Problem D. Data Structure Problem

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	512 mebibytes

Do you like data structure problems with many types of queries? If so, here is one of them:

You are given an array a of 2^p integers. The items in the array are numbered starting from zero. You have to process five types of queries:

1. `add` v δ: increase the v-th element of the array by δ.
2. `sum` l r: compute the sum of the items on the segment $[l, r]$.
3. `and` k: this query can be described by the following pseudocode:

```
b = array of 2^p zeroes
for i in 0..2^p - 1:
  b[i and k] += a[i]
a = b
```

4. `or` k: this query can be described by the following pseudocode:

```
b = array of 2^p zeroes
for i in 0..2^p - 1:
  b[i or k] += a[i]
a = b
```

5. `xor` k: this query can be described by the following pseudocode:

```
b = array of 2^p zeroes
for i in 0..2^p - 1:
  b[i xor k] += a[i]
a = b
```

The binary operations `and`, `or`, and `xor` in the pseudocode above denote the integer bitwise AND, bitwise OR, and bitwise XOR operators, respectively; `2^p` means 2^p (the p-th power of 2).

Input

The first line contains two integers p and q ($0 \le p \le 19$, $1 \le q \le 5 \cdot 10^5$) separated by a single space.

The second line contains 2^p integers a_i ($1 \le a_i \le 10^9$) separated by spaces: the items of the array.

Each of the next q lines contains one of the following queries:

- `add` v δ ($0 \le v \le 2^p - 1$, $1 \le \delta \le 10^9$)
- `sum` l r ($0 \le l \le r \le 2^p - 1$)
- `and` k ($0 \le k \le 2^p - 1$)
- `or` k ($0 \le k \le 2^p - 1$)
- `xor` k ($0 \le k \le 2^p - 1$)

Output

For each query of type `sum`, print one integer in a separate line: the answer to this query.

Example

standard input	standard output
3 6 1 4 2 8 5 7 4 2 add 0 3 sum 3 5 and 5 sum 1 4 xor 7 sum 0 2	20 21 9

Note

After the first query, the array becomes 3 4 2 8 5 7 4 2.

After the third query, the array becomes 5 12 0 0 9 9 0 0.

After the fifth query, the array becomes 0 0 9 9 0 0 12 5.