Topological Sort

Applications of Graphs: Topological Sorting

- Topological order
  - A list of vertices in a directed graph without cycles such that vertex x precedes vertex y if there is a directed edge from x to y in the graph

- Topological sorting
  - Arranging the vertices into a topological order

Applications of Graphs: Topological Sorting

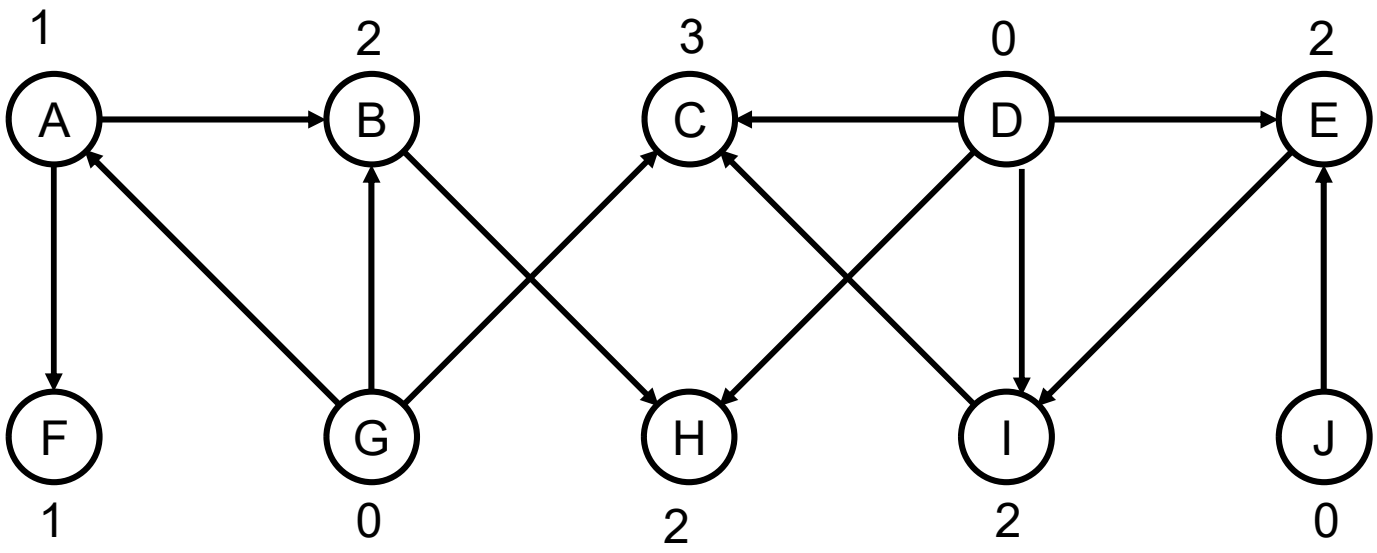
- Directed graph G.
- Rule: if there is an edge u → v, then u must come before v.

Implementation

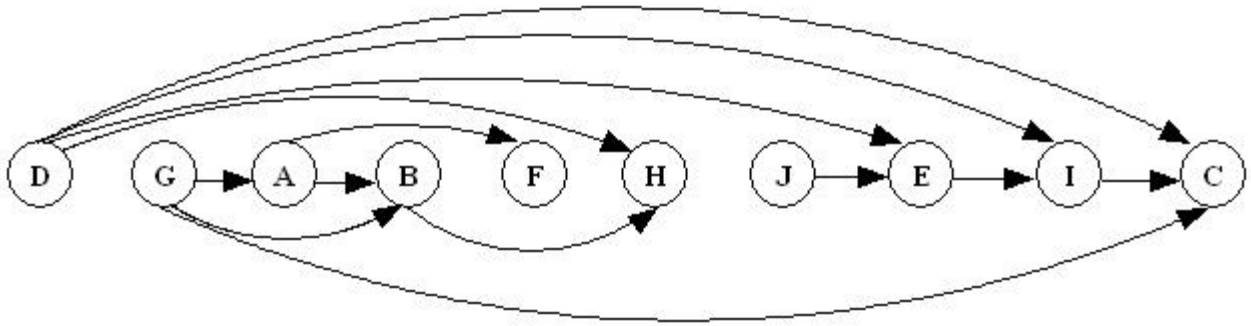
- Start with a list of nodes with in-degree = 0
- Select any edge from list
  - mark as deleted
  - mark all outgoing edges as deleted
  - update in-degree of the destinations of these edges
  - If any drops to zero, add to the list

Topological Sort Example

- **Demonstrating Topological Sort.**



D	G	A	B	F	H	J	E	I	C



Topological Sorting

Figure 13.14

A directed graph without cycles

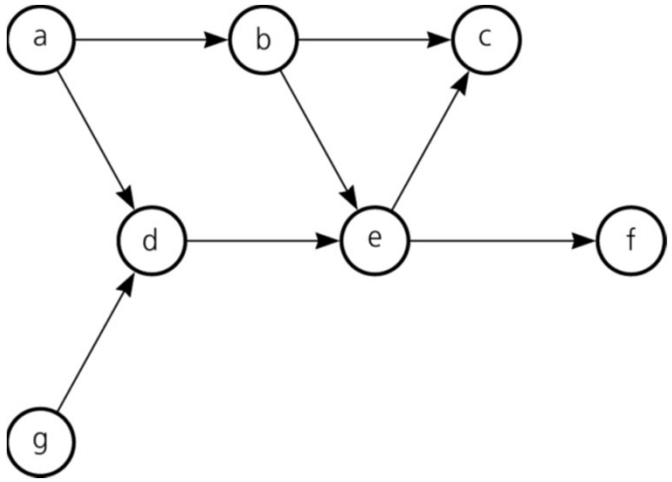
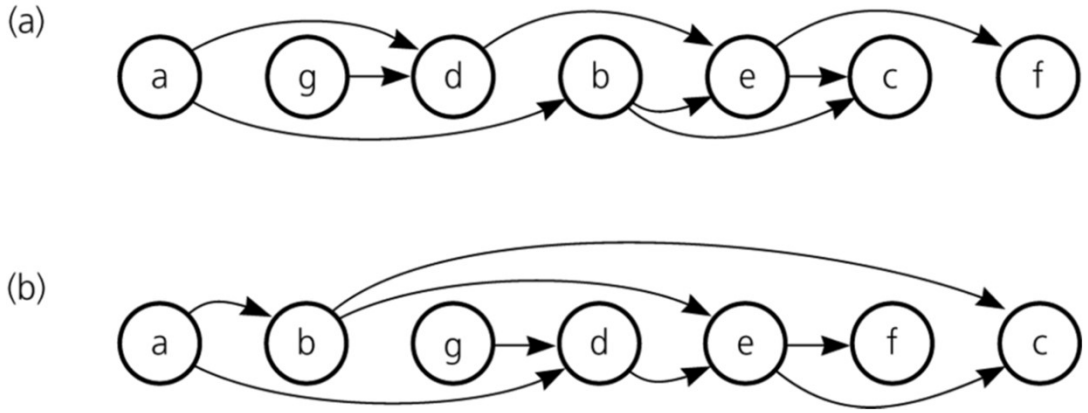


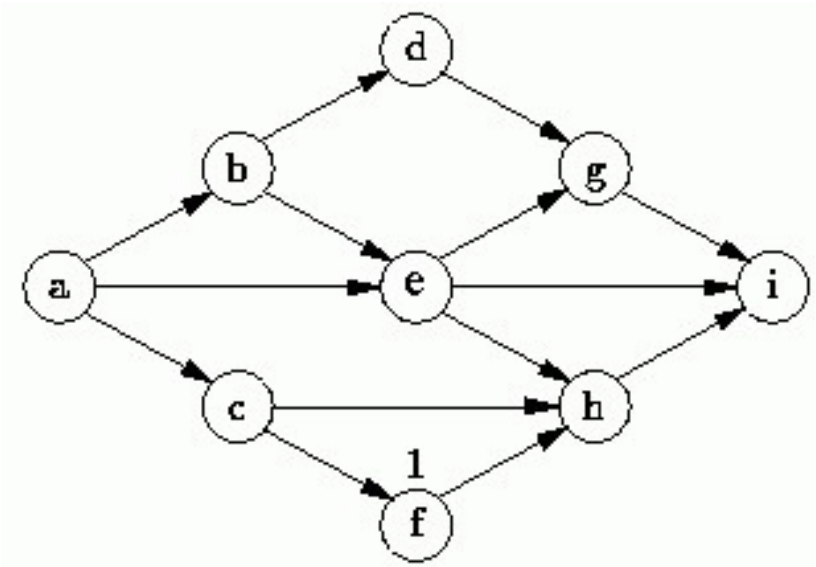
Figure 13.15

The graph in Figure 13-14 arranged according to the topological orders a) *a, g, d, b, e, c, f* and b) *a, b, g, d, e, f, c*



Topological Sort is not unique

- Topological sort is not unique.
- The following are all topological sort of the graph below:



s1 = {a, b, c, d, e, f, g, h, i}

s2 = {a, c, b, f, e, d, h, g, i}

s3 = {a, b, d, c, e, g, f, h, i}

s4 = {a, c, f, b, e, h, d, g, i}

etc.