

Learning Math Facts Through Pattern Recognition

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Introduction

Recognition of patterns is something that humans generally excel in. Even a baby uses pattern recognition without any conscious effort when learning language from words spoken to the baby. When a child starts going to school, it learns how to behave via pattern recognition. When starting a new job, an employee learns patterns needed to function properly in this new role. Pattern recognition appears to be at the center of our attempts to understand the universe in which we live.

The main goal of pattern recognition is to gain knowledge about a particular domain. Pattern recognition is essential in helping students gain confidence as well as competence in courses that they take in schools. This lesson gives students an enjoyable way to learn some lesser known, but very interesting, math facts by the way of pattern recognition.

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 be achieved by pattern recognition. This number guessing problem was published back in 1942, four years before the first electronic computer, by Maurice Kraitchik in his book *Mathematical Recreations*. This problem has now been redesigned as an exercise making use of Ozobot Evo. Students let Ozobot guess a number and are then asked to use logical thinking to discover how Evo accomplishes this.

The Number Guessing Problem

A person is given a list of numbers, asked to select two of them, and not tell what the numbers are. The person is then told to add the two numbers and cancel any digit in the result. The *uncancelled* digits are then added together. This sum is then revealed. The task is to determine the digit that was cancelled.

Working with the OzoBlockly Program

The OzoBlockly program *GuessCancelledDigit.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 the Cancelled Digit.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. The top light then turns red. The student selects the two requested numbers and presses Evo's

button to send him on his way. At each of the next three red vertical bars, the student does the math requested on the horizontal line where Evo stops. After doing the math each time, the student presses the button to send Evo on his way to the next red vertical bar.

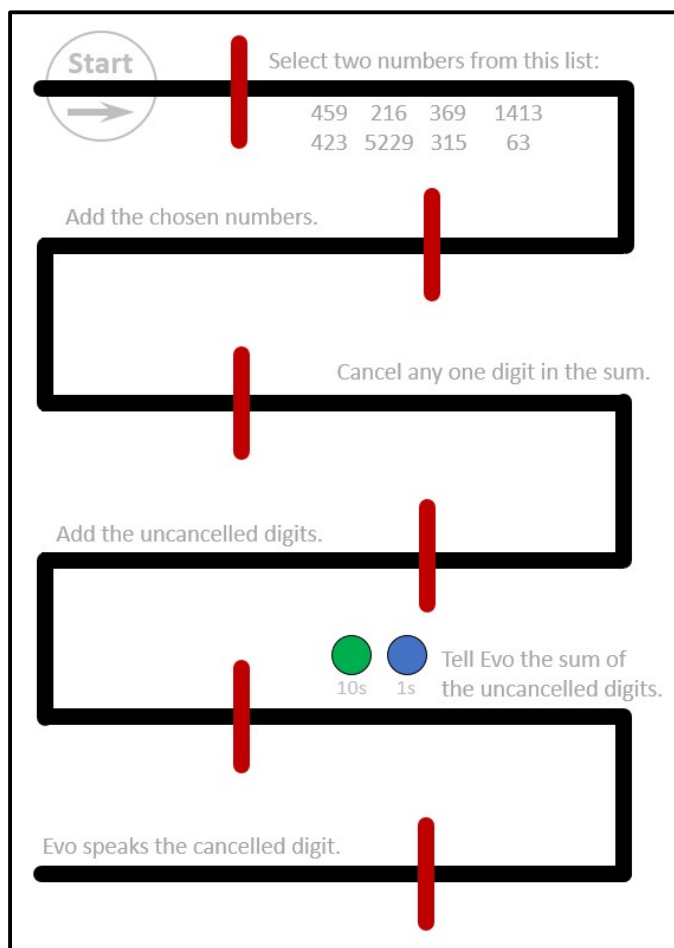


Figure 1

When Evo reaches the next to the last red vertical bar, Evo wants to know the sum of the uncanceled digits. The top light then turns green, and the student has five seconds to press the button the number of times corresponding to the tens digit of the sum. One press means the 10's digit of the sum is 1, while no presses means the digit is 0. 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 of the sum. 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 the cancelled digit.