

*The Global Math Circle presents:*

# Adventures in Kenya!

## Teacher Training Institute in Nairobi



### A big big thank you!

In October 2019, Masake K. LY, one of our Global Math Circle leaders traveled to Nairobi, Kenya, as part of a 5 day Teacher Training Institute, organized in collaboration with Strathmore University, Kenyatta University and the African Maths Initiative (AMI). We would like to extend a big big thank you to all those who made the Institute possible, in particular, Dr. Mary Ochieng (Strathmore University), Dr. Marguerite Khakasa (Kenyatta University) and Michael Mumbo, Patrick Njoroge, Letitia Christine and Maxwell Fundi from (African Maths Initiative). We would also like to thank everyone at the Global Math Circle and Ketan Banjara, a long time Math Circle Parent, who initially planted the seed for this trip.

Below is Masake's account of the adventure!

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What does it mean to be human? How do we answer the big questions of life: of how to live, how to love, how to make meaning and seek truth, while dealing with so much uncertainty?

You might be wondering what these questions have to do with mathematics or circles. Yet these are the guiding questions which lead me to the Math Circle, to believing in its mission and to traveling over 5000km last Fall to share math circles with adults and children, teachers and students, in Nairobi, Kenya.

After months of planning, The Global Math Circle and our partners at the Institute of Mathematical Sciences at Strathmore University and the African Maths Initiative finalized all the details for a one week Math Circle Training Institute to introduce 24 educators (across university, secondary and primary levels) and 50 students to the mission, vision and especially, the practice of the Math Circle. Dr. Mary Ochieng, Director of Graduate Research and Training at the Institute of Mathematical Sciences at Strathmore University, was happy to host us on the university campus during the 5 day programs.

### **Where do we begin?**

Like many things in life, the best way to learn what a math circle is to experience a math circle. In the Institutes that Bob and Ellen Kaplan ran for several years in the United States and in Brazil, part of the day was always for participants to be in math circles themselves.

So, on the first day, after customary introductions and several icebreakers, we were ready to begin. There were educators from kindergarten all the way to university faculty, so I had to choose a problem which would be exciting for all. We began with a Tembo Party: how many elephants can I invite to my party, if all the elephants have to be able to join our line dance. In other words, how many elephants can dance on a line segment? (Tembo means elephant in Swahili).

Now, I don't know about you, but I've never seen an elephant dance, let alone a party of them. Neither had the adults I presented this problem to. Yet suspending one's beliefs for a moment is a key ingredient to solving this type of problem - with a little imagination, a willingness to share ideas and listen to those of others, and the humility to self-correct both as individuals and as a collective, math circles open up worlds of mathematical and fantastic possibilities. And while this problem might appear silly to some and *supposedly* obvious to others, it has multiple entry points which go beyond the original question and extend to fields (*math joke*) across mathematics.

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## Equations come after stories

After much laughter and numerous conjectures, we finished our session on the first problem. It was now time to apply the Math Circle pedagogy to a more typical (and perhaps relevant to teachers) “classroom” problem of finding the area of a Trapezoid. Except that we were not finding it as much as we were constructing it, building towards it. For many of us, the study of geometric figures in elementary school usually went something like this: a teacher draws a regular polygon on the board, labels the figure and then proceeds to write down one or two of its key formulas, usually perimeter and area. Once this is done, the students keep practicing variations of the same problem, with different numbers. Maybe there were a few hands on activities to illustrate why and how these formulas were true. But rare are those fortunate souls who had an opportunity to fully construct the knowledge, together with the teacher, rather than receive the knowledge ‘ready made’.

As teachers began to see how math circle could be both imaginative and practical, they were excited about the idea of learning more about how to lead Math Circles. But terror soon set in when the teachers realized that the children would arrive that same day and that they would have to lead math circles. “The best way to learn to lead a math circle is to lead a math circle,” I tried, likely unsuccessfully, to reassure them as they threw worried glances.

‘What kind of strange and unusual punishment was it to put them in front of eager children without a set lesson plan and classroom activities?’ I imagine that these were some of the thoughts running through their minds. Becoming comfortable with uncertainty is a key element of the training institute, and indeed, you guessed it, the best way to learn how to deal with uncertainty is to deal with uncertainty.

The kids arrived after lunch and we had an initial warm up session all together (50 or so of them) while we finished dispatching the assigned rooms for the sessions. It was wonderful to see so many children, our youngest was 4 years old!

Once we split up, there were two groups of 4-6 year olds, one group of 7-8 year olds, two groups of 9-11 year olds, two groups of 12-13 year olds and one group of 14+ year olds. The average number of students was about 10 per group.

I spent most of the first afternoon walking around and observing the different sessions. What I loved most was that all of the teachers had understood the spirit of the math circle: to let the questions guide the discussions and to welcome and appreciate every child’s ideas and conjectures. What was more challenging, of course, was determining whether a problem they had chosen was a good fit for their group.

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At the end of the day, many teachers expressed a feeling of exhilaration! They had survived their math circles and it seemed like the children had had a good time!

Unbeknownst to us, the children had perhaps enjoyed themselves a *little too much*...

### **Can we handle this party?**

For the next few days, we continued our institute in the same format: mornings for teachers to experience math circles and to ask questions about how to lead math circles; and afternoons to “practice” on, or rather, with the children. We covered topics in algebra, geometry and number theory and the links between them. But we were starting to have a problem: we noticed that we (the adults) were beginning to be spread thin.... There were more and more children! What was going on?!

Well, it seems that many of the children who attended lived in the neighborhood near Strathmore University and others were the children of faculty or staff. As the Institute progressed, other kids got wind of our mathematical shenanigans and decided to tag along. We did not have the heart to turn the kids away. Even though this made it much more difficult for teachers to lead their circles and much more challenging for me to go around and observe all of the teachers (I had to take a lot of 5 year olds to the bathroom), we also decided that it was a sign that the math circles were popular. In fact, when we did a proper tally, we had gone from 50 children on Day 1 to close to 90 children on Day 3!

### **Where is the kit?**

One of the more unnerving aspects of the training to the teachers was that I was not providing them with a pot of golden problems, age-appropriate and perfectly chosen for math circles. It took some time, but towards the end of the Institute, teachers realized that even every day topics could be turned into math circles. And while it certainly helps to have advanced knowledge of mathematics, there are wonders to be discovered even in what might be considered the “simplest” of mathematics. The art of asking the right questions is the most important aspect of leading a circle, along with welcoming everyone’s ideas with equal respect and appreciation.

This brings me back to my opening questions. What does it mean to be human? How do we answer the big questions of life: of how to live, how to love, how to make meaning and seek truth, while dealing with so much uncertainty?

Math Circle does not provide explicit answers to these questions, but I feel that it provides a process for discovering and uncovering many of these mysteries, together. We learn to admire others, to appreciate their ideas, to make meaning of shared experiences or observations, to



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consider our differences, to be willing to self-correct and to accept and even embrace the uncertainty that characterizes our human experience.

Our Institute in the Fall coincided with summer break in Kenya, so many of the teachers have expressed a desire to implement math circles come the start of school in early 2020. As I prepare for another trip to Kenya later this spring, I look forward to hearing the stories of the teachers, some of whom have already begun math circles in their living rooms!



Post Institute: a teacher leads a math circle with children from her neighborhood.