AIMS-IMAGINARY
Maths Communication in Africa
Workshop and Exhibition
AIMS-South Africa, Muizenberg, Cape Town, 5-7 Aug 2014

Marcos Cherinda

WEAVING GEOMETRIC SHAPES

Universidade Pedagógica – Moçambique
Centro de Pesquisa Etnomatemática

Twill weaving

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Twill weaving: over two/under two, ...

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Strips with the same phase

Twill woven artifacts

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

45⁰

Weaving board (WB)

Weaving board (WB)

fixed strips
(F-strips)

loose strips
(L-strips)

MARCOS
CHERINDA

WEAVING GEOMETRIC SHAPES

1

EXPLORING THE WEAVING BOARD

A first step on WB-activities

ACTIVITY

Using your weaving board, copy and try to continue this pattern.

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

ACTIVITY

Using your weaving board, copy and try to continue this pattern.

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

ACTIVITY

Using your weaving board, copy and try to continue this pattern.

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Relation between patterns

Translation

Translation

ACTIVITY

Using your WB, weave the pattern obtained by successive translation of the portion given below.

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Reflection

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

ACTIVITY

Copy and try to continue the pattern below, by reflection in the strip L8.

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Rotation

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

ACTIVITY

Copy and try to continue the pattern below in order to find a twill pattern with rotational symmetry of 180^0.

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Fundamental block of a pattern

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1 2 3 4 5 6 7 8 13 14 15
1
2
3
4
5
6
7
8
9
10
11
12
17
18
19
20
1 2 3 4 9 10 11 12

ACTIVITY

For the given fundamental block, weave the respective pattern.

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

From strip patterns to number patterns

Position	1st	2nd	3rd	4th	5th	…	pth	…
L-strip	1	5	9	13	17	…	?	…

Position	1st	2nd	3rd	4th	5th	…	pth	…
L-strip	2	4	6	8	10	…	?	…

Position	1st	2nd	3rd	4th	5th	…	pth	…
L-strip	3	7	11	15	19	…	?	…

Position	1st	2nd	3rd	4th	5th	…	pth	…
L-strip	1	5	9	13	17	…	?	…

$$L=4p-3$$

Position	1st	2nd	3rd	4th	5th	…	pth	…
L-strip	2	4	6	8	10	…	?	…

$$L=2p$$

Position	1st	2nd	3rd	4th	5th	…	pth	…
L-strip	3	7	11	15	19	…	?	…

$$L=4p-1$$

ACTIVITY

Find a general rule to determine the number *L* of the green strips.

Position	1st	2nd	3rd	4th	5th	6th	…	pth
L-strip	1	3	7	9	13	15	…	?

Position	1st	2nd	3rd	4th	5th	6th	…	pth
L-strip	1	3	7	9	13	15	…	?

$$L = \begin{cases} 3p-2 & \text{for odd } p \\ 3p-3 & \text{for even } p \end{cases}$$

Many more patterns!

Which color will be on (7, 15)?

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Upgraded weaving board

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Mathematics skills and content

- **Inductive/deductive reasoning (visual thinking, conjecturing, testing, generalizing)**
- **Geometric transformations (translation, rotation, reflection)**
- **Sequences and series (*twill* patterns and number patterns)**

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique

Further mathematics content

- Combinatorics (permutations, variations, ...)
- Numeric system (e.g. binary system)
- Matrices
- Algebraic groups
- ...

Marcos Cherinda, mCherinda@gmail.com
Universidade Pedagógica - Mozambique