

## Topological sort:

→ A topological sort is an ordering of vertices in a directed acyclic graph, such that if there is a path from  $v_i$  to  $v_j$ , then  $v_j$  appears after  $v_i$  in the ordering.

\* First  $v_j$  appears

\* second  $v_i$  appears.

→ Topological ordering is not possible if the graph has a cycle, because if two vertices 'v' and 'w' on the cycle, v precedes w and w precedes v.

$u \rightarrow v$   
 $\curvearrowright$   
 $\Rightarrow$   
 $u, v$   
 $v, u$  X NOT Topological Sort

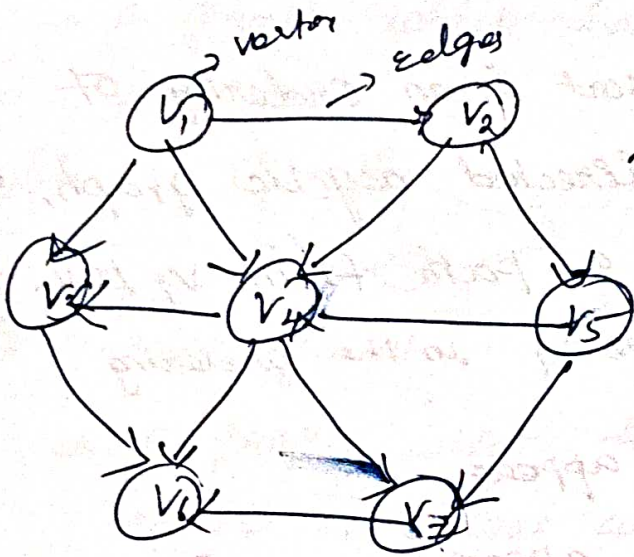
### Algorithm:

1. Find any vertex with no incoming edges.
2. Print this vertex and remove it along with its edges from the graph.

### Steps

1. Find the indegree for every vertices.
2. Place the vertices whose indegree is '0' on the empty queue.
3. Dequeue the vertex v and decrement the indegrees of all its adjacent vertices.

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4. Enqueue the vertex on the queue if its indegree falls to zero
5. Repeat <sup>from</sup> step 3 until the queue becomes empty.

Adjacency Matrix.

	V1	V2	V3	V4	V5	V6	V7
V1	0	1	1	1	0	0	0
V2	0	0	0	1	1	0	0
V3	0	0	0	0	0	1	0
V4	0	0	1	0	0	1	1
V5	0	0	0	1	0	0	1
V6	0	0	0	0	0	0	0
V7	0	0	0	0	0	1	0
Indegree	0	1	2	3	1	3	2

- Adjacent
- V1 → V2, V3, V4
  - V2 → V4, V5
  - V3 → V6
  - V4 → V3, V6, V7
  - V5 → V4, V7
- V6 → —  
V7 → V6.



# Indegree Before Enqueue.

Vertex	Indegree						
	1	2	3	4	5	6	7
V <sub>1</sub>	0	0	0	0	0	0	0
V <sub>2</sub>	1	0	0	0	0	0	0
V <sub>3</sub>	2	1	1	1	0	0	0
V <sub>4</sub>	3	2	1	0	0	0	0
V <sub>5</sub>	1	1	0	0	0	0	0
V <sub>6</sub>	3	3	3	3	2	1	0
V <sub>7</sub>	2	2	2	1	0	0	0
Enqueue	V <sub>1</sub>	V <sub>2</sub>	V <sub>5</sub>	V <sub>4</sub>	V <sub>3</sub> , V <sub>4</sub> 2, V <sub>3</sub> V <sub>7</sub> , V <sub>3</sub>	No new 0's	V <sub>6</sub>
Dequeue	V <sub>1</sub>	V <sub>2</sub>	V <sub>5</sub>	V <sub>4</sub>	V <sub>3</sub>	V <sub>7</sub> ↓ outdoor	V <sub>6</sub>

Topological sorting order

V<sub>1</sub>, V<sub>2</sub>, V<sub>5</sub>, V<sub>4</sub>, V<sub>3</sub>, V<sub>7</sub>, V<sub>6</sub>

(09)

V<sub>1</sub>, V<sub>2</sub>, V<sub>5</sub>, V<sub>4</sub>, V<sub>7</sub>, V<sub>3</sub>, V<sub>6</sub>

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