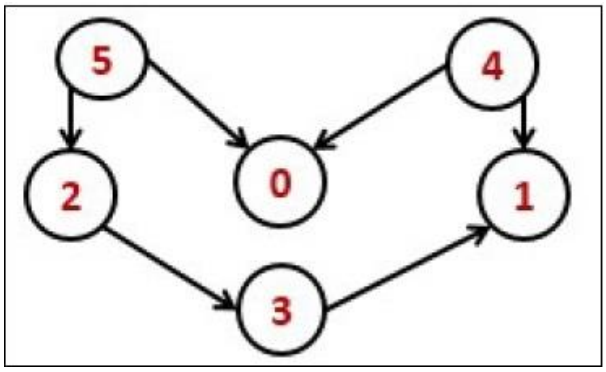
Topological Sorting

The topological sorting for a directed acyclic graph is the linear ordering of vertices. For every edge U-V of a directed graph, the vertex u will come before vertex v in the ordering.



As we know that the source vertex will come after the destination vertex, so we need to use a stack to store previous elements. After completing all nodes, we can simply display them from the stack.

Input and Output

Input:

0 0 0 0 0 0

0 0 0 0 0 0

0 0 0 1 0 0

0 1 0 0 0 0

1 1 0 0 0 0

1 0 1 0 0 0

Output:

Nodes after topological sorted order: 5 4 2 3 1 0

Algorithm

topoSort(u, visited, stack)

Input − The start vertex u, An array to keep track of which node is visited or not. A stack to store nodes.**Output −** Sorting the vertices in topological sequence in the stack.

Begin

mark u as visited

for all vertices v which is adjacent with u, do

```
    if v is not visited, then
      topoSort(c, visited, stack)
  done

  push u into a stack
End
```

performTopologicalSorting(Graph)

Input − The given directed acyclic graph.**Output −** Sequence of nodes.

```
Begin
  initially mark all nodes as unvisited
  for all nodes v of the graph, do
    if v is not visited, then
      topoSort(i, visited, stack)
  done
  pop and print all elements from the stack
End.
```

Example

```
#include<iostream>
#include<stack>
#define NODE 6
using namespace std;

int graph[NODE][NODE] = {
  {0, 0, 0, 0, 0, 0},
  {0, 0, 0, 0, 0, 0},
  {0, 0, 0, 1, 0, 0},
  {0, 1, 0, 0, 0, 0},
  {1, 1, 0, 0, 0, 0},
  {1, 0, 1, 0, 0, 0}
};

void topoSort(int u, bool visited[], stack<int>&stk) {
  visited[u] = true;              //set as the node v is visited
```

```
   for(int v = 0; v<NODE; v++) {
      if(graph[u][v]) {             //for allvertices v adjacent to u
         if(!visited[v])
            topoSort(v, visited, stk);
      }
   }
   stk.push(u);     //push starting vertex into the stack
}

void performTopologicalSort() {
   stack<int> stk;
   bool vis[NODE];

   for(int i = 0; i<NODE; i++)
      vis[i] = false;     //initially all nodes are unvisited

   for(int i = 0; i<NODE; i++)
      if(!vis[i])     //when node is not visited
         topoSort(i, vis, stk);

   while(!stk.empty()) {
      cout << stk.top() << " ";
      stk.pop();
   }
}

main() {
   cout << "Nodes after topological sorted order: ";
   performTopologicalSort();
}
```

Output

Nodes after topological sorted order: 5 4 2 3 1 0