

# The Representation of Graphs and Trees in Computer Storage

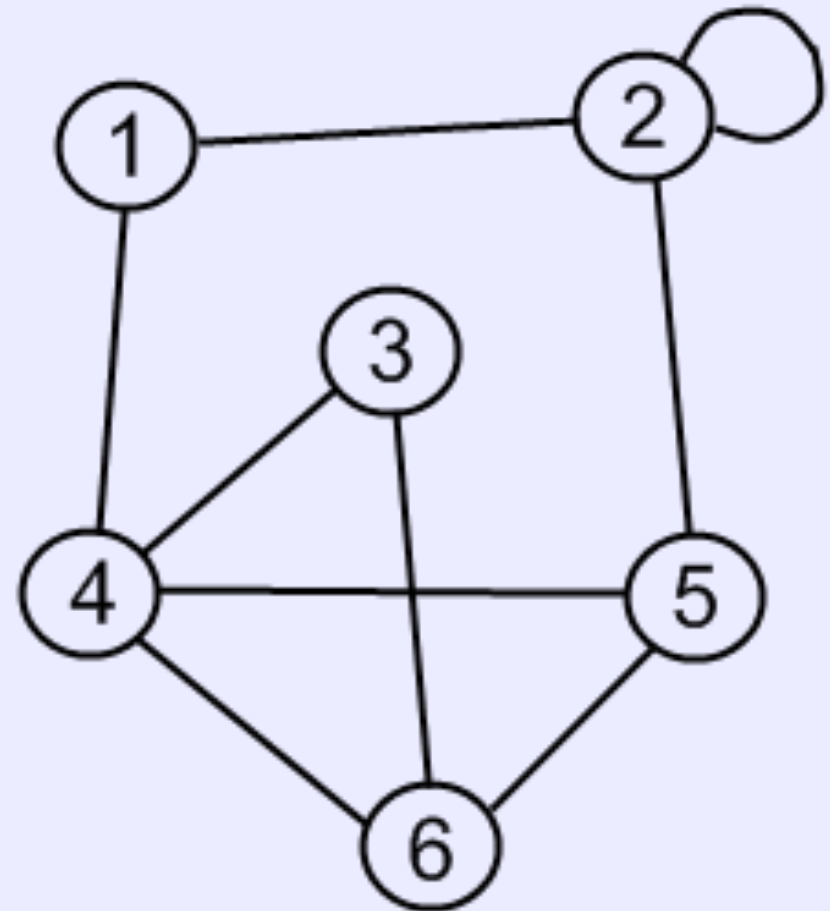
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6 October 2008  
MATH 3220

# Summary

- Definitions
- Adjacency lists and matrices
- Other algorithms

# Graphs

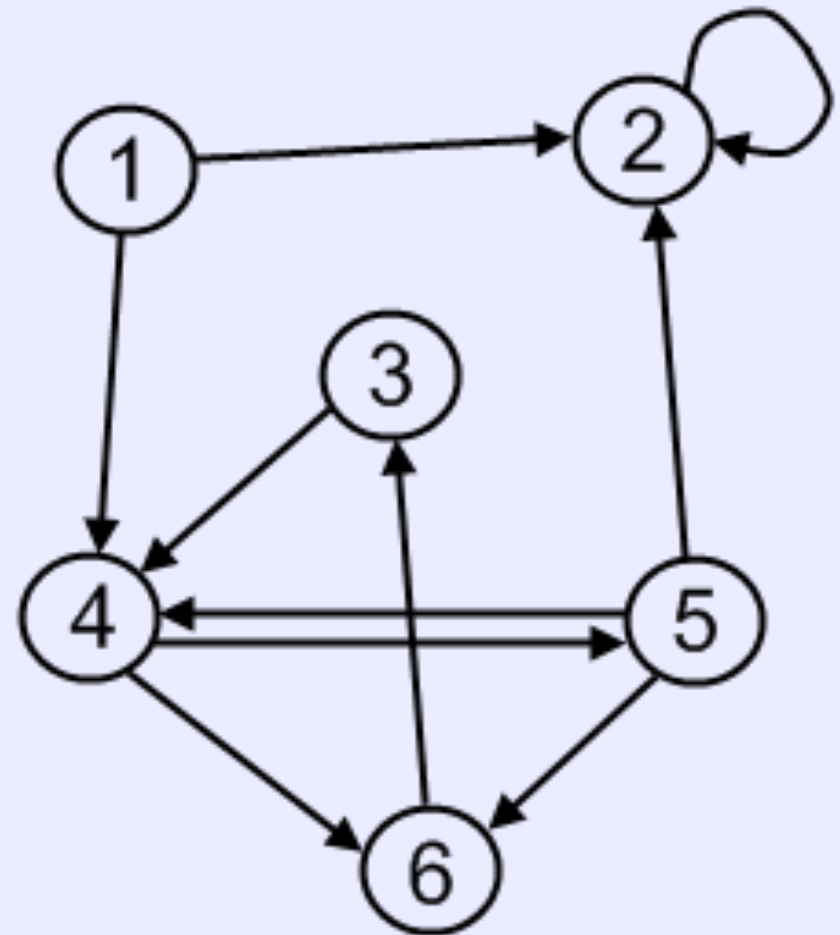
A set of vertices  
connected by  
edges



Source: Black and Tanenbaum, Graph

# Digraphs

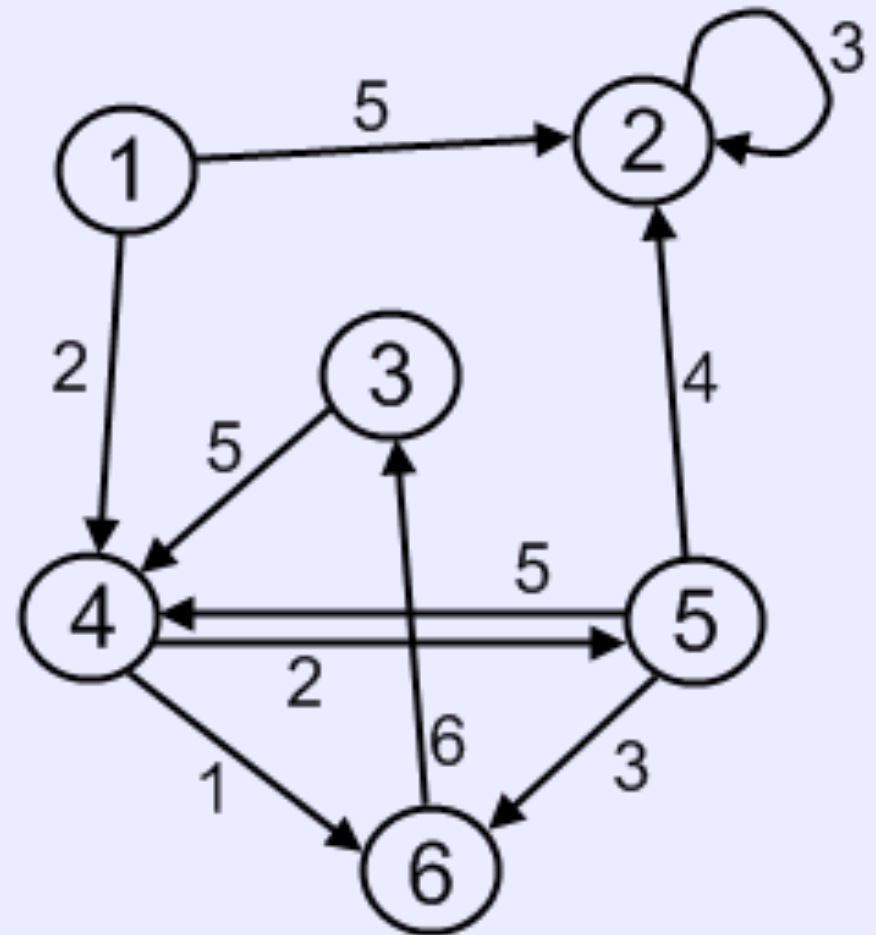
A graph in which each edge points with direction from one vertex to another



Source: Black, Directed graph

# Weighted Graph

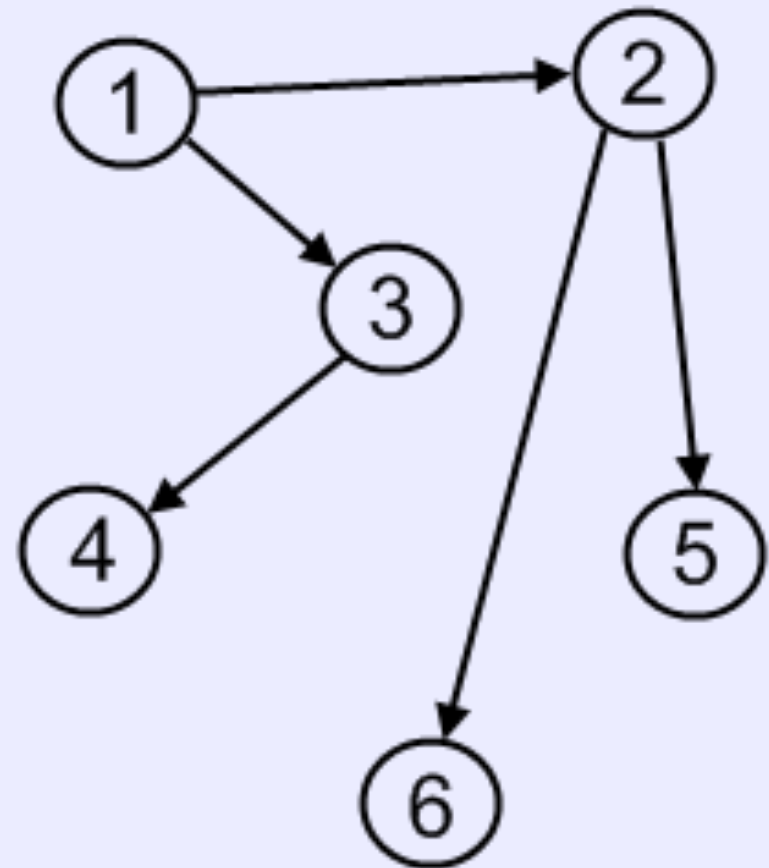
A graph in which each edge has a numeric value (weight)



Source: Black, Weighted graph

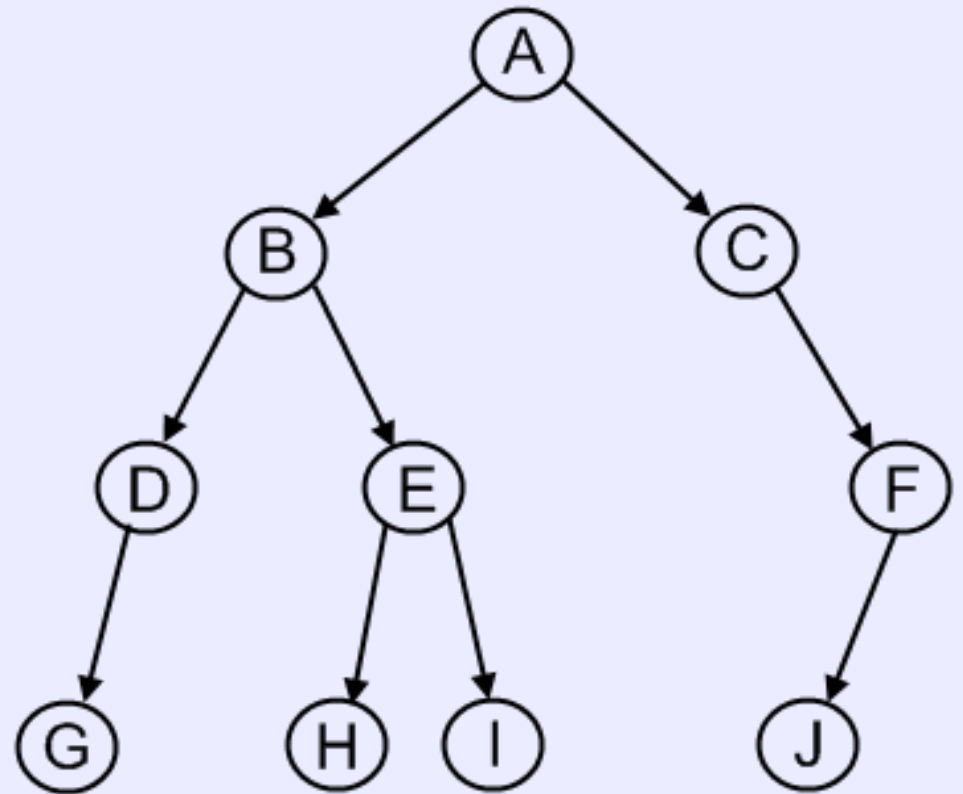
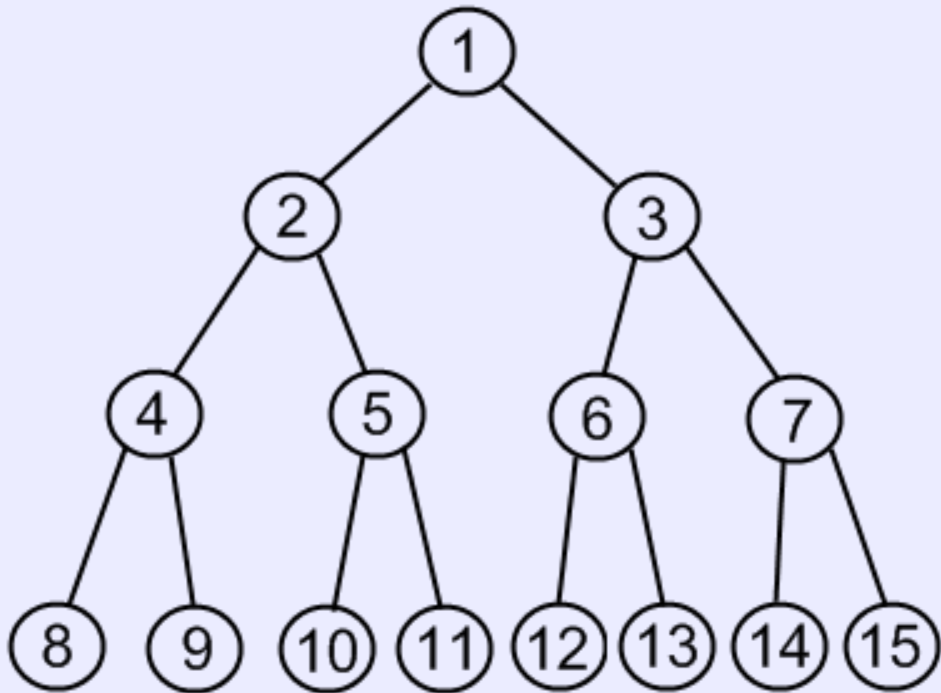
# Tree

A graph in which each vertex is either the root, a leaf, or an internal node

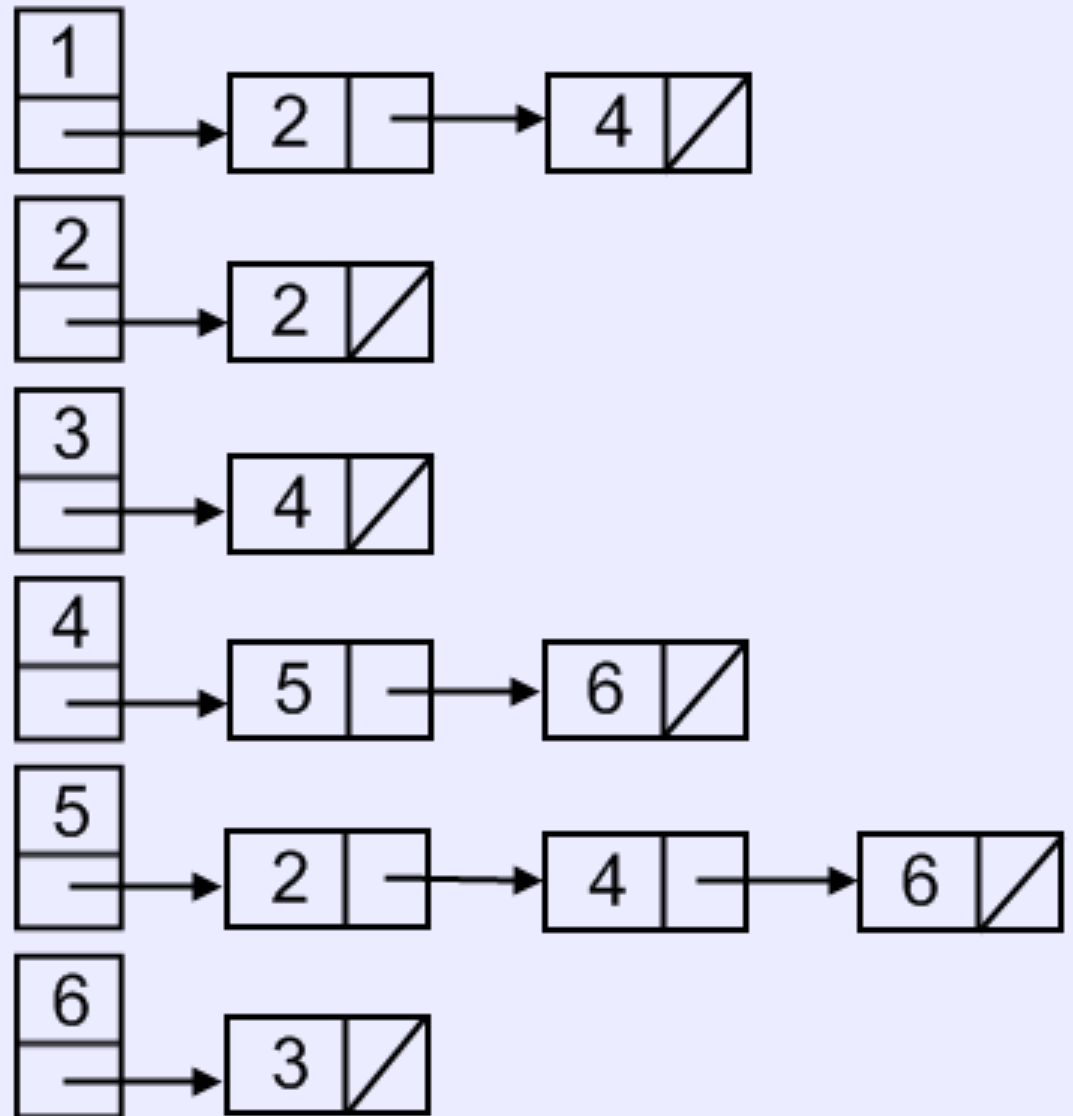
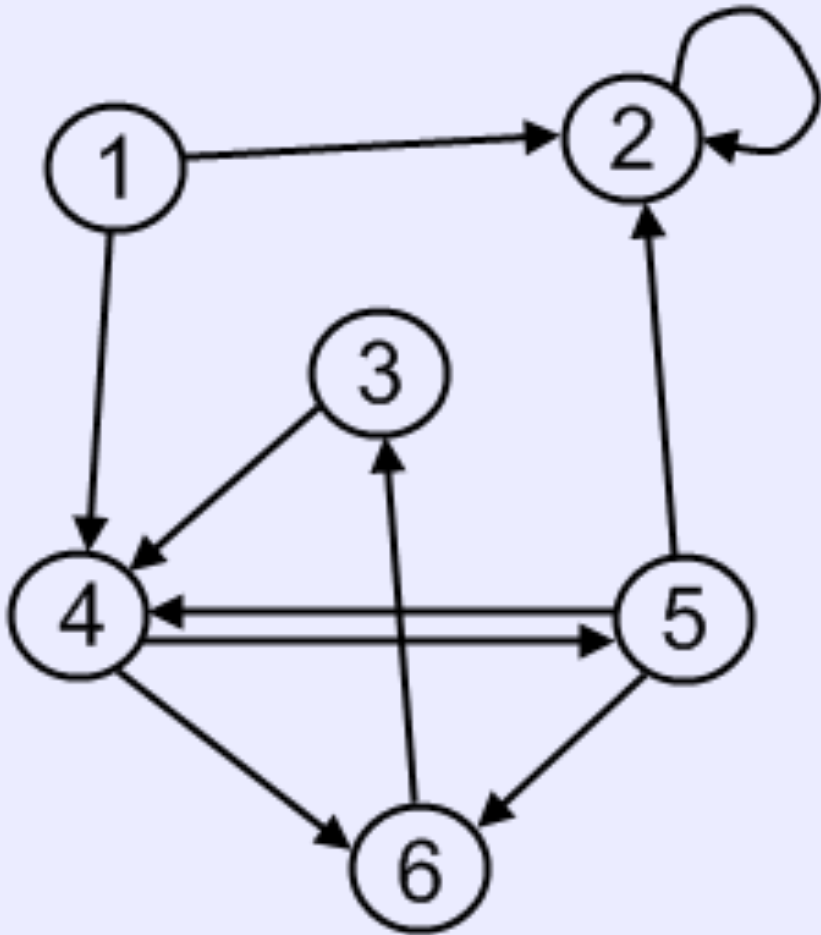


Source: Black, "tree"

# Tree



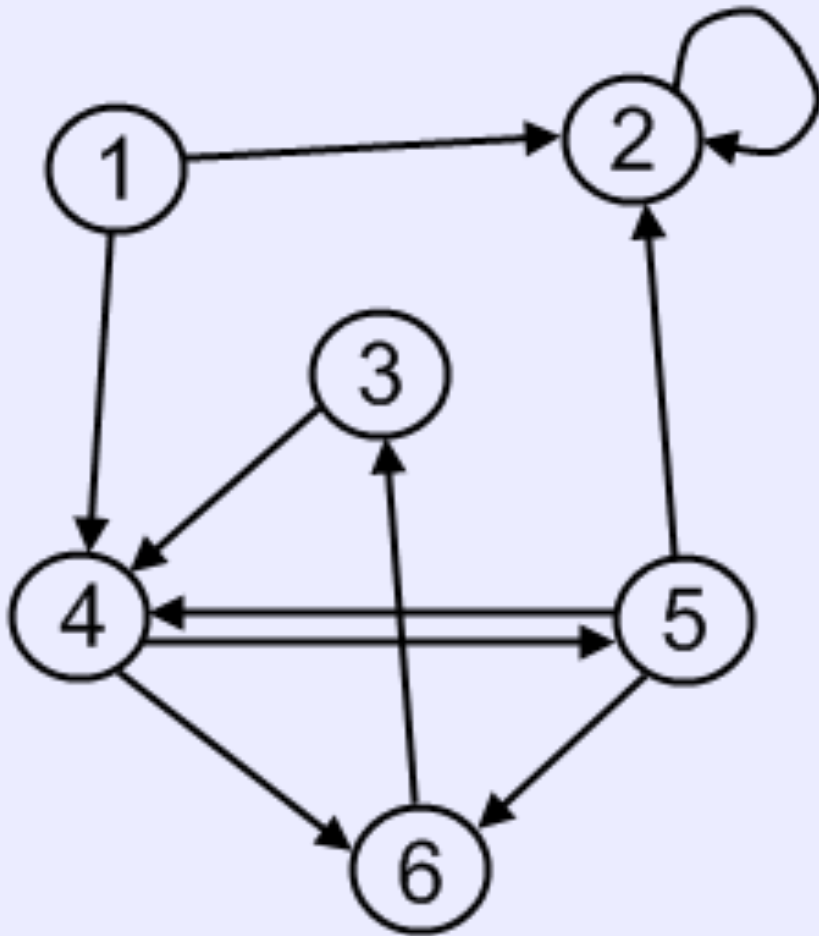
# Adjacency List



Source: Nyhoff, pp. 912-913

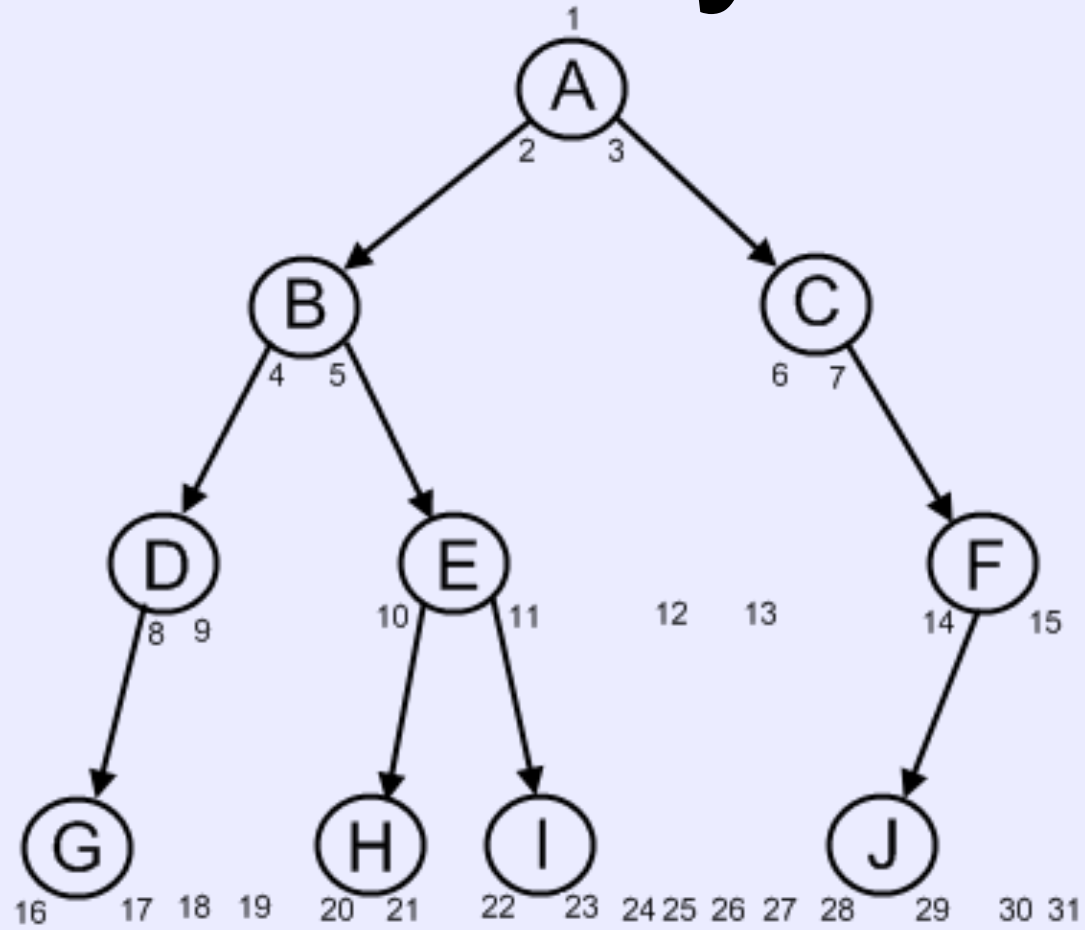


# Adjacency Matrix


$$\begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

Source: Nyhoff, p. 912

# Array



num	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
node	A	B	C	D	E		F	G		H	I			J		

Source: Nyhoff, p. 655

# Other Options

- Edge List
- Linked Tree Representation

# Bibliography

- Black, Paul E. (18 October 2007). Directed graph. *Dictionary of Algorithms and Data Structures*. Retrieved 5 October 2008 from <http://www.nist.gov/dads/HTML/directedGraph.html>
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- Black, Paul E. (27 December 2003). Weighted graph. *Dictionary of Algorithms and Data Structures*. Retrieved 5 October 2008 from <http://www.nist.gov/dads/HTML/weightedGraph.html>
- Black, Paul E., & Paul J. Tanenbaum. (14 August 2008). Graph. *Dictionary of Algorithms and Data Structures*. Retrieved 5 October 2008 from <http://www.nist.gov/dads/HTML/graph.html>
- Nyhoff, Larry R. (2005). *ADTs, data structures, and problem solving with C++* (2nd ed.). Upper Saddle River, NJ: Pearson Education, Inc.