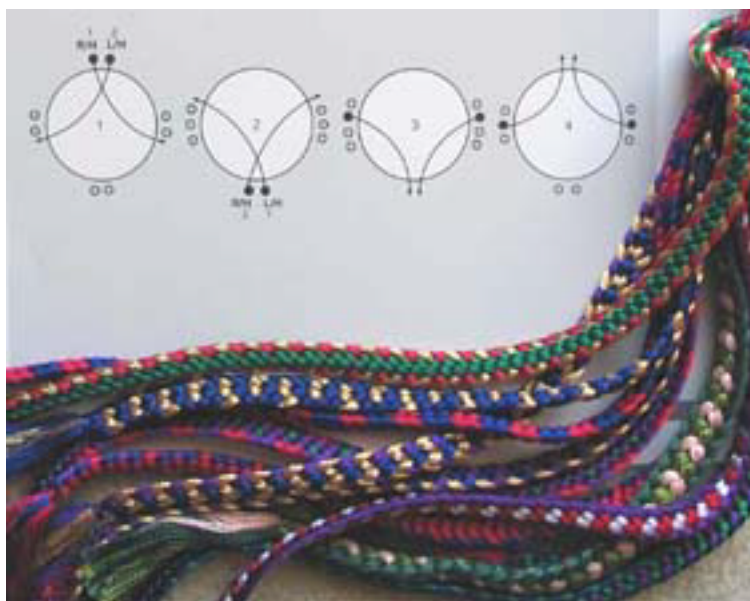# "Colour - by - Numbers"

by Jacqui Carey.

By working different sequences of moves on a Marudai, it is possible to create different braid structures. For each structure, there is a whole range of pattern possibilities. These are created by the different arrangement of coloured threads at the beginning of the work.

The sequence of moves for 8K is illustrated (page 43 in "Creative Kumihimo").
The resulting rounded flat structure can have many different surface patterns.
These are created by having coloured threads starting in different positions.

A braid structure is created through the movement of threads in a particular sequence. Once a sequence has been learnt, it is possible to make many different patterns on that braid by trying different combinations and arrangements of coloured threads. But how does one do this? Well there are three routes that can be taken.

Warp details, braid 4
Bobbin weights: 100g (3½oz)
Weight bag: 300g (10½oz)
● *One rope, blue biron*
○ *One rope, gold metallised biron*

An example of making pattern through instruction (page 58 in the "Beginner's Guide to Braiding").
The diagram shows the initial colour arrangement that will create the pattern shown on the braid sample.

Instruction.
Known patterns can be recreated by following specific instructions from books and teachers.
There are many published solutions, so there is no shortage of designs to choose from.
However, what if you wish to try and find a new, unknown, design?

Trial and Error.
'Trial and error' is the second route for finding pattern variations. New patterns can be
discovered simply by asking "I wonder what will happen if...?" and setting up an experimental
arrangement of colours. This exciting route can lead to many surprises, including the discovery
that seemingly different arrangements can produce the same pattern on a braid!

Prediction.
And so the curious and creative will start to ask questions, which in turn leads to the third route.
This is pattern prediction, a way of being able to control the design and discovery of new
patterns. The grid system in the book "Creative Kumihimo" was the product of an analytical
mind and a background in textile construction, including drafting for complex weaves. BUT, it
is not necessary to understand how the grids evolved in order to use them, merely an ability to
'colour-by-numbers'. It is explained on pages 17 to 21 in "Creative Kumihimo".

What are the grids?
Each unique braid structure has its own unique grid. This is a flat representation of the braid
surface - imagine the braid slit open along its length and the 'skin' removed and laid flat. Each
numbered shape represents a 'stitch' on the braid, with the grid showing one repeat of the
whole structure. The grey lines illustrate any corner edges of the 3-dimensional shape. The grid
can be repeated top and bottom, with the numbered shapes neatly locking into place to give a
longer view of the braid structure. If the grid is folded around, then the two side edges will also
fit snuggly together to form a model of the braid surface.
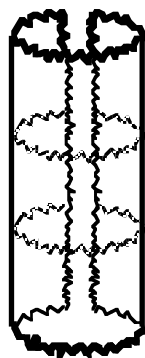
A grid can be repeated top and bottom, as well as joined at the sides,

The grid represents the surface area only, with no internal workings. Do not try to make connections between the illustrated grid and the sequence of moves. The moves are a 3-dimensional action, whilst the grid only shows the 2-dimensional surface of the resulting braid, consequently the internal working of the braid are missing!

The representation of a contoured, 3-dimensional area onto a flat surface is challenging, and compromises must be made. The shapes representing the stitches have been 'squared off' so that they lock neatly together around the whole surface, doing their best to illustrate how each stitch relates to the other bordering stitches.
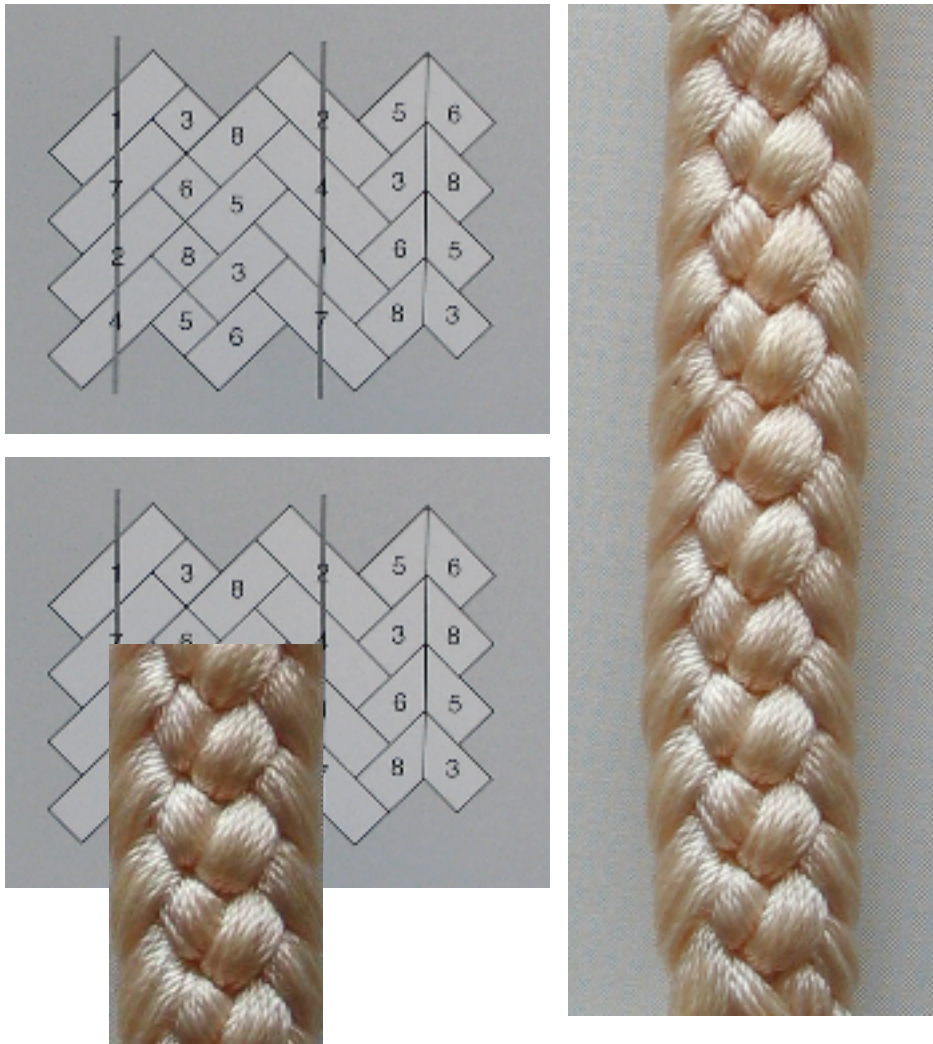

The grid for braid 8K and a sample of the actual braid. The contoured stitches of
the real braid have been 'squared off' in the grid so that they fit together.
Note that the grid shows both sides of the 3-dimensional structure.
The grey lines show the edges, and how the stitches fold around onto the other side.

The numbers inside each shape relate to the starting position of the bobbins. At the start of work, each bobbin is designated a number (shown in detail on page 26 of Creative Kumihimo). The corresponding number in the shapes shows the stitches that bobbin creates as it works its way across the surface. It is therefore possible to observe the result of having a particular colour on a particular bobbin.
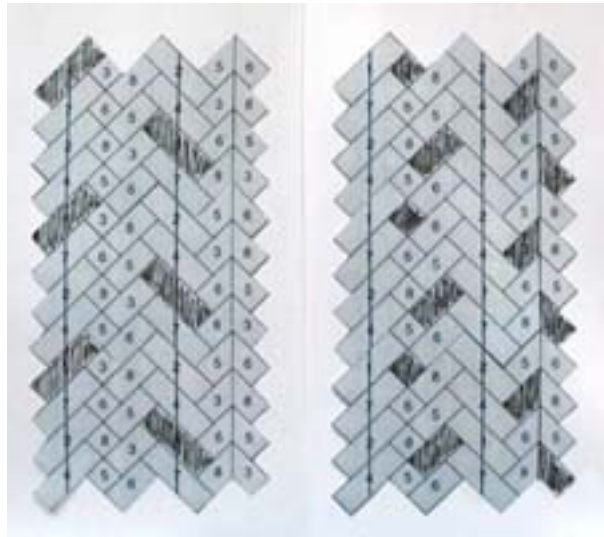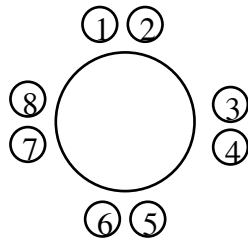
Each bobbin is designated a number which corresponds to the numbers in the grid.
This shows the stitches that will be created by that particular bobbin.
For example 8K is shown. If bobbin number one is black, then the resulting braid
will have black stitches appearing on both outer edges of the braid.
However, if bobbin number three is black, then the black will
appear on the central ridges of both sides.

This ability to predict the path of the coloured threads allows you to play around with colouring pencils to test out and discover new patterns. This is done by filling in the initial colour layout, then the corresponding numbers on the grid, revealing the pattern it will produce. Alternatively, the grid can be filled in first, then the corresponding initial colour layout, thus revealing the set up required to produce the design.

Further Mathematics?
For those who wish to pursue the matter a little further.....
The grid also reveals some of the characteristics of a braid. Braids are made from bobbins interworking together in different ways. Clues to their structure, and the relationships between the bobbins, can be revealed in the grid. These can be found by looking at the arrangement of the numbers within the grid (see page 20 and 21 in "Creative Kumihimo" for more details on how to look for these). Understanding these relationships can help in the designing process, as it can highlight possible solutions to patterns.

The grids are also the key to unlocking ALL pattern possibilities. By looking at combinations and permutations, all the possible solutions for a given set of circumstances can be found. Again, it helps to understand the relationships between the numbers in the grid.
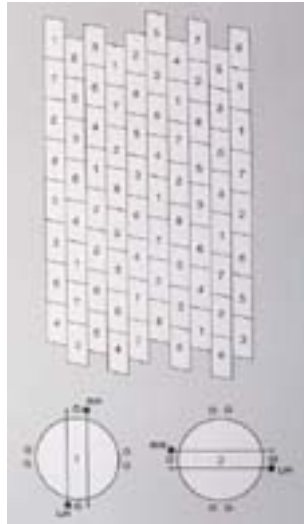
This is the grid and sequences of moves for braid 8B.
This was an interesting one to draw as the grid seems far too long
for a sequence that repeats after two moves. The braid is formed from
two sets/teams of bobbins that all circulate on the Marudai in a
clockwise direction. This adds a torque/twisting force to the braid
which sends the stitches skidding off at an angle. The visual result is
of stitches do not sit neatly on top of each other but gradually spiral around
the structure, before finally making a repeat that will lock together top and bottom.

These are all the pattern possibilities for 8B, using just two colours.....

The solutions are given below, with the numbers referring to the intial colour layout.

Ratio 8:0
Mauve = 1,2,3,4,5,6,7,8
Purple =

Ratio 7:1
Mauve = 2,3,4,5,6,7,8
Purple =1

Ratio 6:2

Mauve = 3,4,5,6,7,8	Mauve = 2,3,4,5,6,7,8	Mauve = 2,4,5,6,7,8	Mauve = 2,3,5,6,7,8
Purple = 1,2	Purple = 1,5	Purple = 1,3	Purple = 1,4

Ratio 5:3

Mauve = 3,4,6,7,8	Mauve = 4,5,6,7,8	Mauve = 3,5,6,7,8	Mauve = 3,4,5,6,8
Purple = 1,2,5	Purple = 1,2,3	Purple = 1,2,4	Purple = 1,2,7
Mauve = 2,4,6,7,8			
Purple = 1,3,5			

Ratio 4:4

Mauve = 5,6,7,8	Mauve = 4,6,7,8	Mauve = 3,4,6,8	Mauve= 5,6,7,8
Purple = 1,2,3,4	Purple = 1,2,3,5	Purple =1,2,5,7	Purple = 1,2,3,4
Mauve = 3,5,6,8	Mauve = 4,5,6,8	Mauve = 3,5,6,7	Mauve = 2,4,6,8
Purple = 1,2,4,7	Purple = 1,2,3,7	Purple = 1,2,4,8	Purple = 1,3,5,7

Ratio 3:5

Mauve = 1,2,5	Mauve = 1,2,3	Mauve = 1,2,4	Mauve = 1,2,7
Purple = 3,4,6,7,8	Purple =4,5,6,7,8	Purple = 3,5,6,7,8	Purple = 3,4,5,6,8
Mauve = 1,3,5			
Purple = 2,4,6,7,8			

Ratio 2:6

Mauve = 1,2	Mauve = 1,5	Mauve = 1,3	Mauve = 1,4
Purple =3,4,5,6,7,8	Purple = 2,3,4,5,6,7,8	Purple = 2,4,5,6,7,8	Purple = 2,3,5,6,7,8

Ratio 1:7
Mauve = 1
Purple = 2,3,4,5,6,7,8

Ratio 0:8
Mauve =
Purple =1,2,3,4,5,6,7,8