

More Digital Delirium**1. Digital Inequalities**

Write each of the digits from 1 to 9 in the boxes below so that all the inequalities are satisfied

$$\square < \square < \square > \square < \square > \square < \square < \square > \square.$$

Prove that the digits can always be inserted to satisfy the inequalities no matter what string of inequalities are given.

2. Building Primes

Use each nonzero digit 1, 2, 3, . . . , 9 exactly once to build three prime numbers whose sum is less than 1000. If A , B , and C are such prime numbers, what are the possible values of $A + B + C$?

3. Big Numbers

- (a) What is special about the number 8549176320.
- (b) What do the following three numbers have in common: $a = 3076521984$, $b = 3718250496$, and $c = 6398410752$?

4. Fabulous Fractions

- (a) Find four different decimal digits a, b, c, d so that $\frac{a}{b} + \frac{c}{d} < 1$ and is as close to 1 as possible. Prove that your answer is the largest such number less than 1. Trouble getting started? Try this with just two digits: make a/b as large as possible but less than 1.
- (b) Thanks to Sam Vandervelde for this problem. Use exactly eight digits to form four two digit numbers \underline{ab} , \underline{cd} , \underline{ed} , \underline{gh} so that the sum $\frac{\underline{ab}}{\underline{cd}} + \frac{\underline{ef}}{\underline{gh}}$ is as small as possible. As usual, interpret \underline{ab} as $10a + b$, etc.
- (c) Use exactly eight nonzero digits to form four two digit numbers \underline{ab} , \underline{cd} , \underline{ed} , \underline{gh} so that the sum $\frac{\underline{ab}}{\underline{cd}} + \frac{\underline{ef}}{\underline{gh}}$ is as small as possible. As usual, interpret \underline{ab} as $10a + b$, etc.
- (d) Find six different nonzero decimal digits a, b, c, d, e, f so that $\frac{a}{b} + \frac{c}{d} = \frac{e}{f}$.
- (e) Find six different nonzero decimal digits a, b, c, d, e, f so that $\frac{a}{b} + \frac{c}{d} + \frac{e}{f} < 1$ and the sum is as large as possible.