The Quest for Balanced Leaves: Paper Mario and the AVL Tree.

Once upon a time, Mario embarked on a new adventure in the Mushroom Kingdom. His mission is to restore balance to the enchanted forest by organising the leaves on the **Great Tree of Wisdom**. But this wasn't just any tree—it was an **AVL tree**, a magical structure that maintained perfect balance.

The Forest Dilemma

The Great Tree had grown wild over the years. **Its leaves—each representing a piece of ancient skill—were scattered haphazardly**. Some hung low, while others reached for the sky. Mario knew its branches needed to be evenly distributed for the tree to thrive. The Great Tree has several unique characteristics, which are:

- The Great Tree of Wisdom consists of many **leaves**.
- Each **leaf** represents an **ancient skill** and its corresponding **unique power level**.
- The **ancient skill** was utilised as the **key** in the AVL tree. Moreover, the Great Tree of Wisdom ensures that **every ancient skill has a different one**. In other words, **each leaf has a unique ancient skill**.
- The leaf is stored in **ascending order** (i.e., from most minor to most significant) based on its **ancient skill**.

Mario's Quest

Just as knowledge needed equilibrium, so did our hearts and minds. Mario vowed to protect the AVL tree, ensuring that wisdom flowed freely through its leaves. **Please help Mario build three main actions to maintain the balance of the Great Tree.**

1. **Insert Leaf and Magic Rotation**

   Mario's first action was to insert a new leaf into the tree. If he added too many leaves to one side, he performed a magic rotation that allowed him to shift branches, ensuring the tree remained height-balanced.

   a. This action will **insert a new leaf [power level, ancient skill]** into the Great Tree.
   b. The **power level is an integer type**, and the **ancient skill is a string type**.
   c. The action is as follows:

```
1 ≪power level≫ ≪ancient skill≫
```

d. If the leaf with the same **ancient skill already exists** in the great tree, please **ignore this action**.

e. This action **does not produce any output**.

2. Delete Leaf

Sometimes, a leaf had to be removed—perhaps it contained an outdated skill. Mario learned that deleting a leaf required finesse. He couldn't just yank it out; he had to rearrange the remaining leaves to maintain balance.

a. This action will **delete a leaf** from the Great Tree.

b. The action is as follows:

```
2 ≪ancient skill≫
```

c. If such an ancient skill **exists** in the Great Tree, the leaf will be **deleted**. Otherwise, nothing will happen.

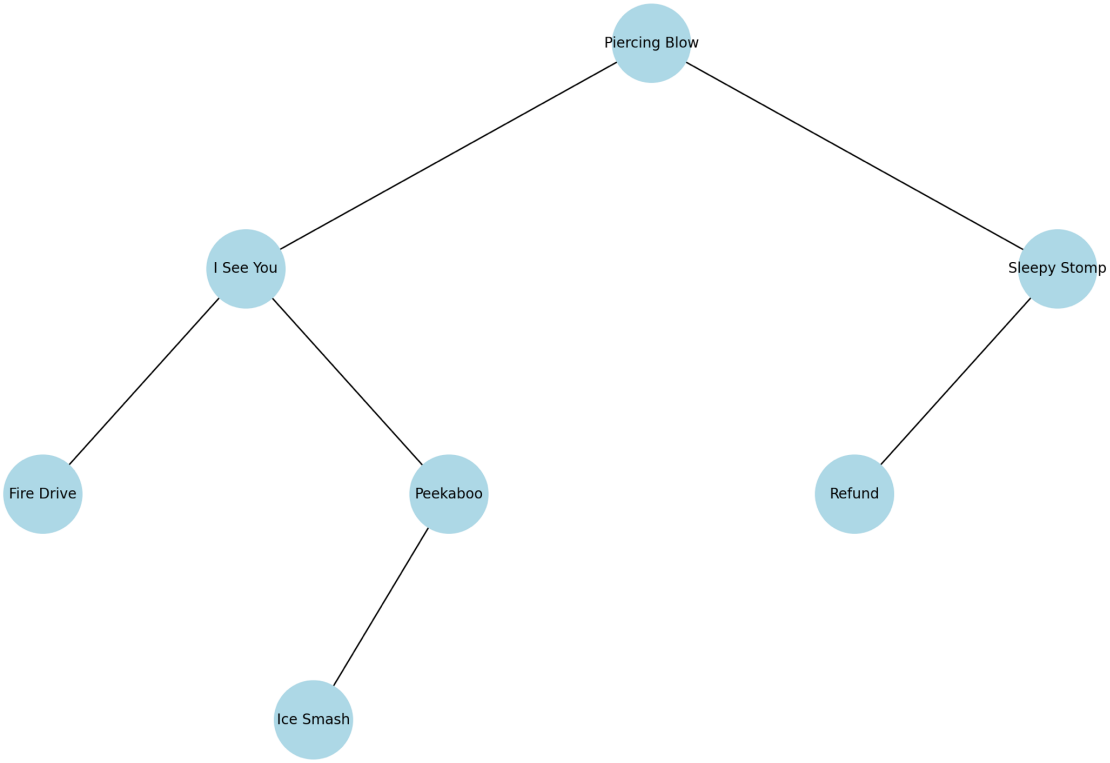
d. After this action, please **output the number of leaves in the Great Tree**.

3. Find Ancient Skill

This action **locates an ancient skill with its name**. It will show the path to its location, i.e., left **(L)**, right **(R)**, and found **(F)**. If the ancient skill is **located in the root**, this action will return **"Mamma Mia!"**. Moreover, **if the ancient skill is not located in the tree**, nothing will happen. The action is as follows:

```
3 ≪ancient skill≫
```

For instance, if the Great Tree of Wisdom consists of these leaves:



Then, the example output of this action is as follows:

INPUT	OUTPUT
3 Sleepy Stomp	(R)(F)
3 Refund	(R)(L)(F)
3 Ice Smash	(L)(R)(L)(F)
3 Piercing Blow	Mamma Mia!