Lesson 7, October 20, 2009 BMC Elementary

1.Our first discussion was about the game with 16 points on the circle.
Kids asked very good questions. They made a conjecture, that if there is an odd number of points on the circle, e.g. 17, the second player would win. But this is not true: the number of chords in that case will be (7 sides + (17-3) diagonals), an odd number anyway.
Another very good question was the following: what happens if the first player does not follow the strategy with the mirror and does something different. The answer is that it does not matter, what he does in this game – he has no other option but to win.
After all these observations it is natural to consider this game as pointless and boring. I was sure that kids think the same, and I asked them, if they would like to play such game with their friends.
"YES!!!" – was the surprising answer of the whole class. ☺

2. It puzzled me for a long time, why kids get mature for algebra much earlier than for geometry. One could think that it should be the opposite: Eucledian geometry is illustrated with pictures, and algebra is all about abstract variables. . .
On the Lesson 6 we did the experiment with adding the angles of the triangle. Kids obviously did not like it much, at least nobody named this experiment, when we recalled our past activities in the beginning of the Lesson 7. This did not stop me from giving them the second part of the activity – with the sum of angles of a quadrilateral. We overviewed different types of quadrilaterals that we know. As with triangles, experiments with quadrilaterals did not produce much excitement, but everyone honestly completed the task.
After the workshop I made 3 easy puzzles (see below), based on the sums of angles in a triangle and quadrilaterals. The puzzles were given for take-home, we did not discuss them in class.

3. Our last activity was a real hit – we simply made polygons out of K'Nex constructor.

GAME: POINTS ON THE CIRCLE

Sixteen points are marked on a circle. Players take turns and connect on each step two points by a chord. The chords can not intersect each other. The person who draws the last chord wins.
Question: Who always wins and why?

1. Some additional questions that may help to solve the main one:

   Consider the same game but only with 2, 4, 6 … points on the circle. Who will always win? How many chords are drawn during the game? How many chords are drawn during the game with 16 points?

2. Probably, you've got that the number of chords is odd, so the first player always wins. You can try to prove that . One of the possible ways is the following – you can show how the first player should play.

On the first move he may connect two opposite points on the circle. It will serve as a mirror. Then, after each step of the second player, the first player draws a similar chord, which is the mirror image of the last chord of the second player. Then whatever the second player does, the first player can always repeat that.

These puzzles are based on the property that the sum of the angles in a triangle is 180, and a sum of angles in a convex quadrilateral is 360.

1. Cut the triangle, the rhombus and the square along the red dashed lines and rearrange pieces to get pictures on the right.
2. Make your own puzzles like these ones.