Math Circle 10/23/2017 Meeting: Logic, Part I

The Rules

Each puzzle below represents an arithmetical statement. In other words, in a single puzzle a P might represent the digit 4, and if so, then it represents a 4 everywhere in the puzzle, and no other letter will have that value. But the value of P can be different in different puzzles. If we write AB, we mean the integer with tens digit A and units digit B. That is, juxtaposition of letters denotes place value, and not multiplication. Multiplication, either of single digits or multi-digit numbers, is indicated with a "×". We assume for this sort of puzzle that there are no leading zeroes (zeroes to the left of the numeral).

Problem 1. HH+HH=OOT

Problem 2.

MA × CA = WWW

Problem 3.

Show that the puzzle BAA + BAA = EWE has no solution.

Problem 4. HEN+E=EGG

Problem 5. DAD+DAD+DAD+DAD+DAD=GLAD

Lewis Carroll Puzzles

Problem 6. A says B lies;B says C lies; C says A and B lie.

Who lies and who tells the truth?

Problem 7. If exactly one of the following is true, which is it?

(a) Puppies are cuter than kittens.

(b) Puppies are cuter than bunnies and kittens.

(c) Puppies are by far the cutest animals.

Problem 8. If exactly one of the following is true, which is it?

(a) 10 year olds are delightful.

(b) 11 year olds are delightful.

(c) Either 10 year olds or 11 year olds are delightful.

(d) Blue is the loveliest color.