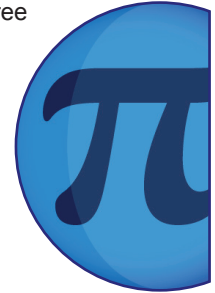




Transformations: Skateboarding

Key Learning Content

This film introduces translations, rotations and reflections through the example of skateboarding. All three transformations change the position of an object but not its shape. Technical language is avoided, and all three transformations are illustrated by simple movements of the skateboard. The film finishes by suggesting the idea of a combination of transformations.



Core Outcomes

Learning Points

- Be able to understand that rotations, reflections and translations preserve length and angle so that a transformed shape under any of these transformations remains congruent to the original shape.
- Be able to understand that rotations are specified by a centre and an angle.
- Be able to understand that translations are specified by a distance and direction.
- Be able to understand that reflections are specified by a mirror line.

Suggested Activities

- Identify the image of an object under different transformations.
- Rotate, reflect and translate objects.

Extension Outcomes

Learning Points

- Be able to identify and give complete descriptions of transformations.
- Be able to find the mirror line of a reflection given object and image.
- Be able to find the centre and angle of a rotation given object and image.

Suggested Activities

- Use a ruler and compass to find centres of rotation and mirror lines of reflection.
- Explore equivalences between multiple transformations, e.g. two reflections in parallel mirror lines are equivalent to a single translation.



A skateboarder performs three main geometric transformations: translation, rotation and reflection.

Related Films

To use before the lesson plan:

Geometry: Euclid

This film provides an introduction to the history and foundations of geometry.

To use after the lesson plan:

The Mirror Lines of the Taj Mahal

This film explores the role of reflections in the design and appeal of this famous building.

The Beauty Formula

This film argues that reflective symmetry has a lot to do with our perception of human beauty.

Painting By Numbers

This film describes the effect of perspective, which is very similar to the idea of enlargement.

Guide Lesson Plan

Introduction

Using software or a remote control robot, or even manually, get students to give simple instructions to navigate an object through a maze, specifying angles of rotation and distance of translation. Reflect on how complicated this can be even for a simple path.

Show Film

Transformations: Skateboarding

Main Activity

Foundation

Show students diagrams with an object shape and multiple images. Then get students to pair up images with descriptions of translations, rotations and reflections. Then give students the coordinates of the vertices of a shape and get them to change it under different transformations.

Advanced


Show students how to find the mirror line of a reflection by joining up corresponding points on object and image and then bisecting these lines. Then show how to find the centre of a rotation by joining up corresponding points of object and image, drawing the perpendicular bisectors of these lines, and seeing where the bisectors cross. Finally show how to measure the angle of rotation given object, image and centre of rotation. Set exercises to test these methods.

Extension Activity


Take an object shape and reflect it in two parallel lines to form an image after two reflections. Work out the single translation that is equivalent to the two reflections. Do this several times and try to work out the connection between the position of the mirror lines and the length of the translation.

Optional Extra

Explore what happens when an object's shape is reflected in more than two parallel lines. Find a general result for the cases when the number of parallel mirror lines is even, and odd.



Rotation



Translation

Moving in translation means that every point of the skateboard moves the same distance in the same direction; in rotation the skateboarder jumps and rotates the board 180° around a fixed centre point.