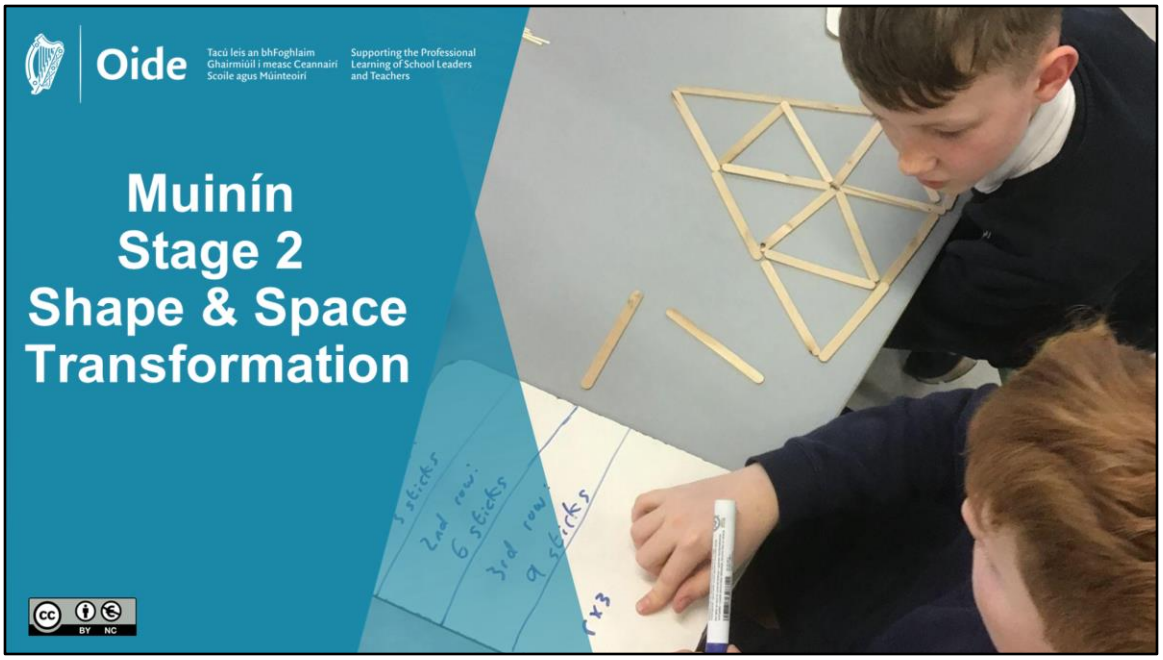
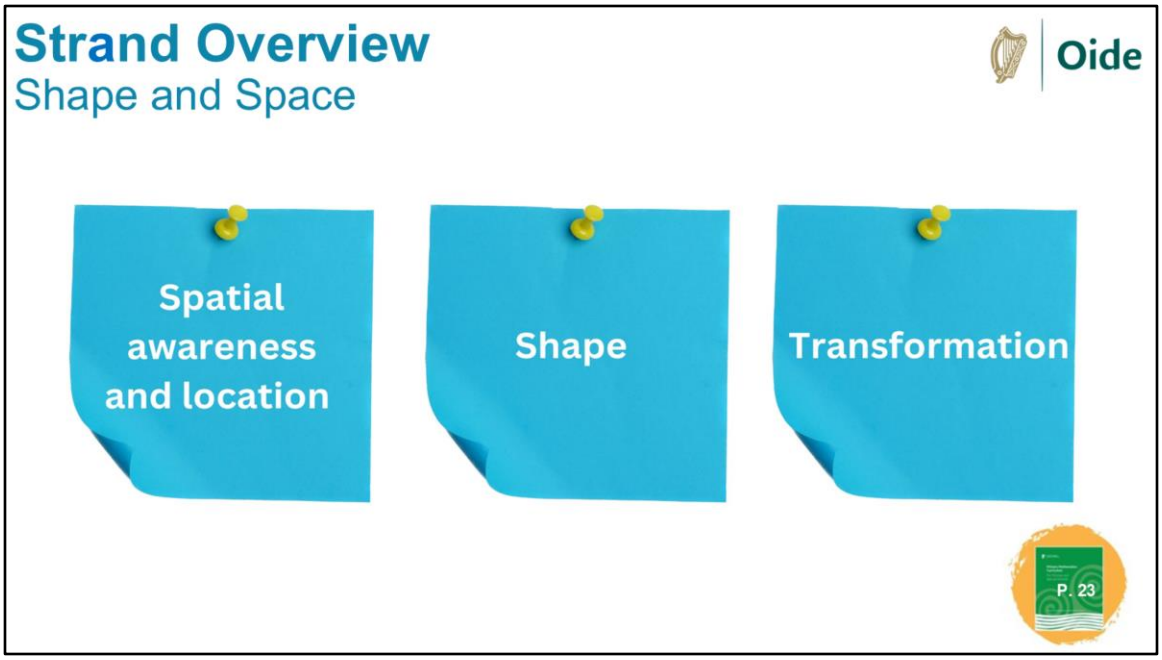


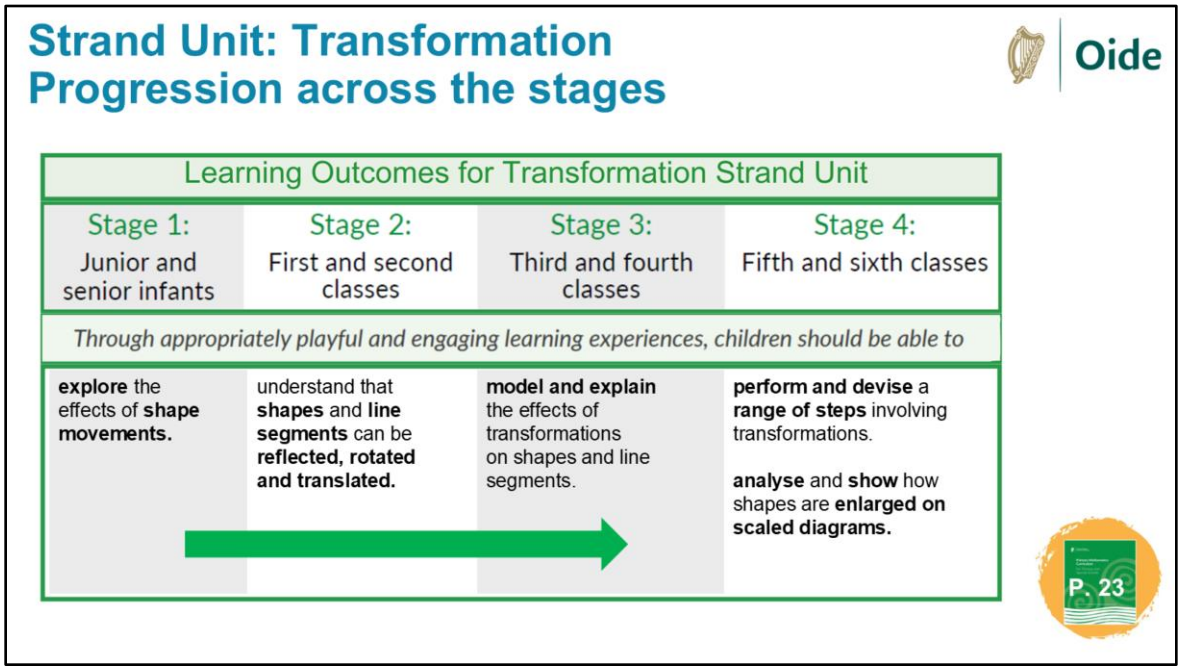
Purpose of slide:
Introductory slide for presentation of Stage 2 Shape & Space - Transformation.



Purpose of slide:
To provide an overview of the Strand of Shape and Space.

Notes for teachers:

- Go to p.23 of the curriculum document and take some time to look at the strand units of Shape and Space.
- Please note that '**Transformation'** is a new strand unit in the PMC.
- This presentation will explore the strand unit Transformation, but also aspects of the strand unit 'Shape' as they naturally complement each other.



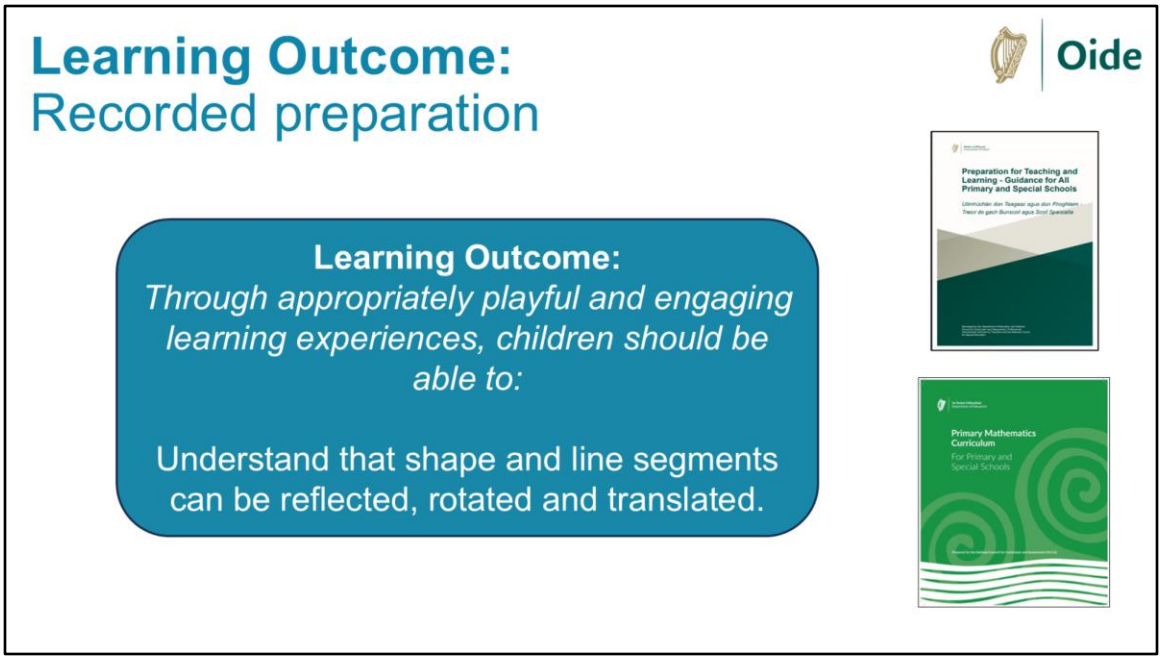
Purpose of slide:
To explore the progression across the stages in the strand unit Transformation.

Notes for teachers:

- Notice the progression along the stages.
- Note how language, knowledge and skills are developed from stages 1 to 4.
- Knowledge of progression is necessary so that we can adapt and extend our teaching based on the knowledge we have of the children in front of us.
- Looking at the learning outcomes we can see how each stage builds upon the last, fostering a rich understanding of transformation and its mathematical significance.
- In Stage 1 pupils will use **informal language** such as ***flip/turn/slide.*** This foundational stage encourages curiosity about the basic movements of shapes without formal terminology.
- In Stage 2, pupils progress to using **formal mathematical language** ***reflect/rotate/translate.*** Pupils continue to explore, learn and build knowledge about specific types of transformations—reflections, rotations,

and translations. They start to recognise and differentiate these movements, deepening their understanding of how shapes can change position and orientation.

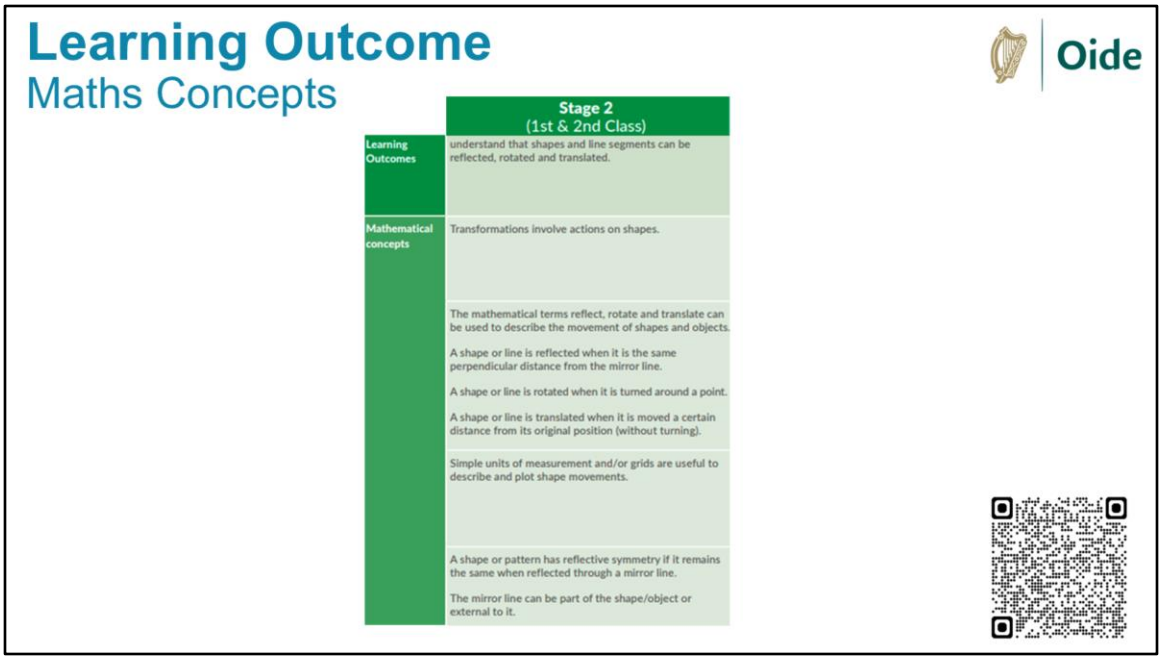
- In Stage 3, pupils **model transformations and explain their effects on shapes and line segments**. They begin to articulate their understanding, using appropriate terminology to describe how transformations alter the shapes' positions and properties.
- In Stage 4, pupils not only perform various transformations but also **creatively devise their own sequences of steps** involving these movements. They analyse how shapes can be enlarged or reduced in scaled diagrams, integrating their knowledge of transformations into more complex scenarios.
- Each stage builds upon the last, fostering a comprehensive understanding of geometric transformations.
- Summary:
    - (Stage 1) Exploration of movements leads to
    - (Stage 2) understanding transformations which evolves into
    - (Stage 3) the ability to model and explain those transformations
    - (Stage 4) where pupils perform and create transformations, applying their knowledge.



Purpose of slide:
To highlight the learning outcome as the starting point for preparation for teaching and learning.

Notes for teachers:

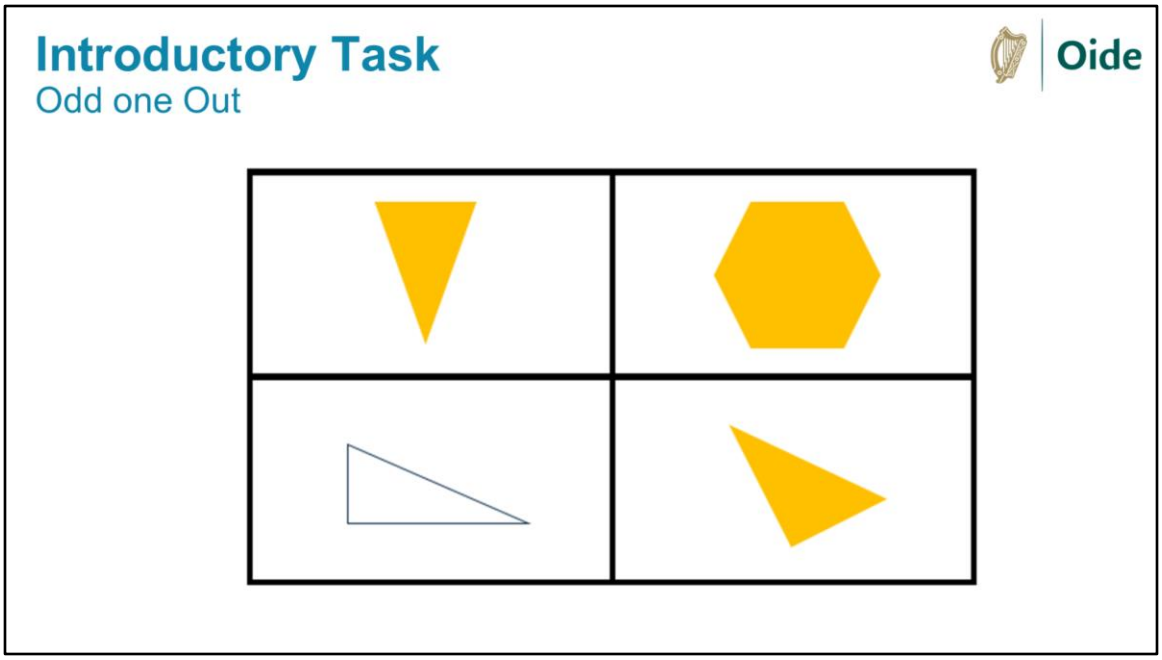
- This is the learning outcome for Stage 2 Shape and Space Transformation.
- Learning outcomes are broad in nature. They are the big mathematical ideas that pupils work towards over a 2-year period.
- When working with learning outcomes it is useful to break down the learning outcome into areas of focus using the maths concepts (see next slide).
- For Stage 2 Transformation the pupils will *understand that shape and line segments can be reflected, rotated and translated.*



Purpose of slide:
To highlight the Maths Concepts which underpin the learning outcome for Stage 2 Transformation.

Notes for teachers:

- The Maths Concepts are the key mathematical ideas that underpin each learning outcome.
- The Maths Concepts may be useful in identifying a Focus of New learning when preparing for teaching and learning.
- Take a few moments to explore the Learning Outcomes and the Maths Concepts on the NCCA Maths Toolkit by using the QR code above.



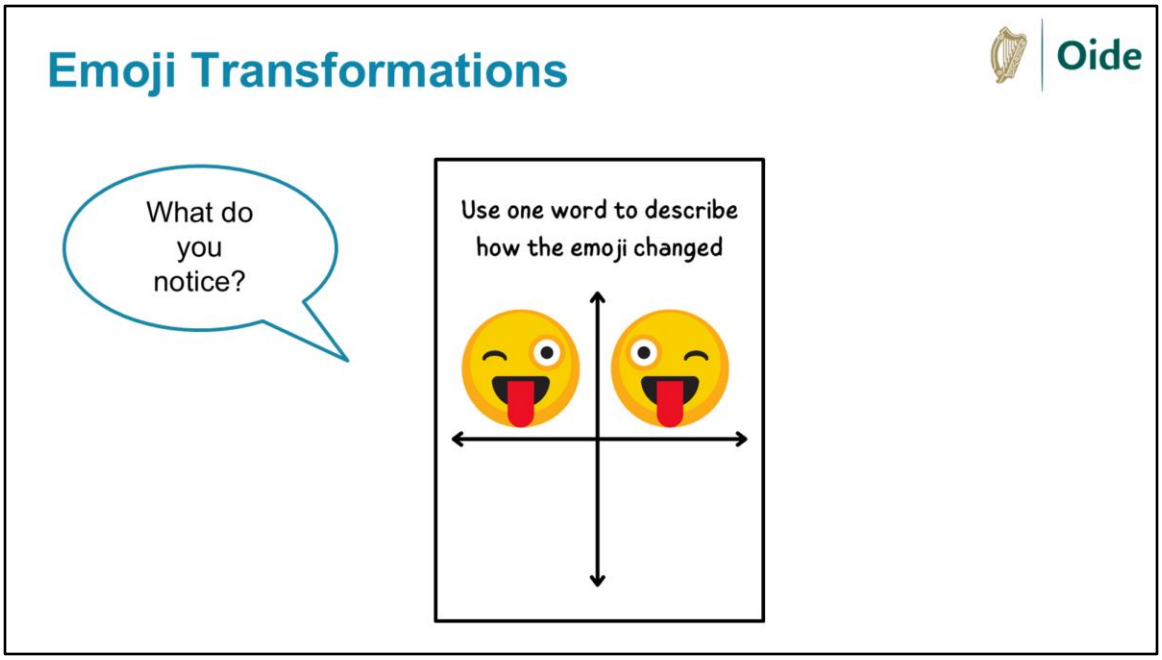
Purpose of slide:
To engage participants in a maths task that promotes maths talk based on Shape and Space.

Notes for teachers:

- Odd One Out activities ask learners to identify which picture, image or number doesn't belong. There is no right or wrong answer and success is based on the ability to justify their answer.
- By encouraging all learners to 'have a go' and 'valuing all contributions', odd one out activities develop the skills of reasoning and communicating.
- Learners discuss and share their thinking and their ideas while
    - Reflecting on their understanding.
    - Developing their ability to express their thinking.
    - Justifying their ideas.
    - Making sense of their ideas and those of others.
- Odd One Out activities can be used to assess prior knowledge, learning at the end of a unit of work or mathematical language.
- Odd One Out activities are suitable for all age groups.
- Ask pupils to take a moment to look at the images on the slide and think

about which one they think is the odd one out and why?

- Ask pupils to turn to the person beside them and tell them which one they think is the odd one out and why.
- Encourage pupils to share their thinking with the whole class.
- Bring pupils attention to symmetry if this has not been previously mentioned.



Purpose of slide:
To introduce the formal language of transformation using the Mathematical Concept: *Use the terms reflect, rotate, and translate to describe the movement of shapes and objects.*

Notes for teachers:

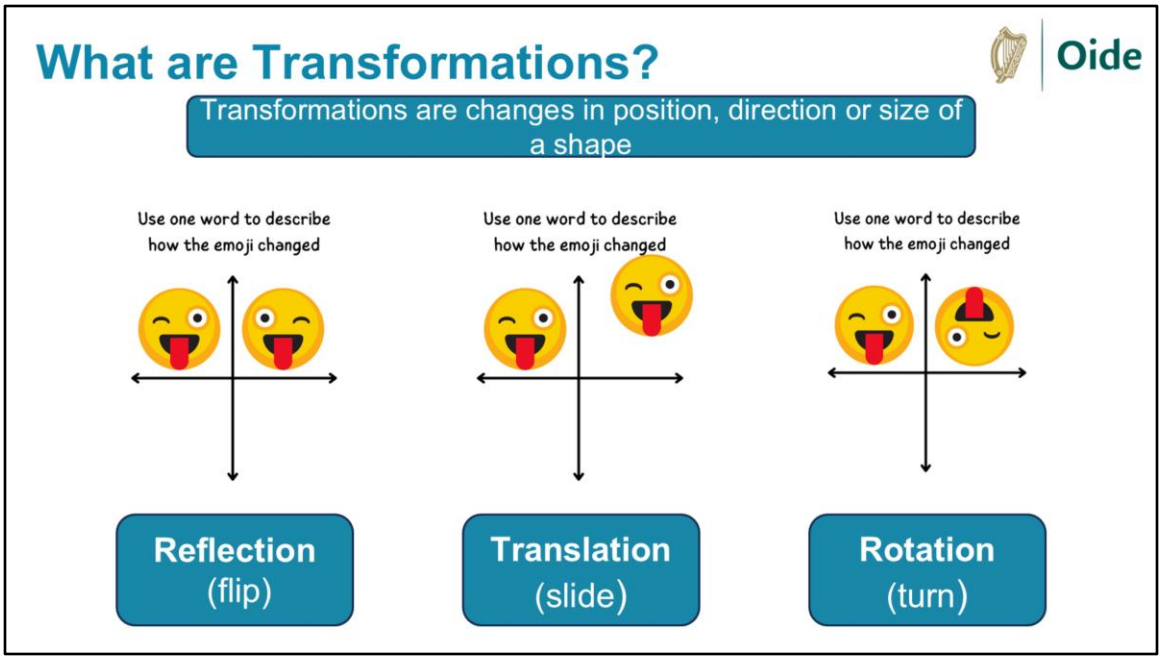
- In stage one, the pupils use informal maths language when describing transformations e.g. flip, turn, slide.

The goal is to introduce mathematical language *just in time NOT just in case*—connecting understanding to terms like *reflection* (flip), *rotation* (turn), and *translation* (slide).

- <u>How this would look in the classroom:</u>

1. Observation - Ask pupils to observe the emoji poster and share what they notice.
2. Classroom Application - In groups or pairs, pupils discuss what they notice and wonder (linked to mathematical elements and dispositions).

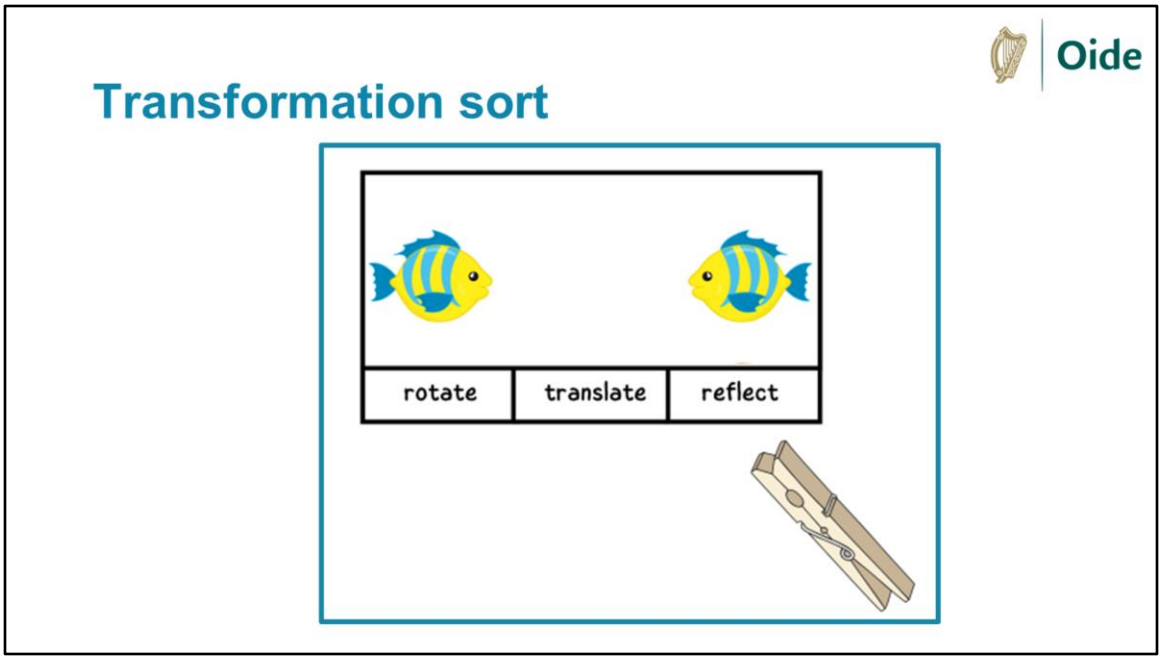
3. Group Discussion - Pupils describe how the emoji changes in each image, using one word to explain what has happened.
4. Whole-Class Discussion - The teacher leads a discussion, providing mathematical terms as needed. Example: A pupil says, "The emoji flipped." The teacher introduces the formal language, "We call that a reflection. Can you think of anywhere else that happens?”



Purpose of this slide:
To explain what transformations are and the key language linked with the strand unit.

Notes for teachers:

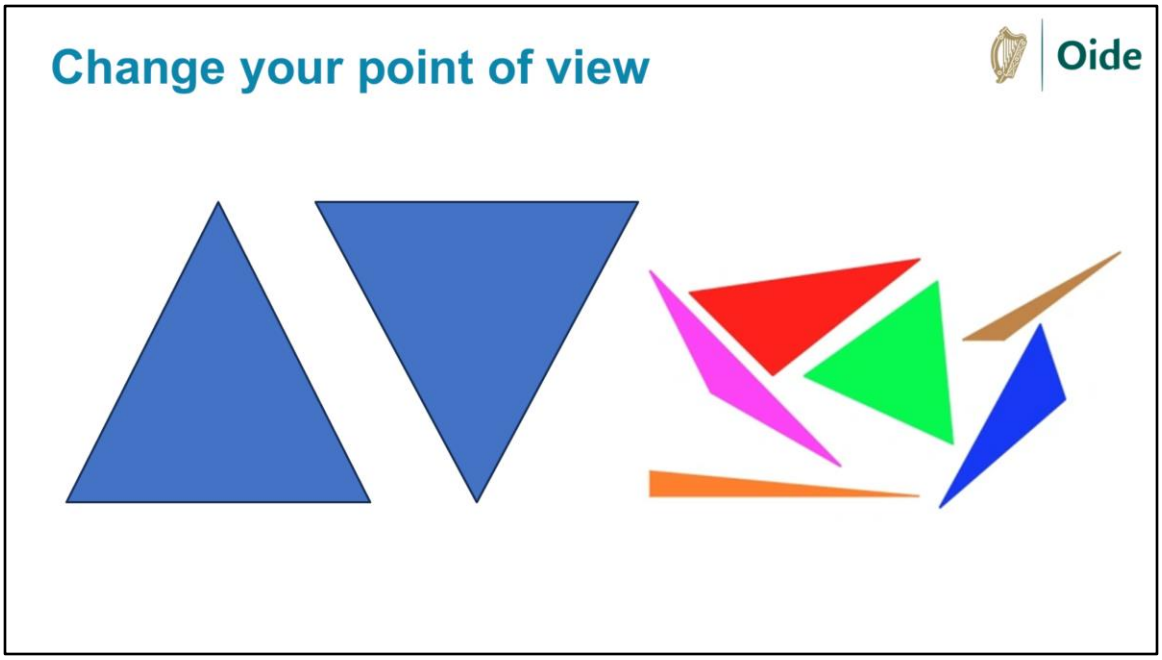
- Transformations are changes in position, direction or size of a shape: Reflections (flips), Translations (slides), Rotations (turns).
- Reflections are when we flip the shape, Translations are when a shape slides and rotations are when a shape is turned.



Purpose of slide:
To highlight a transformation activity.

Notes for teachers:

- Ask the pupils to look at the images.
- What do they notice? What has changed? What word could they use to describe what has happened?
- The pupils stick the clothes peg on the correct term.
- These could be used as a form of assessment.



Purpose of slide:
To develop the idea that moving shapes in different ways to achieve a purpose does not change their size or features, even though the shapes may look different.

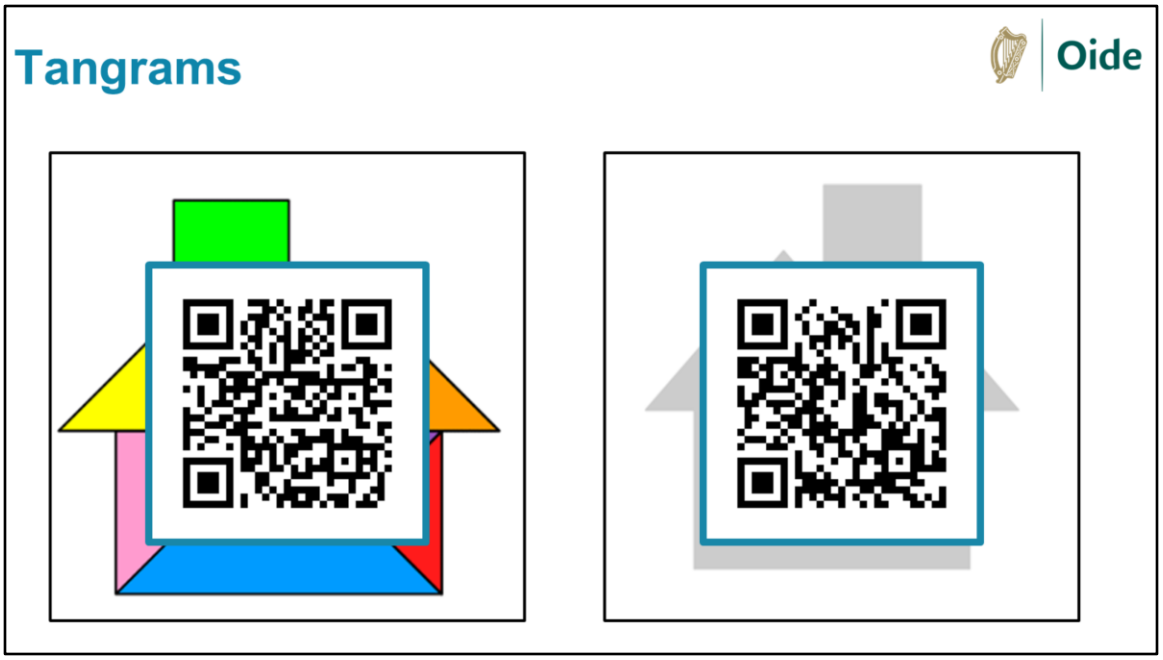
Notes for teachers:

- Ask the pupils: *What do we call this shape? What do we call the second shape?* Have you ever heard a pupil refer to it as an upside-down triangle?
- Prototypical and non-prototypical - As many puzzles, posters, picture books and even textbooks focus on prototypical shapes such as the regular (all sides and angles equal) triangle and pentagon, pupils may have limited or no experience working with non-prototypical shapes.
- Research indicates that the overuse of prototypical shapes can lead to difficulties in recognising particular shapes as belonging to a specific category (Fox, 2000; Edwards and Harper, 2010).
- For example, the first triangle, the equilateral triangle, is a common triangle prototype. However, if children are exposed only to this prototype,

they may not recognise that the other shapes are triangles and they lose opportunities to identify what a triangle really is – not a “shape that looks like this,” but a shape made up of three straight sides.

- A shape’s position, orientation or size can be changed without changing the kind of shape it is.
- We want children to recognise shapes by their properties not simply by 'what they look like'
- Suggested activities

    1. Viewpoint (*taken from First Steps Maths p.110)* - Have students say how something will look from a different view. For example, invite students to draw a familiar object, such as a bucket, a cup, a milk carton, or a toy. At first, focus the students on representing the parts that they can see. Then ask them to imagine and make another drawing of what they think is on the other side. Ask: Is there something on the other side that you know is there but you can’t see from here? What side will the handle be on if you draw it from the other side? How do you know?
    2. Fruit Bowl (*Fruit bowl – taken from First Steps Maths p.88)* - Have students sit in groups around a bowl of fruit, draw line drawings of what they see, and leave their drawings in a pile on the table. Invite them to exchange tables with another group, choose a drawing from that table and match the viewpoints with one of the drawing positions. Ask: How do you know it comes from here? What piece of fruit can you see when you are sitting in this seat? What can’t you see? Which seat would you be sitting in if you could see what is shown in this drawing?



Purpose of slide:
To highlight tangrams as a useful resource to reinforce the language and visualization of shape transfromation.

Notes for teachers:

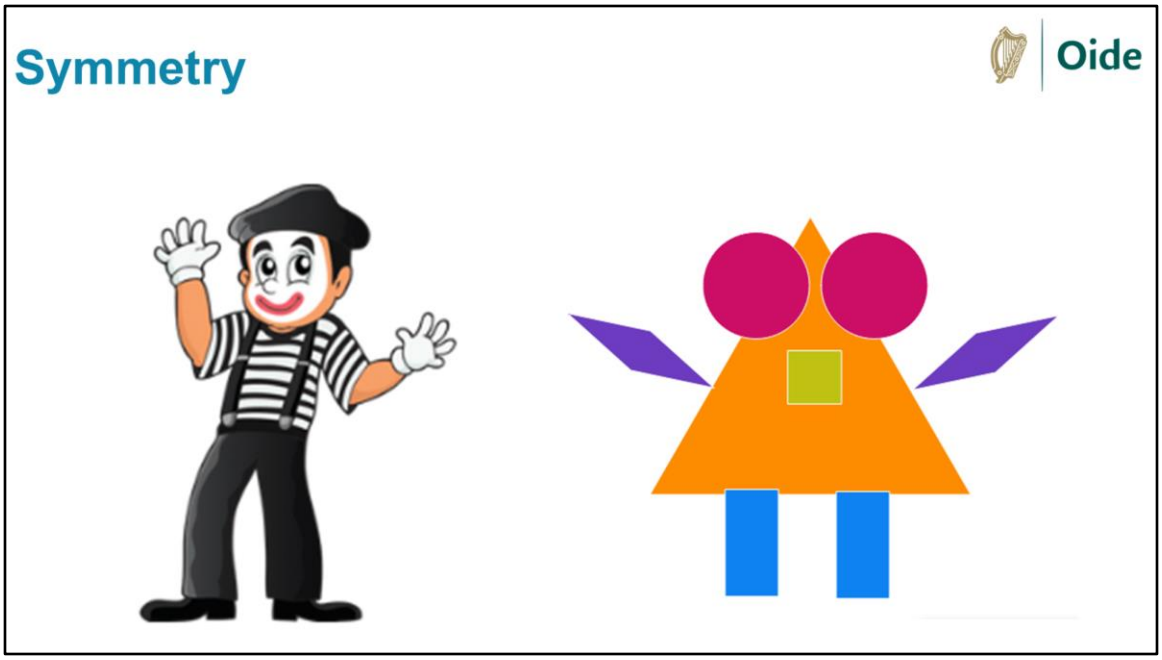
- Pupils will need many opportunities to work with hands on materials to help them visualize transformations.
- Pupils create a picture using basic shapes (e.g. a house or an animal).
- One child draws around the outline of their chosen shape.
- Their partner then fills in the outline using tangrams encouraging them to use the language of transformation: reflect, rotate, translate.

Virtual Activity:

- Pupils can then try the virtual tangrams with guidelines and the tangram builder (QR Codes).
- Discuss and compare afterwards how they found the activity with and without the guidelines.

Resources:

- Left QR is Amplify Polypad shapes to make house online manipulative: https://polypad.amplify.com/p/AnUwwItjFlOKg
- Right QR code is link to useful resource from Amplify Polypad – virtual Tangrams: https://polypad.amplify.com/tangram (tangram builder)



Purpose of slide:
A shape or pattern has reflective symmetry if it remains the same when reflected through a mirror line.

Notes for teachers:

Mime Symmetry - Miming Reflection
- Each pupil will be paired with a partner.

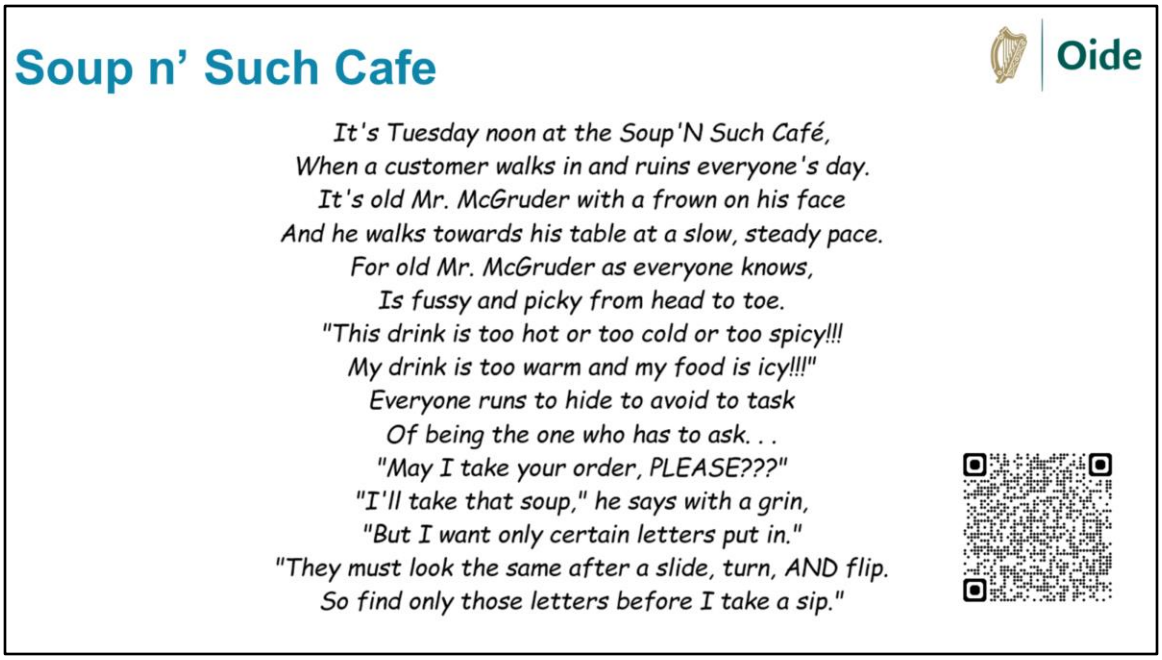
- Partners will face each other and will be instructed to 'reflect' or mimic each other's actions.
- The activity will begin at a slow pace and gradually increase in speed.
- If time permits, pupils can change partners.
- After the activity, discuss the properties of reflection, emphasizing that actions performed with one hand (e.g., left hand) are mirrored with the opposite hand (e.g., right hand), and vice versa.

Mirror Reflection
- Each group will receive a hand-held mirror, and a large floor-to-ceiling mirror if available in the classroom.

- Groups will observe themselves, other objects in the classroom, and a sheet containing various symbols through the mirrors.
- During the exploration of the symbols, formally discuss the point of reflection for each object.

Resources:

This link provides an activity for pupils to reflect the shape monster above through a diagonal line on the Amplify Polypad website:
https://mathigon.org/polypad/8E6rxw22xMPm6g



Purpose of slide:
To show how to use poetry/story as a stimulus for a transformation activity.

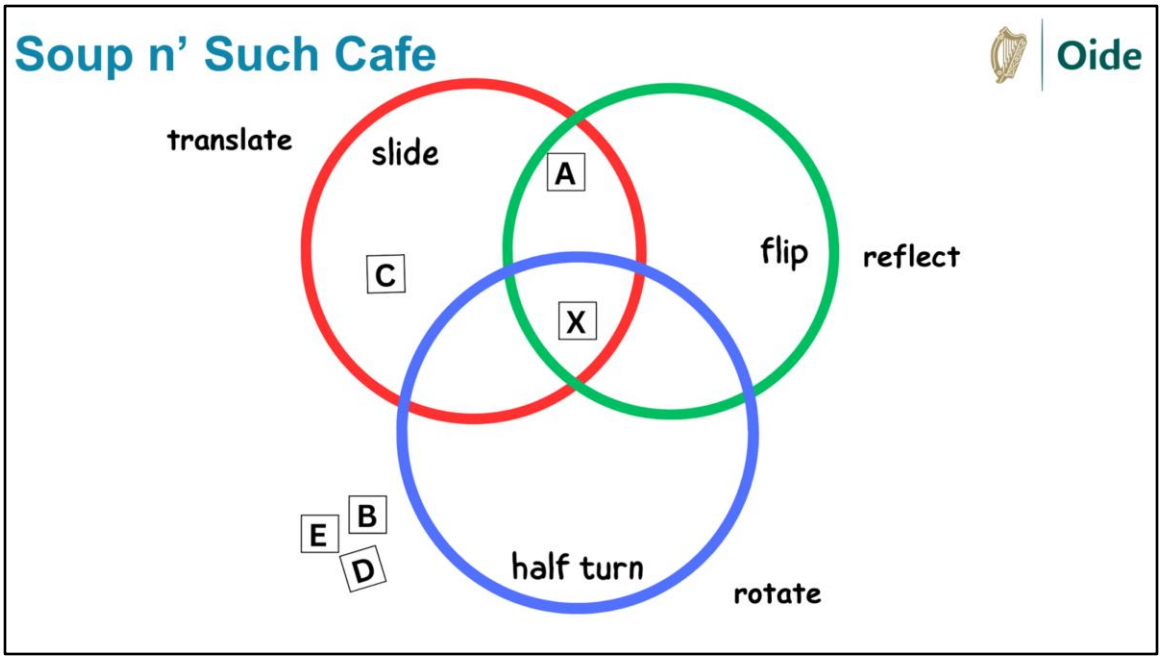
Notes for teachers:

- Pupils will work in groups to determine which letters to add to the 'soup'. Using concrete alphabet letters (magnetic or cardstock), they will explore which letters remain the same after specific transformations:
  - Slide or translation
  - Flip or reflection
  - Turn or rotation
- Students will sort the letters into groups based on these transformations and ultimately figure out which letter will go into the soup.
- Consider how the pupils will engage with the four elements in a task such as this.
- Encourage the use of tools like a chart, table, or Venn diagram to help pupils to visually represent their thinking (see next two slides).
- Additionally, concepts like quarter, half, and full turns, can be introduced here leading into a discussion on rotational symmetry.

- Answers to task:
  - Letters that remain the same after a slide/translation: All letters.
  - Letters that remain the same after a flip/reflection: A, H, I, M, O, T, U, V, W, X, Y.
  - Letters that remain the same after a 180° turn (rotational symmetry): H, I, N, O, S, X, Z.
  - The letters that appear in all three groups are the ones that go into the soup: O, H, I, X.

Resources:

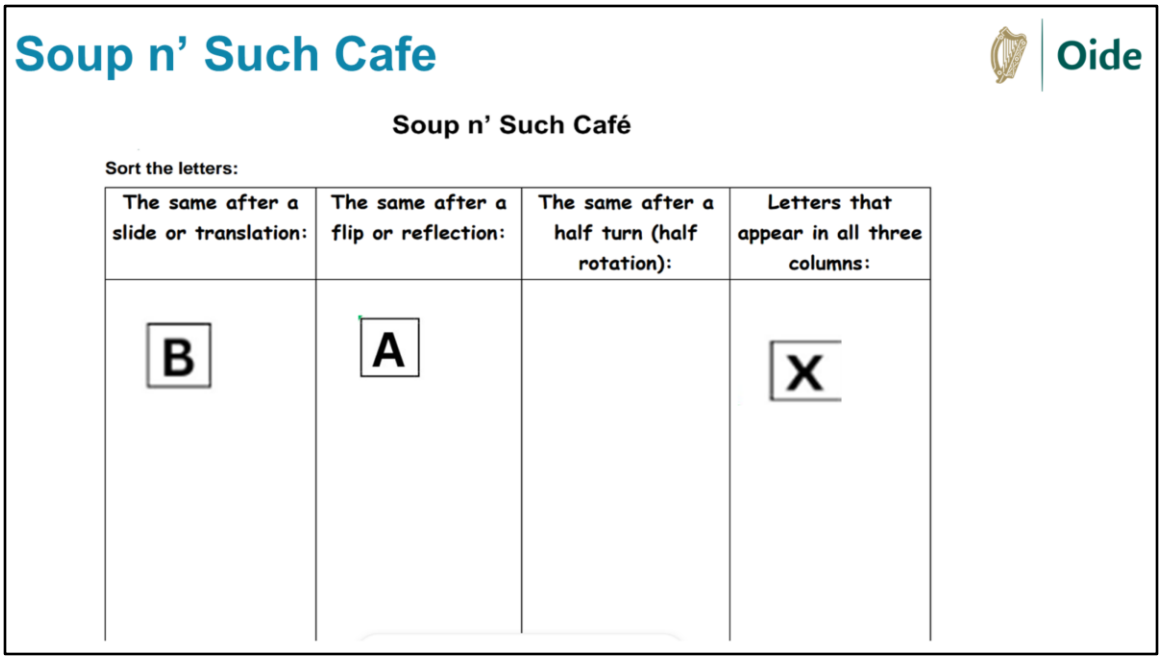
This activity is available as an Exemplar on https://pmc.oide.ie/resources/exemplars/ and via the QR code



Purpose of slide:
To show how to use poetry/story as a stimulus for a transformation activity and linking transformation with Data.

Notes for teachers:

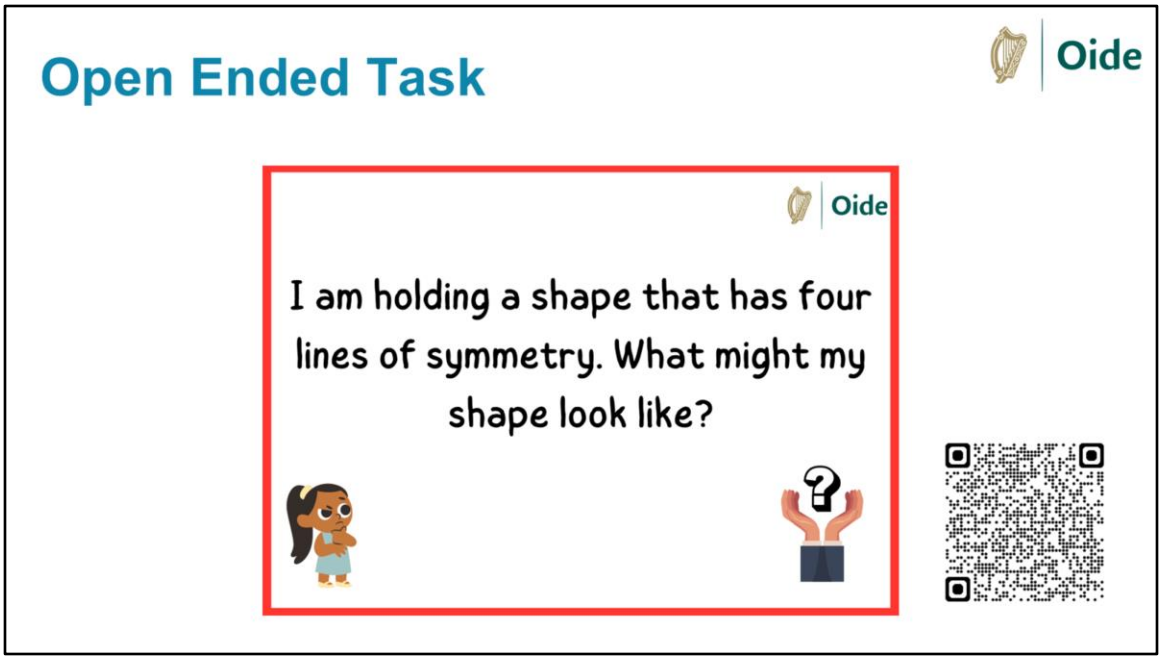
- A Venn diagram can help pupils to sort the soup letters – this could be done using hoops in the classroom.
- Teachers can use their agency here to decide whether the use of informal or formal language of transformation is more appropriate for their class at the time.



Purpose of slide:
To show how to use poetry/story as a stimulus for a transformation activity and linking transformation with Data.

Notes for teachers:

- A Carroll diagram may also be used to sort the letters for the soup.



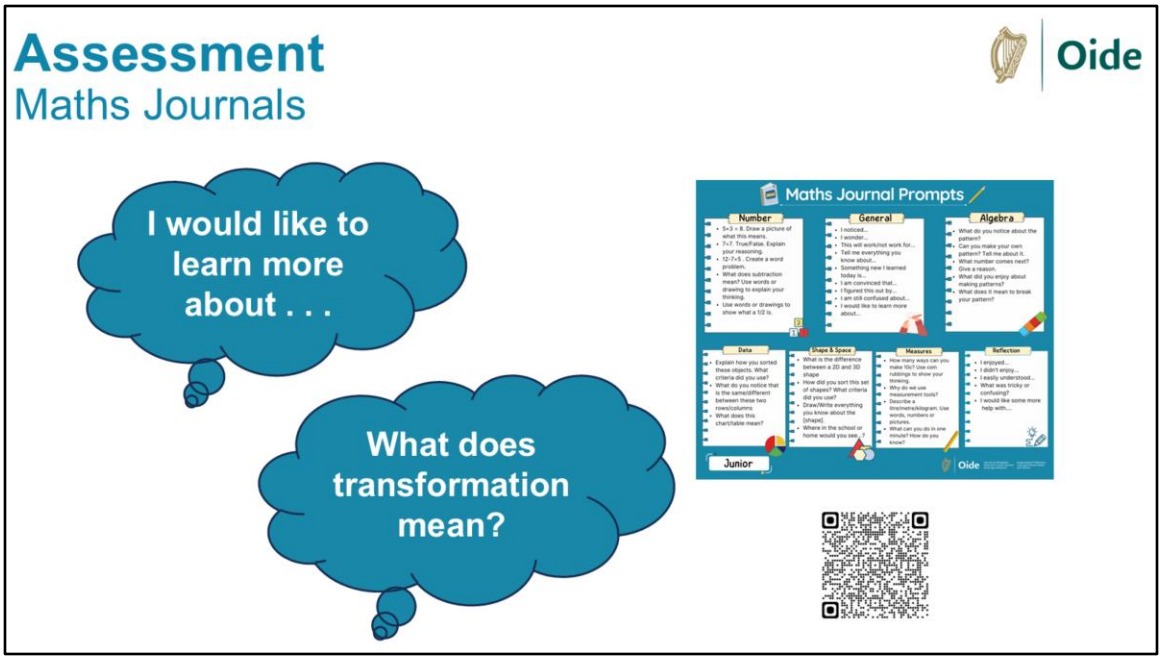
Purpose of slide:
To demonstrate an open ended task linked to transformation.

Notes for teachers:

- An open-ended task is one where there is a range of 'correct' solutions and/or a range of ways to achieve one or more solutions.
- Using open-ended tasks is one way to encourage playfulness in mathematics.
- Open-ended tasks, like this task, provide opportunities for *exploration, investigation, challenge, creativity, choice and independence.*
- A key aspect of children engaging in open-ended tasks is the follow-up discussions that take place either in a small group or a whole class setting.
- If the emphasis is placed on the generation of different ideas, all children feel that they have something to contribute, and, moreover, learn from the ideas and strategies of their peers.
- Open-ended tasks are also one way of providing cognitively challenging tasks in maths.
- When selecting an open-ended task, as with selecting any task, it is

important to keep in mind the mathematical goal.

Resources:
Further Open Ended tasks may be explored on
https://pmc.oide.ie/resources/micro-maths/ or via the QR code



Purpose of slide:
To provide reflective prompts for Maths Journals to use in class.

Notes for teachers:

- Journals are useful for both teachers and learners to assess attitudes, knowledge and skills.
- Children can keep track of their thinking and understanding in the journal.
- Journals can contain general observations about Maths or can be more specific and focus on a particular concept.
- On the slide are two journal prompts which can be used in class. The first one focuses on the child's disposition and can be used across all strand units.
- Journal prompts:
    - I OBSERVED, I DISCOVERED, I CHECKED, I PROVED…
    - Today I enjoyed… general prompt to get the children thinking about maths and the areas that they are curious about.
    - Specific strand-based prompts….Draw your favourite shape. Where might you see it all around you? Use words or drawings

to explain your thinking. (See example on next slide)

- Use the QR Code on the slide to find the above journal prompts on the PMC Hub.