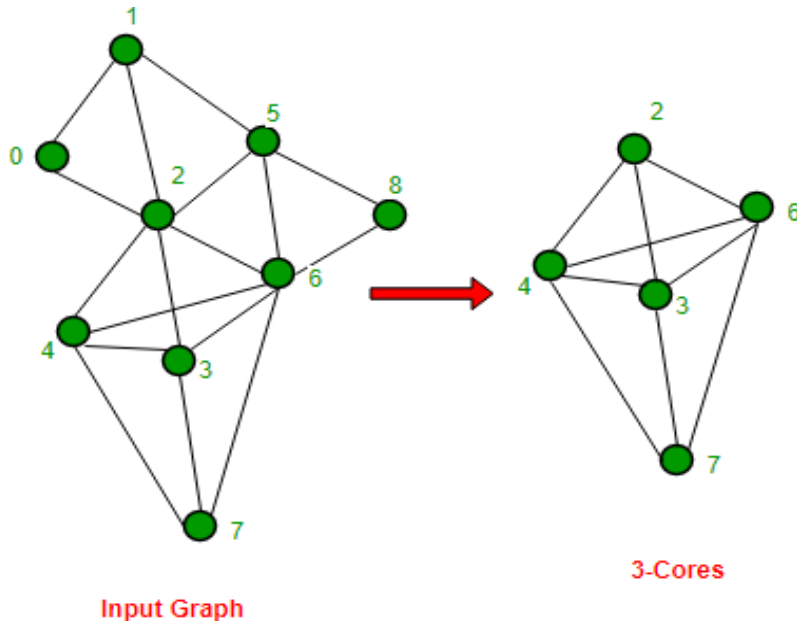


Exercise # 1: K - Cores

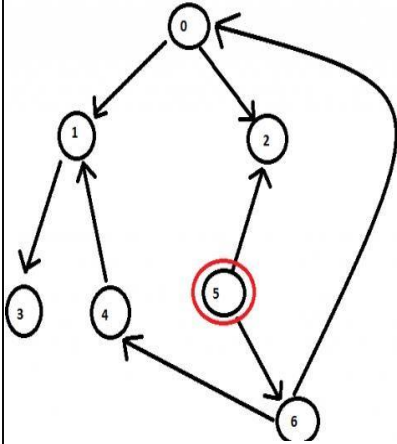
Given a graph G and an integer K , K -cores of the graph are connected components that are left after all vertices of degree less than k have been removed.

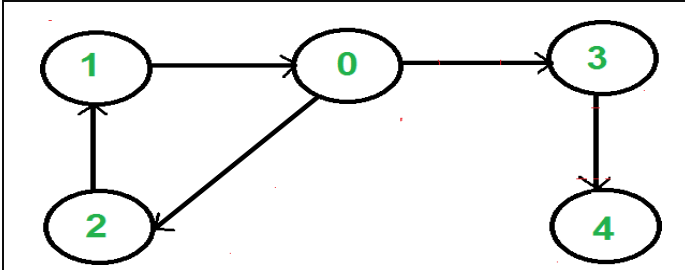


Input	Adjacency list representation of graph shown in the diagram above. $K = 3$
Output	<pre>{ 2: [3,4,6], 3: [2,4,6,7], 4: [2,3,6,7], 6: [2,3,4,7], 7: [3,4,6] }</pre>

Exercise # 2: Mother Vertex

Find a Mother vertex in a graph. Mother vertex in a graph $G = (V, E)$ is a vertex v such that all other vertices in G can be reached by a path from v .

Input	Adjacency list of the graph shown below	
		<p>In this graph the mother vertex is- '5'(circled red) as we can reach any node from - '5' through a directed path</p> <p><u>To reach 0-</u> 5->6->0</p> <p><u>To reach 1-</u> 5->6->0->1</p> <p><u>To reach 2-</u> 5->2</p> <p><u>To reach 3-</u> 5->6->0->1->3</p> <p><u>To reach 4-</u> 5->6->4</p> <p><u>To reach 6-</u> 5->6</p>
Output	[5]	

Input	Adjacency list representation of a graph shown below	
		
Output	[0, 1, 2]	

Exercise # 3: Course Schedule

Bob loves foreign languages and wants to plan his course schedule for the following years.

He is interested in the following nine language courses: LA15, LA16, LA22, LA31, LA32, LA126, LA127, LA141, and LA169.

The course prerequisites are:

- ❖ LA15: (none)
- ❖ LA16: LA15
- ❖ LA22: (none)
- ❖ LA31: LA15
- ❖ LA32: LA16, LA31
- ❖ LA126: LA22, LA32
- ❖ LA127: LA16
- ❖ LA141: LA22, LA16
- ❖ LA169: LA32

In what order can Bob take these courses, respecting the prerequisites?

Example 1 :	
Input	List of Courses & Course Pre-Requisites
Output	LA15, LA22, LA16, L31, L32, LA169, LA126, LA127, LA141