

2020-06-20 - Handout – Topological Sorting

Q1. Course Schedule II

Link <https://leetcode.com/problems/course-schedule-ii/>

There are a total of n courses you have to take, labeled from 0 to $n-1$.

Some courses may have prerequisites, for example to take course 0 you have to first take course 1, which is expressed as a pair: [0,1]

Given the total number of courses and a list of prerequisite **pairs**, return the ordering of courses you should take to finish all courses.

There may be multiple correct orders, you just need to return one of them. If it is impossible to finish all courses, return an empty array.

Example 1:

Input: 2, [[1,0]]

Output: [0,1]

Example 2:

Input: 4, [[1,0],[2,0],[3,1],[3,2]]

Output: [0,1,2,3] or [0,2,1,3]

Q2. Alien Dictionary

Link: <https://leetcode.com/problems/alien-dictionary/>

There is a new alien language which uses the latin alphabet. However, the order among letters are unknown to you. You receive a list of **non-empty** words from the dictionary, where words are **sorted lexicographically by the rules of this new language**. Derive the order of letters in this language.

Note:

1. You may assume all letters are in lowercase.
2. The dictionary is invalid, if a is prefix of b and b is appear before a.
3. If the order is invalid, return an empty string.
4. There may be multiple valid order of letters, return the smallest in normal lexicographical order

Example 1:

Input : ["wrt","wrf","er","ett","rftt"]

Output : "wertf"

Explanation :

from "wrt"and"wrf" ,we can get 't'<'f'

from "wrt"and"er" ,we can get 'w'<'e'

from "er"and"ett" ,we can get 'r'<'t'

from "ett"and"rftt" ,we can get 'e'<'r'

So return "wertf"

Example 2:

Input : ["z","x"]

Output : "zx"

Explanation :

from "z" and "x", we can get 'z' < 'x'

So return "zx"

Bonus Question- Parallel Courses

Link <https://leetcode.com/problems/parallel-courses/>

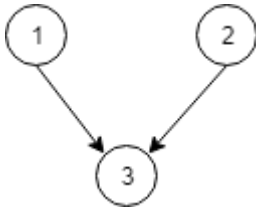
There are N courses, labelled from 1 to N.

We are given relations[i] = [X, Y], representing a prerequisite relationship between course X and course Y: course X has to be studied before course Y.

In one semester you can study any number of courses as long as you have studied all the prerequisites for the course you are studying.

Return the minimum number of semesters needed to study all courses. If there is no way to study all the courses, return -1.

Example 1:



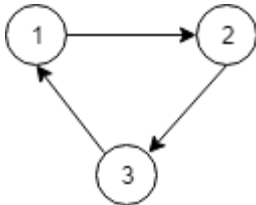
Input: N = 3, relations = [[1,3],[2,3]]

Output: 2

Explanation:

In the first semester, courses 1 and 2 are studied. In the second semester, course 3 is studied.

Example 2:



Input: N = 3, relations = [[1,2],[2,3],[3,1]]

Output: -1

Explanation:

No course can be studied because they depend on each other.