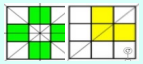
Global Teacher Empowerment Network GTEN

14 August 2021

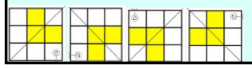
SYMMETRY CHALLENGE

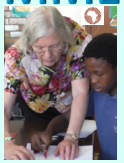






How many symmetric patterns can you find if you shade some of the 9 squares in a 3 by 3 grid? Count only one of the 4 patterns below as they are equivalent.

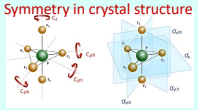


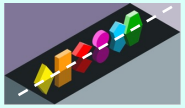

Toni Beardon


Caroline Ainslie


Sam Okoth

Symmetry in crystal structure





APPLICATIONS OF SYMMETRY GROUPS PARTICLE PHYSICS March 2017

1

AIMS

African Institute for Mathematical Sciences
SCHOOLS ENRICHMENT CENTRE

MATHS TOYS

Global Teacher Empowerment Network (GTEN)

Programme for Symmetry Challenge Workshop 14 August 2021

Improve knowledge and understanding of:
Symmetry
Reflections
Rotations
Translations
Systematic planning and working and creativity

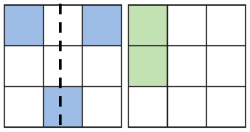
Learning Spiral

8. Applications of symmetry to new discoveries in Science
7. Two reflections in parallel mirrors give a translation
6. Two reflections in intersecting mirrors give a rotation
5. Identifying reflections, rotations and translations
4. Planning and working systematically to find all possible solutions
3. Creating patterns with reflection and rotation symmetry
2. Making symmetric shapes by folding and cutting paper
1. Recognising different types of symmetry

2

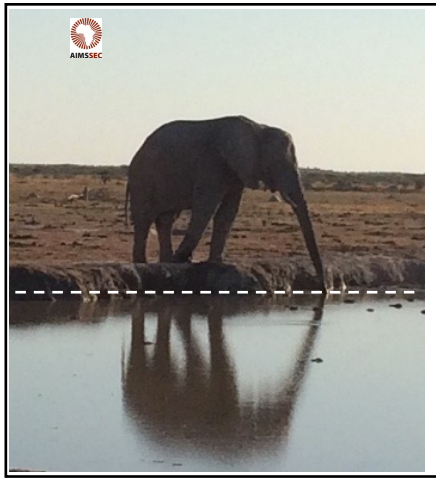
SYMMETRY – STARTER ACTIVITY FOR ALL

Look at your hands. How are they the same?
How are they different?
They are symmetric, like reflections.
Look in a mirror (or imagine it).
What else in your body is symmetric?



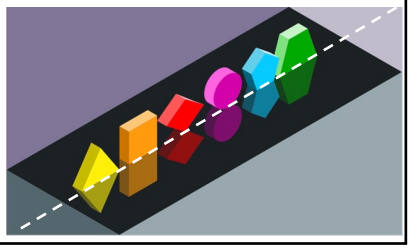
Look at these two 3x3 grids.
What do you notice about their symmetry?
Are they symmetric or not?
Is there mirror line?

3



REFLECTION SYMMETRY

The white dotted lines are mirror lines or axes of symmetry.



4

SYMMETRY - EARLY YEARS


Play with making symmetrical shapes.
Fold a piece of scrap paper.
Tear or cut a shape and then open it out.
You will have a symmetric shape with the fold line making a line of symmetry (mirror line).
Describe the symmetries.

Try it now!

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

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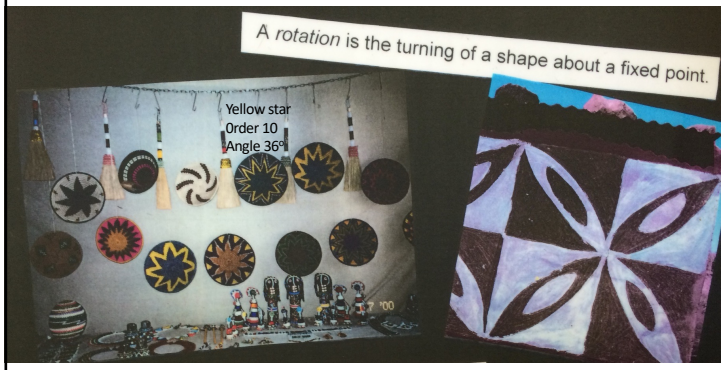
ROTATION SYMMETRY



Pick a basket, describe it in the chat, give the order of rotational symmetry and the angle.

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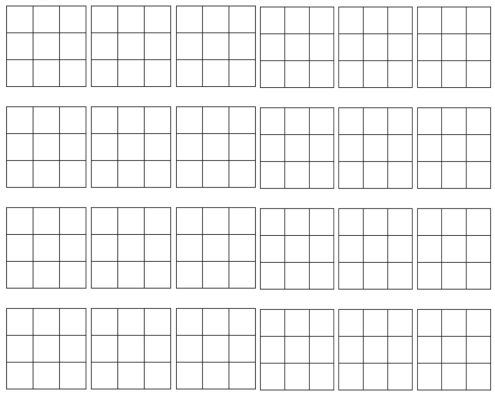
SYMMETRY CHALLENGE - PRIMARY



In each grid, can you shade some of the 9 squares to make symmetric patterns?

How many more symmetric patterns can you find?

Compare your patterns with other students. How many can you find together?

How will you know when you have found them all?

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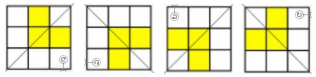
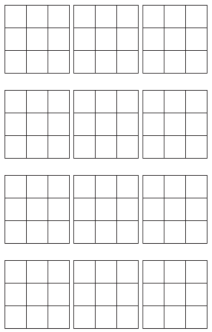
SYMMETRY CHALLENGE - LOWER SECONDARY





Can you shade some of the 9 squares in the 3x3 grids to make more than 60 symmetric patterns?

Notice that, the yellow patterns are repeated 4 times by images under rotation. The 4 yellow shaded patterns above can only be counted as ONE PATTERN. Only count ONE pattern from each set. Other patterns are repeated twice, and some other are not repeated.

Work with other students. How many can you find together?

Work systematically? For example, start by shading just one square and find all the symmetric patterns. Then shade 2 squares... and so on.

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SYMMETRY CHALLENGE - KEY QUESTIONS

1. Are all the patterns you have shaded symmetrical?
2. Where are the lines of symmetry (mirror lines)?
3. Which patterns are the same and which are different?
4. Are there any more symmetric patterns with the same number of squares shaded?
5. What counts as the same?
6. Have we found all the possibilities? How do we know we have found them all?
7. How can we find other solutions?
8. What if we shaded 8 of the nine squares? Or 7 …?
9. Try shading 1 square only. What symmetries are possible?
10. Have you found all the possibilities? How do you know that?
11. Try shading 2 squares, then 3 squares … what symmetries are possible now?
12. How will you record your findings?
13. **The 3 by 3 grid has four lines of symmetry and rotational symmetry of order 4. How might this help?**

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