4. BOOLEAN EXPRESSIONS
10/20 POINTS

PROBLEM: Given a Truth Table, write the Boolean expression it represents.

A	B	A OR B	A AND B	XOR
1	2	3	4	5
0	0	0	0	0
0	1	1	0	1
1	0	1	0	1
1	1	1	1	0

Given that there are two inputs (A, B) that are represented by columns 1 and 2 and that column 3 is evaluated by an operation on columns 1 and 2, it can be determined that the operation must be an OR. Therefore, column 3 is (A OR B). If column 4 is evaluated using columns 1 and 2, it is (A AND B). If column 5 is found by operations on columns 3 and 4, the operation is XOR. The Boolean expression is:

((A OR B) XOR (A AND B))

To avoid any problems caused by the lack of uniqueness, you will have to check the operations and use the first occurrence in the following order: AND, OR, XOR, NAND, NOR and XNOR.

INPUT: There will be 10 inputs. Each will contain the number of variables, the number of operations, strings representing the outcomes of the operations across the rows, and two-character strings representing in order the columns used in each operation. The input for the above problem would be as shown in sample input #3.

OUTPUT: Print the Boolean expression. Even though the commutative property applies, answers must be written in the order implied by the given column numbers. All two-term operations must be printed with parentheses as shown below.

SAMPLE INPUT	**SAMPLE OUTPUT**
1. 2, 2, 00,01,00,11, 12, 23	1. (B OR (A AND B))
2. 2, 2, 01,10,11,00, 12, 13	2. (A XNOR (A XOR B))
3. 2, 3, 000,101,101, 110, 12, 12, 34	3. ((A OR B) XOR (A AND B))
8. 3, 3, 000, 011, 011, 110, 000, 011, 011, 110, 23, 23, 45	8. ((B AND C) XOR (B OR C))
9. 3, 3, 000, 010, 111, 111, 100, 111, 111, 111, 12, 23, 45	9. ((A OR B) AND (B OR C))
10. 3, 3, 001, 001, 100, 100, 100, 111, 001, 010, 12, 13, 45	10. ((A XOR B) XNOR (A AND C))