

Practice Problem PD

Tree Beauty

There is a rooted tree of N vertices, numbered from 1 to N . Vertex 1 is the root of the tree, while P_i is the parent of vertex i , for all $2 \leq i \leq N$. Each vertex has a beauty value, which is initially 0.

You can use a special machine that can increase the beauty value of the vertices. By giving three parameters X , Y , and K to the machine, the machine will increase the beauty value of all vertices in the subtree of vertex X . If vertex X' is in the subtree of vertex X , then its beauty value will increase by $\lfloor \frac{Y}{K^d} \rfloor$, where d is the number of edges in the path connecting vertex X to vertex X' . For example, the beauty value of vertex X will increase by Y , the beauty value of all children of vertex X will increase by $\lfloor \frac{Y}{K} \rfloor$, the beauty value of all children of vertex X 's children will increase by $\lfloor \frac{Y}{K^2} \rfloor$, and so on.

You are going to perform Q operations one by one. Each operation is one of the following types.

1. Use the special machine by giving three parameters X , Y , and K to the machine.
2. Report the total beauty value of all vertices in the subtree of vertex X .

For each operation of the second type, output the total beauty value of all vertices in the subtree of vertex X .

Input

Input begins with a line containing two integers: N Q ($1 \leq N, Q \leq 100\,000$) representing the number of vertices and the number of operations, respectively. The next line contains $N - 1$ integers: P_i ($1 \leq P_i < i$) representing the parent of vertices $i \in [2, N]$; note that i starts from 2. The next Q lines each contains one of the following input format representing the operation you should perform.

- 1 X Y K ($1 \leq X \leq N; 1 \leq Y, K \leq 100\,000$)
Use the special machine by giving three parameters X , Y , and K to the machine.
- 2 X ($1 \leq X \leq N$)
Output the total beauty value of all vertices in the subtree of vertex X .

There will be at least one operation of the second type.

Output

For each operation of the second type in the same order as input, output in a line an integer representing the total beauty value of all vertices in the subtree of vertex X .

Sample Input #1

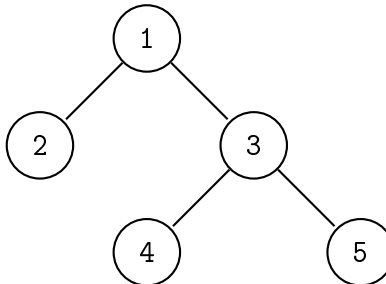
```
5 5
1 1 3 3
1 1 99 2
2 1
2 3
1 3 2 3
2 3
```

Sample Output #1

```
245
97
99
```

Explanation for the sample input/output #1

The tree is illustrated by the following image.



- The first operation increases the beauty values of vertex 1 by 99, vertex 2 and 3 by 49, and vertex 4 and 5 by 24.
- The total beauty value of all vertices in the subtree of vertex 1 is $99 + 49 + 49 + 24 + 24 = 245$.
- The total beauty value of all vertices in the subtree of vertex 3 is $49 + 24 + 24 = 97$.
- The fourth operation increases the beauty values of vertex 3 by 2 and vertex 4 and 5 by 0.
- The total beauty value of all vertices in the subtree of vertex 3 is $51 + 24 + 24 = 99$.