

# COMBINATIONS OF TRANSFORMATIONS.

## INVESTIGATIONS OVERVIEW PAGE

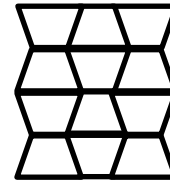
THIS PAGE IS A SUMMARY OF THE INVESTIGATIONS THAT STUDENTS MAY ENGAGE IN TO DEEPEN THEIR RELATIONAL UNDERSTANDING. INVESTIGATIONS WITH INSTRUCTIONS TO STUDENTS FOLLOW ON SUBSEQUENT PAGES.

- In pairs, children select a shape or a pattern block. They draw the shape in its current position and orientation. They perform a combination of translations, reflections, and rotations on the shape, recording each transformation. They describe the effect of each combination of translations, reflections, and rotations on the shape. *Reflection: What changes when we perform combinations of reflections, translations, and rotations on a shape?*
- In pairs, children have a two-dimensional shape or a pattern block. They create and describe patterns by repeatedly performing combinations of translations, reflections, and rotations on a shape. *Reflection: How can we create patterns by repeatedly performing combinations of reflections, translations, and rotations on a shape?*
- In pairs, children select a shape or a pattern block. They draw the shape in its current position and orientation. They plan a combination of translations, reflections, and rotations to perform on the shape. They visualise and draw what the effect will be. They perform the combination of translations, reflections, and rotations on the shape and check their prediction. They explain the effects. *Reflection: What changes when we perform combinations of reflections, translations, and rotations on a shape?*
- In pairs, each child selects a different shape or pattern block. They each draw their shape in their current positions and orientations. They decide to each perform the same combination of translations, reflections and rotations on their shape. They visualise and draw what the effect will be. They perform the combination of translations, reflections, and rotations on the shape and check their prediction. For example, translate to the right, reflect over a line of symmetry to the right, rotate 90 degrees clockwise. *Reflection: How can we visualise the transforming effect of combinations of translations, reflections, and rotations on a shape?*
- In pairs, children use the draw tools on a word processing program, for example, Microsoft Word, to construct two-dimensional shapes. They perform combinations of translations, reflections, and rotations by double clicking on the shape and selecting 'Rotate' or 'Flip' from the Design menu. They rotate the shape right or left  $90^\circ$ , or select a number of degrees from the 'More rotation options' menu. They reflect the shape vertically (in a vertical direction, ie up and down) or horizontally (in a horizontal direction, ie left to right), describing the transforming effect of the reflection. They translate the shape manually by selecting the shape and dragging it. They describe the transforming effect of the combinations of translations, reflections, and rotations. *Reflection: How can we perform combinations of translations, reflections, and rotations using a computer program?*
- Children create patterns and art works by translating, rotating, and reflecting shapes multiple times, possibly based on the symmetry artwork of Escher (<http://www.mcescher.com/Gallery/gallery-symmetry.htm>). *Reflection: How can we create artworks through combinations of translations, reflections and rotations?*
- Children investigate designs made from tiles, motifs in Central Asian textiles, Tibetan artefacts, Indian lotus designs and Yolngu Central/Western Desert art

(available on the internet), identifying translations, reflections, rotations, symmetry and tessellations. Reflection: How can we identify combinations of translations, reflections, and rotations in Central Asian textiles, Tibetan artefacts, Indian lotus designs, and Yolngu Central/Western Desert art?

- In pairs, children create designs using combinations of translations, reflections and rotations in different directions, for example, They identify symmetry and tessellation in their design.

Reflection: How can we create designs using combinations of translations, reflections, and rotations in different directions?



# Combinations of Transformations.

Select a shape or a pattern block.

Draw the shape in its current position and orientation.

Perform a combination of translations, reflections, and rotations on the shape, recording each transformation.

Describe the effect of each combination of translations, reflections, and rotations on the shape.

Reflection: What changes when we perform combinations of reflections, translations, and rotations on a shape?

# Combinations of Transformations.

Have a two-dimensional shape or a pattern block.

Create and describe patterns by repeatedly performing combinations of translations, reflections, and rotations on a shape.

Reflection: How can we create patterns by repeatedly performing combinations of reflections, translations, and rotations on a shape?

# Combinations of Transformations.

Select a shape or a pattern block.

Draw the shape in its current position and orientation.

Decide on a combination of translations, reflections, and rotations to perform on the shape.

Visualise and draw what the effect will be.

Perform the combination of translations, reflections, and rotations on the shape and check your prediction.

Explain the effects.

Reflection: What changes when we perform combinations of reflections, translations, and rotations on a shape?

# Combinations of Transformations.

Sit with a friend.

Each of you select a different shape or pattern block.

Each of you draw your shape in its current position and orientation.

Decide to each perform the same combination of translations, reflections and rotations on your shape, for example, translate to the right, reflect over a line of symmetry to the right, rotate 90 degrees clockwise.

Visualise and draw what the effect of this combination of translations, reflections and rotations on your shape, will be.

Perform the combination of translations, reflections, and rotations on your shape and check your prediction effect.

Reflection: How can we visualise the transforming effect of combinations of translations, reflections, and rotations on a shape?

# Combinations of Transformations.

Use the draw tools on a word processing program, for example, Microsoft Word, to construct two-dimensional shapes.

Perform combinations of translations, reflections, and rotations by selecting (double clicking on) the shape and selecting 'Rotate' or 'Flip' from the Design menu.

For example,

- Rotate the shape right or left  $90^\circ$ , or select a number of degrees from the 'More rotation options' menu.
- Reflect the shape vertically (in a vertical direction, ie up and down) or horizontally (in a horizontal direction, ie left to right) using the 'Flip Vertical' or 'Flip Horizontal' menu,
- Translate the shape manually by selecting the shape and dragging it.

Describe the transforming effect of the combinations of translations, reflections, and rotations.

Reflection: How can we perform combinations of translations, reflections, and rotations using a computer program?

# Combinations of Transformations.

Create patterns and art works by translating, rotating, and reflecting shapes multiple times, possibly based on the symmetry artwork of Escher (<http://www.mcescher.com/Gallery/gallery-symmetry.htm>).

Reflection: How can create artworks through combinations of translations, reflections and rotations?



# Combinations of Transformations.

Investigate designs made from tiles, motifs in Central Asian textiles, Tibetan artefacts, Indian lotus designs and Yolngu Central/Western Desert art (available on the internet).

Identify translations, reflections, rotations, symmetry and tessellations.

Reflection: How can we identify combinations of translations, reflections, and rotations in Central Asian textiles, Tibetan artefacts, Indian lotus designs, and Yolngu Central/Western Desert art?

# Combinations of Transformations.

Create designs using combinations of translations, reflections, and rotations in different directions, for example,

Identify symmetry and tessellation in their design.

Reflection: How can we create designs using combinations of translations, reflections, and rotations in different directions?

