Problem H. Helter Skelter

Input file:	standard input
Output file:	standard output
Time limit:	5 seconds
Memory limit:	128 mebibytes

A non-empty string s is called a *binary string* if it consists only of characters '0' and '1'. A substring $s[l \ldots r]$ ($1 \le l \le r \le |s|$) of string $s = s_1 s_2 \ldots s_{|s|}$ (where $|s|$ is the length of string s) is the string $s_l s_{l+1} \ldots s_r$.

Professor Zhang has got a long binary string s starting with '0', and he wants to know whether there is a substring of s such that the number of occurrences of '0' and '1' in this substring are exactly a and b, respectively, where a and b are two given integers.

Since the binary string is very long, we will compress it. The compression method is as follows:

- Split the string into runs of equal consecutive characters.

- Any two adjacent runs consist of different characters. Use the length of each run to represent the string.

For example, the runs of the binary string "00101100011110111101001111111" are $\{00, 1, 0, 11, 000, 1111, 0, 1111, 0, 1, 00, 1111111\}$, so it will be compressed into $\{2, 1, 1, 2, 3, 4, 1, 4, 1, 1, 2, 7\}$.

Input

There are multiple test cases. The first line of input contains an integer T, indicating the number of test cases. For each test case:

The first line contains two integers n and m ($1 \le n \le 1000$, $1 \le m \le 5 \cdot 10^5$): the number of runs and the number of queries. The next line contains n integers: $x_1, x_2, \ldots, x_n$ ($1 \le x_i \le 10^6$) indicating the length of each run.

Each of the following m lines contains two integers a_i and b_i ($0 \le a_i, b_i \le |s|$, $1 \le a_i + b_i \le |s|$) which means that Professor Zhang wants to know whether there is a substring of s such that the number of occurrences of '0' and '1' in this substring are exactly a_i and b_i, respectively.

There are no more than 200 test cases, and the total size of the input is at most 20 mebibytes. Additionally, the sum of m in all test cases is at most $2 \cdot 10^6$.

Output

For each test case, print a binary string of length m. The i-th digit must be '1' if the answer for the i-th query is "yes", or '0' otherwise.

Example

standard input	standard output
3	111
2 3	0101
3 4	1111101111
3 0	
3 4	
1 2	
3 4	
1 2 3	
5 1	
4 2	
1 3	
3 2	
12 10	
2 1 1 2 3 4 1 4 1 1 2 7	
2 1	
2 2	
2 3	
2 4	
2 5	
4 1	
4 2	
4 3	
4 4	
4 5	