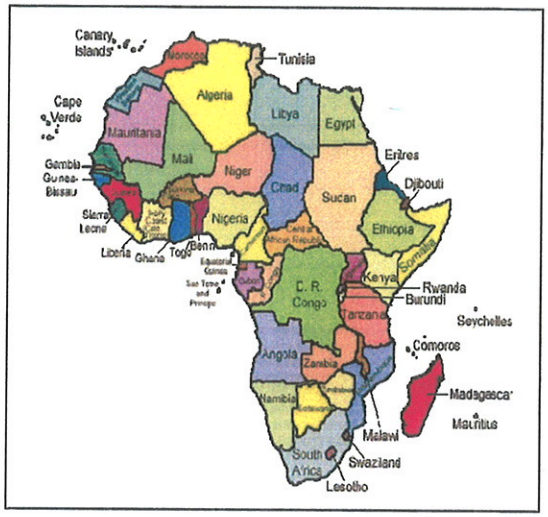
Celtic and African Knots (1)



1. Knots are all around us. List where you might see knots or their uses.

2. Using the grids supplied, practice drawing some *simple* Celtic knots. Colour in your creations.

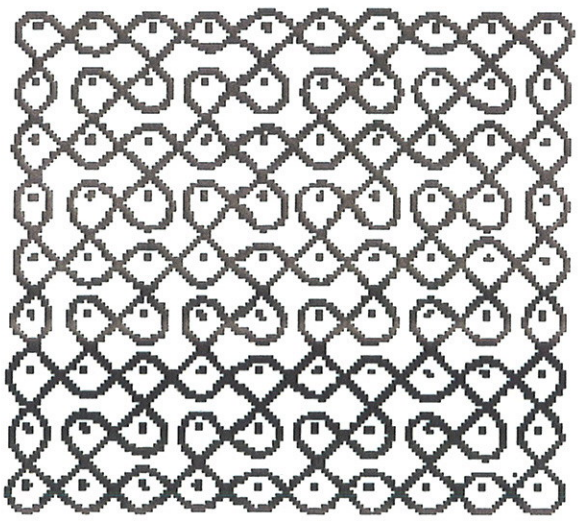
3. Practice drawing some plaited mat Sona pictures.

4. Make up a story based around a Sona pattern.

5. i) Find the highest common factor for the following pairs of numbers
(2, 6), (4, 5), (3, 6).

ii) Taking each pair in turn, draw a simple Celtic knot with the first number being the number of vertical lines, and the second the number of horizontal lines.

iii) Check how many pieces of string are needed for each and verify the rule that is the highest common factor.



Chased Chicken

6. **(Hard)** By making some drawings and thinking about them, investigate how the number of *crossings* depends on the number n of vertical lines and m of horizontal lines. Can you find a general rule? HINT : consider the product of n and m.

Maths Masterclass, 2007 **Chris Budd, University of Bath**

Celtic and African Knots (2)

1) Using the grids supplied, practice drawing some *complex* Celtic knots. Decorate these using stunning colours. (For neatness you can try drawing some of the curves by using a pair of compasses). Think about how you might use symmetry in your designs. (Prize for the best creations).

2) You can also draw a complex Celtic knot in a *circular* grid. One is supplied. Experiment with drawing similar grids and draw ever more exotic Celtic knots.

3) i) Using the mathematical notation I introduced, try drawing the following knot:

{BAAB} {AAAA} {BAAB} or $\{BA^2B\}$ $\{A^4\}$ $\{BA^2B\}$

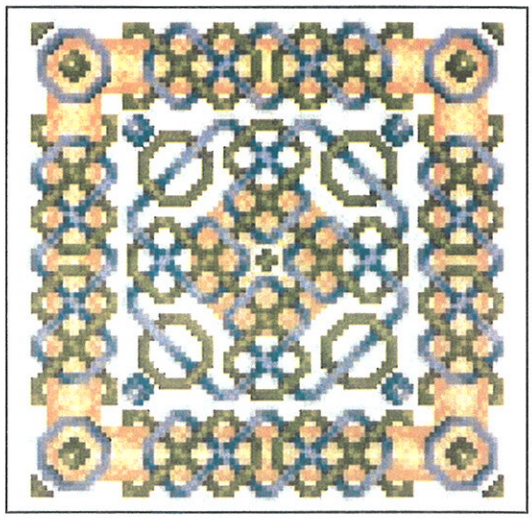
This is called a Josephine Knot (after Napoleon and Josephine).

ii) What symmetries does this knot have?

iii) A more complicated Josephine Knot is given by

$\{BA^2B^2A^2B\}$ $\{A^8\}$ $\{BA^2B^2A^2B\}$ $\{A^8\}$ $\{BA^2B^2A^2B\}$

Try drawing this knot.



4) See if you can design a knot using the mathematical notation first and then draw it.

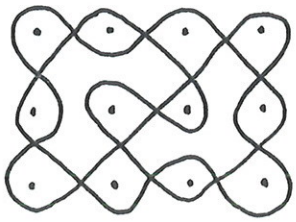
5) i) Draw all <u>three</u> complex knots that you can construct in a grid of 2 squares by 2 Squares.

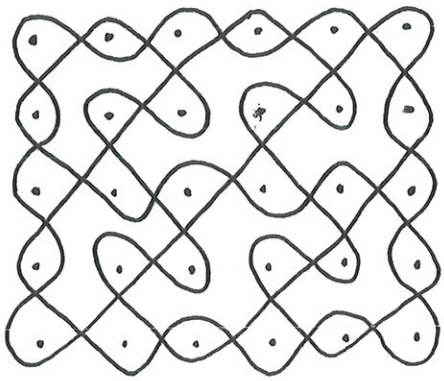
ii) Take several grids with 3 squares horizontally and 2 squares vertically. Draw as many *different* complex Celtic knots as you can in the grids (always following the rules).

iii) How many different possible knots can you draw in this grid? Make sure that you have drawn them all. How many have one string and how many are really knotted?

iv) (HARD). Now suppose that you have a grid with m squares horizontally and n squares vertically. How many different knots can you draw if you keep to the rules? Prize for the best solution.

6) Here are (3, 4) and (5, 6) Chased Chicken designs.





i) What symmetries do these figures have?
ii) Check that you understand the algorithm and using this draw (9, 10) and (5, 10) designs, showing that in each case you get a monolinear design.

7) (Harder) Draw a (5, 4) and a (7, 6) design showing you need 3 and 4 lines respectively.

Illustration from the Book of Kells