

Global Teacher Empowerment Network GTEN
 Saturday 18 November 15.00 – 17.00 London Time

TRANSFORMATIONS AND SYMMETRY

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Mirror 1 Mirror 2
 Reflection of B1 in mirror 1 B2
 B1
 Reflection of B2 in mirror 2 B3

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AIMS African Institute for Mathematical Sciences SCHOOLS ENRICHMENT CENTRE
Global Teacher Empowerment Network (GTEN)
 PROGRAMME: TRANSFORMATIONS AND SYMMETRY

Learning Spiral – tasks for all ages on a common theme

IMPROVE SKILLS, KNOWLEDGE AND UNDERSTANDING OF:

Transformations:
 Reflection
 Rotation
 Translation
 Glide reflection
 Enlargement
 Symmetry

UPPER SECONDARY
LOWER SECONDARY
UPPER PRIMARY
LOWER PRIMARY
EARLY YEARS

10. Symmetry Challenge; working systematically to find all solutions.
9. Frieze Patterns
8. Glide Reflections
7. Reflection in parallel mirrors and translations
6. Reflection in mirrors at different angles
5. Analysing patterns with rotational symmetry
4. Pictures showing rotational symmetry and reflection symmetry
3. Rotation
2. Reflection in parallel mirrors and effects
1. Pictures showing reflection and symmetric objects

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GTEN **AIMSSEC**

Learner Teacher

During this session you should wear 2 hats. Do the activities, as if you were a learner, to appreciate how a learner would do them.

Reflect as a teacher on what your learners could learn and how you could guide the learning

When you see this icon answer the question and pause the video if you need time.

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LOOK AT THE BUTTERFLY – LOOK AT YOUR OWN HANDS


a. What do you notice?
 b. What are the similarities and difference in these two pictures?
 c. Where are the mirror lines (also called axes of symmetry)?

A butterfly is symmetric. One hand is not symmetric.

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LOOK AT THE ELEPHANT - LOOK IN THE MIRROR

What do you notice?

Where is the mirror line (also called axis of reflection)?

Is Toni pointing to her right ear or to her left ear? Try this for yourself.

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REFLECTIONS

What do you notice about these pictures? Where are the mirror lines in each picture (axes of reflection)?




Mount Hood, Oregon and Mirror Lake

Fish Hoek

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REFLECTIONS

Leeds, Liverpool Canal, Ormskirk



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GIRL IN A LIFT

What do you notice?





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STAND UP – TURN AROUND
People Maths Activity

Everyone in the class should stand up and face the front.
 Give directions like:
 Turn all the way around
 Turn to face the back wall
 Turn to face the side wall on this side (pointing to a wall)
 Turn to face the side wall on the other side of the room

Ask questions like:
 Can you describe how much you turned?
 Can you describe that another way? (e.g. quarter turn or turned through 90°)
 Did you turn to your right or to your left?
 Did you turn like the hands of a clock (clockwise)?
 Did you turn anticlockwise?

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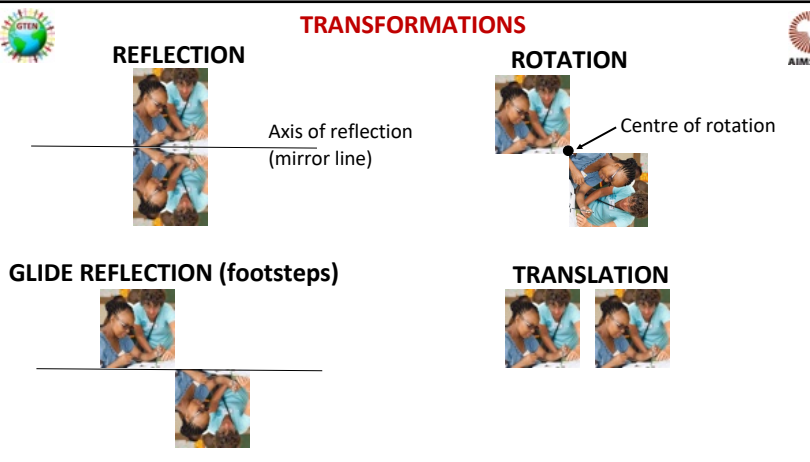
TRANSFORMATIONS

REFLECTION
 Axis of reflection (mirror line)

ROTATION
 Centre of rotation

GLIDE REFLECTION (footsteps)

TRANSLATION



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REFLECTION, ROTATION & TRANSLATION

A reflection is a transformation where each point has an image an equal distance away on the other side of a given line.

A rotation is the turning of a shape about a fixed point.

A translation is a simple shifting or sliding of a shape.


Transformation Geometry in South African crafts



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REFLECTION AND ROTATION

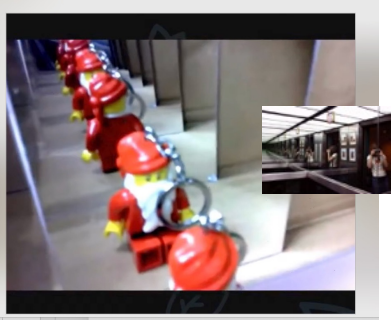
What do you notice in these pictures? Find the centre of rotation in each picture.



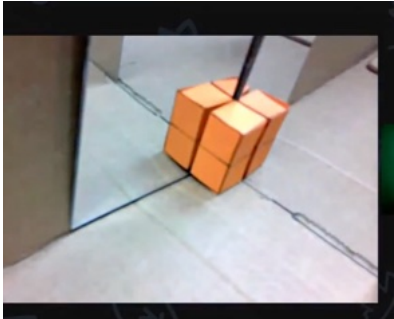
12

DEMONSTRATION YOU CAN DO WITH 2 MIRRORS

[Watch the video](#)



Santa keyring between 2 parallel mirrors

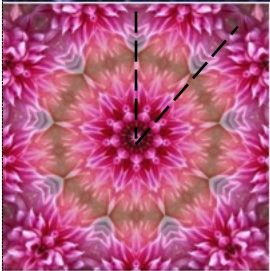


Cuboid measuring 1 by 1 by 2 between two perpendicular making a 2 by 2 by 2 cube.


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REFLECTION AND ROTATION


What do you notice in these pictures? Find the centre of rotation in each picture.



The pattern is made up of 9 copies of the basic design (motif) between the 2 lines. It has 9-fold rotational symmetry. The order of rotational symmetry is 9.
 $360 \div 9 = 40$
 so the angle of rotation is 40° .

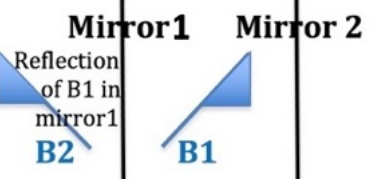


The pattern is made up of 6 copies of the basic design (motif). It has 6-fold rotational symmetry. The order of rotational symmetry is 6.
 $360 \div 6 = 60$
 so the angle of rotation is 60° .




The pattern is made up of 16 copies of the basic design (motif). It has 16-fold rotational symmetry. The order of rotational symmetry is 16.
 $360 \div 16 = 22.5$
 so the angle of rotation is 22.5° .

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Copy the two mirror lines and flags B1 and B2 as shown in this picture. Flag B2 is the reflection of flag B1 in Mirror 1. Draw flag B3 which is the reflection of flag B2 in Mirror 2. What single transformation would move flag B2 to the position of flag B3?



What do you notice about this picture of a girl in a lift taking a picture of herself? What is the connection with the diagram above?

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REFLECTIONS

Look at the lights. Look at the ceilings. How many reflections?






Hall of Mirrors Versailles one reflection.




Hall of Mirrors Versailles many reflections.

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 **REFLECTIONS & GLIDE REFLECTIONS FORM FRIEZE (STRIP) PATTERNS**
WHERE THE SAME MOTIF IS REPEATED BY TRANSLATIONS 

 **TIRE TRACKS**



FOOTPRINTS
These are glide reflections

END OF PART 1