

A formal system (*un système formel*)

dmeyer@math.ucsd.edu

A string (*une chaîne de caractères*) is a sequence of letters, like **MI**, in which the order matters (so **MI** is a different string than **IM**). We are going to play a game in which you can do any of the following things to a string*:

1. If the last letter in a string is **I**, you can add a **U** at the end. For example:

$$\mathbf{MI} \rightarrow \mathbf{MIU}.$$

2. If a string has the form **Mx**, where *x* is any string, then you can double *x*, giving **Mxx**. For example:

$$\mathbf{MIU} \rightarrow \mathbf{MIUIU}.$$

3. If a string has the sequence **III** you can replace that sequence with **U**. For example:

$$\mathbf{MIII} \rightarrow \mathbf{MIU} \text{ or } \mathbf{MUI}.$$

Working in your group, use these rules in any order and as many times as you like, to make as many different strings as you can, starting from the string **MI**.

* D. R. Hofstadter, *Gödel, Escher, Bach: an Eternal Golden Braid* (New York: Basic Books 1979).



Say something true about the strings you can make starting from the string **MI** and following the rules. For example: *Every string contains only the letters **M**, **I** and **U**.*

Starting from the string **MI** and following the rules, can you make the string **MU**? If yes, explain how; if no, explain why not.

