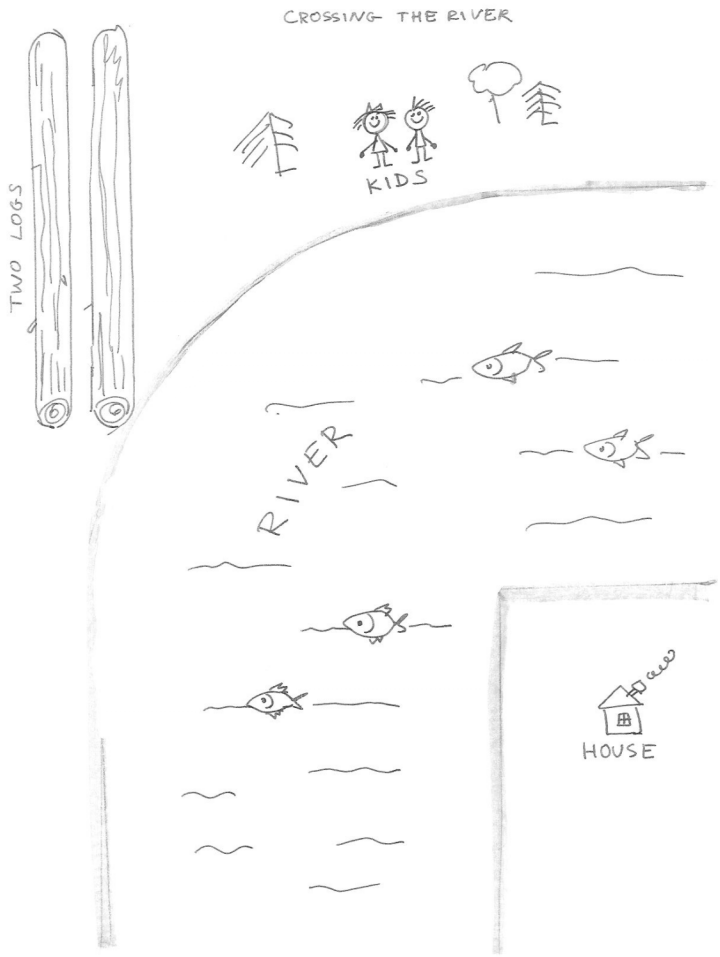
Lesson 5 October 6, 2009 BMC Elementary

Overview.

1. We overviewed the Random maze experiment from last time. Now our goal was to explain, why the Exit 3 was the most popular one. Using the handout with the Random maze, for each crossroad we counted the number of ways that connect the entrance to that crossroad (binomial coefficients). Someone in 6 pm group even recalled the name of Pascal triangle, and one girl in 7 pm group remembered it from her math book (I think, from “Adventures of Penrose Cat”)
2. We computed the sums of numbers in each row of the Pascal triangle. Well, nobody told me that these are powers of two, but we agreed that the sequence looks familiar. And that every next sum is double of the previous one. Someone made a (wrong) guess that these are squares of numbers. After that I reminded that when we computed the number of new branches on our fractal tree, we got the same numbers.
3. The next task was to color all even numbers in a bigger copy of Pascal triangle. In the 6 pm group we refreshed in our minds that even numbers are the ones with the last even (or zero) digit. Since they recalled this fact so easily, in the 7pm group I forgot to talk about that, and this was a mistake – some kids got confused and kind of upset about coloring big even numbers. Also the last numbers in the triangle did not read well. But finally we completed the task, and got a copy of Sierpinski triangle – another remarkable feature of Pascal’s triangle modulo two.
4. We looked at the numbers in the balloons and discussed, which ones are for sure divisible by 3. I explained the test of divisibility by 3 of big numbers by looking at the sum of digits. I do not think that they appreciated it a lot, but again, the first time is just the first time.
5. For the second half of an hour we worked with wooden sticks. Unfortunately, the desks are too small in our room (even smaller than I remembered them), so it was very inconvenient to work with sticks, and we did only the “fish” and “small squares” problem. One of the girls proudly told me that she did similar problem with a house (it was on the sample page posted sometime ago) – that pleased me a lot.
6. We also did the problem with crossing the river. The trickiest part for the instructors was to explain, why you can not just put one stick on the end of the other to make the bridge (in reality, it would sink down). Lena told me, that there was again a question ” How is this related to math?”. To prove that solution works one may need to use an inequality like $2\sqrt{2} < 3$ (of course, this was not in the scope of our discussions with kids).

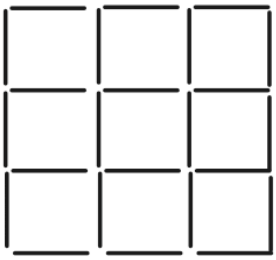
Two logs (a problem with two sticks).
Two kids want to cross the river. They have two logs - the length of each log is exactly the width of the river (see the picture). Help the kids to build a safe stable bridge that they can walk over.



PROBLEMS WITH STICKS

Picture 2. Put away 4 sticks to get 5 equal squares.
Picture 3. Move 3 sticks to get 4 triangles (not all of them are equal).
Picture 4. Put away 2 sticks to get 4 equal squares.
Picture 5. Move 2 sticks and the bead so that the fish would go some other direction.

2.



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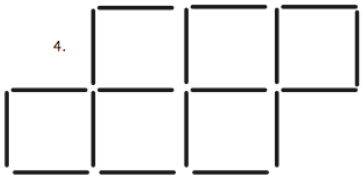
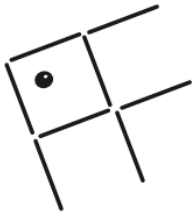
4.

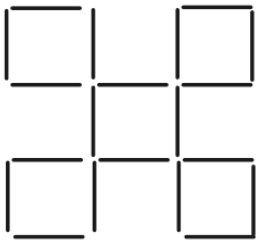


5.



Source: http://children.kulichki.net/igry/matches (in Russian)

ANSWERS

2. 

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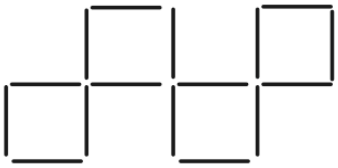
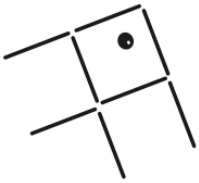
4. 

5. 

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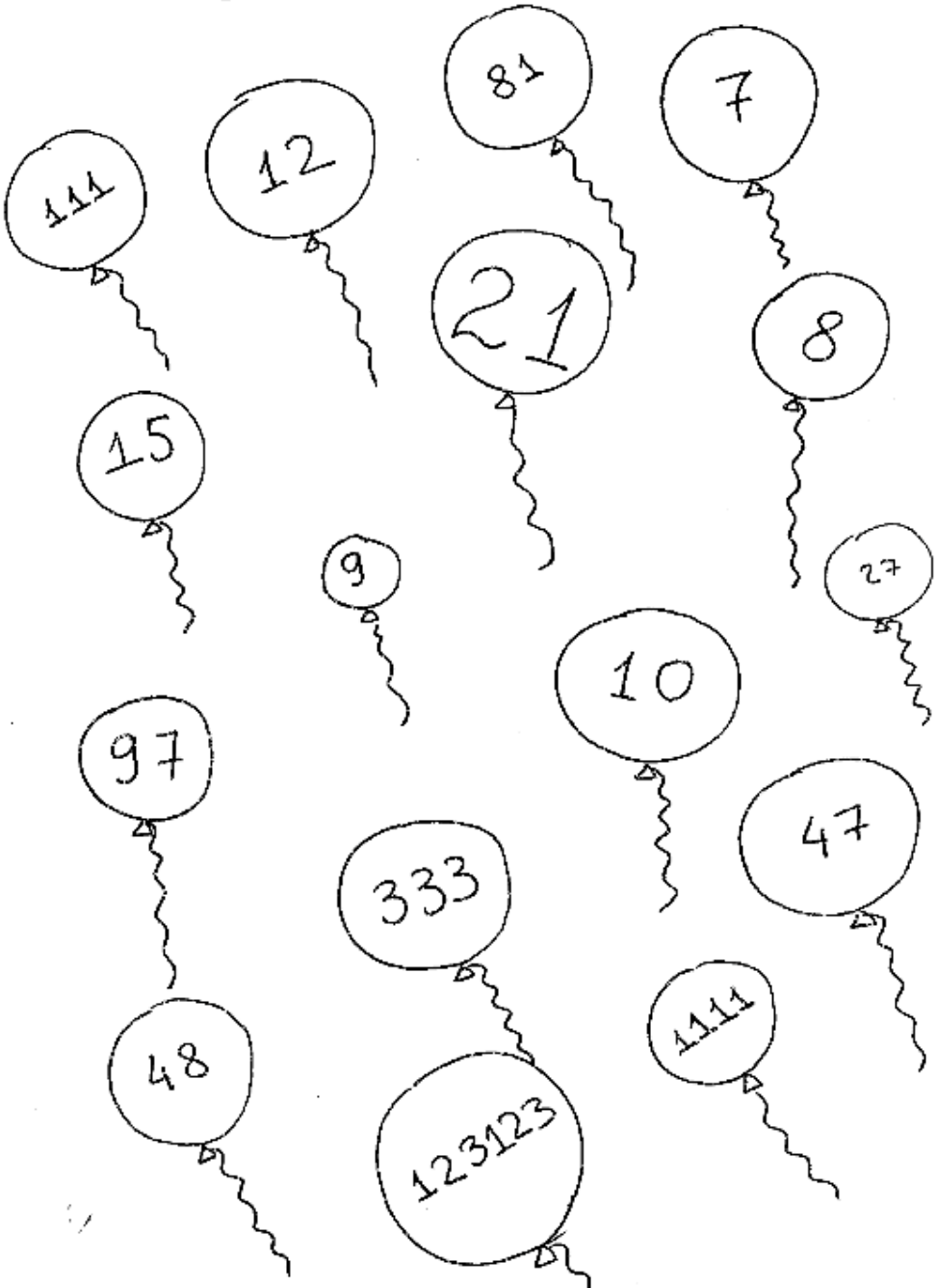
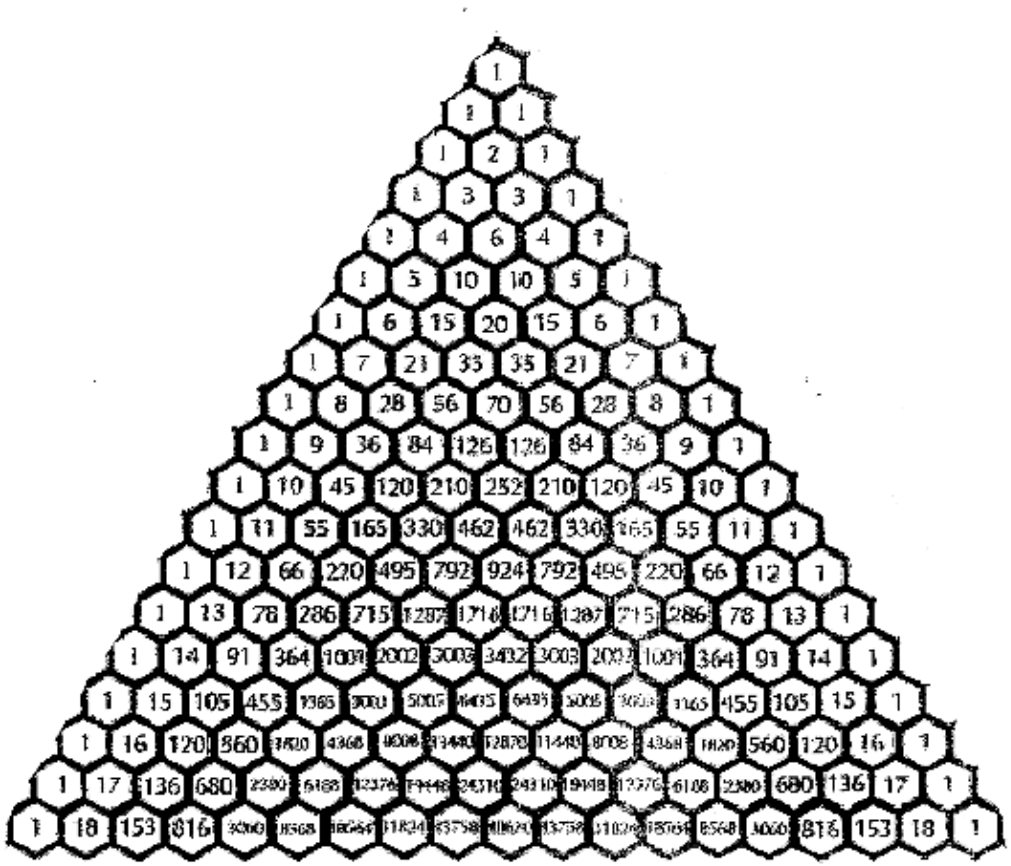


FIND THE NUMBERS DIVISIBLE BY 3

Color all even numbers in the Pascal triangle. What kind of pattern do you see?



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