

The MIU System and the Impossibility of MIII

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Goal

The goal is to determine whether it is possible to derive MIII starting from MI using the rules of the MIU system.

Rules

Rule I: If you possess a string whose last letter is I, you can add a U at the end.

Rule II: Suppose you have Mx. Then you may add Mxx to your collection.

Rule III: If III occurs in one of the strings in your collection, you may make a new string with U in place of III.

Rule IV: If UU occurs inside one of your strings, you can drop it.

Attempts

v-----v

MI - MIU - MIUIU - MIUUIUU - MII - MIIU - MIIUU - MII *

MIIII - MUI - MUI - MUIIU

THOUGHT If possible, try to get MIII

For example: starting with one I, Rule II can double it, giving two total I's with a U in between. Because the only way for the number of I's to grow is doubling, every time Rule III might apply, there will always be one leftover. This means it is never possible to reach exactly three I's.

Conclusion

None of the rules leads to the number of I's being three.

- Rule I has no effect on the number of I's.
- Rule II can only double the I's, which means they are always even after the first step. Getting exactly three I's is therefore impossible.
- Rule III is the important rule, because if we could get three I's, this is how we would turn it into MU. But since we can't reach three I's, the rule never helps.
- Rule IV has no effect on the number of I's.

Therefore, it is impossible to derive MIII from MI.