

Combinations of Transformations.

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Differentiate and Assess

Not every student will be ready to investigate this concept at this Level and so we will need to differentiate to ensure every student is learning at their leading edge. Select the Differentiate button on this screen.

Integrate

Every mathematical concept is integrally related to other mathematical concepts. Teaching and learning related concepts simultaneously develops deep relational understanding. Select the Integrate button on this screen.

Intervene

Some students may not yet be ready to investigate this concept at any Level, and so we will need to provide some intervention. Select the Intervention button on this screen.

COMBINATIONS OF TRANSFORMATIONS.

EXPLICIT TEACHING PLAN OVERVIEW PAGE

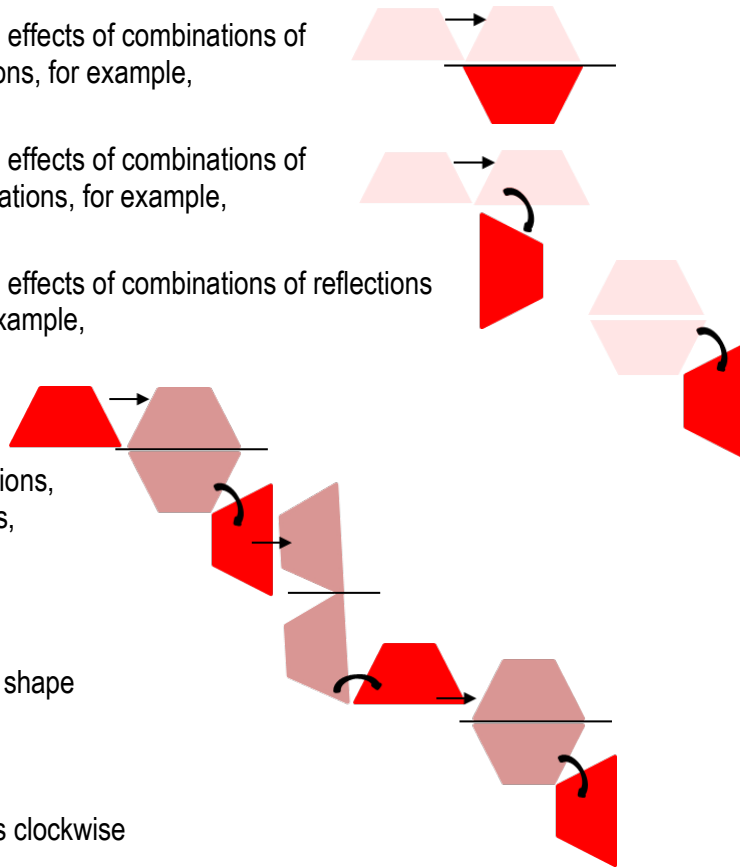
THIS PAGE IS A SUMMARY OF THE EXPLICIT TEACHING PLAN, INCLUDING STRATEGIC QUESTIONS, AND DESCRIBING THE SEQUENCE WHICH WILL OCCUR OVER MULTIPLE LESSONS.

RESOURCES: PATTERN BLOCKS AND OTHER TWO-DIMENSIONAL SHAPES, RULER, PENCIL, PAPER

WHAT COULD WE DO?

Children:

- investigate transforming effects of combinations of translations and reflections, for example,
- investigate transforming effects of combinations of translations and 90° rotations, for example,
- investigate transforming effects of combinations of reflections and 90° rotations, for example,
- create patterns using repeated combinations of translations, reflections, and rotations, for example,
- record, for example, repeatedly translate the shape to the right, then reflect it downward over a line of symmetry, then rotate it 90° clockwise



WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

Children:

- ask one another questions about the transforming effects of combinations of translation, reflection and degrees of rotation, for example:
 - ▶ how could we translate then reflect this shape?
 - ▶ how could we translate then rotate this shape 90° ?
 - ▶ how could we reflect then rotate this shape 90° ?
 - ▶ when we translate, reflect or rotate a shape, does its properties change?
- ▶ how could we create patterns using repeated combinations of translations, reflections and rotations?
- ▶ how could we describe this pattern created using repeated combinations of translations, reflections and rotations?

COMBINATIONS OF TRANSFORMATIONS.

EXPLICIT TEACHING PLAN

FULL EXPLICIT TEACHING PLAN, EMBEDDING DEEP RELATIONAL UNDERSTANDING, METALANGUAGE, AND QUESTIONS THAT MAY BE USED OVER MULTIPLE LESSONS.

WHAT COULD WE DO?

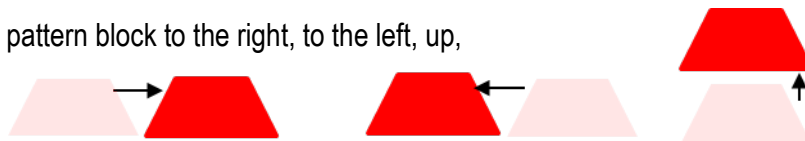
Children think about, talk and listen to a friend about, then have the opportunity to share what they already know.

Display a pattern block, for example,

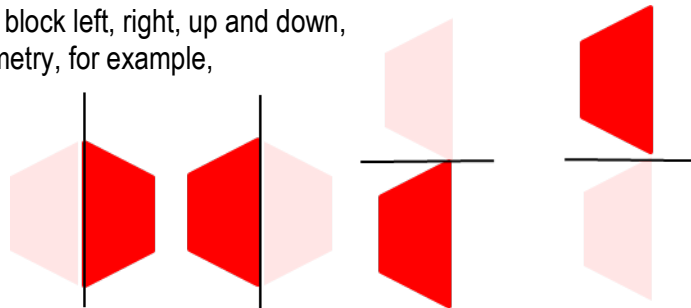


Record, for example, translate.

Translate the pattern block to the right, to the left, up, for example,



Reflect the pattern block left, right, up and down, over a line of symmetry, for example,



WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

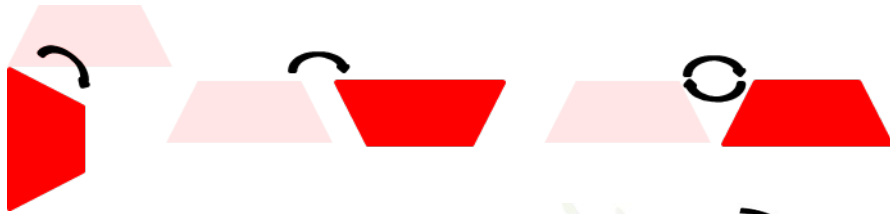
- ▶ Today brings an investigation about translating, reflecting and rotating shapes.
- ▶ What do you know about translating, reflecting and rotating shapes?
- ▶ What do you wonder about translating, reflecting and rotating shapes?
- ▶ Talk about translating, reflecting and rotating shapes with a friend.
- ▶ Is anyone ready to share what they are thinking about translating, reflecting and rotating shapes?

- ▶ We've investigated translating, reflecting and rotating shapes.

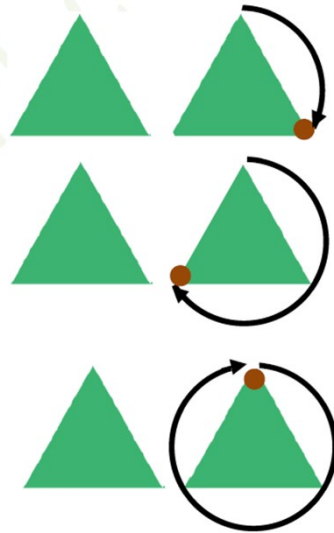
- ▶ We found that when we translate a shape, its position changes.

- ▶ We found that when we reflected a shape, we reflected it over a line of symmetry.
- ▶ Reflecting a shape over a line of symmetry creates a mirror image of the original shape.

Rotate the pattern block 180 degrees, 90 degrees, and 360 degrees, for example,



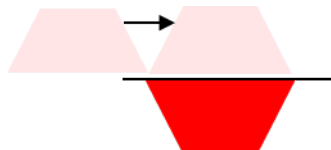
Slowly rotate the second triangle, stopping each time it looks the same as it did before we began to rotate it, for example,



Display a pattern block, for example,



Translate the pattern block to the right, then reflect it downwards over a line of symmetry, for example,



► We found that when we rotated a shape we could measure the degree of rotation.

► We investigated rotational symmetry.

► And we found that when a shape looks the same as it did before we rotated it, it has rotational symmetry.

► We found that if we counted the number of times a shape looked the same as it did before we rotated it during 1 full rotation, we could record the shape's order of rotational symmetry.

► Today we're going to investigate the transforming effects of combinations of translation, reflection and degree of rotation.

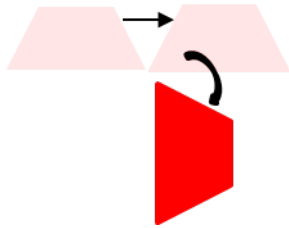
► Let's begin by combining a translation with a reflection.

► Let's translate the pattern block to the right, then reflect it downwards over a line of symmetry.

► What is the effect of translating the pattern block to the right, then reflecting it downwards over a line of symmetry?

► Has the shape's position and orientation changed?

Translate the pattern block to the right, then rotate it 90 degrees clockwise, for example,



Reflect the pattern block downwards over a line of symmetry, then rotate it 90 degrees clockwise, for example,



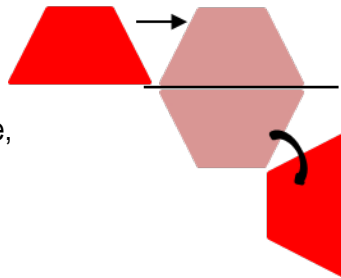
- ▶ Let's combine a translation with a rotation.
- ▶ Let's translate the pattern block to the right, then rotate it 90 degrees clockwise.
- ▶ What is the effect of translating the pattern block to the right, then rotating it 90 degrees clockwise?
- ▶ Has the shape's position and orientation changed?

- ▶ Let's combine a reflection with a rotation.
- ▶ Let's reflect the pattern block downwards over a line of symmetry, then rotate it 90 degrees clockwise.
- ▶ What is the effect of reflecting the pattern block downwards over a line of symmetry, then rotating it 90 degrees clockwise?
- ▶ Has the shape's position and orientation changed?
- ▶ What is the effect of combined translations, reflections and rotations on a shape?
- ▶ Is the effect that the shape's position and orientation may change, but its shape and size remain the same?

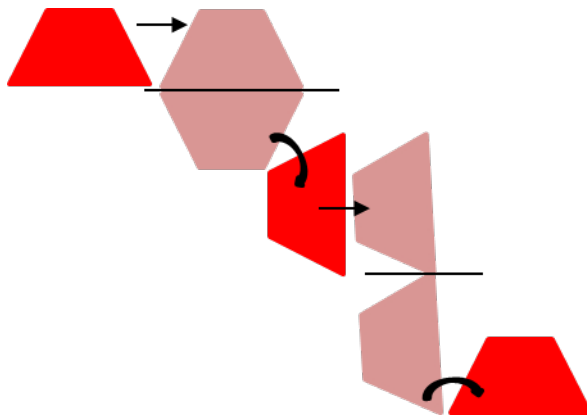
Display a shape, for example,



Translate the shape to the right, then reflect it downward over a line of symmetry, then rotate it 90 degrees clockwise, for example,



Translate the shape to the right, then reflect it downward over a line of symmetry, then rotate it 90 degrees clockwise again, for example,



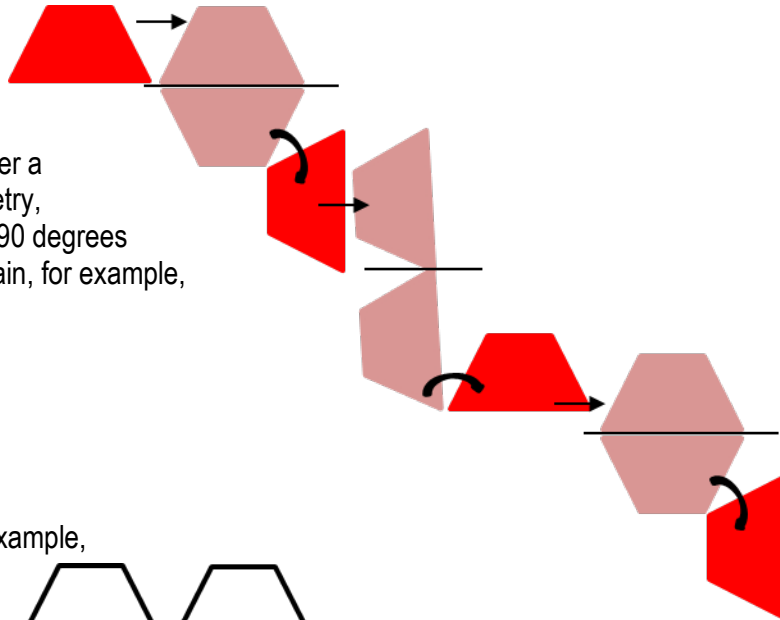
► **Today we're going to investigate patterns formed by combinations of translation, reflection and rotation.**

- What is a pattern?
- Is a pattern formed by repeatedly doing something?
- Could we create a pattern by repeatedly translating, reflecting and rotating a shape?
- Let's select a shape, and perform a combination of transformations on it.

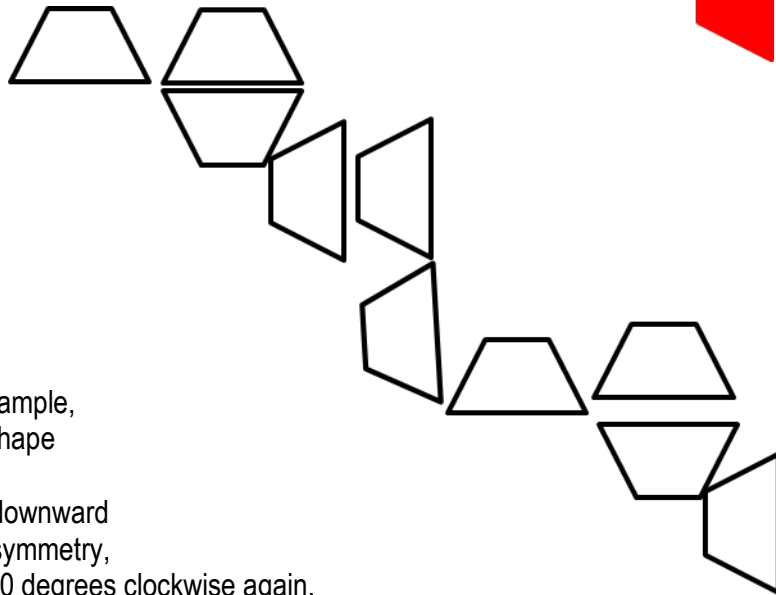
- Let's translate the shape to the right, then reflect it downward over a line of symmetry, then rotate it 90 degrees clockwise.

- Let's repeat the combination of transformations.
- Let's translate the shape to the right, then reflect it downward over a line of symmetry, then rotate it 90 degrees clockwise again.

Translate the shape to the right, then reflect it downward over a line of symmetry, then rotate it 90 degrees clockwise again, for example,



Record, for example,



Record, for example, translate the shape to the right, then reflect it downward over a line of symmetry, then rotate it 90 degrees clockwise again.

- ▶ Let's repeat the combination of transformations.
- ▶ Let's translate the shape to the right, then reflect it downward over a line of symmetry, then rotate it 90 degrees clockwise again.

▶ How could we record this pattern?

▶ How could we record the way the pattern repeats?