

Challenge 266: Magical Transformations

Our favourite mathematician (see challenge 257) is back with some even more impressive tricks! He claims he has been learning the art of alchemy and can, amongst other things, turn “lead” into “gold”.

He explains that technically he transforms words, rather than objects, using a series of basic transformations, each of which is one of the following:

1. Add any vowel to the start of a word. For example, he can transform MAZE into AMAZE.
2. Add any consonant to the end of a word. For example, he can transform CARD into CARDS.
3. Delete two or more consecutive vowels. For example, he can transform PLEASE into PLSE.
4. Delete two or more consecutive consonants. For example, he can transform STRING into SING, RING, ING or STRI.
5. Double the entire word. For example, he can transform AYE into AYEAYE.

Note that the mathematician does not confine himself to the words in the dictionary – he considers any string of letters to be a word. He also allows the “empty word”, which has no letters, and refers to it as “nothing”.

(a) Find a way for the mathematician to make GOLD from LEAD

(b) The mathematician claims he can make anything disappear to nothing, that is, starting with any word he can perform a series of transformations to get to the empty word. Can you prove or disprove his claim?

(c) Now he claims that he can create anything he wants from nothing, that is, given a target and starting with the empty word he can perform a series of transformations to get to the target word. Can you prove or disprove this claim?