

Nine Digits Puzzle

Here is a neat little series of problems, suitable as a whole class activity. Depending on the depth to which you go, it is suitable for students from grade 3 to grade 12.

Tear a piece of paper into 9 bits, On each bit of paper write one of the digits from 1 to 9, so each bit of paper has a different digit written on it.

1. The first problem is to use the 9 bits of paper to make three 3 digit numbers such that the sum of the smaller two numbers equals the larger number. Here is an incorrect attempt.

$$\begin{array}{r} 347 \\ + 265 \\ \hline 819 \end{array}$$

This is incorrect because $347 + 265$ doesn't equal 819. In fact, it was not even close.

2. The class should find as many solutions as possible. As they are found, they should be recorded on the board.
3. After some solutions are found, the class can start to search for patterns in the answers and make conjectures.
4. Students should then search for counter-examples, trying to disprove any conjectures.
5. For conjectures that survive this search, students can use the conjectures to find more solutions.
6. How many solutions are there? Can the class find all of the solutions?
7. For any conjecture, the students should try to prove algebraically that the conjecture must be true.
8. Can the class prove that they have found all of the solutions?