Mathletes Problem of the Week #23

Autobiographical Numbers

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This week we are exploring **autobiographical numbers**, which are numbers that describe themselves. The first digit says how many 0s are in the entire number; the second digit says how many 1s are in the entire number; the third digit tells how many 2s are in the entire number, and so on. The number 1210 above is an example of an autobiographical number because its first digit tells us the number has one 0, the second digit tells us the number has two 1s, the third digit tells us the number has one 2, and the final digit tells us the number has zero 3s.

- a. There is one other four-digit autobiographical number. Can you find it?
- b. There is exactly one five-digit autobiographical number. Try to find it.
- c. Let's think smaller for a moment. Can you find a one-digit, two-digit, or three-digit autobiographical number? If so, how many are there? If not, why not?
- d. Now, let's think really big. Can you find the only ten-digit autobiographical number?
- e. Take a look at the **digit sums** of each of the autobiographical numbers you've found. (A digit sum is the sum of all the digits in a number.) What do you notice? Can you explain why this is happening?

Solutions & Explanations: (Try one or try them all! Record your solutions and explanations below or on the back.)

Name _____   Class _____

(First and last name, please!)   Solutions due: June 5th