Lesson 8 October 27, 2009 BMC Elementary

1. We started with the short logic problem. Kids looked tired (the middle of semester), and obviously the first problem did not look short – too much reading. For this reason I retold in my own words the content of the problem and outlined the hidden information that John and Peterson are different people. The rest of the problem went easily. The second problem was not discussed in class.

2. We draw again coded pictures. The codes are contained in the second set of the handout, posted in the Lesson 2.

3. The next activity was to fill in the entries of addition and multiplication table, and to look at some patterns in the table. I thought that the addition table would be very easy for kids, but it turned out that, that just writing of the numbers takes a lot of time. Also, some kids did coloring in a very sketchy way, and others put a lot of effort in each box. Soon we were split into two groups: kids that already finished coloring of the first table, an kids who were still writing numbers. We briefly went over the multiplication table and went to the next set of operations: tropical addition and multiplication.
For parent's reference: such operations indeed exist in mathematics, they are called tropical operations. I changed the words a "tropical addition and multiplication" to "banana" and "sun" (these terms do not exist in tropical mathematics ☺) – to avoid confusion. I was wondering, if these notions wiould be too abstract or too easy for our participants, and it turned out that both: each class split into two parts, one consisted of kids, who easily manipulated with new operations, and the other part looked a little bit puzzled. But everyone completed the table of "banana" operation and colored the required numbers easily.

SHORT LOGIC PROBLEMS

1. John, Karl and Peter take the same bus every day.
 Once John told to his friends:
- How funny, our last names are Johnson, Karlson and
    Peterson!
- But nobody from us has the first name that would sound
like his last name! – Exclaimed another boy, - for example,
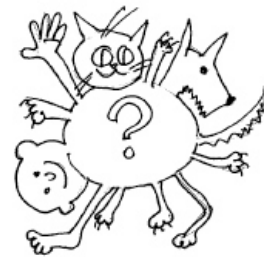my last name is Peterson!
    What are the full names of the boys?

2. Today I saw in the park some
people, some cats and some dogs.
I counted all the heads and all the legs
of all the dogs, and all the cats, and all
the people, and I've got 18 all
together.
And there were two times less cats than dogs.
How many cats, dogs and people did I meet today?

ARITHMETIC OPERATIONS
1. What is a possible rule for filling the numbers in this table?
2. Color every number that is divisible by 3 in red,
3. Color every number that is divisible by 4 in blue.

Table 1

	1	2	3	4	5	6	7	8
1	2	3	4					
2	3	4	5					
3			6					
4								
5								
6								
7								
8								

Table 2

	1	2	3	4	5	6	7	8
1	1	2	3					
2	2	4	6					
3			9					
4								
5								
6								
7								
8								

Answer: addition and multiplication tables

TROPICAL ARITHMETICS
(DEDICATED TO THE PROGRAM ON TROPICAL AND REAL GEOMETRY AT MSRI, FALL 2009)

In the warm tropical part of the world there is a small island. On that island people do not know what is addition or multiplication. Instead, they have their own operations:

✹ ("sun" operation)

🍌 ("banana" operation)

SUN OPERATION

✹ is the same as addition. If you see 5 ✹ 7 that means $5+7$.

For example,

$$5 \text{ ✹ } 7 = 12, \qquad 6 \text{ ✹ } 3 = 9, \qquad 1 \text{✹} 2 = 3.$$

Problem 1. Compute tropically

5 ✹ $3 =$

10 ✹ $10 =$

11 ✹ $1 =$

BANANA OPERATION

The "banana" for two numbers, say 1 🍌 8 , means the smallest of these two numbers (in this example it is 1).

$$1 \; 🍌 \; 8 = 1, \qquad 100 \; 🍌 \; 4 = 4,$$

$$12 \; 🍌 \; 5 = 5, \quad 3 \; 🍌 \; 3 = 3.$$

Problem 2. Compute tropically

$$5 \; 🍌 \; 3 =$$

$$17 \; 🍌 \; 9 =$$

$$12 \; 🍌 \; 18 =$$

Problem 2. Compute tropically

$$(5 \; 🍌 \; 3) \; ✸ \; 2 =$$

$$5 \; 🍌 \; (3 \; ✸ \; 2) =$$

$$(100 \; 🍌 \; 10) \; ✸ \; (10 \; 🍌 \; 1) =$$

Problem 3. 1. Fill in the table for tropical multiplication
2. Color every number that is divisible by 3 in red.
3. Color every number that is divisible by 4 in blue.

Table 3

	1	2	3	4	5	6	7	8
1	1	1	1					
2	1	2	2					
3								
4								
5								
6								
7								
8								