Problem A. Harder Satisfiability

Time limit: 2 seconds

A *fully quantified* boolean 2-CNF formula is a formula in the following form: $Q_1x_1 \ldots Q_nx_n\, F(x_1, \ldots, x_n)$. Each Q_i is one of two quantifiers: a *universal* quantifier $\forall$ ("for all"), or an *existential* quantifier $\exists$ ("exists"); and F is a conjunction (boolean `AND`) of m clauses $s \vee t$ (boolean `OR`), where s and t are some variables (not necessarily different) with or without negation. This formula has no free variables, so it evaluates to either `true` or `false`. We can evaluate a given fully quantified formula with a simple recursive algorithm:

1. If there are no quantifiers, return the remaining expression's value of `true` or `false`.
2. Otherwise, recursively evaluate formulas: $F_z = Q_2x_2 \ldots Q_nx_n\, F(z, x_2, \ldots, x_n)$ for $z = 0, 1$.
3. If $Q_1 = \exists$ return $F_0 \vee F_1$; otherwise if $Q_1 = \forall$ return $F_0 \wedge F_1$.

You are given some fully quantified boolean 2-CNF formulas. Find out if they are true or not.

Input

The first line of the input contains a single integer t ($1 \le t \le 10^5$) — the number of test cases.

The first line of a test case contains two integers n and m ($1 \le n, m \le 10^5$) — the number of variables and the number of clauses in F. The next line contains a string s with n characters describing the quantifiers. If s_i = '`A`' then Q_i is a universal quantifier $\forall$, otherwise if s_i = '`E`' then s_i is an existential quantifier $\exists$.

Next m lines describe clauses in F. Each line contains two integers u_i and v_i ($-n \le u_i, v_i \le n$; $u_i, v_i \ne 0$). If $u_i \ge 1$ then the first variable in the i-th clause is x_{u_i}. Otherwise, if $u_i \le -1$ then the first variable is $\overline{x_{-u_i}}$ (negation of x_{-u_i}). The second variable in the i-th clause is similarly described by v_i.

The sum of values of n for all test cases does not exceed 10^5; the sum of values of m does not exceed 10^5.

Output

For each test case output "`TRUE`" if the given formula is true or "`FALSE`" otherwise.

Example

standard input	standard output
3 2 2 AE 1 -2 -1 2 2 2 EA 1 -2 -1 2 3 2 AEA 1 -2 -1 -3	TRUE FALSE FALSE

Note

The first sample corresponds to a formula $\forall x_1\, \exists x_2\, (x_1 \vee \overline{x_2}) \wedge (\overline{x_1} \vee x_2) = \forall x_1\, \exists x_2\; x_1 \oplus x_2$. For any x_1 we can choose $x_2 = \overline{x_1}$ making it true, hence the formula is true.

The second sample changes the order of quantifiers. Now the answer is "`FALSE`", because for any value of x_1 we can choose $x_2 = x_1$ and the formula becomes false.

The third formula is $\forall x_1\, \exists x_2\, \forall x_3\, (x_1 \vee \overline{x_2}) \wedge (\overline{x_1} \vee \overline{x_3})$. If we substitute $x_1 = 1$, $x_3 = 1$ then no assignment of x_2 can make the second clause true, so the formula is false.