The Quest for Balance: Link and the Triforce Tree

In the land of **Hyrule**, a young hero named **Link** embarked on a perilous journey. His mission is to restore harmony to the sacred **Triforce Tree**, a mystical structure that held the balance of power in the kingdom. However, this was not just any tree—it was an **AVL tree**, a magical structure that maintained perfect balance.

The Triforce Tree

The Triforce Tree stood tall in the heart of the Lost Woods. Its leaves—each representing one of the three virtues: **Power**, **Wisdom**, and **Courage**—were scattered across its branches. But chaos loomed. Some branches sagged under the weight of too much power, while others thirsted for wisdom. The Triforce Tree has several unique characteristics, which are:

- The Triforce Tree consists of many **leaves**.
- Each leaf consists of a **virtue** and its **unique ancient number**. Each leaf represents one of the virtues of **Power**, **Wisdom**, and **Courage**.
- The **ancient number** was utilized as the **key** in the AVL Tree. Moreover, the Triforce Tree ensures that **every ancient number has a different value**. In other words, **each leaf has a unique ancient number**.
- Based on its ancient number, the leaf is stored in ascending (i.e., most minor to most significant).

Link's Quest

The legend of **Link, the AVL Hero**, was born—a tale of rotations, balance, and the eternal struggle for equilibrium. Link vowed to protect the Triforce, ensuring power, wisdom, and courage flowed harmoniously.

1. **Insertion Challenge and Triforce Rotation**
   Link discovered a new leaf—a golden Triforce fragment containing ancient knowledge. The Triforce Tree's rules demanded balance: no subtree could be significantly taller than the other. Legends spoke of a secret technique—the **Triforce Rotation**. By rearranging branches, Link could restore balance.
   a. This action will **insert a new leaf [ancient number, virtue]** in the Triforce Tree.
   b. The **ancient number is an integer type**, and the **virtue is a string type**.
   c. The **virtue value** is represented by one of the virtues: **Power, Wisdom, and Courage.**
   d. The action is as follows:

   ```
   1 ≪ancient number≫ ≪virtue≫
   ```

e. Please ignore this action if the leaf with the **same ancient number already exists** in the Triforce Tree.
f. After this action, please **output the total number of each virtue in the Triforce Tree**.

2. **Deletion Quest**
   Sometimes, a leaf had to be removed. Link learned that deleting a leaf requires finesse. He adjusted the remaining leaves, ensuring the Triforce's harmony.
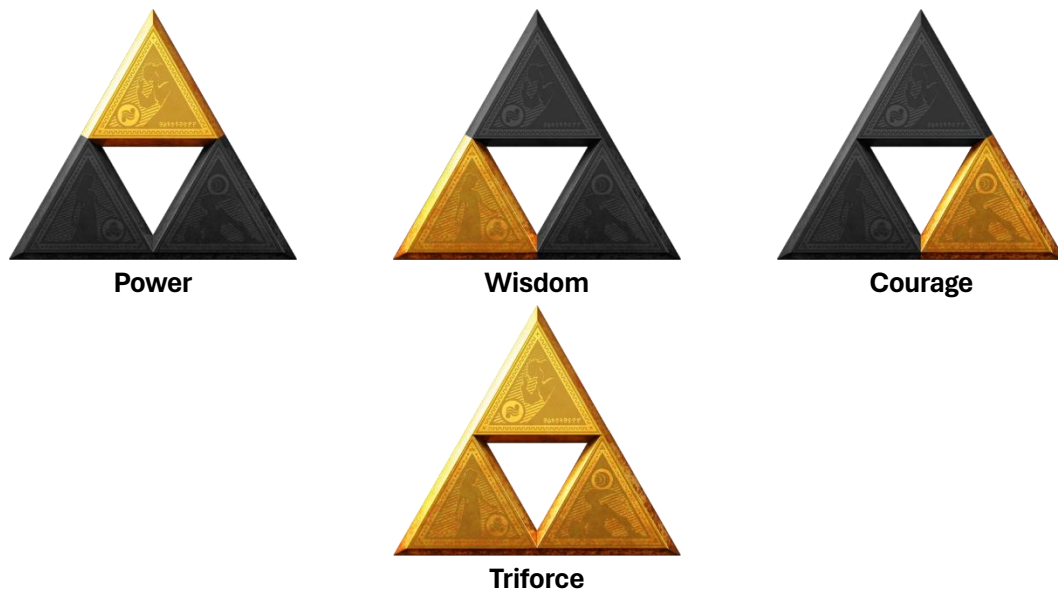   a. This action will **delete a leaf** from the Triforce Tree.
   b. The action is as follows:

   ```
   2 ≪ancient number≫
   ```

   c. If such an ancient number **exists** in the Triforce Tree, the leaf will be **deleted**. Otherwise, nothing will happen.
   d. After this action, please **output the number of leaves in the Triforce Tree**.

3. **Find the Triforce**
   The Triforce is the ultimate source of power in the land of Hyrule. **The Triforce consists of three virtues**: the Triforce of **Power** on the **top**, the Triforce of **Wisdom** on the **left**, and the Triforce of **Courage** on the **right**.

Power   **Wisdom**   **Courage**

Triforce

This action **searches all the Triforce fragments located on the Triforce Tree**. If the combination of fragments embodies a Triforce, this action will return: "**May your courage to seek wisdom grant you power!**". Otherwise, nothing will happen. Although you may find more than one Triforce, please note that you need to print it once. The action is as follows:

```
3
```

Application Usage

Because the interface is unavailable, all actions will be inputted using the console. **The first input line is an integer** N, which is the **number of input actions to be executed**. Then, the input will be **followed by** N **lines combining each action available**. The input examples are as follows:

LINE	INPUT	OUTPUT
1	12	0 0 1
2	1 89 Courage	1 0 1
3	1 57 Power	1 1 1
4	1 34 Wisdom	1 1 1
5	1 34 Courage	May your courage to seek wisdom grant you power!
6	3	2 1 1
7	1 26 Power	2 1 2
8	1 13 Courage	4
9	3	2 1 2
10	2 89	5
11	1 77 Courage	May your courage to seek wisdom grant you power!
12	2 78	
13	3	

Explanation

1. The first output line is "0 0 1" because the system inputs a courage fragment to the Triforce Tree.
2. The second output line is "1 0 1" because the system inputs a power fragment to the Triforce Tree.
3. The third output line is "1 1 1" because the system inputs a wisdom fragment to the Triforce Tree.
4. The fourth output line is "1 1 1" because the input action of line 5 was ignored, i.e., the same ancient number already exists in the Triforce Tree.
5. The fifth output line is "May your courage to seek wisdom grant you power!" because the fragments embody a Triforce.
6. The sixth output line is "2 1 1" because the system inputs another power fragment to the Triforce Tree.
7. The seventh output line is "2 1 2" because the system inputs another courage fragment to the Triforce Tree.

> ⚠️ *Please note that input line 9 (i.e., 3) produced no output. It is because no combination of fragments in the Triforce Tree embodies a Triforce.*

8. The eighth output line is "4" because the system removes one leaf, i.e., Courage fragment.

9. The ninth output line is "2 1 2" because the system inputs another courage fragment to the Triforce Tree.

10. The tenth output line is "5". Please note that the delete action of line 12 failed because ancient number 78 does not exist in the Triforce Tree.

11. The eleventh output line is "May your courage to seek wisdom grant you power!" because the fragments embody a Triforce.

~ Godspeed ~