

# 3179. Maximum Points After Collecting Coins From All Nodes

## Difficulty : Hard

<https://leetcode.com/problems/maximum-points-after-collecting-coins-from-all-nodes>

There exists an undirected tree rooted at node 0 with  $n$  nodes labeled from 0 to  $n - 1$ . You are given a 2D **integer** array `edges` of length  $n - 1$ , where `edges[i] = [ai, bi]` indicates that there is an edge between nodes  $a_i$  and  $b_i$  in the tree. You are also given a **0-indexed** array `coins` of size  $n$  where `coins[i]` indicates the number of coins in the vertex  $i$ , and an integer  $k$ .

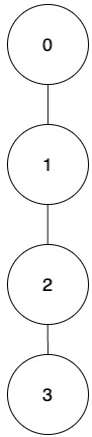
Starting from the root, you have to collect all the coins such that the coins at a node can only be collected if the coins of its ancestors have been already collected.

Coins at node <sub>$i$</sub>  can be collected in one of the following ways:

- Collect all the coins, but you will get `coins[i] - k` points. If `coins[i] - k` is negative then you will lose `abs(coins[i] - k)` points.
- Collect all the coins, but you will get `floor(coins[i] / 2)` points. If this way is used, then for all the node <sub>$j$</sub>  present in the subtree of node <sub>$i$</sub> , `coins[j]` will get reduced to `floor(coins[j] / 2)`.

Return the **maximum points** you can get after collecting the coins from **all** the tree nodes.

### Example 1:



**Input:** `edges = [[0,1],[1,2],[2,3]]`, `coins = [10,10,3,3]`, `k = 5`

**Output:** 11

**Explanation:**

Collect all the coins from node 0 using the first way. Total points =  $10 - 5 = 5$ .

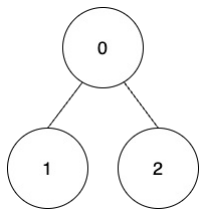
Collect all the coins from node 1 using the first way. Total points =  $5 + (10 - 5) = 10$ .

Collect all the coins from node 2 using the second way so coins left at node 3 will be  $\text{floor}(3 / 2) = 1$ . Total points =  $10 + \text{floor}(3 / 2) = 11$ .

Collect all the coins from node 3 using the second way. Total points =  $11 + \text{floor}(1 / 2) = 11$ .

It can be shown that the maximum points we can get after collecting coins from all the nodes is 11.

### Example 2:



**Input:** `edges = [[0,1],[0,2]]`, `coins = [8,4,4]`, `k = 0`

**Output:** 16

**Explanation:**

Coins will be collected from all the nodes using the first way. Therefore, total points =  $(8 - 0) + (4 - 0) + (4 - 0) = 16$ .

### Constraints:

- $n == \text{coins.length}$
- $2 \leq n \leq 10^5$
- $0 \leq \text{coins}[i] \leq 10^4$
- $\text{edges.length} == n - 1$
- $0 \leq \text{edges}[i][0], \text{edges}[i][1] < n$
- $0 \leq k \leq 10^4$

