

Summary of learning goals

- Students explore the effect of transformations and identify symmetry in frieze patterns in the real world. Students identify the transformations used and use this to name frieze patterns.

Australian Curriculum: Mathematics (Year 7)

ACMMG181: Describe translations, reflections in an axis and rotations of multiples of 90° on the Cartesian plane using coordinates. Identify line and rotational symmetries.

Summary of lessons

Who is this sequence for?

- Students beginning this sequence will have had prior experience of transforming shapes by flipping, reflecting or rotating them, and will be familiar with the formal language of transformations (i.e. reflection, rotation and translation). They will understand the concept of symmetry and will be able to identify the line of symmetry in a shape.

Lesson 1: Footprints in the Sand

Students physically recreate the movements used to make patterns of footprints left in sand. They revisit the ideas of flip, slide, turn, and mirror image and symmetry (of earlier years), as well as the more precise language of reflections, rotations and translations. They explore symmetries in the footprint patterns.

Lesson 2: Frieze Patterns

This task introduces friezes with examples from decor in Old Parliament House, Canberra. Students identify the different symmetries that are present in frieze patterns and then group the patterns based on their symmetries. They consolidate their learning by looking at what would happen if one panel in a wrought iron lace railing was installed the wrong way around.

Lesson 3: Creating Frieze Patterns

Students create their own frieze designs with chosen symmetries. First, they create a cell by applying transformations to a design element. This cell is then repeatedly translated a fixed distance to create a frieze. Together, students make a class display of friezes.

Reflection on this sequence

Rationale

This sequence explores how transformations can be used to create symmetrical pattern strips called frieze patterns. It builds students' visualisation of the effect of transformations and different types of symmetry. Through hands-on experiences, some students will be able to easily visualise a transformed image; all students will know what to use to help them find it. Students' fluency with these transformations and symmetry is developed across the lesson sequence.

Throughout this sequence, a wide range of examples of friezes are encountered, such as footprints in the sand, decor in Parliament House, wrought iron lace on terrace houses, and tyre treads. In addition, students are encouraged to find friezes in their own environments and contribute sketches or pictures to the class display.



reSolve mathematics is purposeful

- Students observe how geometry is evident in the world around us, highlighting both mathematical and artistic creativity.
- Students' fluency with transformations is developed as they classify patterns and create their own frieze designs.



reSolve tasks are inclusive and challenging

- Students use physical movements and manipulate transparent overlays to support the visualisation of transformations.
- The frieze patterns used vary in complexity; some students may focus on patterns with basic symmetry, whereas those students who require further challenge are extended through complex movements and complex designs. The opportunity to create their own frieze patterns allows students to engage in the activity at different levels of complexity.
- The attractive designs involved should appeal to those students with a range of interests relating to art and design.



reSolve classrooms have a knowledge-building culture

- Students work collaboratively to sort and classify the frieze patterns. In their small groups or pairs, students are encouraged to build consensus on the symmetry of designs through active exploration, mathematical reasoning and clear communication.

Acknowledgements

- Old Parliament House, Canberra for granting permission to photograph frieze patterns within the building.
- Isabella Tripet for videos and photographs of friezes.
- Bridgestone Tyres for permission to reproduce images of its tyre treads.
- Central Foundry (Sydney), Hindmarsh Fencing (Adelaide), Melbourne Lacework (Melbourne) for permission to reproduce/photograph the wrought iron frieze images.