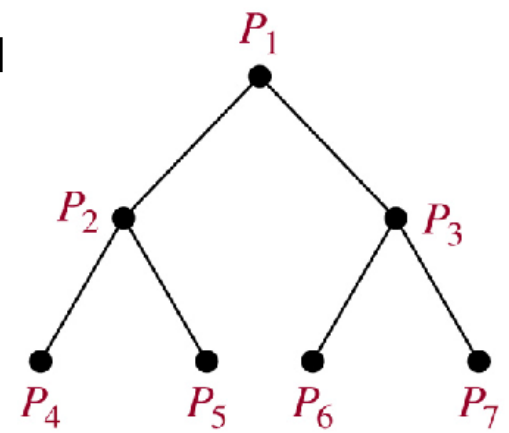
nu

6. What is the sibling of P_2 ?

P_3

7. What is the parent of P_2 ?

P_1



8. Is the tree a binary search tree?

Yes

9. Where should 63 be added to the tree?

52s Right child

10. Where should 32 be added to the tree?

33s left child

procedure *insertion*(*T* : binary search tree, *x* : item)

v := root of *T*

while *v* ≠ null **and** label(*v*) ≠ null

if *x* < label(*v*) **then**

if left child of *v* ≠ null **then** *v* := left child of *v*

else add *new vertex* as left child of *v*

v := null

else if right child of *v* ≠ null **then** *v* := right child of *v*

else add *new vertex* as right child of *v*

v := null

if root of *T* = null **then** add a vertex *v* to tree and label it with *x*

else if *v* is null or label(*v*) ≠ *x*

then label new vertex with *x* and let *v* be the new vertex

