

Once is Enough

The Strong Men of Titan from Saturn's largest moon, consider repetition to be a sin. However, they only have 3 sounds that they can make "Kah", "Brrrr", and "Umph" (Let's call them **K**, **B** and **U** for short.) so it is sometimes difficult not to repeat.

What the strong men of Titan mean by repetition is any sequence of sounds that *immediately* follows the same sequence... so

UBUBUKUBUKBKUBUKBUKU

is not a sinful utterance because of this:

UBUBUKUBUKBKUBUKBUKU

but is a sinful utterance because of this:

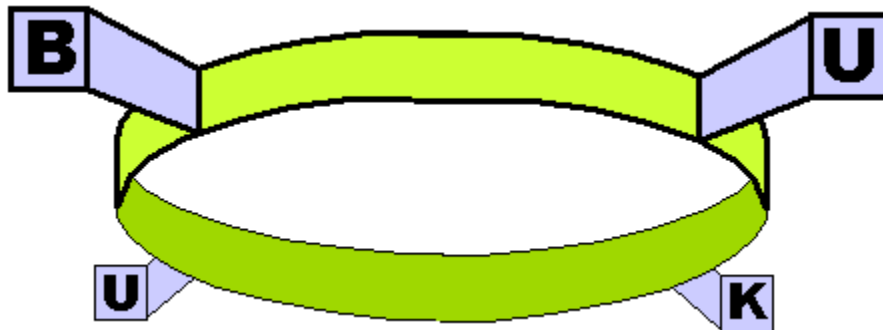
UBUBUKUBUKBKUBUKBUKU

Show that the strong men of Titan make 10 sounds in a row without sinning?

Extensions:

- When the evil Strong Men of Titan want to sing an evil chant, they write X utterances on a wheel and whirl it around and around - singing as it spins. Is it possible that they don't sin until they have spun the wheel twice?

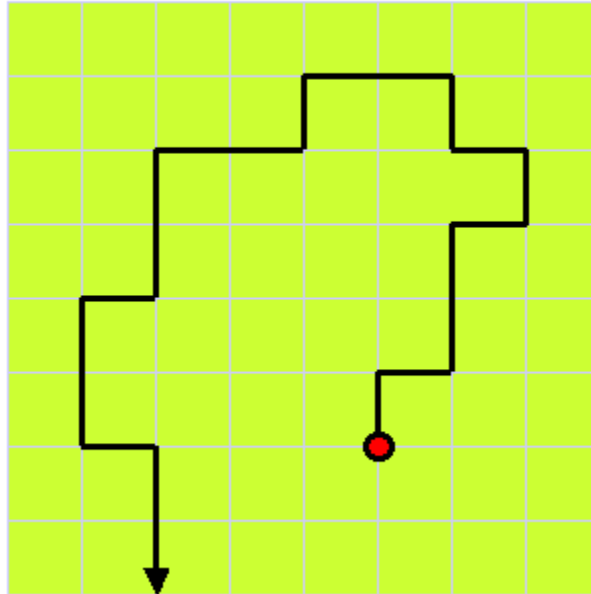
The answer is yes for the following wheel of 4 utterances:



- Find a larger wheel for which this is true?

- Whenever the Strong Men of Titan drive on their orthogonal highways, they never repeat a sequence of turns. Replace "B,U,K" above with "Forward, Left, Right" to get an idea of how they move. After he begins his journey by moving forward, can a Strong Men of Titan ever return home to his mom?

FRLFRFLRLFLRFLRFLRFR



An example of a strong man trying to return home to mom (red dot) without sinning.

- What is the largest N by M paragraph ($N, M > 1$) so that no two rectangles sharing an edge have a repetition? The following 6x6 paragraph is sinful because the red rectangles repeat:



The Math in This Problem:

This exercise involves mathematical pattern analysis of a long row of alphabets. Using the same line, students are challenged to show that there are ten consecutive sequences without a sequence following an identical one.