1) See if you can use your knowledge of the definition of place value for standard base 10 numbers to work out an explanation for the 1089 trick we saw at the beginning of class. Recall that one starts off with a three digit number. Then one reverses the number, subtracting the smaller from larger. Next one reverses this resulting number (it should be a three digit number still) and adds those together. The result is 1089 no matter what three digit number you start with. Suppose 824 is chosen. Then 824 - 428 = 396. Next add 396 + 693 and you end up with 1089, as predicted. Why is this always the case? Good luck!

Note one typically adds one extra caveat when asking for a three digit number from someone to start with - you can specify that the first digit and the last digit differ by at least two from each other - consider a "bad" choice 252 - oops! 252 - 252 = 0, likewise 352 runs into problems with 352 - 253 = 99, just two digits instead of three.

2) Magic squares part two! First (a) just in case you didn't work through this in class, go ahead and finish writing down your own five by five Magic Square using the "up and over/or down" approach we looked at in class.

(b) Next try creating a seven by seven Magic Square using the same approach you used to create the five by five square - good luck!

3) Now, (a) by modifying your Magic Square from the last question come up with two different seven by seven Magic Squares (i.e. ones that you couldn't get by just rotating or flipping the one you came up with in the last question

(b) Finally see if the "up and over" approach can be used to create a four by four magic square - you'll need to pick a place to start with the "1" You'll find out that no matter what you do, it won't quite work out(!) - how close does it get to creating a magic square?

Bonus - see if you can alter the "up and over" approach so that you do in fact create a legitimate 4 by 4 square - keep in mind Adam's observations about where each run of four consecutive numbers starts in the square (i.e. the runs starting on 1, 5, 9, and 13) - good luck!

4) Just for fun - you've got to read the following **Stamps with Magic Squares** (!) article - why don't we

have such a stamp in the U.S.?! For this problem please just vote on your favorite stamp on the discussion board (you can't see each others' votes until you submit your own entry) - I'll let you know what the class favorite was!

5) In class we looked at a couple of examples of students' work for an addition problem (Michael and Kiku). Kiku used something that looked like a number line, but that didn't actually have numbers on it to start with. Following up on this approach, please read the following article **The Empty Numberline**. After reading the article please go to our class discussion board and add a comment either about one of the article's points about reasons for using the empty number line with students in math classes, or responding to concerns about its possible misuse. I've kicked things off with a brief opening statement/question. Please fee free to add your own opinion about its use - would you consider using this approach? You can either start your own comment, or respond to someone else who might have already made the point you were hoping to make.

6) Next, your last(!) foray with Martian symbols. Using the addition chart that you created for the Martian number system, use it to work out the following **Martian Subtraction Problems** (some will look a bit familiar from class problems, and some will involve negative Martian numbers!) Again, please show all of your work as you get to each of the answers (not just the answers themselves as that's somewhat beside the point) - you don't need to write down any textual explanations of what you're doing - just show the symbolic work you do as you work through each of the problems.

7) Revisit the quick subtraction problems that we talked about during class (I'd asked you to quickly solve the problems: 29 - 7, 52 - 48, 52 - 19, 69 - 31). This time, come up with your own examples - create three "quick" subtraction problems and for each one show two different ways that a student might do the problem in their head, briefly explaining their solution. Try to pick your examples to show off as many different solution methods as possible.

8) And one more, brief, reading. At one point in class I wrote down the set {0,1,2,3,...} and called them the "Counting numbers" but that label typical refers to the set {1,2,3,...} that doesn't include zero. These sets are sometimes referred to as the "Natural numbers" or "Whole numbers" and, again, you'll see texts that sometimes include zero with these sets, and some that don't (i.e. these labels are ambiguous in terms of zero). Please read this short article from the early 1970s **Number Definitions** to see that this issue has been around for quite some time! Afterwards, thinking about the points it makes about the difference between definitions that research mathematicians use and what students and teachers use, then see if you can come up with a reasonable definition of the set of rational numbers (e.g. fractions) that could be shared with middle school students - a definition that balances mathematical rigor with understandability (you should include the question of when two fractions represent the same number, and looking out for dividing by zero) - as a teacher one is always making such choices in how we speak with our students!

As a (non) example - "A fraction is something like a number over another number" is too simplistic a definition as there are too many holes in this - what kind of numbers? What does it mean to be "a number over another number?" etc.

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