

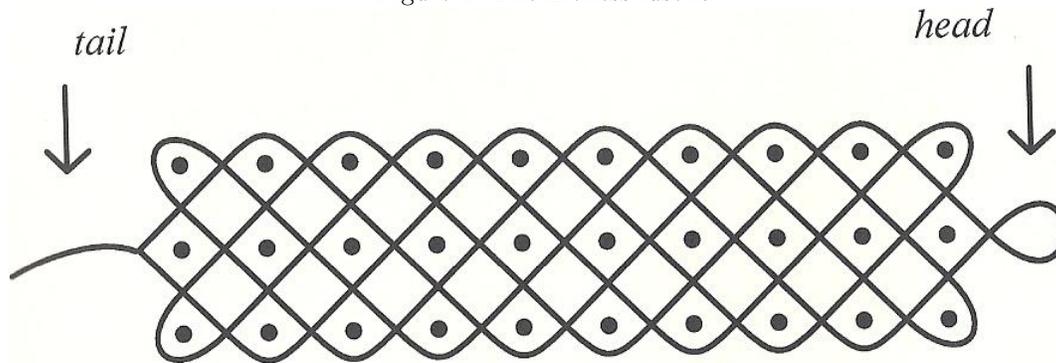
The mathematics of Sona (sand drawings from central Africa)

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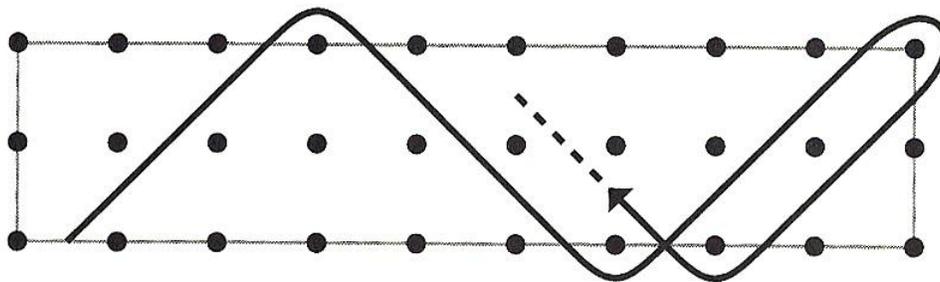
The sona (singular: lusona) are a kind of storytelling art used by the Chokwe people of Angola, Zambia, and the Democratic Republic of Congo.¹ Here is an example of a lusona:

Figure 1: The Lioness lusona



Sona are drawn by first clearing a bit of sand, then placing an array of dots with the finger tips. Then a line is drawn at a 45° angle, “bouncing” off of the boundary at 90° angles:

Figure 2: Drawing the Lioness lusona

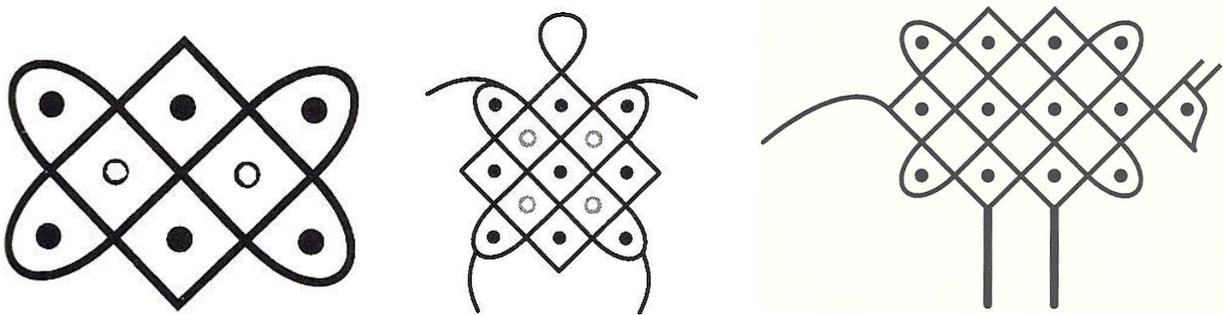


Then extra features, such as the head and tail above, are added last.

¹The idea for this presentation was taken from a presentation outline by Jane Long at Stephen F. Austin State University, and much material was taken from the webpage of Darrah Chavey at Beloit College.

Here are three more sona. In the tortoise and friendship sona, the open circles are added last, just like the tail, feet, and head of the antelope.

Figure 3: Friendship, Tortoise, and Antelope sona

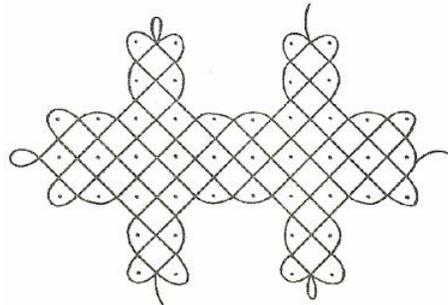


Question 1. *How many intersection points are there when you start with a given rectangular array? How many turns do you have to make?*

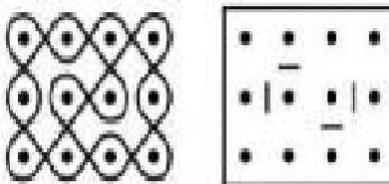
Question 2. *How many lines do you need to make a lusona? When do you only need one line? Does it matter where you start drawing? (Hint: start with rectangular arrays of points)*

Question 3. *What happens to a lusona when you add more points? For example, the Lion With Cubs pictured below is a rectangle with four squares added on.*

Figure 4: Lion with Cubs



Question 4. *Below is a lusona where “mirrors” are used. What does adding a mirror do to the number of lines in the lusona?*



Question 5. *Is there a pattern between the number of intersection points, the number of line segments, and the number of plane regions? Can you prove your observation?*