## MATH CRAFT : STRING ART

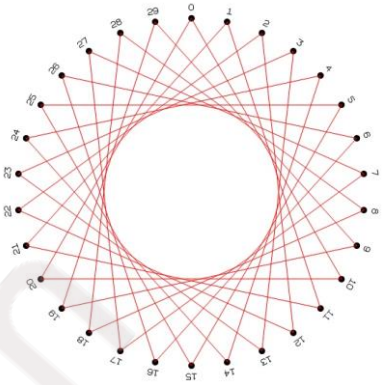

*Figure 1*

This is a DIY activity kit, which can be used to learn/teach mathematics and Artwork. The output is simply MatheMagical, so enjoy. Once completed it becomes a décor or a proud display worth hanging on the wall. Or the strings can be removed and again tried for a different number. Different patterns emerge with different numbers and combinations and different colors of strings and there is no end to creativity or learning with String Art. From creating a simple design to more complex ones the child develops abilities to create various patterns and shapes.

Contents : Printed 30 & 50 hole patterns, 3 frames with 20,30 & 40 holes, threads ( 3 colors ) and Instruction sheet.

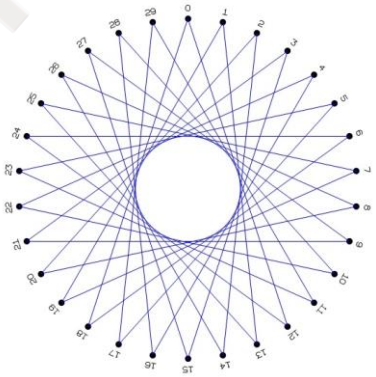

*Figure 2*

**Activity1: Pencil sketch Practice**: Printed 30 & 50 dots pattern sheet is given with the kit. You can download these patterns from https://greamake.com/string-art/ and print more for further practice. Students can use pencil/sketch of different colors to join the dots as per different mathematical rules to generate different patterns.

**Method 1: Addition:** First choose a printed sheet with N dots (say N=30 dots). Start with first dot (dot zero). Add a fixed number K to zero to get the connecting dot. Now draw lines between dots 0→K, 1→K+1, 2→K+2 … up to N-1→N+K. Say N = 30 and K = 10, then draw lines between: 0→10, 1→11, 2→12 … up to 29→39. But wait a minute, there is no 39 in the sheet. So, when number exceeds N, simply do a modulo N! i.e. 39 == 39-30 == 9 (dot numbered 9).

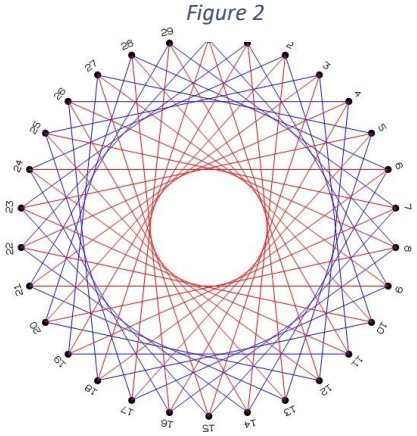

*Figure 3*

Figure 1 shows sample output with N=30 and K = 10.
Figure 2 shows sample output with N=30 and K = 12
Figure 3 shows sample output with N=30 and K = 12, followed by K = 8 with a different color pencil.

**Method 2: Multiplication:** First choose a printed sheet with N dots (say N=30 dots). Start with first dot (dot zero). MULTIPLY a fixed number K to zero to get the connecting dot. Now draw lines between dots 0→0, 1→1*K, 2→2*K, 3→3*K, … up to N-1→(N-1) *K. Say N = 30 and K = 2, then draw lines between: 0→0, 1→2, 2→4, 3→6 … up to 29→58. But wait a minute, there is no 58 in the sheet. So, when number exceeds N, simply do a modulo N! i.e. 58 == 58-30 == 28 (dot numbered 28).

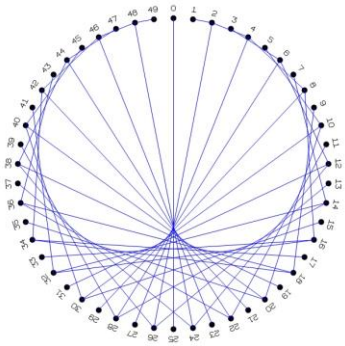

*Figure 4*

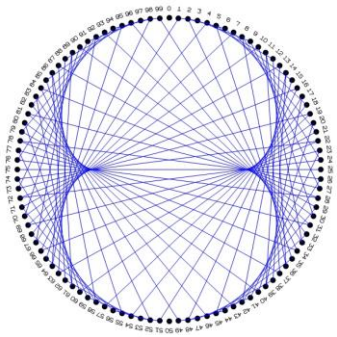

*Figure 5*

Figure 4 shows sample output with N=50 and K = 2.
This pattern is called a CARDIOID (heart shape)
Figure 5 shows sample output with N=100 and K = 3

The output is simply **MATHEMAGICAL !** Different color pencils can be used to see the variations in patterns.

**Activity2: String art:** String art is mathematically same as pencil sketching, except that we use threads/strings to joint the points/holes instead of a pencil line. We use normal woolen/embroidery threads. Unlike pencil, a string can't be lifted out of the paper for jumping. So the procedure is slightly different. Tie the start of the string to the frame at notch 0, and bring the running string to the front of the frame. Pulling the string tight and keeping it taunt all the time will make it easy to work with.

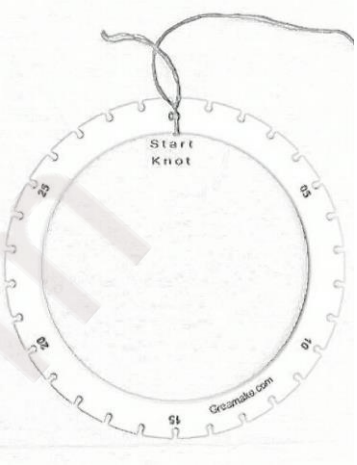


*Figure 6*

Note: Threads can get quickly entangled and hence to be handled carefully. It is better to wind the threads on a spool. If the thread you buy is not wound on a spool, better to find an object (scale/comb etc. will do) and wind the thread on it to form a spool.

**Method1**: 0 – 10F – 1B – 11F – 2B– 12F – 3B – 13F and so on where F means front and B means back. This method is easiest for a kid to do, but uses more thread length to complete. But when doing on a slab, you will notice that while "10 addition star pattern" has formed on front side, simultaneously "9 addition star pattern" has formed on the back side.

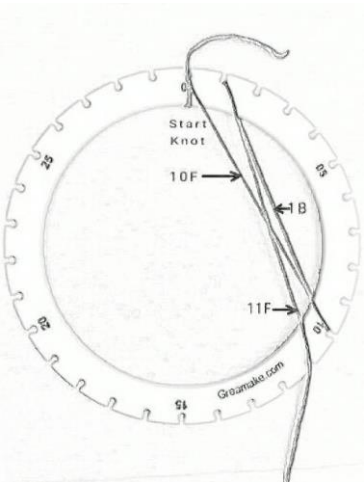


*Figure 7*

**Method2**: 0 – 10f – 9b – 19f – 18b– 28f – 27b – and so on. This method uses lesser thread, but mental arithmetic is little more challenging for a kid. After completing the "10 addition star pattern", you can start another pattern say "12 addition star pattern" using a different color thread. Both patterns will look super imposed and look very beautiful.

**Reference Links**:
For more advanced string art patterns, refer these links:
http://antiprism.com/album/865_string_art/index.html
https://en.wikipedia.org/wiki/String_art
https://hackaday.com/2019/02/23/polar-platform-spins-out-intricate-string-art-portraits

Refer https://greamake.com/string-art/ for more detailed instructions, videos and illustrations and some more advanced mathematical & art tasks for your kids learning and fun! Happy stringing.