109 Data Structure
the 4ᵗʰ Homework

Symbolic Equations (20%)

- Symbolic equation is a mathematical equation declaring the equivalence of a group of operations.

- You need to print the general solutions to a symbolic system. The general solutions are ones which cannot be simplified.

- If any of the equations contain circular reference or self reference, the answer shall be "no solution".

Symbolic Equations (20%)

- Input:
- Line 1: An integer N indicates the number of variables.
- Line 2: N space-separated variables.
- Line 3: An integer M represents the number of equations.
- Next M lines: An equation in the format of variable = function.
- Note: If a variable is not declared, the solution for the variable is itself.

- Output:
- N lines: A solution for each variable. The solution should be formatted as variable -> solution.
- Or
- Line 1: No solution.

Symbolic Equations (20%)

- For example:
- 3 (N)
- x y z
- 2 (M)
- z = f (x y)
- y = h (x)

- output:
- x -> x
- y -> h (x)
- z -> f (x h (x))

Symbolic Equations (20%)

- For example (circular reference):
- 2 (N)
- x y
- 2 (M)
- x = f (y)
- y = f (x)

- output:
- No solution.

Symbolic Equations (20%)

- For example (self reference):
- 3 (N)
- x y z
- 2 (M)
- x = f (x)
- y = g (y z)

- output:
- No solution.

Symbolic Equations (20%)

- For this problem:

- The number of variables is N.
- $1 \leq N \leq 10$
- The number of equations is M.
- $0 \leq M \leq 10$

- $1 \leq$ the length of each variable name ≤ 2
- $1 \leq$ the length of each function name ≤ 2

- Time Limit: 2 seconds.

A Sticky Safe Lock (20%)

- There is a locked safe in front of you. You know the 4-digit password of its password lock.

- Unfortunately, the password lock on it is sticky. When you rotate one of the dials, the dials next to it will also be turned.
- Moreover, there are a note and a set of forbidden password on the lock: "If you rotate the dials casually, the safe will explode."

- You decide to write a program to solve this problem.

A Sticky Safe Lock (20%)

- Input:
- Line 1: 4 integers indicate the digits on the password lock now, separated with space.
- Line 2: 4 integers represent the password, separated with space.
- Line 3: An integer N.
- Next N lines: The forbidden password.
  - The sequence of your steps should not contain the password in the set.

- Output:
- Line 1: An integer M indicates the shortest step.
- Next M lines: The sequence of the steps.
- Or
- Line 1: "Impossible" if the explosion can't be avoided.

A Sticky Safe Lock (20%)

- For example:
- 0 0 0 0
- 0 0 0 1
- 2 (N)
- 1 1 0 0
- 0 0 1 1

- Output:
- 3 (M)
- 9990
- 0090
- 0001

A Sticky Safe Lock (20%)

- For this problem:

- There are 4 digits on the lock.
- The digits of the password can be [0..9]. 0 is after 9, and 9 is before 0.

- The number of the forbidden password is N.
- $0 \leq N \leq 9999$

- Time Limit: 2 seconds.

Haunted Mansion(30%)

- There's a haunted mansion. Your scouts report you the message of the mansion. You need to figure out the information about the monsters.

- However, there are mirrors in the mansion. Moreover, each kind of the monsters has a different property about the mirrors.

- You need to consider both of the mirrors and the properties of the monsters, then find out the most reasonable information.

Haunted Mansion(30%)

- Input:
- Line 1: 3 Integers Vcount, Zcount, Gcount indicate the number of each type of monster in the grid.
- Line 2: An integer N indicates the size of the manor.
- Next 4 lines: N integers represent the number of visible monsters from
  - top of the grid, from left to right.
  - bottom of the grid, from left to right.
  - left of the grid, from top to bottom.
  - right of the grid, from top to bottom.
- Next N lines: N characters. '.' indicates a monster in the grid, and '/', '\' indicate a mirror in the grid.

Haunted Mansion(30%)

- Output:
- N lines: N characters.
  - The lines represent the whole manor.
  - The character will be
    - V for a vampire
    - Z for a zombie
    - G for a ghost
    - / or \ for a mirror.
  - You can't see a vampire through a mirror.
  - You can see a zombie directly or through a mirror.
  - You can see a ghost ONLY through a mirror.

Haunted Mansion(30%)

- For example:
- Input:
- 1 3 2   // Vcount, Zcount, Gcount
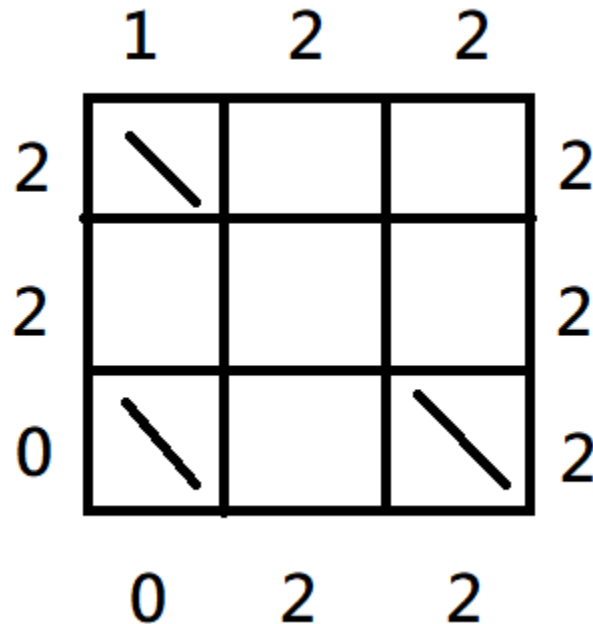- 3 (N)
- 1 2 2
- 0 2 2
- 2 2 0
- 2 2 2
- \..
- ...
- \.\

Haunted Mansion(30%)

- For example:
- 1 3 2 (Vcount, Zcount, Gcount)
- Output:
- \VZ
- GZZ
- \G\

Haunted Mansion(30%)

- For this problem:

- The size of the manor is N.
- $0 \leq N \leq 7$
- $0 \leq Vcount \leq N$
- $0 \leq Zcount \leq N$
- $0 \leq Gcount \leq N$

- Time Limit: 2 seconds.

Baba is You(30%)

- In...nt. T...e in...

- In...c...

- Y...

- T..."

Baba is You(30%)

- In this puzzle, I'll give you a set of universal truths, you need to determine whether
  - All pigs can fly.
  - Some pigs can fly.
  - No pigs can fly.

Baba is You(30%)

- Each of the input sentences contains a logical statement in the general form:
    - ObjectA (are ObjectB | have Trait | can Ability)
    - or TraitA are TraitB

- Furthermore, objects can be expanded to:
    - Object [with TraitA [and TraitB ...]] [that can AbilityA [and AbilityB ...]]

    - MICE are RODENTS
    - MICE have WINGS
    - MICE that can FLY are ANIMALS with SUPERPOWERS

Baba is You(30%)

- For example:
    1)MICE are RODENTS
    2)MICE with WINGS are BATS
    3)MICE that can FLY are ANIMALS with SUPERPOWERS
    4)BATS are RODENTS
    5)RODENTS with FEET and NOSES that can EAT are POPSICLES

- To clarify, statement 1 means that all MICE are RODENTS, but only some RODENTS are MICE.
- It cannot be assumed from statement 1 and 4 that some MICE are BATS.

Baba is You(30%)

- The other examples:
  - 1) CHICKENS with BEAKS are LLAMAS with MOUTHS
  - 2) CHICKENS have BEAKS
  - Some LLAMAS with MOUTHS have BEAKS.
  - All CHICKENS are LLAMAS with MOUTHS.

  - 1) CHICKENS with BEAKS are LLAMAS with MOUTHS
  - 2) CHICKENS have BEAKS and EYES
  - Some LLAMAS with MOUTHS have EYES (and BEAKS).
  - All CHICKENS are LLAMAS with MOUTHS.

Baba is You(30%)

- For all the inputs, print "No/Some/All pigs can fly." (30%)

- Line 1: An integer N represents the number of logical statements.
- Next N lines: A logical statement.
- output: "All/Some/No pigs can fly."

Baba is You(30%)

- For example (green sentences are results):
  - 3
  - PIGS are BACONS
  - BACONS are GODS
  - (Thus, All PIGS are GODS)
  - GODS can FLY

  - output: All pigs can fly

Baba is You(30%)

- 7
- GEESE are CHICKENS with BEAKS
- BEAKS are TOENAILS
- CHICKENS with BEAKS are LLAMAS with MOUTHS
- CHICKENS have EYES
- (All GEESE are LLAMAS with MOUTHS and EYES and TOENAILS and BEAKS)

- CHICKENS with EYES and TOENAILS are TREES that can FLY
- (All GEESE are CHICKENS with EYES and TOENAILS)
- → (All GEESE are TREES that can FLY)

- LLAMAS with TOENAILS are PIGS
- PIGS are TREES that can WALK
- (All GEESE are PIGS, All GEESE are TREES that can FLY)
- (Some PIGS are GEESE)
- output: Some pigs can fly

Baba is You(30%)

- For this problem:

- The number of the statements is N.
- $2 \le N \le 15$
- The length of the a statement is L.
- $1 \le L \le 256$

- "PIGS" exists in 1 or more statements for sure.
- "FLY" exists in 1 or more statements for sure.
- Object, Trait, Ability are written in uppercase, and everything else is in lowercase.
- Time Limit: 2 seconds.

Reminders

- For all of the question, please read test.txt as input and output in the terminal window.
- 對於所有問題，請都讀test.txt作為input，然後輸出在小黑窗上
- If you can, please let me know how to change your I/O file name so that I can modify the path from test.txt to test1.txt, test2.txt, etc.
- 假如可以的話，讓我清楚知道從哪裡更改你I/O檔案的名稱，方便我可以從讀test.txt改成讀test1.txt, test2.txt，會改得比較快。
- 如果我看不懂，那我不會改你的code，一律讀test.txt。

Reminders

- Only accept C
- Deadline : 2020/12/21 23:59, please be on time.
- File name : [student ID]_[question No.(1..4)].[file name extension]
- e.g. 7109056193_1-1.c
- If there are more than 1 file for 1 question, please give a readme.txt for me and let me know the meaning of each file.
- No need to give me the output, I'll execute your program.

- Zip all your files and hand in on the i-learning, the file name is [student ID]_homework4.
- Plagiarism is prohibited.
- Dev-C++ 5.11 is used for checking this homework.