Xtreme Fake Coins

Time limit: *500 ms*
Memory limit: *256 MB*

Help IBM research's puzzlemaster to verify solutions for May 2018's challenge.

There are N coins, represented by the first N capital letters of the English alphabet. Exactly two of them are counterfeit and have a slightly smaller weight. M weightings using a double-pan balance scale have been performed, but they may not uniquely determine the pair of counterfeit coins.

Find all counterexamples of two pairs of coins $((a,b),(c,d))$ $(a<b,\ a\leq c,\ c<d,\ (a,b)\neq(c,d))$ whose weights are indistinguishable with respect to the M weightings.

Standard input

The first line contains two comma separated integers, N and M.

The next M lines contain two strings of disjoint subsets of the first N English capital letters, separated by a `-` sign.

There always is an equal amount of coins on both sides.

Standard output

List of lexicographically ordered counterexamples for the solution.

Each of them consists of two letters, an `=` sign and then another two letters.

A counterexample is a set of two pairs that cannot be distinguished by the set of M weightings.

Constraints and notes

- $0\leq M\leq 10$
- $2\leq N\leq 26$
- The counterexamples should be formed using only the first N letters

Input	Output	Explanation

`11,4`
`ABCDE-FGHIJ`
`AHJ-FBD`
`AGI-KCE`
`BJ-IE`
	`AC=AK`
	`AG=AH`
	`BC=BK`
	`BE=CD`
	`BE=DK`
	`BH=BJ`
	`BH=DJ`
	`BI=DG`
	`BJ=DJ`
	`CD=DK`
	`CE=EK`
	`CG=DH`
	`CH=EJ`
	`CI=EG`
	`CI=EI`
	`EG=EI`
	`FH=GK`
	`GH=IJ`
		In the first weighting we are comparing `ABCDE` on the left pan and `FGHIJ` on the right; on the last weighting we compare `BJ` on the left with `IE` on the right. In the answer we give all the cases where the proposed solution does not work. For example the last line (`GH = IJ`) means that we can not distinguish between the case where `G` and `H` are counterfeited and the case where `I` and `J` are counterfeited. The reason is that in both cases the four results of the four weightings are the same:
		• `ABCDE > FGHIJ`
		• `AHJ < FBD`
		• `AGI < KCE`
		• `BJ = IE`

`15,5`
`ABCDE-FGHIJ`
`ACEGI-BDFHJ`
`ABCKL-FDEMN`
`EGOBH-IJLMN`
`DEGKL-FMIBC`
	`AB=BC`
	`AE=EK`
	`AF=CF`
	`AH=BG`
	`AI=CI`
	`AM=CM`
	`AM=CN`
	`BM=BN`
	`CM=CN`
	`DG=EH`
	`FH=FO`
	`FJ=FM`
	`FJ=FN`
	`FJ=JM`
	`FK=HJ`
	`FK=JO`
	`FM=FN`
	`FM=JM`
	`FN=JM`
	`HJ=JO`
	`IK=IL`
	`IM=IN`
	`JK=JL`
	`KM=LM`
	`KN=LN`
		The first line in the solution (`AB = BC`) is because
		• `ABCDE < FGHIJ`
		• `ACEGI = BDFHJ`
		• `ABCKL < FDEMN`
		• `EGOBH < IJLMN`
		• `DEGKL > FMIBC`

`7,3`
`ADE-BCG`
`AG-BE`
`AC-DG`
		This solution is correct so there is no counterexample.