Sec. 11.1

12.

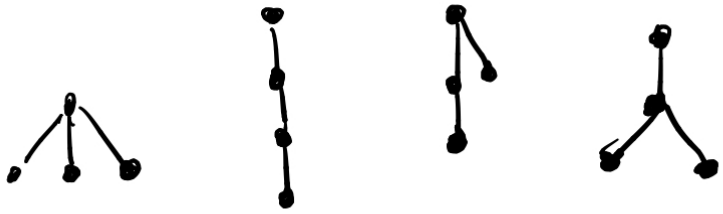
a) How many nonisomorphic unrooted trees are there with four vertices?

two.

a straight line and a $K_{1,3}$.

b) How many nonisomorphic rooted trees are there with four vertices (using isomorphism for directed graphs)?

four.



20. How many leaves does a full 3-ary tree with 100 vertices have?

$m = 3, n = 100$

$[(m-1)n+1]/m = 67$

21. Suppose 1000 people enter a chess tournament. Use a rooted tree model of the tournament to determine how many games must be played to determine a champion, if a player is eliminated after one loss and games are played until only one entrant has not lost. (Assume there are no ties.)

1000/2 = 500

500/2 = 250

250 /2 =125

125/2 = 62

63/2 = 31

32/2 = 16 ...

500 + 250 + 125 + 62 +31 + 16+8+4+2+1 = 999

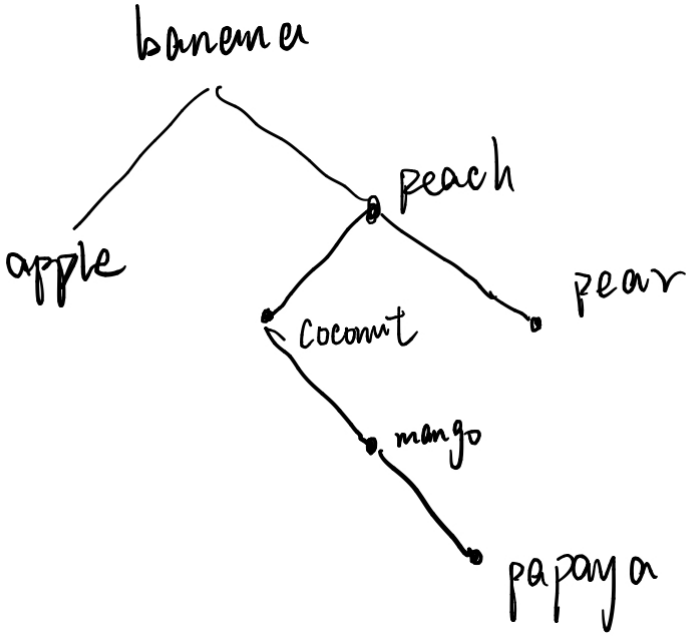
28. How many vertices and how many leaves does a complete m-ary tree of height h have?

leaves = m^h

vertices = $1 + m + m^2 + \ldots + m^h = \frac{m^{h+1}-1}{m-1}$.

Sec. 11.2

1. Build a binary search tree for the words banana, peach, apple, pear, coconut, mango, and papaya using alphabetical order.

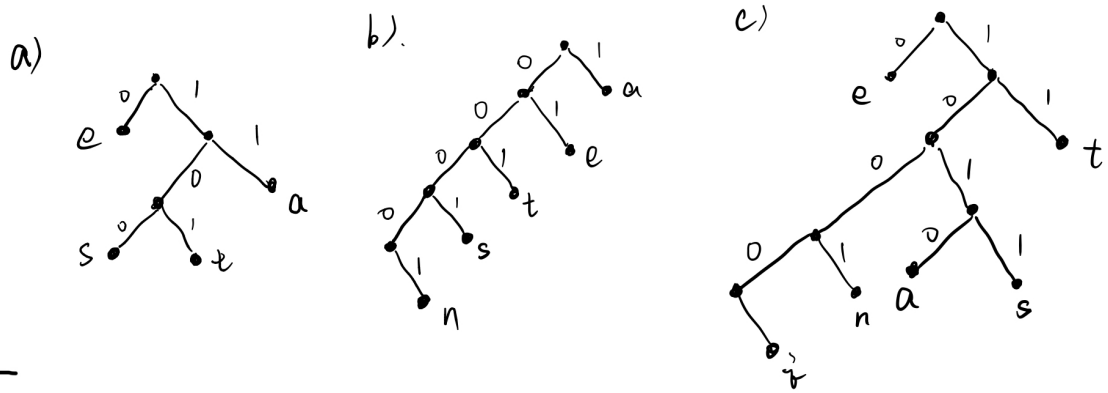


20. Construct the binary tree with prefix codes representing these coding schemes.

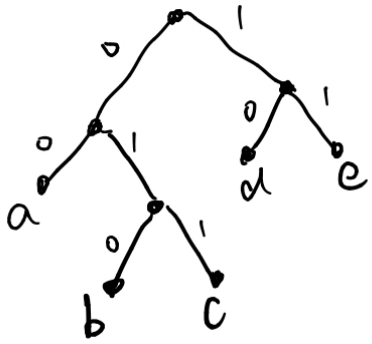
a) a: 11, e: 0,t: 101, s: 100

b) a: 1,e: 01, t: 001, s: 0001, n: 00001

c) a: 1010, e: 0,t: 11, s: 1011, n: 1001, i: 10001



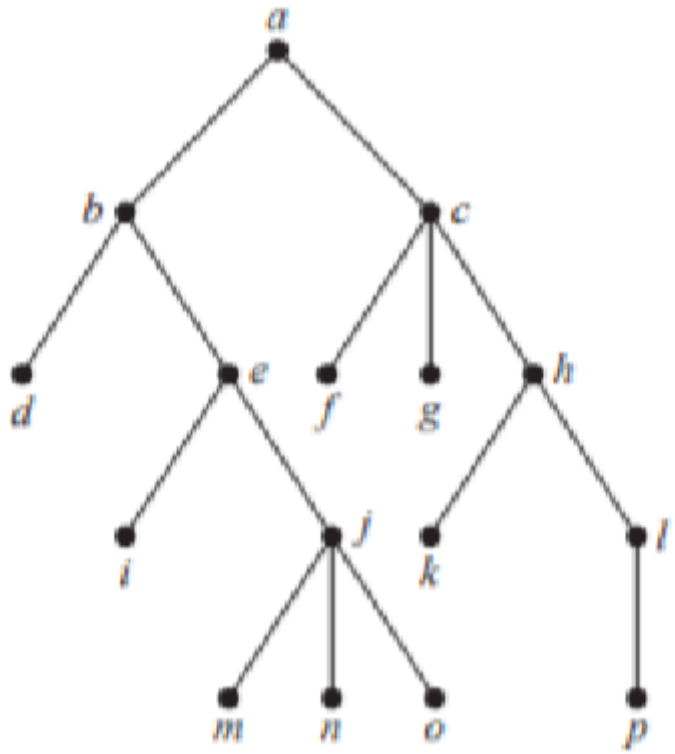
23. Use Huffman coding to encode these symbols with given frequencies: a: 0.20, b: 0.10, c: 0.15, d: 0.25, e: 0.30. What is the average number of bits required to encode a character?



$0.2 * 2 + 0.1 * 3 + 0.15 * 3 + 0.25 * 2 + 0.3 * 2 = 2.25$

Sec 11.3

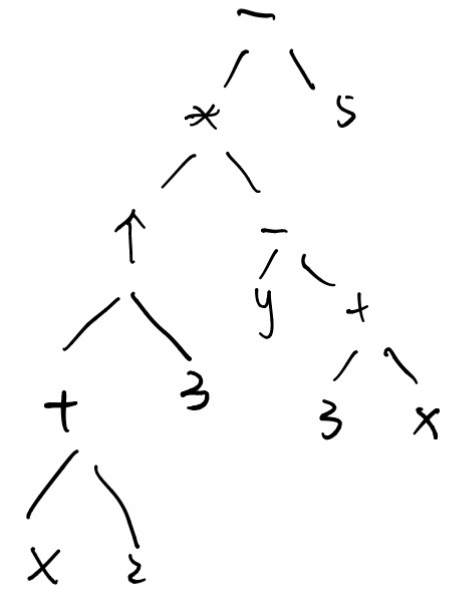
8. determine the order in which a preorder traversal visits the vertices of the given ordered rooted tree.



a, b, d, e,i, j, m, n, o, c, f, g, h, k, l, p

16.

Represent the expression ((x + 2) ↑ 3) ∗ (y −(3 + x)) − 5 using a binary tree



Write this expression in b) prefix notation.

− ∗ ↑ + x 2 3 − y + 3 x 5

c) postfix notation

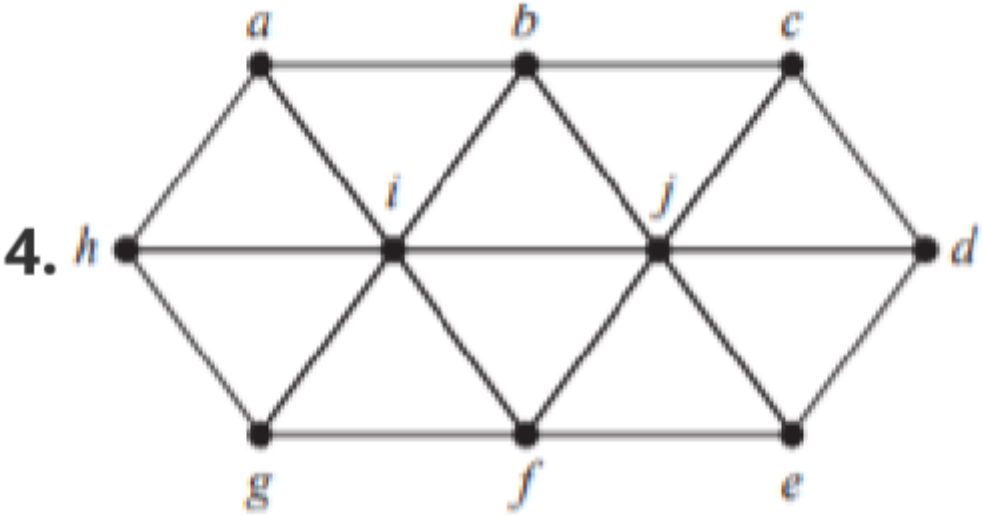
x 2 + 3 ↑ y 3 x + − ∗ 5 −

d) infix notation

((((x + 2) ↑ 3) ∗ (y − (3 + x))) − 5)

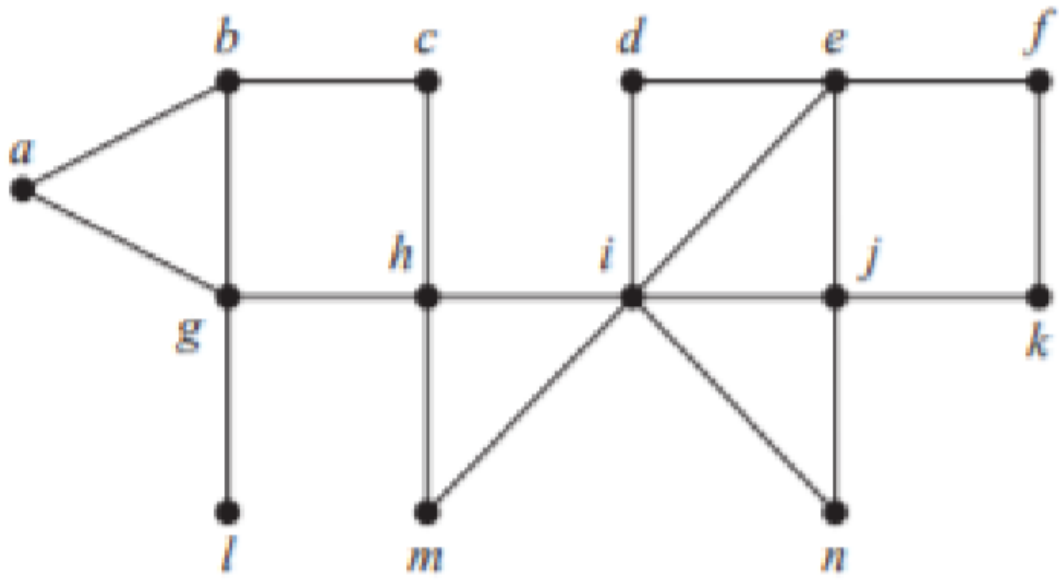
Sec 11.4

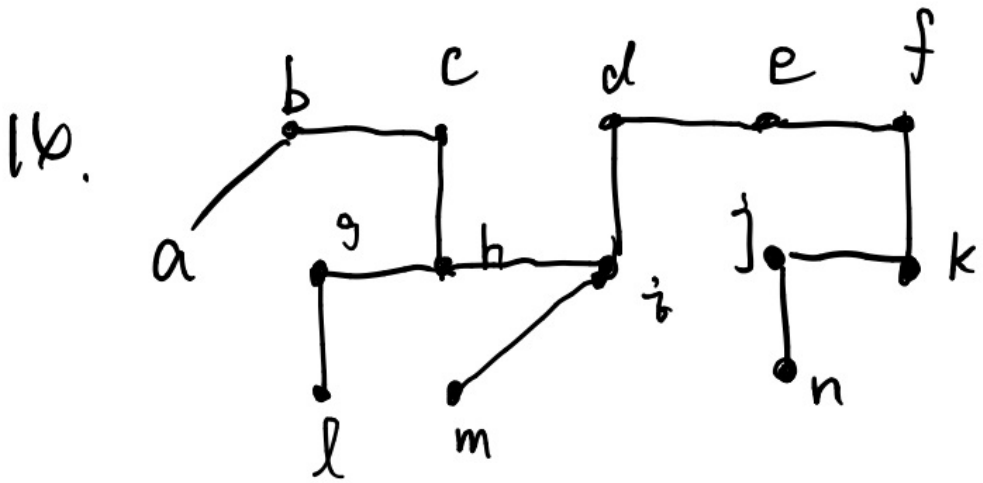
4. find a spanning tree for the graph shown by removing edges in simple circuits.



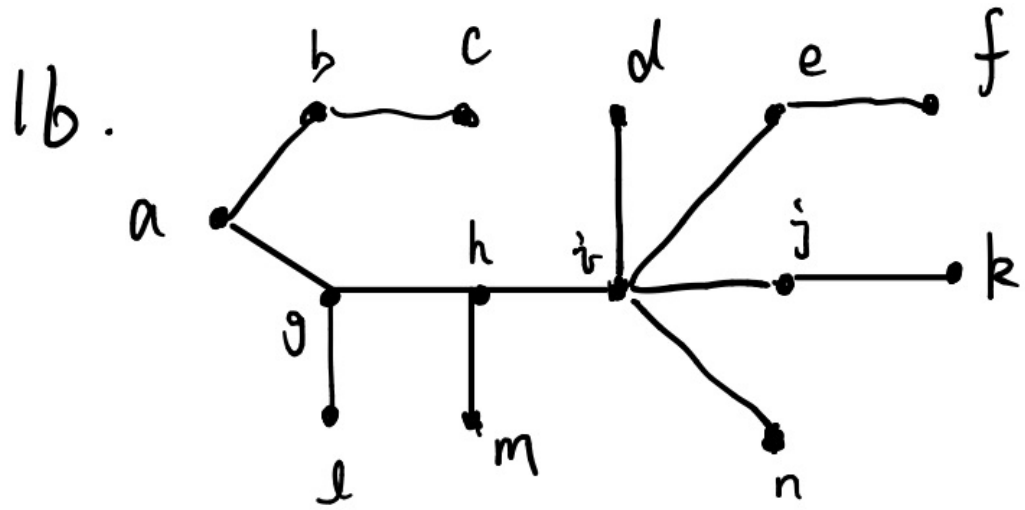
Remove {a,i}, {b,i}, {b, j}, {c, d}, {c, j}, {d, e}, {e, j}, {f,i}, {f, j}, {g,i}, the left edges is a spanning tree.

14. use depth-first search to produce a spanning tree for the given simple graph. Choose a as the root of this spanning tree and assume that the vertices are ordered alphabetically





16. Use breadth-first search to produce a spanning tree for each of the simple graphs in Exercises 14. Choose a as the root of each spanning tree.



29. Explain how backtracking can be used to find a Hamilton path or circuit in a graph.

When all vertices have been visited, allow returning to the start. When going through a path backtrack and try all extension of the current path.