Math 105

Supplemental Homework

Number

A1. Consider the following game. We deal an ordinary deck of 52 cards, and each of us gets 26 cards. We simultaneously turn up a card. If both cards are black, you get them. If both cards are red, I get them. If they are different colors, they are discarded. The process is repeated until all the cards are used. You get $5 if you have won more cards. I get $1 if you haven't. Is it profitable for you to play the game with me? Explain.

Place Value

A2. In the lettered number system in "A Place of Value",

a. Count from FFD to A0AB
b. What number comes after CFEF? After FEFF? Before DC0? D0C0? DC00?

A3. Suppose we used our usual symbols (0, 1, 2, etc.) for quantities, but each bundle had x objects (instead of ten or seven). What would be another way to write the numeral 45032 in terms of x?

A4. Suppose the ban on the usual symbols in "Place of Value" #2 has been lifted. You may now once again use the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. However, because of the rubber band crisis in our country, there is a new bundling rule that says you must bundle later than ten. This many sticks now comprises one bundle:

||||||||||||

Keeping in mind that there can only be one symbol in each place of a numeral, what must be done before you count a bunch of sticks?

a. Count from 0 to 23 in this system. Count from 96 to 110 in this system. Be sure to describe your decision-making process.
b. What is the symbol for the quantity that comes right before 400? 4690? 4010? 4900? Be sure to describe your decision-making process.

A5. Comment on the differences (pros and cons) of learning about place value with sticks/rubber bands, base ten blocks, an abacus, coins, or a calculator.

Intro to Integers

A6. Suppose each red chip represents -1 and each black chip represents +1. Using chips, represent 11 in three different ways. Represent -3 in three different ways.

A7. Sam thinks that -4 is greater than 3 because 4 red chips are more than 3 black chips as well as -4 is further away from zero than 3 on the number line. In two different ways (e.g., chips, realistic story context, number line, etc.), help Sam recognize why 3 is actually greater than -4.

Decimals

A8. What if we wanted to be more precise in our counting (e.g., we want to quantify how many pounds and partial pounds of sand we have). How can the system be extended (might want to replace 0-A-F with 0-6 here) with places to the right of the "ones" place, yet still be consistent with the rules for counting you developed in parts a and b. What would the numeral 6403.405 represent in your usual "base ten" notation (you may use fractions)?)

Addition and Subtraction Algorithms:

A9. Using the "Base Thirteen" place value system (Allowable symbols before bundling are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C), find the following sum and difference. Be sure to describe your decision-making process:

a. 5C8 + 99B6

b. 80A5 – BA9

Addition and Subtraction of Integers

A10. Use a story, chips, and the meaning of addition to show why it makes sense to define (-3) + (-9) to be -12.

A11. Make up and solve two story problems, one using take-away and the other using missing addend subtraction, to show why it makes sense to define 5 - (-7) to be 12. Use chips and a number line to illustrate your solution.

Multiplication of Integers

A12. Make up and solve a "Checks and Bills" Mailing problem to show why it makes sense to define 8 x (-3) to be -24. Solve it using chips and a number line.

A13. In three different ways, show why it makes sense to define (-6) x (-3) to be 18. You are *not* allowed to use commutative or associative properties of multiplication.