



# Jerboa

Almothana the Jerboa lives in the middle of the Empty Quarter, a desert represented by  $N$  oases numbered from 0 to  $N - 1$ . The oases are connected by  $N - 1$  shady paths coming from oasis 0, directed away from it, forming one-way connections. Every oasis can be reached from oasis 0 by exactly one path.

Oasis  $i$  contains  $A_i$  units of water. Almothana starts his journey at Oasis 0, and whenever he visits an oasis, he drinks all the water there.

Almothana can travel by jumping along the shady paths. He jumps with  $M$  different jump lengths  $B_0, B_1, \dots, B_{M-1}$ , where each jump length  $B_j$  allows him to move exactly  $B_j$  steps along shady paths - following the tree structure - in a single move.

He can use any number of jumps of any available length, as long as he follows the shady paths. Help Almothana maximize the total amount of water he can drink by choosing the optimal sequence of jumps starting from oasis 0.

## Implementation details

You should implement the following procedure.

It will be called by the grader once for each test case.

For C++:

```
long long max_water(int N, int M,  
    std::vector<int> A,  
    std::vector<int> U,  
    std::vector<int> V,  
    std::vector<int> B  
);
```

For Python:

```
def max_water(N: int, M: int,  
    A: list[int],  
    U: list[int],  
    V: list[int],  
    B: list[int]) -> int
```

- $N$ : the number of oases
- $M$ : the number of allowed jump lengths

- A: an array of size  $N$ , where  $A_i$  is the amount of water in oasis  $i$
- U: a list of  $N - 1$  directed edges, where each edge is a pair  $(U_i, V_i)$  indicating a **one-way shady path** from oasis  $U_i$  to oasis  $V_i$ .
- V: same as explained.
- B: an array of  $M$  jump lengths

## Examples

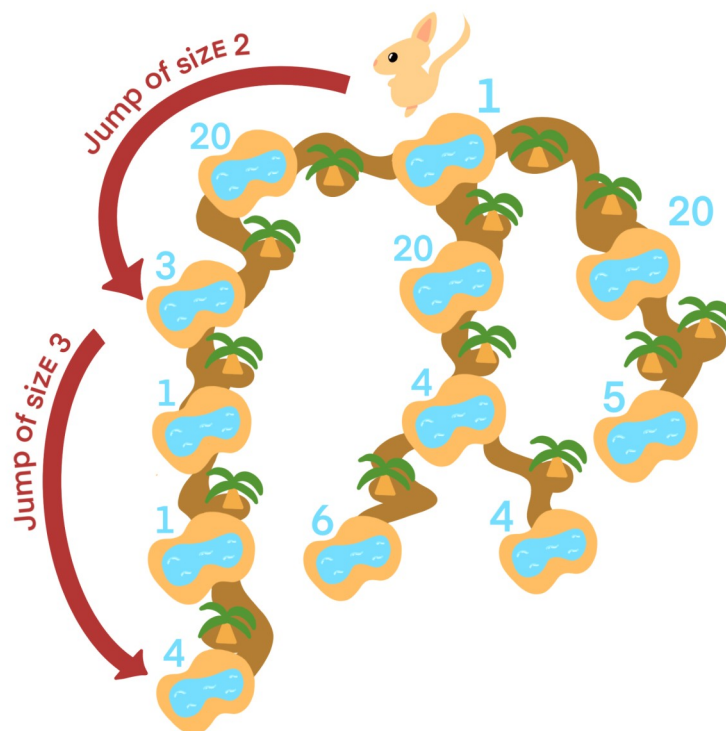
### Example 1

```

N = 12, M = 2
A = {1, 20, 3, 1, 1, 4, 20, 4, 6, 4, 20, 5}
U = {0, 1, 2, 3, 4, 0, 6, 7, 7, 0, 10}
V = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}
B = {2, 3}

```

The answer is 8.



The total value after jumping to oasis 2 (using a jump of size 2) then to oasis 5 (using a jump of size 3) will be  $1 + 3 + 4 = 8$  (oasis number 1 is always included). You can notice that this is the maximum amount of water Almothana can have.

## Constraints

- $1 \leq N \leq 10^5$
- $1 \leq M \leq 30$
- $1 \leq A_i < 10^9$

- $0 \leq U_i \neq V_i < N$ .
- $1 \leq B_j < N$

## Subtasks

1.  $N \leq 400$  (11 points)
2.  $N \leq 3000$  (19 points)
3. For every  $0 < i < N$ ,  $B_i = B_{i-1} + 1$  (20 points)
4.  $M = 1$  (10 points)
5.  $M = 2$  (20 points)
6. No Additional Constraints (20 points)

## Sample grader

line 1:  $N, M$

line 2: array  $A_i$ ,  $N$  integers space separated

line 3: array  $B_i$ ,  $M$  integers space separated

lines 4 to  $N + 2$ : two integers space separated  $U_i, V_i$