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When I was asked by Tatiana Subin to lead a session of the AIM Math Teachers' Circle, I almost refused. I had been asked in the past, but schedule conflicts had prevented me from participating, and I was secretly glad to avoid it. I had many misgivings about leading a session; it appeared to me that it would take special skills that I did not have. One needs to pick a good problem and be dynamic and enthusiastic, but not too helpful. Finally, however, Tatiana talked me into it and I decided to give it a try for the first time.

My first challenge was to find an appropriate problem to present, which I finally found on the [Cal Poly Math Department's Puzzle of the Week web page](#). A problem that caught my eye was to consider the following: Can one remove one of the factorials from

$1!2!3! \dots 99!100!$  so that what remains is a square? It seemed like a good problem, open to generalizations and a number of problem-solving techniques. It is a problem that raises many questions, so I knew it would be a perfect one for an interactive discussion.

When it came time for the session, I gave no hints or lectures, just presented the problem, and then

everyone started working in groups. After a time, I looked over some of the computations and noticed that most of the participants had simplified the problem and were starting to look for patterns. Some

were counting factors; some were trying to group factors; some were doing the smallest cases; but everyone was doing something!

Just to sit silently and watch the problem solving unfold was actually very hard for me. As a college calculus teacher, my instinct was to jump in and help.

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I wanted to give hints or write something on the board or suggest methods of attack. After about ten minutes of watching everyone work, I asked Tatiana if I should start to give hints or summarize. “Why would you do that?” she asked. “Everyone is still working.” As more time passed, I asked the participants if they would like me to go over the answer or to give hints, but everyone chimed in with pleas for more time to continue their own problem-solving approaches. So I waited longer, and soon realized that these teachers were learning by doing; they were busy developing their very strong problem-solving skills. They were trying examples. They were trying the simplest cases. They were talking and reasoning together. They were looking for patterns and generalizing. They were even answering a question that I had not thought about: is there more than one way to do this?

This was in such contrast to my long-time experience in a college classroom, where often the only question asked is, “How do you do number six on the homework?” In my classroom, I often end up talking too much because most students are truthfully not interested. It was so refreshing to see that these teachers were truly having fun with math. It is my hope that future calculus students, if exposed to these teachers from the group earlier in their education, might learn some of their enthusiasm and learn to love math themselves. And, most surprisingly, I found myself having a lot of fun as well. In fact, I found myself wondering why I had waited so long to try leading a Circle in the first place. ☐



Estelle Basor is the Deputy Director of the American Institute of Mathematics. Her main research interests include Operator theory and Random Matrix Theory. [Contact Estelle.](#)

## Links and Resources:

View Estelle's meeting notes and handout from the session she led, “Factorials and Squares,” on [the MTC website](#).

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