



# BLUEBIRD MATH CIRCLE Alliance of Indigenous Math Circles

## Issue 10 Recap

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<https://aimathcircles.org/Bluebird>

**NEWSFLASH** Join LIVE Bluebird Math Circle with friends and family.

August 23rd, 5-6 PM MDT online.

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<https://aimathcircles.org/Bluebird>

## Introduction

At our session, we had a special honored guest. Delaine Tootsie-Chee, a noted Hopi potter, was kind enough to join us and talk to us a bit about her life and her art.

Then we worked on some problems based on the designs on pottery.



## Counting Stars on Pottery Designs

Delaine first gave an interesting account of how she forms a pot. Hopi potters don't use a potter's wheel, yet they get their pots nearly perfectly circular. "Most people use a gourd," she said, "which already has its shape. And it's nice—a half circle. They can use that to shape up their pottery. But for me, I can't. I have to use my fingers. I have to feel the nature of the air bubbles. I need to eliminate the air bubbles as I go along. So I format the way the bowl is shaped. I start with the shape of the bowl..."

Often, a potter will divide the circle of the pot into equal parts. But how does Delaine do this? We asked her how. "I do not use a pencil or a ruler or anything to help me. I just work with the clay. It's the shape of the pot that gives the diameters and tells me how it's going to be equally divided. I use the four directions. I make a line with the paint on the pottery. And when I begin painting, I always consider the first circle as the top circle, which represents unity, you as a person, a whole year, a complete circle. And then there's the second circle with the opening in it to release negativity. There's no geometric measurement. It's what the pottery tells you."

Delaine also mentioned using her fingers or hand to measure out parts of her design. Mary Clarke asked her: "Since potters use parts of their body to measure, does the final product indicate what size individual made the pot?" The answer was yes. So pieces of pottery, sometimes quite ancient, can tell us about their creators.

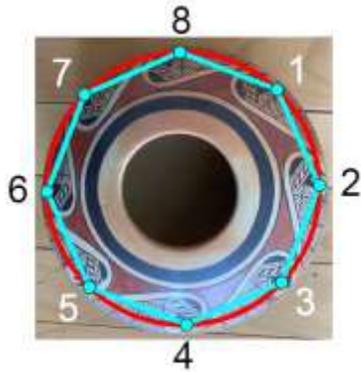
Delaine told us more about her creative process: "If you're working with your pottery, you pick it up and it will talk to you. I am different from other parties, when I pick up the pot, I'll put the yucca brush on it. And starting from there, it's like magic. I really don't have any sketch. I do not plan my designs on the pottery. It just comes to me naturally. For instance, if I make a sequence of eagles, I will use the four directions. I go in between each one after I make dots on the top. I look at the tail part of the eagle and the top of the head. I use the distance between the top of the head and the bottom."

At this point we looked at a pot by one of Delaine's relatives, Fannie Nampeyo. The design on this pot had eight equally-spaced designs on it in the 'migration' or 'bear claw' pattern. Delaine showed us how we could tell where the artist had

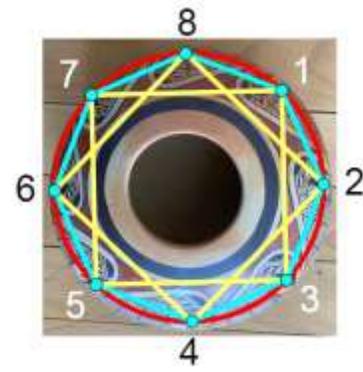
started each copy by putting down her yucca brush.



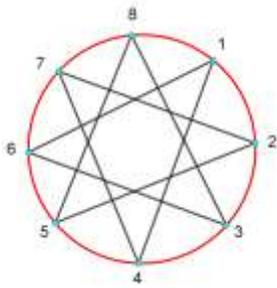
We looked at how we could make stars by connecting evenly spaced points around the circle. We first made an octagon, by connecting consecutive points around the circle:



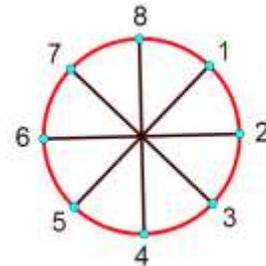
Then, by skipping one point each time, we made a square, then a second square with the points that had been left out:



Then we made a star by skipping two points each time:



Skipping three points, and filling in the skipped vertices, gave us an 'asterisk':



Students worked on these tasks, then discovered that skipping four points gave us the same star that we got by skipping two points, but traced in the opposite direction. Similarly, skipping five points gave us the two squares again, and skipping six points gave us the octagon 'backwards'.

We then looked at a pot by the Zuni artist Anderson Peynetsa. This pot had seven equally spaced figures of a deer:



We started making stars from the seven points given by these figures. It was easy to make a heptagon. We realized that we could not make an asterisk, which would require an even number of vertices. But we explored some other stars on this

We briefly looked at a pot by the Navajo artist Gary Skeets:

pot. Here is a diagram of all possible stars for 2 through 9 points.

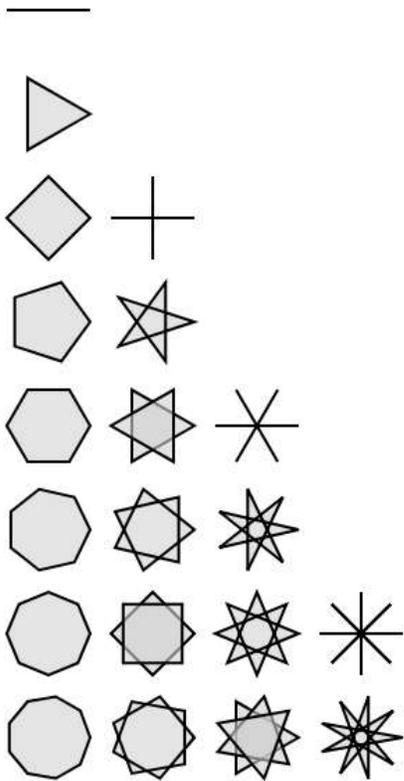
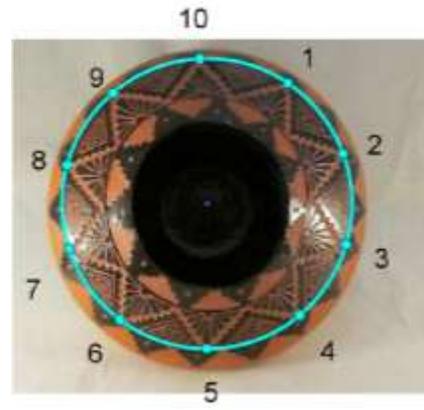


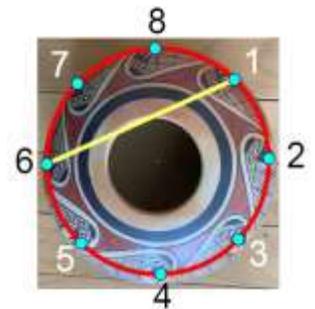
Image: MathCreation.com



This one had 10- and 11-point stars. But we didn't have time to examine these in detail.

Delaine instantly knew how many stars were possible for each number of points. She also explained how a potter sees these invisible star-lines and other auxiliary lines, the pot "telling" the artist how to paint it. For example, the 1-to-6 line and other skip-2 lines are tangential to the opening of this pot.

The following construction, which we sketched in Zoom following Delaine's step-by-step guidance, uses radiuses to determine the position of the thick black belt on the pot:



Delaine called this construction Orion's Belt, after the constellation. "If you ever consider looking at astronomy, that helps. Look at the stars. They help us."

The topic is a rich one for discussion. You can make your own copy of our jamboard here:

<https://jamboard.google.com/d/1AFHzfX4IGszkAqafveGDDI5sQK14jT0kGnXVJYSvhmg/edit?usp=sharing>

Once you make a copy, you and your family or group can sketch your star polygons and discuss the suggested questions.

Can you make stars from the points on this pot (Fannie Nampeyo, Hopi)?

Try skipping every other point, as we did altogether. That is, go from point 8 to point 2, then to point 4, and so on. You will make a star composed of two squares.

Then try skipping two points: point 8 to point 3, then point 6, and so on. (We did this altogether.)

Image: Jamboard sketches by Brianna W., Lila A., and other math circle participants

Share your ideas with other Bluebird Math Circle participants at <https://aimathcircles.org/Bluebird>

## New Questions for Bluebird

*Is it possible to have a certain number of points on the circle, so that when we start at a point and keep skipping the same number of points, we keep going forever, never coming back to the starting point?* – from Tatiana Shubin

**BLUEBIRD SAYS**—Curious question. I will fly around and seek an answer. Watch this space in the next flyer!



Submit your math-related questions at <https://aimathcircles.org/Bluebird>