



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
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Input	Output	Explanation
<div>11, 4</div> <div>ABCDE - FGHIJ</div> <div>AHJ - FBD</div> <div>AGI - KCE</div> <div>BJ - IE</div>	<div>AC=AK</div> <div>AG=AH</div> <div>BC=BK</div> <div>BE=CD</div> <div>BE=DK</div> <div>BH=BJ</div> <div>BH=DJ</div> <div>BI=DG</div> <div>BJ=DJ</div> <div>CD=DK</div> <div>CE=EK</div> <div>CG=DH</div> <div>CH=EJ</div> <div>CI=EG</div> <div>CI=EI</div> <div>EG=EI</div> <div>FH=GK</div> <div>GH=IJ</div>	<p>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:</p> <ul style="list-style-type: none"> $ABCDE > FGHIJ$ $AHJ < FBD$ $AGI < KCE$ $BJ = IE$
<div>15, 5</div> <div>ABCDE - FGHIJ</div> <div>ACEGI - BDFHJ</div> <div>ABCKL - FDEMN</div> <div>EGOBH - IJLMN</div> <div>DEGKL - FMIBC</div>	<div>AB=BC</div> <div>AE=EK</div> <div>AF=CF</div> <div>AH=BG</div> <div>AI=CI</div> <div>AM=CM</div> <div>AM=CN</div> <div>BM=BN</div> <div>CM=CN</div> <div>DG=EH</div> <div>FH=FO</div> <div>FJ=FM</div> <div>FJ=FN</div> <div>FJ=JM</div> <div>FK=HJ</div> <div>FK=JO</div> <div>FM=FN</div> <div>FM=JM</div> <div>FN=JM</div> <div>HJ=JO</div> <div>IK=IL</div> <div>IM=IN</div> <div>JK=JL</div> <div>KM=LM</div> <div>KN=LN</div>	<p>The first line in the solution ($AB = BC$) is because</p> <ul style="list-style-type: none"> $ABCDE < FGHIJ$ $ACEGI = BDFHJ$ $ABCKL < FDEMN$ $EGOBH < IJLMN$ $DEGKL > FMIBC$
<div>7, 3</div> <div>ADE - BCG</div> <div>AG - BE</div> <div>AC - DG</div>		<p>This solution is correct so there is no counterexample.</p>