Problem K. Fake Plastic Trees 2

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	1024 mebibytes

You are given a tree with N vertices numbered from 1 to N. The tree is vertex-weighted. In other words, each vertex of the tree is assigned a nonnegative integer weight.

We will delete some edges from the tree. After the deletion, for each connected component, the sum of vertex weights should be in the range $[L, R]$.

For all integers $0 \le i \le K$, determine if we can achieve this goal by deleting **exactly** i edges.

Input

The first line contains a single integer T, the number of test cases. Then T test cases follow, each following the given specification:

The first line of each test case contains four integers N, K, L, and R ($1 \le N \le 1000$, $0 \le K \le \min(50, N-1)$, $0 \le L \le R \le 10^{18}$).

The next line contains N integers $A_1, A_2, \ldots, A_N$, where A_i denotes the weight of vertex i ($0 \le A_i \le 10^{18}$).

Each of the next $N-1$ lines contains two integers x, y, denoting the pair of vertices connected by an edge ($1 \le x, y \le N$, $x \ne y$). It is guaranteed that the given graph is a tree.

For all test cases, the sum of N is at most 1000.

Output

For each test case, output a binary string of length $K+1$. The i-th character should be '1' if it is possible to achieve the desired goal by deleting exactly $i-1$ edges. Otherwise, the i-th character should be '0'.

Example

standard input	*standard output*
3 4 3 1 2 1 1 1 1 1 2 2 3 3 4 4 3 1 2 1 1 1 1 1 2 1 3 1 4 4 3 0 0 1 1 1 1 1 2 1 3 1 4	0111 0011 0000