Task: TUV
Tunnel Vision

AACPP SuSe 2025 Round 3 Memory: 128MiB 2025.05.27 – 2025.06.03

Observing the cat's behaviour, the owner of Dexter the Cat noticed that Dexter and his friends often leave toys around meeting places they frequent. The owner got a suspicion that there's a rule to the number of toys left around, so he decided to investigate further in a controlled environment.

Thus, he bought a set of $n-1$ complex cat tunnels with n transparent chambers between them, so that he can observe the number of toys left in each chamber. To simplify his task, he made sure that there was only a single way to get from each chamber to every other chamber.

At **each** entrance to the tunnel system, he placed g piles of toys, consisting of $m_1, m_2, ..., m_g$ toys each. The owner placed the piles one at a time, one entrance at a time, and let the cats play with each one separately, clearing the system between each go. These are his findings:

Figure 1: The cat tunnel system the owner found on the Internet.

- After a cat enters a chamber with d tunnels not yet visited by anyone, he splits the pile of toys into d equal piles, taking each new pile into a separate tunnel. If there are no more toys left, the cat leaves.
- If the pile can't be divided into equal-sized piles, the cat taking care of the pile just carries the excess toys outside the tunnel system until the pile can be equally divided. Of course, if there are less toys than unexplored tunnels, the cat carries the whole pile outside.

The figure below shows an example of the owner placing m toys near the entrance of the system made of three unvisited tunnels converging in a single chamber. The cats divide the pile into three equal piles of size $\lfloor \frac{m}{3} \rfloor$.

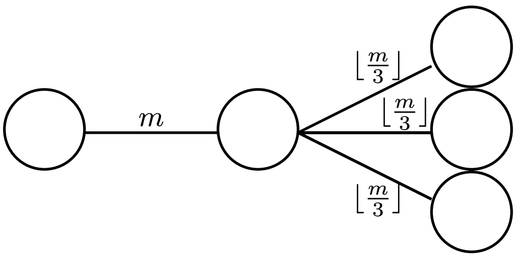

Figure 2: A simple cat tunnel system with a tunnel splitting into three.

The owner chooses a tunnel to track and places a camera to count the total number of toys the cats carry over the tunnel. He got the camera from the dollar-store he usually shops at, so it can only count the carried toy piles consisting of exactly k toys. How many toys in total will the camera detect?

Input

First line of input contains three integers n, g, and k, the number of chambers, the number of toy piles placed at the entrances, and the size of the toy piles detected by the camera, respectively. The chambers are numbered from 1 to n.

Second line of input contains g integers $m_1, m_2, ..., m_g$, where m_i denotes the size of the i-th pile of toys placed at each entrance to the tunnel system.

The next $n-1$ lines describe the tunnels of the system. The i-th of them contains two integers a_i, b_i, denoting that the chambers numbered a_i and b_i are connected by a tunnel. The camera is placed in the first tunnel described.

Output

Output a line containing s, the total number of toys detected by the camera.

Example

For input:

```
7 5 3
3 4 1 9 11
1 2
1 4
4 3
4 5
4 6
6 7
```

Give output:

```
21
```

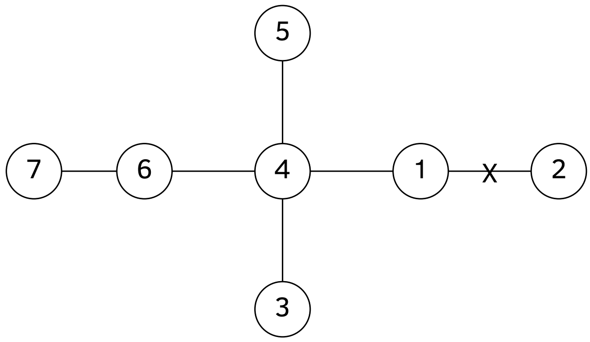

Figure 3: The structure of the tunnel system.

At each entrance to the tunnel system, numbered 2, 3, 5, 7, the owner places 5 piles of toys, one entrance and one pile at a time. The camera is placed between chambers 1 and 2. First, it detects the cats carrying the toys from the first pile with 3 toys placed at entrance 2.

The same pile placed at other entrances is not big enough to eventually reach the tunnel with the camera and still have the size of 3 in the sub-piles. Same goes for the piles of size 4 and 1.

The piles of size 9 and 11 when placed at entrance 2 are too big to be detected by the camera, despite the cats carrying them through the tunnel to chamber 1 and further. However, these piles, when placed at entrances 3, 5, and 7, are splite into 3 sub-piles of size 3 in chamber 4. One of the sub-piles is carried through tunnel 4-1 and eventually 1-2.

For the pile with 11 toys, the cats carry 2 toys outside the tunnel system, when they can't equally split the pile into 3 sub-piles of size 3.

Additional examples

The following initial tests are also available:

- `0b` – $n = 20$, $g = 20$, $k = 5$, the chambers are connected by tunnels in a way that forms one long tunnel. The camera is placed into the tunnel at one end. The sizes of toy piles are $1, ..., 20$;
- `0c` – $n = 2^{19} + 1$, $g = 20$, $k = 1$, the tunnel system looks as follows: the chamber 1 is connected to chamber n (with the camera in the resulting tunnel), and the i-th chamber for $i = 2, 3, ..., n - 1$ is connected to the chamber $\lfloor \frac{i}{2} \rfloor$. The sizes of the toy piles at the entrances are successive powers of 2: $2^0, 2^1, ..., 2^{19}$.

Limits

Your solution will be evaluated on a number of hidden test cases divided into groups. Points for a group are awarded if and only if the submission returns the correct answer for each of the tests in the group within the allotted time limit. These groups are organised into subtasks with the following limits and points awarded.

Subtask	Limits	Points
3.	$2 \le n, g \le 100$, $1 \le k \le 10^9$, $1 \le m_i \le 10^9$ for all $1 \le i \le g$, $1 \le a_j, b_j \le n$ for all $1 \le j \le n - 1$	2
3.	$2 \le n * g \le 10^6$, $1 \le k \le 10^9$, $1 \le m_i \le 10^9$ for all $1 \le i \le g$, $1 \le a_j, b_j \le n$ for all $1 \le j \le n - 1$	3
3.	$2 \le n, g \le 10^6$, $1 \le k \le 10^9$, $1 \le m_i \le 10^9$ for all $1 \le i \le g$, $1 \le a_j, b_j \le n$ for all $1 \le j \le n - 1$	5