CSE 2010, HW3, Fall 2022
Due Thu Oct 6 at the start of your lab section; Submit Server: class = cse2010, assignment = hw3SxIndividual
Due Thu Oct 6 at the end of your lab section; Submit Server: class = cse2010, assignment = hw3SxGroupHelp
x is 12 or 34—your merged section number or "c" for c submissions.

Organizations usually have hierarchical structures that can be represented as trees; for example, companies, governments, and schools.

The goal of HW3 is to build a tree from organizational data and answer queries on the organizational structure. Your submission has a Tree `class` that has a linked structure of tree nodes and supports (at least) the following operations:

- addChild(node, childNode) // to maintain alphabetical/lexicographical order of the children
- getChildren(node)
- getParent(node)

We will evaluate your submissions on code01.fit.edu so we strongly recommend you to test your programs on code01.fit.edu. To preserve invisible characters, we strongly recommend you to download and save, NOT copy and paste, input data files.

Input: Input is from the command-line arguments for HW3.java in this order:

1. filename of the organizational data—the top entity in on the first line, a pair of supervisor and subordinate is on each line starting on the second line.
2. filename of queries, each line has one of the following queries:
   - DirectSupervisor *entity*
   - DirectSubordinates *entity*
   - AllSupervisors *entity*
   - AllSubordinates *entity*
   - NumberOfAllSupervisors *entity*
   - NumberOfAllSubordinates *entity*
   - IsSupervisor *entity supervisor*
   - IsSubordinate *entity subordinate*
   - CompareRank *entity*1 *entity*2
   - ClosestCommonSupervisor *entity*1 *entity*2

You may assume entities in the queries exist in the organizational data. Sample input files are on the course website.

Output: Output goes to the standard output (screen), each line has an answer with the corresponding query:

- DirectSupervisor *entity supervisor*
- DirectSubordinates *entity subordinate*1 *subordinate*2 ...
- AllSupervisors *entity supervisor*1 *supervisor*2 ...
- AllSubordinates *entity subordinate*1 *subordinate*2 ...
- NumberOfAllSupervisors *entity count*
- NumberOfAllSubordinates *entity count*
- IsSupervisor *entity supervisor yes/no*
- IsSubordinate *entity subordinate yes/no*
- CompareRank *entity*1 *entity*2 *higher/lower/same*
- ClosestCommonSupervisor *entity*1 *entity*2 *closestCommonSupervisor*

DirectSubordinates (if any) are in the alphabetical/lexicographical order. AllSubordinates (if any) are in "pre-order". AllSupervisors (if any) are in the order of supervisor, grand-supervisor, ... IsSupervisor/IsSubordinate refers to any supervisor/subordinate. In an organization, an entity has a higher rank when it is closer to the top in the hierarchy. CompareRank prints higher (lower/same) if *entity*1 has a higher (lower/same) rank than *entity*2. ClosestCommonSupervisor (if any) is the lowest-ranking supervisor of both entities. Sample output is on the course website.

Submission: Submit HW3.java that has the main method and other program files. Submissions for Individual and GroupHelp have the same guidelines as HW1.

Note the late penalty on the syllabus if you submit after the due date and time as specified at the top of the assignment.