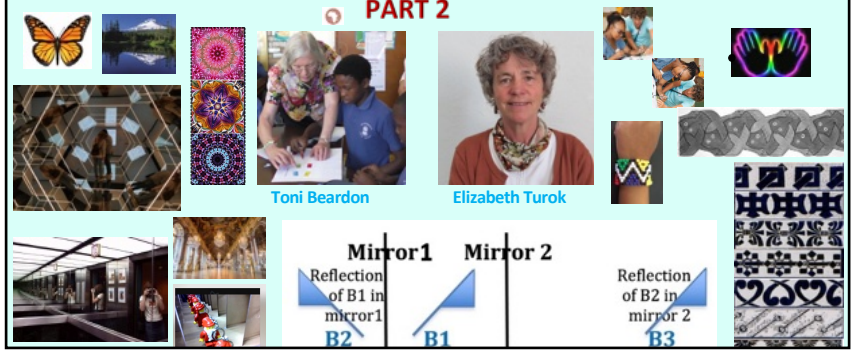
Global Teacher Empowerment Network GTEN

TRANSFORMATIONS AND SYMMETRY

PART 2



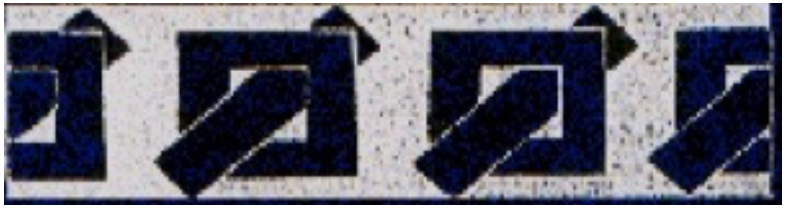
18

PART 2

THERE ARE 7 FRIEZE PATTERNS AND ONLY 7 – also called strip patterns

Here is the simplest of the patterns.

What transformations can you see in this pattern? How is this pattern repeated?



Repeated just by **TRANSLATIONS**

pppppppp frieze pattern

19

THERE ARE 7 AND ONLY 7 FRIEZE PATTERNS – also called strip patterns

What transformations can you see in this pattern?
How is this pattern repeated?

REFLECTIONS IN A VERTICAL MIRROR LINE and repeated by **TRANSLATIONS**

dbdbdbdb frieze pattern

20

THERE ARE 7 AND ONLY 7 FRIEZE PATTERNS – also called strip patterns

What transformations can you see in this pattern?
How is this pattern repeated?

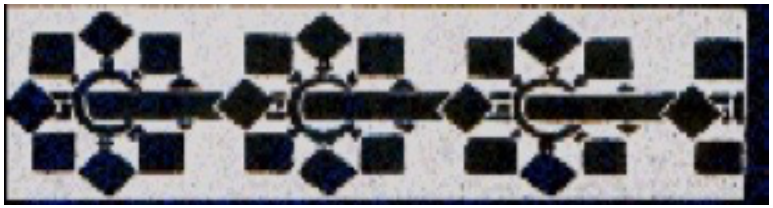
REFLECTION IN HORIZONTAL & VERTICAL MIRROR LINES and **ROTATIONS** repeated by **TRANSLATIONS.**

HHHHHHHH frieze pattern

21

There ARE 7 AND ONLY 7 FRIEZE PATTERNS – also called strip patterns

What transformations can you see in this pattern?
How is this pattern repeated?



REFLECTION IN A HORIZONTAL MIRROR LINE repeated by **TRANSLATIONS**

EEEEEEE frieze pattern

Notice – there is no rotational symmetry and no vertical reflections

22

THERE ARE 7 AND ONLY 7 FRIEZE PATTERNS – also called strip patterns

What transformations can you see in this pattern?
How is this pattern repeated?

GLIDE (FOOTSTEPS) REFLECTIONS and **ROTATIONS** repeated by **TRANSLATIONS,**

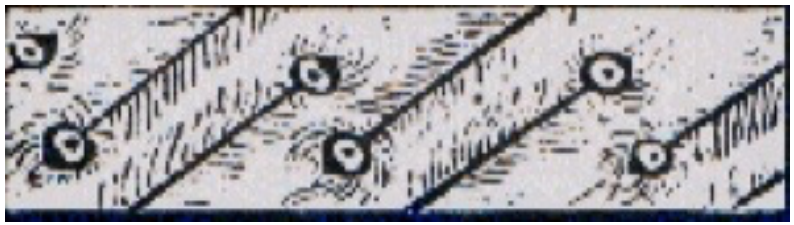
pbpbpbpb frieze pattern

Notice – there are no vertical reflections.

23

THERE ARE 7 AND ONLY 7 FRIEZE PATTERNS – also called strip patterns

What transformations can you see in this pattern?
How is this pattern repeated?



ROTATIONS repeated by **TRANSLATIONS**

pdpdpdpd frieze pattern

24

THERE ARE 7 AND ONLY 7 FRIEZE PATTERNS – also called strip patterns

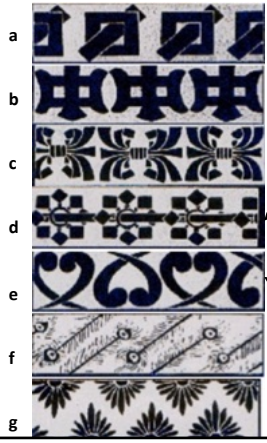
What transformations can you see in this pattern?
How is this pattern repeated?

REFLECTION IN VERTICAL MIRROR LINES, GLIDE (FOOTSTEPS) REFLECTIONS
and **ROTATIONS** repeated by **TRANSLATIONS**

pqbdpqbd frieze pattern

25

MATCH THE FRIEZE PATTERNS – draw connecting arrows

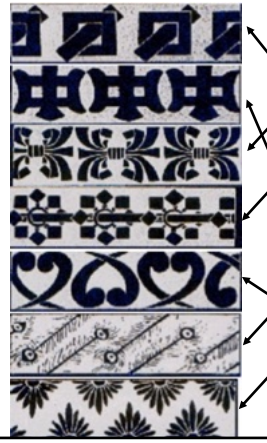


1 HHHHHHH
2 EEEEEEEEE
3 ppppppppp
4 pdpdpdpd
5 pqbdpqbd
6 pbpbpbpb
7 dbdbdbdb

Fill in Solutions d2 and e6 are given

26

MATCH THE FRIEZE PATTERNS – draw connecting arrows



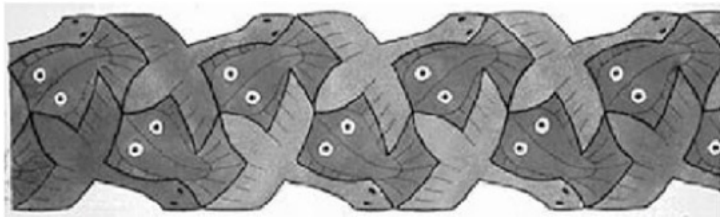
1 HHHHHHH
2 EEEEEEEEE
3 ppppppppp
4 pdpdpdpd
5 pqbdpqbd
6 pbpbpbpb
7 dbdbdbdb

Fill in solutions
a 3
b 7
c 1
d 2
e 6
f 4
g 5

27

FRIEZE PATTERN with a motif made up of a bird and a fish

What do you notice?
Which type of frieze pattern is this?



28

SYMMETRY CHALLENGE

https://aiminghigh.aimssec.ac.za/symmetry-challenge/

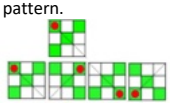
How many different symmetric patterns can you make by shading some squares in a 3 by 3 grid?

There are more than 60 possibilities. What can you say about the symmetries?

ACTIVITY FOR ALL

Make some symmetrical shapes by tearing or cutting scrap paper and describe their symmetries. Can you make a line of paper people holding hands?

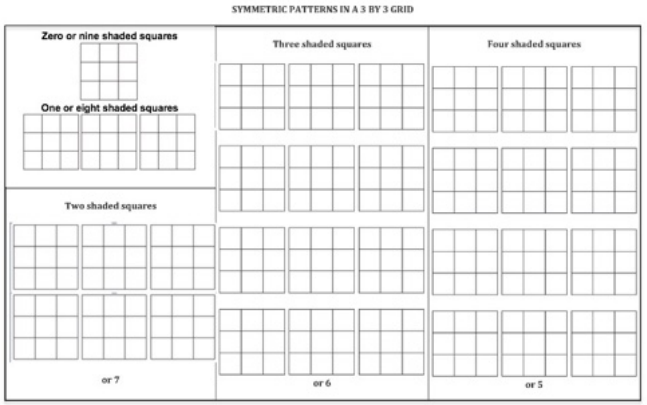
There are hundreds of patterns and we look for ***different*** patterns. Patterns are the ***same*** if they are reflections or rotations of each other like the pattern below shown with 4 repeats of the same pattern.



This pattern has one line of reflection symmetry and no rotational symmetry.

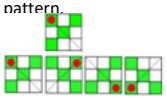
29

WORK SYSTEMATICALLY TO FIND ALL POSSIBLE SOLUTIONS



https://aiminghigh.aimssec.ac.za/symmetry-challenge/

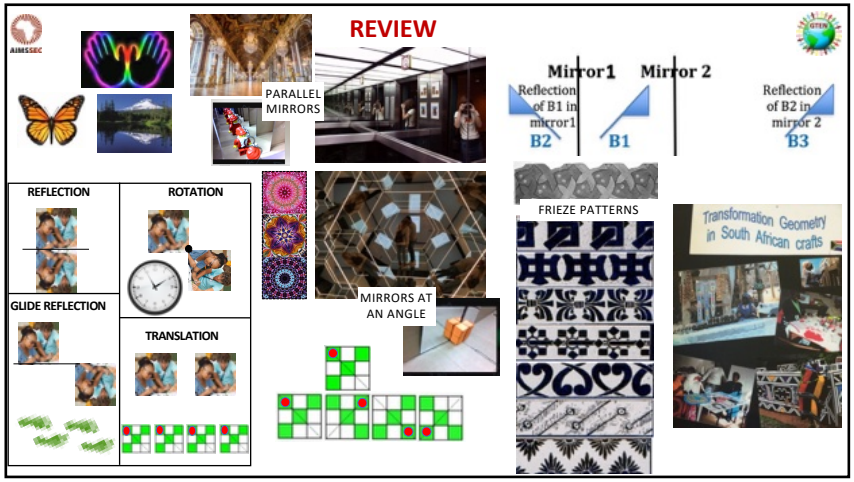
There are hundreds of patterns and we look for ***different*** patterns. Patterns are the ***same*** if they are reflections or rotations of each other like the pattern below shown with 4 repeats of the same pattern.



This pattern has one line of reflection symmetry and no rotational symmetry.

30

REVIEW



31

AIMINGHIGH TEACHER NETWORK

AIMSSEC

See the Learning Packs on AIMING HIGH

SYMMETRY CHALLENGE https://aiminghigh.aimssec.ac.za/symmetry-challenge/

REFLECTING SQUARELY https://aiminghigh.aimssec.ac.za/reflecting-squarely/

MIRROR MIRROR https://aiminghigh.aimssec.ac.za/mirror-mirror/

PAPER DOLLS https://aiminghigh.aimssec.ac.za/paper-dolls/

TRANSFORMATION ART https://aiminghigh.aimssec.ac.za/transformation-art/

Video: https://youtu.be/Jcyg2TtDFi4?si=Blk7O8KIeReQE--W

32

LET'S PLAY MATHEMATICALLY AND LEARN

Order from AMAZON or TARQUIN https://www.tarquingroup.com/products/aiming-high-lets-play-mathematically

Play Mathematically

- to develop a love for mathematics
- to unlock knowledge and understanding
- to improve numeracy and visualisation skills
- to practise mathematical procedures
- to motivate concentration and critical thinking
- to boost confidence in mathematical ability.

This **first book** in this AIMING HIGH series provides 36 games that are easy to learn and enjoyable to play for any age. Each comes with reflective questions and materials designed to bring out mathematical thinking and provide a deeper understanding of the topic that underlies the game. Even for the youngest players, this can be transformational.

The **second book** offers suggestions for teachers for using games and puzzles in lessons to teach the regular curriculum with different ideas for different age groups.. It is due to be published in mid 2026.

33

AIMS African Institute for Mathematical Sciences SCHOOLS ENRICHMENT CENTRE

GTEN

Thanks for coming to this workshop.
Use the AIMSSEC ideas on AIMING HIGH and add comments.
Share what you have learned with other teachers.
Try to help all your learners to have a 'Yes I Can' attitude to mathematics.

34