Southeastern European Regional Programming Contest Bucharest, Romania<br>October 18, 2003

## Problem I

Binary Polynomials
Input File: I.IN
Output File: standard output
Program Source File: I.PAS or I.C or I.CPP or I.JAVA
Each mapping $f$ of the set $\{0,1\}^{n}$ of $n$-dimensional binary vectors to $\{0,1\}$ is called Boolean function of $n$ variables and denoted by $f\left(x_{n}, x_{n-1}, \ldots, x_{1}\right)$. For cryptography some properties of the Boolean functions are interesting. Let denote by $B(n, k)$ the set of $n$-dimensional binary vectors that have $k$ 1 's. The task is for given Boolean function $f$ to find the number of vectors ( $b_{n}, b_{\left.n-1, \ldots, b_{1}\right)}$ from $B(n, k)$ such that $f\left(b_{n}, b_{n-1, \ldots,}, b_{1}\right)=1$.

The Boolean function will be given by its (unique) polynomial modulo 2. In these polynomials the operations addition and multiplication modulo 2 are used, defined as shown in the tables of Fig. 1. In the polynomial of a function any product of $m$ variables $x_{i_{1}} x_{i_{2}} \mathrm{~K} x_{i_{m}}$ could participate or not participate. So the general form of the polynomial for $n$ variables is:

$$
a_{0}+a_{1} x_{1}+a_{2} x_{2}+a_{3} x_{2} x_{1}+a_{4} x_{3}+a_{5} x_{3} x_{1}+a_{6} x_{3} x_{2}+a_{7} x_{3} x_{2} x_{1}+\ldots+a_{N} x_{n} x_{n-1 \ldots} x_{1}
$$

where all coefficients $a_{j}, j=0,1, \ldots, N=2^{n}-1$, are 0 's or 1 's and if the coefficient is equal to 0 we will omit the corresponding product and if it is equal to 1 we just will omit the coefficient. For example, the polynomial of the Boolean function disjunction of 2 variables given on Fig. 2 is $0+1 \cdot x_{1}+1 \cdot x_{2}+1 \cdot x_{2} x_{1}=x_{1}+x_{2}+x_{2} x_{1}$.

| + | 0 | 1 |
| :---: | :---: | :---: |
| 0 | 0 | 1 |
| 1 | 1 | 1 |


| $*$ | 0 | 1 |
| :--- | :--- | :--- |
| 0 | 0 | 0 |
| 1 | 0 | 1 |


| $x 2$ | $x 1$ | $f$ |
| :---: | :---: | :---: |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

Fig. 1
Fig. 2
Your program has to be ready to solve more than one test case. The first line of the input file will contains only the number $T$ of the test cases. Each of the following $T$ lines will describe one function - first the numbers $n$ and $k$ separated by single space ( $1 \leq n \leq 18,0 \leq k \leq n$ ) and then, separated by one more space a string of $2^{n} 0$ 's and 1 's that are the coefficients of the corresponding polynomial, ordered as in the general form of the polynomial given above.

The output file have to contain $T$ lines with a single number each - the number of vectors found by your program.

EXAMPLE

| Input |  |  |  |
| :--- | :--- | :--- | :--- |
| 3 |  | Output |  |
| 2 | 1 | 0111 | 2 |
| 4 | 2 | 1000000000000000 | 6 |
| 5 | 3 | 00000000000000000000000000000001 | 0 |

