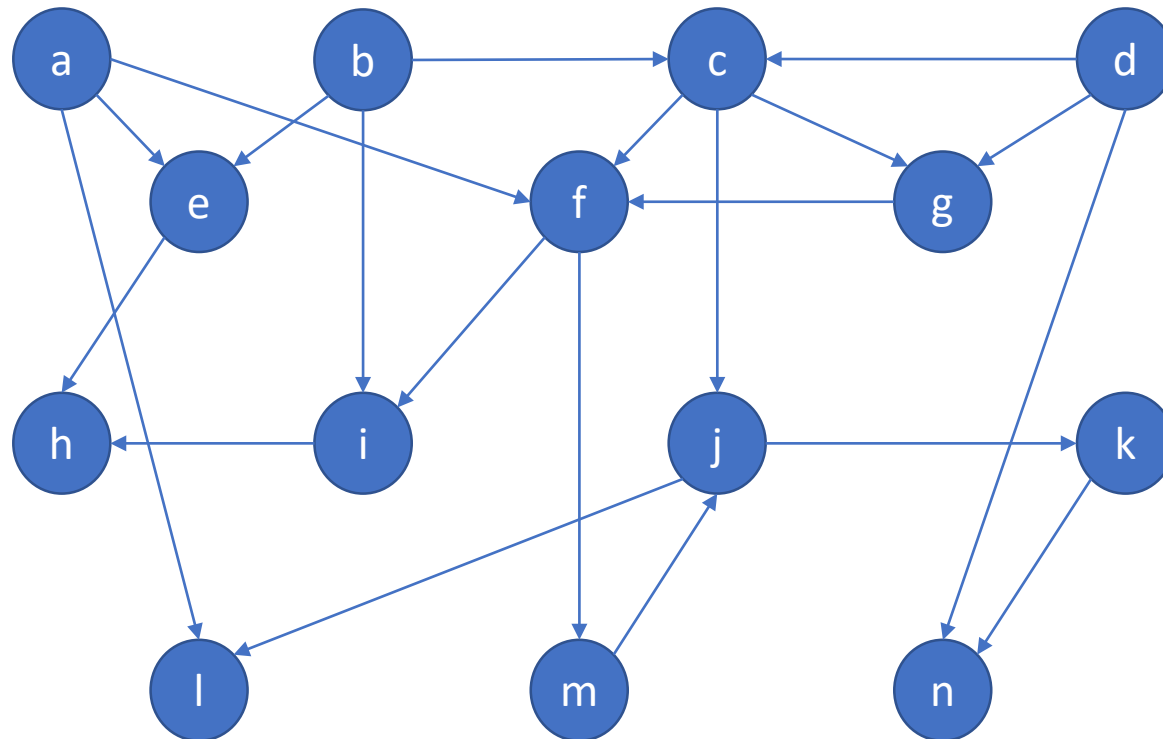# COMP 3711
Tutorial 8
Topological-Sort

Problem 1

Give a topological ordering of the following graph.

Problem 1

```
TopologicalSort(G){
      Q = empty;                                    //initialize Queue
      For each u in V do                            //n times
            in_deg[u] = 0;                          //initialize the in-degree array
      For each u in V do                            //n times
            for each v in Adj(u) do                 //O(out_deg(u))
                  in_deg[v] = in_deg[v]+1;          //increase in-degree by one for each incoming edge
      For each u in V do                            //n times
            if(in_deg[u]==0)
                        Enqueue(Q,u);

      While (Q is not empty) do                     //n times
                  u = Dequeue(Q);

                  Output u;

                  for each v in Adj(u) do           //O(out_deg(u))

                              in_deg[v] = in_deg[v]  - 1;

                              if (in_deg[v]==0)

                                          Enqueue(Q,v);

}
```
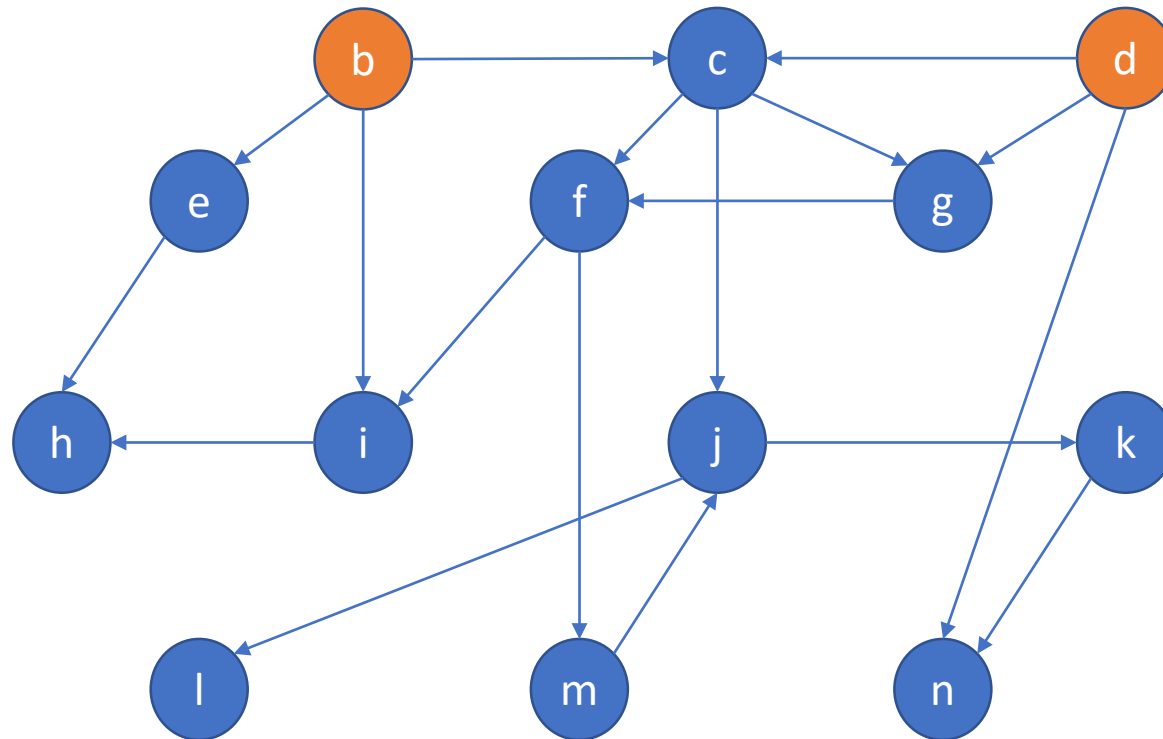
Solution

After initialization, 3 vertices are found to have in-degree 0 and are put on Q.
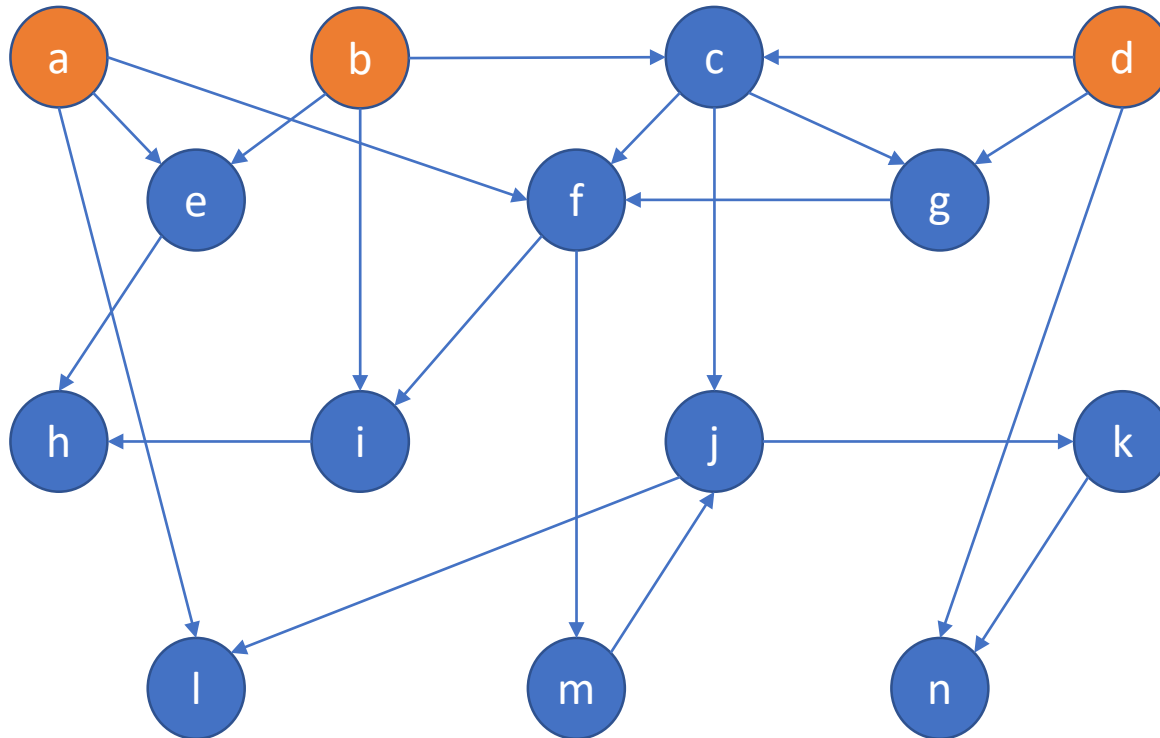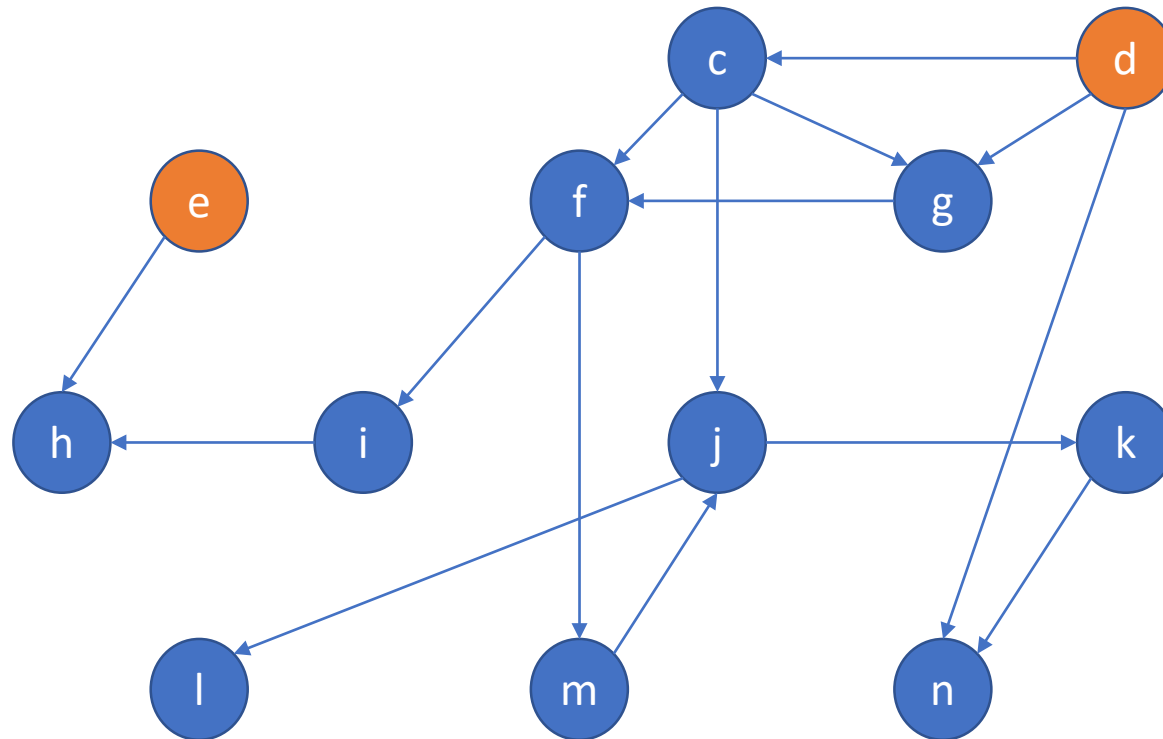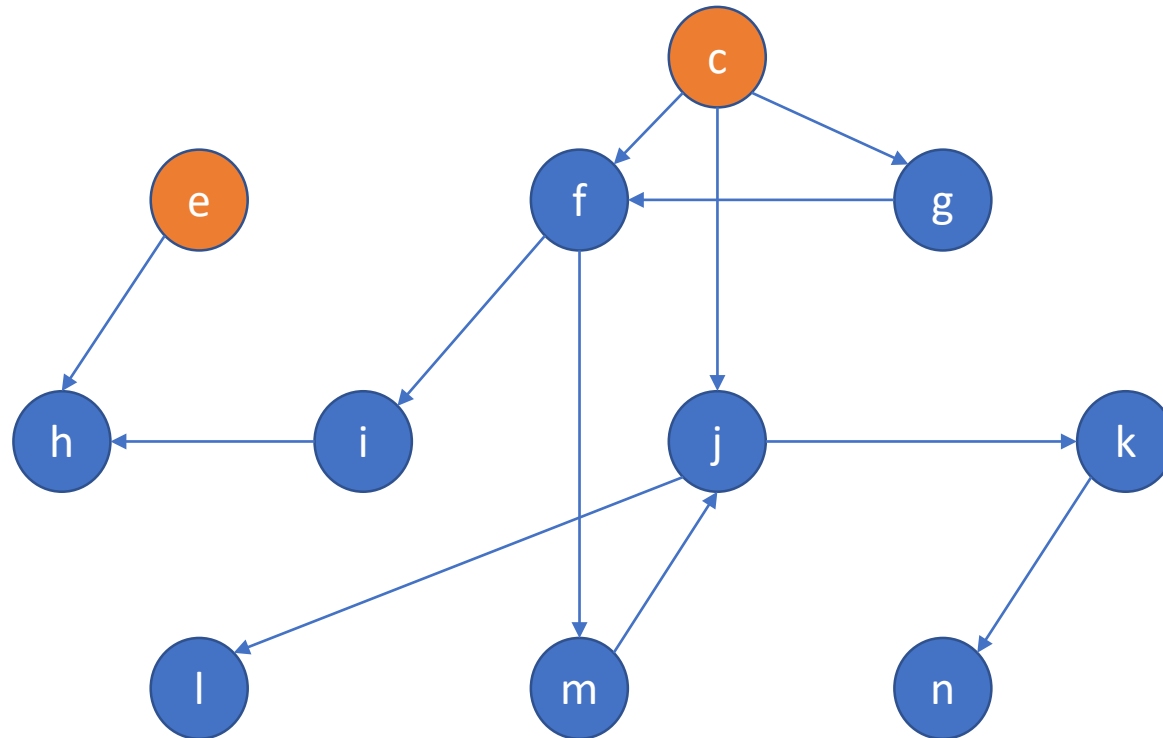
Q={a,b,d}

Output=[]

Solution
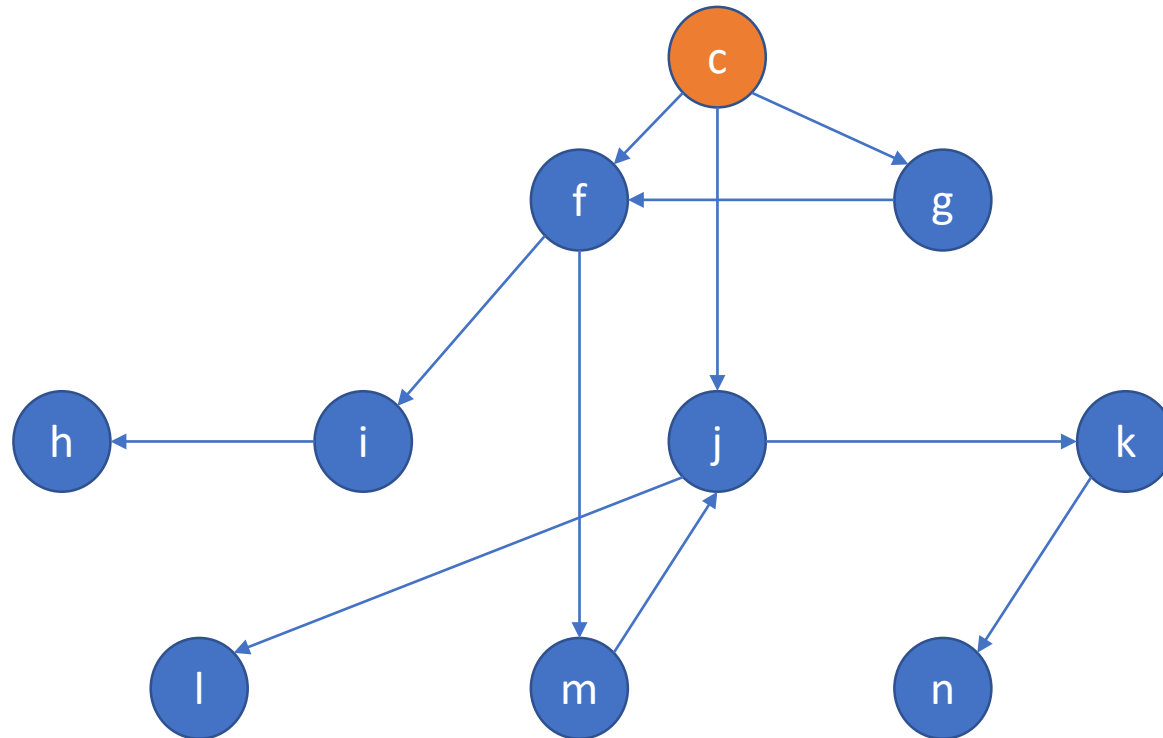

Q={b,d}

Output=[a]

Solution

Q={d,e}

Output=[a,b]

Solution

Q={c,e}

Output=[a,b,d]

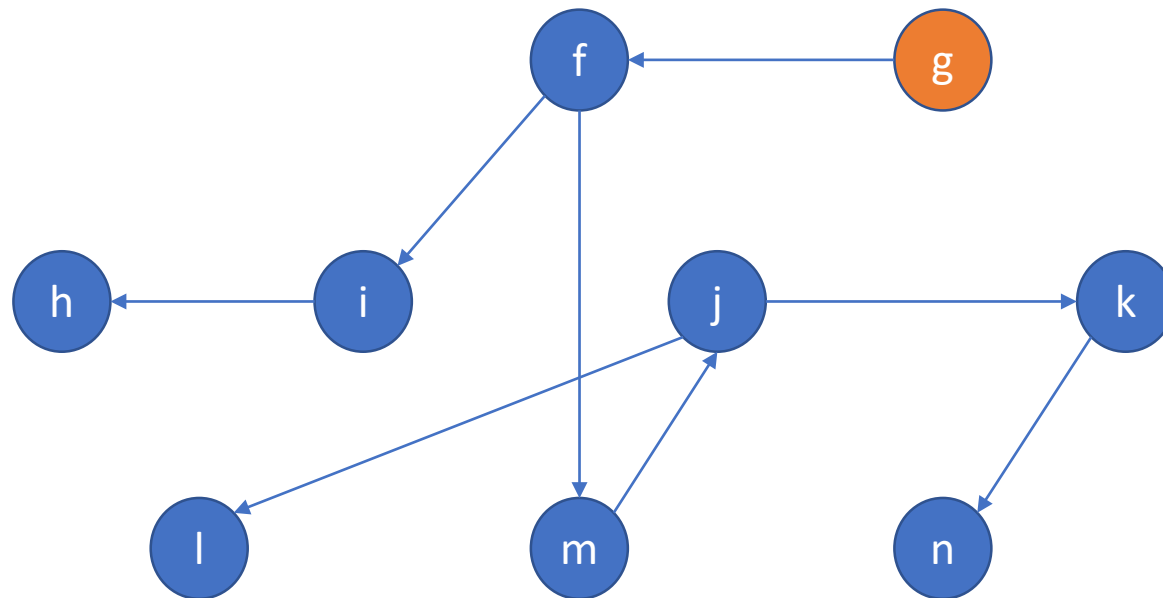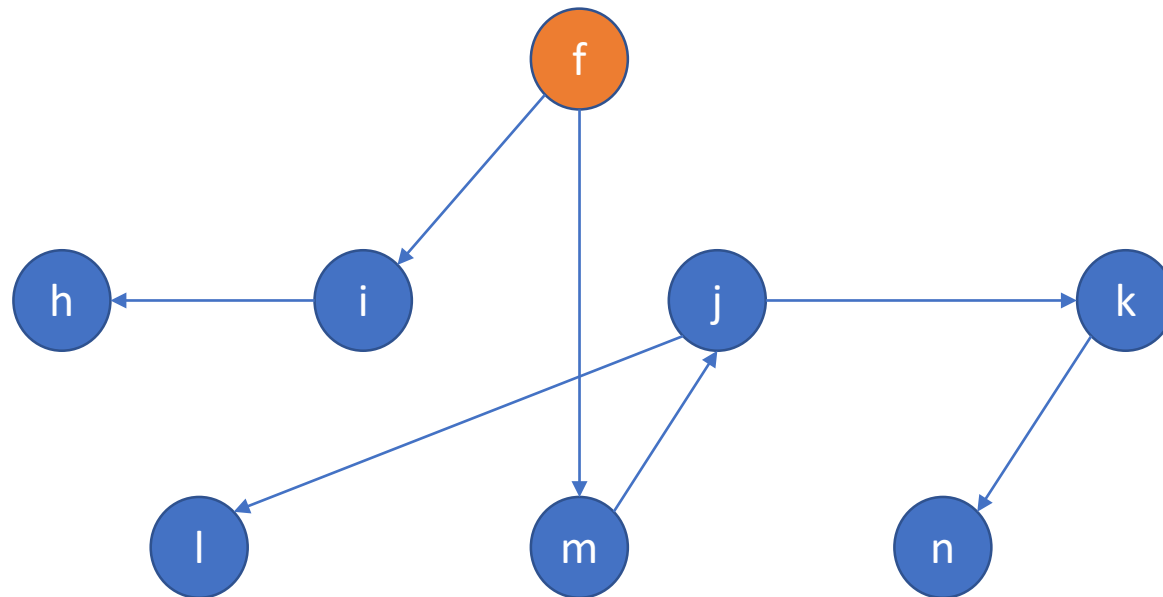# Solution

Q={c}

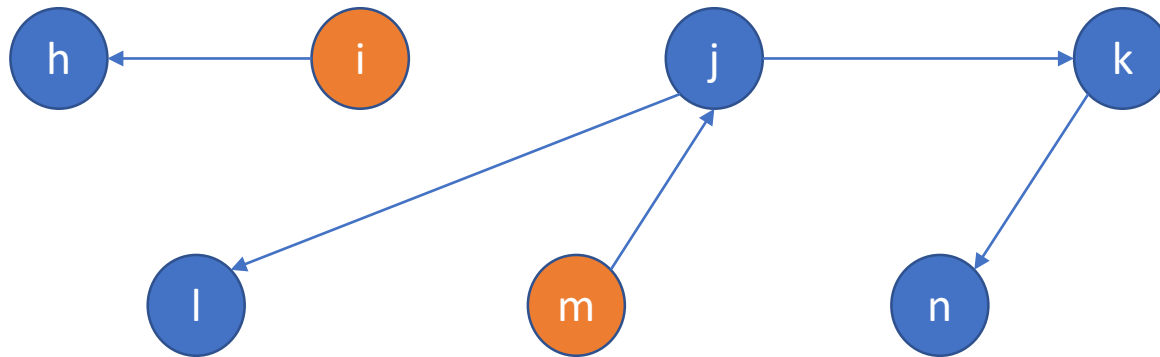Output=[a,b,d,e]

Solution

Q={g}

Output=[a,b,d,e,c]

Solution

Q={f}

Output=[a,b,d,e,c,g]

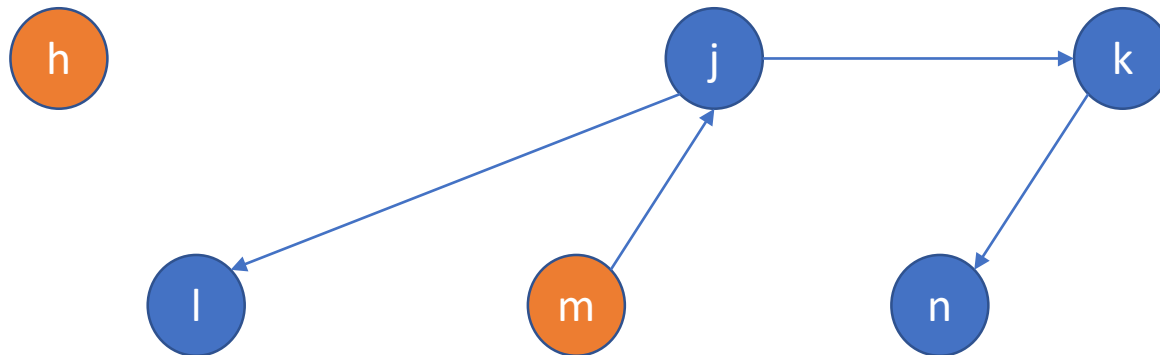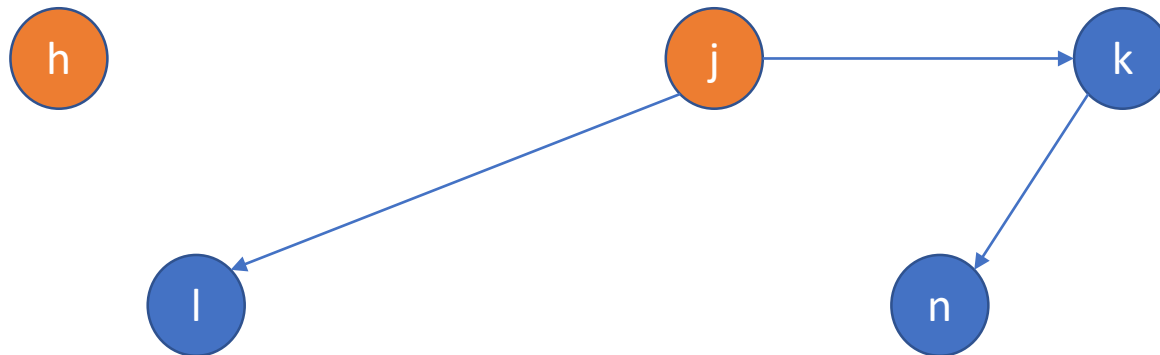# Solution

Q={i,m}

Output=[a,b,d,e,c,g,f]
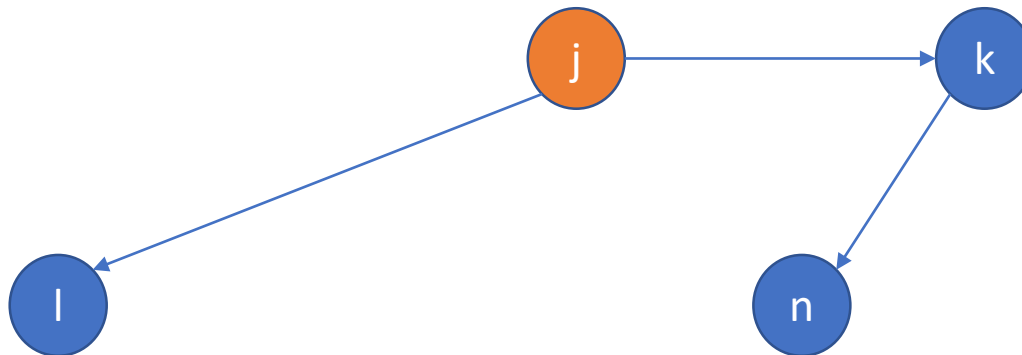
Solution

Q={h,m}

Output=[a,b,d,e,c,g,f,i]

Solution

Q={h,j}

Output=[a,b,d,e,c,g,f,l,m]

Solution

Q={j}

Output=[a,b,d,e,c,g,f,i,m,h]

Solution

Q={l,k}

Output=[a,b,d,e,c,g,f,i,m,h,j]

Solution

Q={l,n}
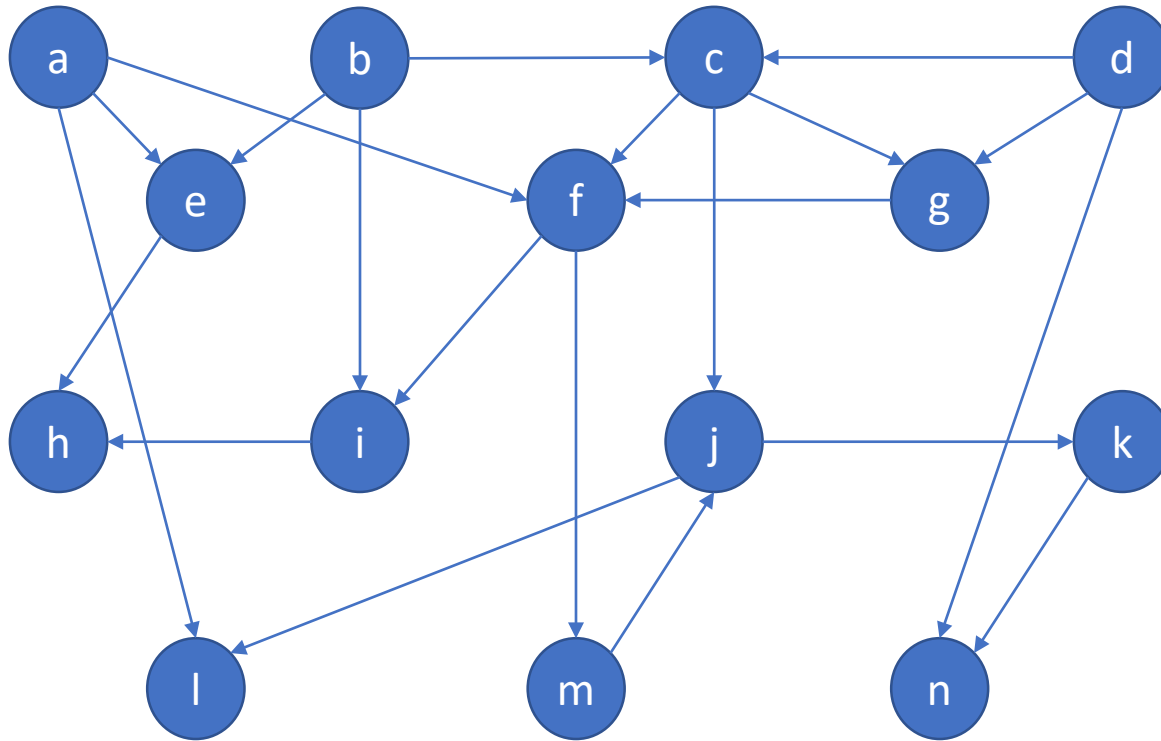
Output=[a,b,d,e,c,g,f,i,m,h,j,k]

l

n

Solution

Q={n}

Output=[a,b,d,e,c,g,f,i,m,h,j,k,l]

n

Solution

Q={}

Output=[a,b,d,e,c,g,f,i,m,h,j,k,l,n]

Output is a topological ordering of the original input graph

Note: the enqueue operation here added items to front of queue.
It would have still worked if we had added items to tail of queue as we did in class.