

Algebra Challenge: Evo Guesses Two Numbers

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Introduction

Number guessing games have fascinated people for centuries. There are numerous ways of guessing a number chosen by someone when provided with the result of certain operations done on the number. In this lesson, we will consider an example whose solution can make use of algebra. This number guessing problem was published back in 1942, four years before the first electronic computer, by Maurice Kraitichik in his book *Mathematical Recreations*. This problem has now been redesigned as an exercise making use of Ozobot Evo. Students let Ozobot guess the numbers and are then asked to use logical thinking and algebra they have learned to figure out how Evo accomplishes this.

The Number Guessing Problem

The student selects two non-negative integers, neither of which is greater than nine. In order to determine the selected numbers, Evo asks the student to multiply one of two numbers by 5, add 7, double the sum, add the other number and then tell Evo the result. Evo then replies by speaking the value of the two integers selected by the student.

Working with the OzoBlockly Program

The OzoBlockly program *GuessNumbers.ozocode* is loaded into Evo. Evo is then placed at the start location facing the direction of the arrow in the Ozomap shown in Figure 1. A full-size copy of this Ozomap, for students to work with, can be printed from the file *Ozomap for Guessing Two numbers.pdf*.

With Evo at the start location, Evo is turned on by pressing the button once. Then the button is double-pressed to start the OzoBlockly program. Evo's top light turns white, and then Evo moves to the first red vertical bar where he stops momentarily. The student selects the two requested numbers. At each of the next four red vertical bars, the student does the math requested on the horizontal line where Evo stops.

When Evo reaches the next to the last red vertical bar, Evo asks for the result of the math operations. The top light will be red for three seconds, during which the student tells Evo the hundreds digit in the results. One press means the digit is 1, while no presses means the digit is 0. The top light then turns green, and the student has seven seconds to press the button the number of times corresponding to the tens digit. Finally, the top light turns blue, and the student has seven seconds to press the button the number of times corresponding to the ones digit. Evo then speaks the result as a confirmation that the student did not make an error when entering the digit values. If the student did make an error, Evo will need to be turned off and restarted at the start location on the Ozomap.

Note that with each press of the button, Evo will quickly flash white to confirm that Evo has recognized the button press.

When Evo reaches the horizontal line at the bottom of the Ozomap, he will speak the value of each number originally selected by the student.

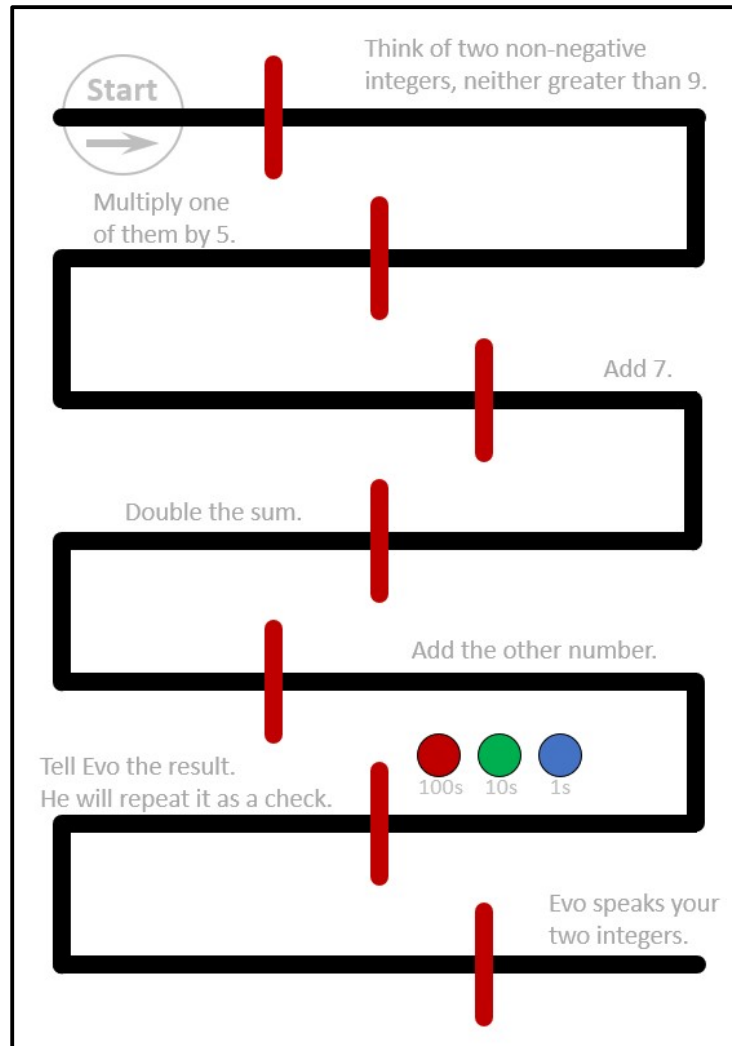


Figure 1

Using a little bit of algebra and some logical thinking, the student should be able to explain how Evo was able to guess the two numbers.