Bebra Computing Competition

Before	After

Between the 4th and 15th of November is the annual Bebra Computing Challenge. Each participant has 45 minutes to tackle a series of interactive tasks, designed to encourage logical thinking and problem-solving skills appropriate for their age group. The challenge is conducted online, and tasks are marked automatically by our competition system. Last year, over 3 million students from more than 80 countries participated! The tasks are designed to allow every student the opportunity to showcase their potential, whether they excel in maths or computing, or not.

The UK Bebras Challenge is organised by the Raspberry Pi Foundation and delivered in partnership with the University of Oxford.

If you would like to give one of the previous year's questions a go, I have placed it below for you to solve. This is a question aimed at 14-16 year olds. The solution can be found on the next page.

In a land called Mysteria, there lives a wizard. The wizard can transform into a fairy or create a fairy that stands to his right. The fairy can transform into a potion with a dragon on its right, or transform into a wizard with a potion on its left and a dragon on its right. The table shows the two possible ways a wizard can transform and the two possible ways a fairy can transform:

These magical transformations can happen any number of times, in any order. That is, any wizard and any fairy can transform at any time. In this way a long arrangement of magical things can be created from a single wizard or fairy.

Before	After

Continued…

High School & Sixth Form

Question: Starting with a single wizard, which arrangement is not possible to obtain?

Mrs Alexandra Holmes

Answer below....

Answer:

Explanation: Suppose the magical transformations are numbered 1 to 4 as follows:

Number	Before	After
1		
2		
3		
4		

Above can be obtained by starting with a single wizard and applying transformations, 1, 4, 2 and 3 in that order.

Above can be obtained by starting with a single wizard and applying transformations 2, 2, 3, 4, and 1 in that order.

Above can be obtained by starting with the single wizard and applying transformations 2, 1, 3 and 3 in that order.

One quick way to see that above is not possible is to notice that the transformation rules always create a potion and a dragon at the same time. Therefore, the number of potions in Mysteria will always equal the number of dragons, which is not the case in this answer option.

Background information

The magical transformations can be thought of as a set of rules used to generate patterns of objects in Mysteria. In computer science, a 'context-free grammar' is one tool that can be used to describe rules that generate patterns. Context-free grammars can describe languages (both formal and natural) and by repeatedly applying the rules of the grammar you can generate words (or strings) that make up the language. In this task, you were asked to determine which of the given words was not part of the Mysteria language.