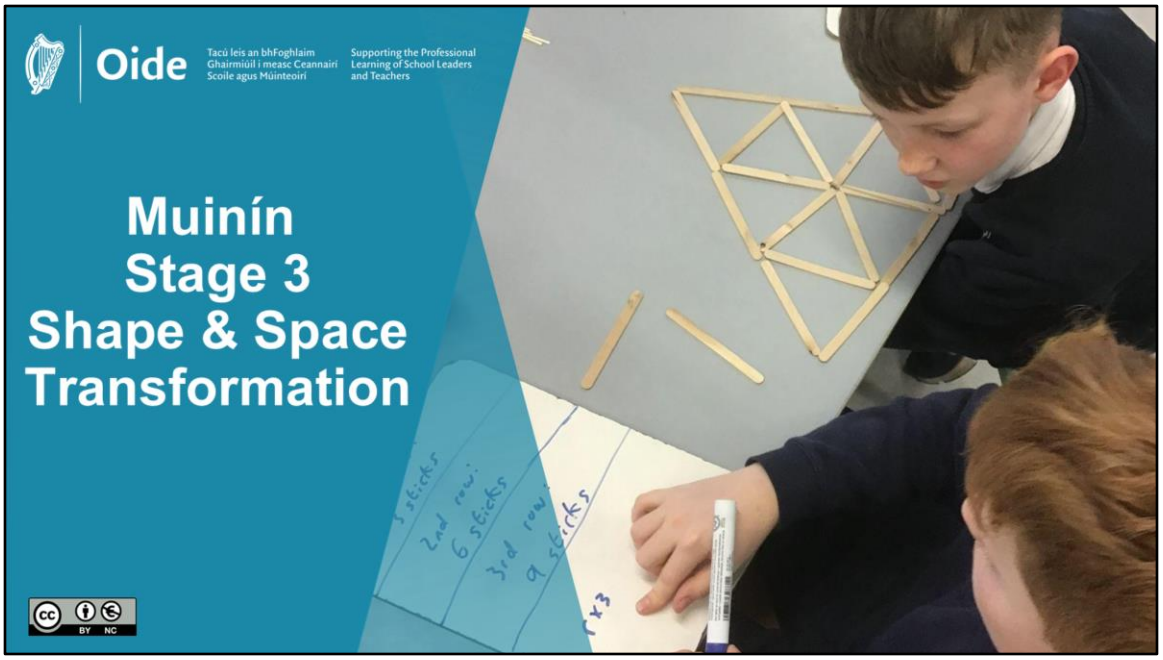
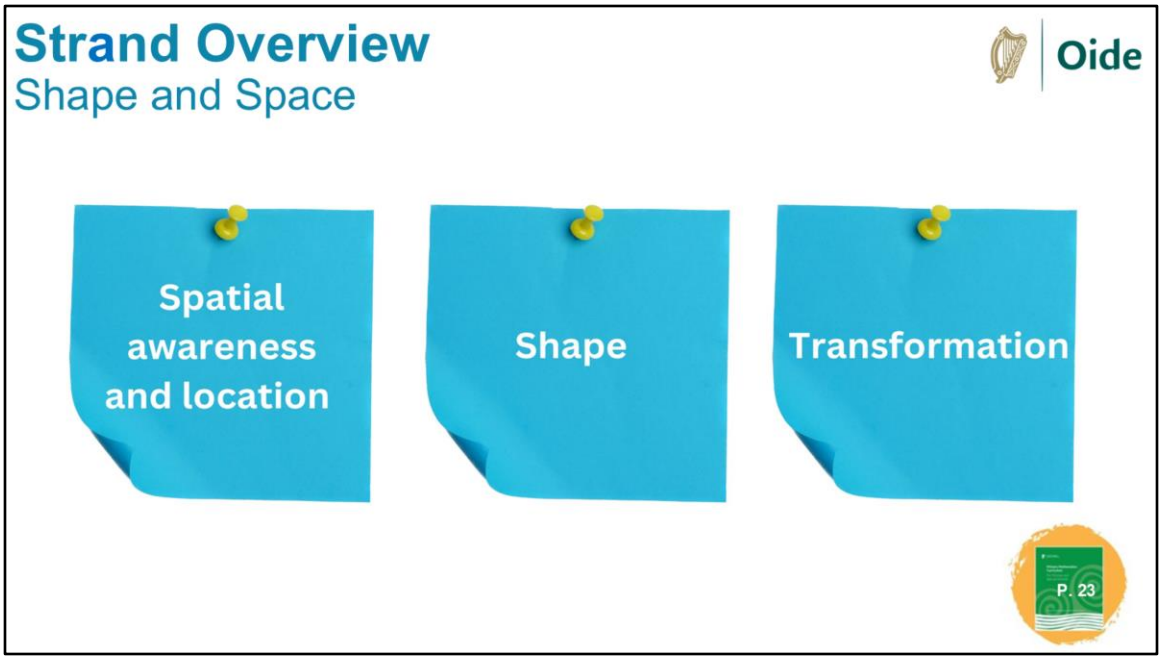


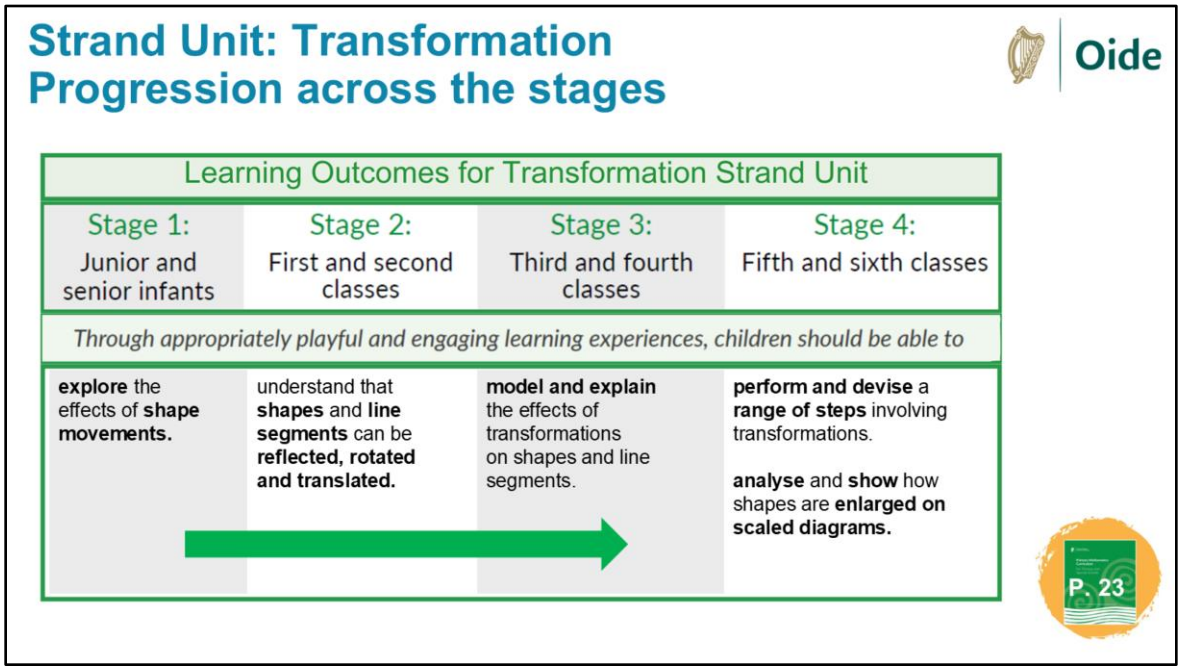
Purpose of slide:
Introductory slide for presentation of Stage 3 Shape & Space - Transformation.



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

Notes for teacher:

- 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.



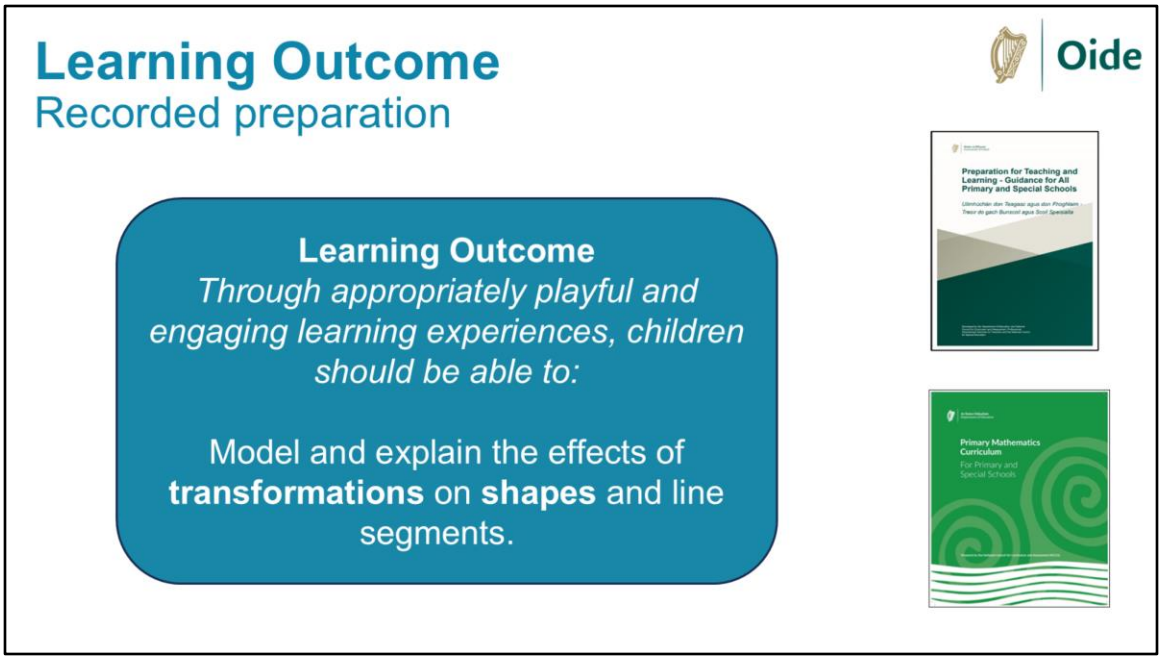
Purpose of slide:
To explore the progression across the stages in the strand unit Transformation.

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.

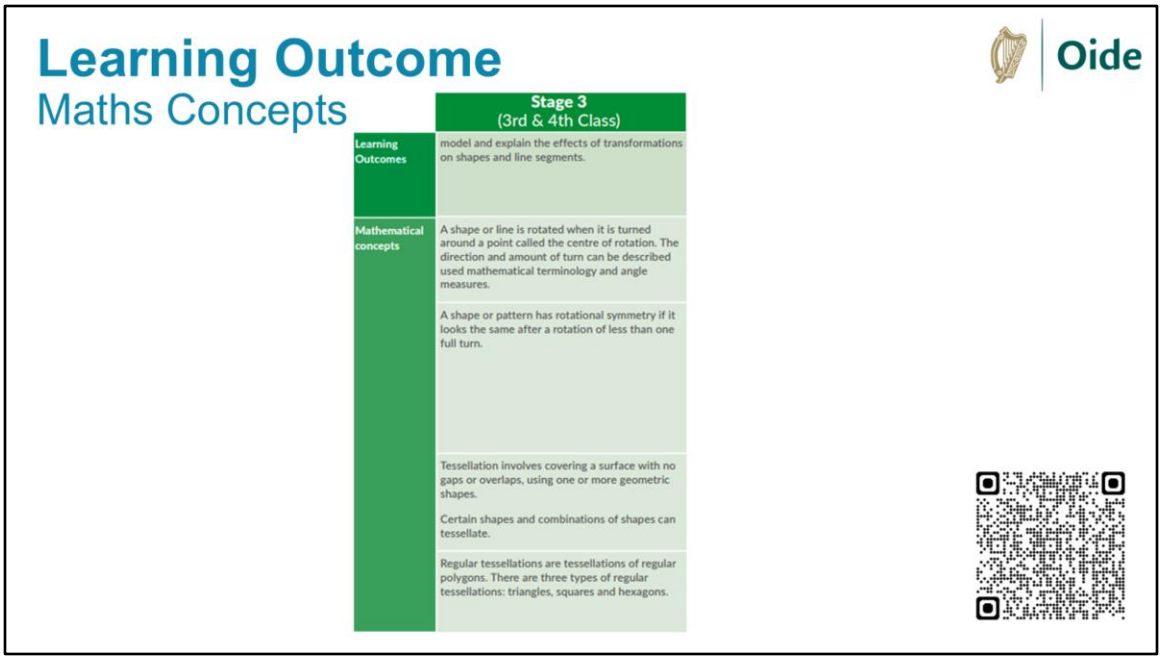
- In Stage 3, pupils **model transformations and explain their effects on shapes and line segments**. They begin to articulate their understanding, using appropriate terminology to describe how transformations alter the shapes' positions and properties.
- In Stage 4, pupils not only perform various transformations 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:

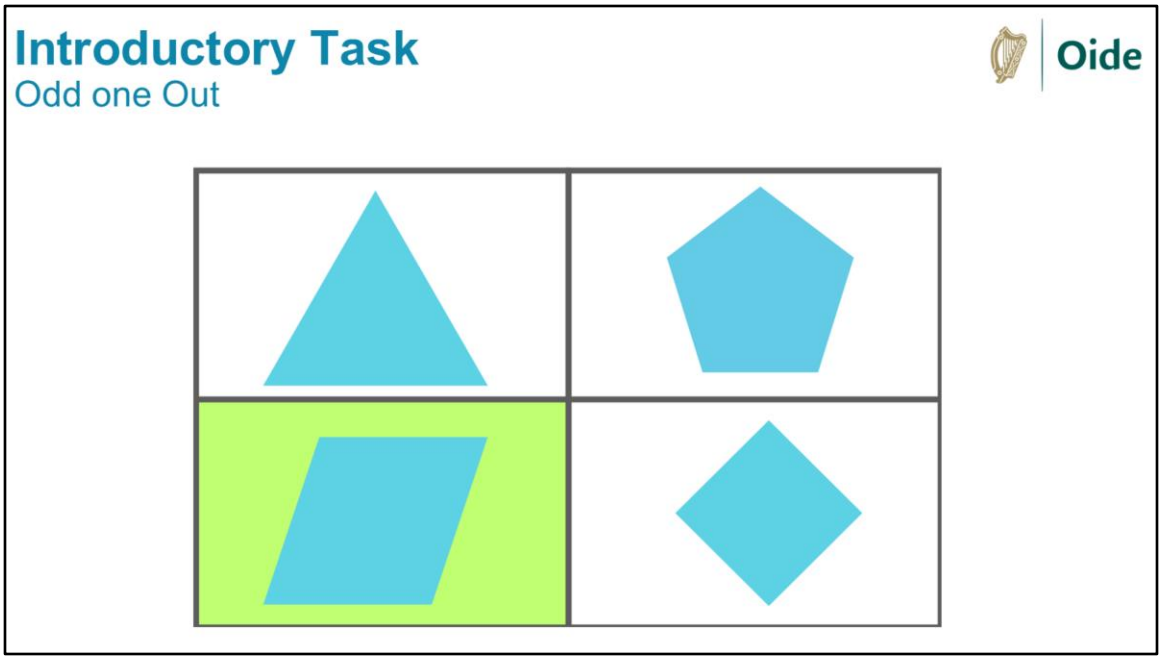
- This is the learning outcome for Stage 3 Shape and Space Transformation.
- Learning outcomes are broad in nature. They are the big mathematical ideas that pupils work towards over a 2-year period.
- When working with learning outcomes it is useful to break down the learning outcome into areas of focus using the maths concepts (see next slide).
- For Stage 3 Transformation the pupils will *model and explain the effects of transformations on shapes and line segments.*



Purpose of slide:
To highlight the Maths Concepts which underpin the learning outcome for Stage 3 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.



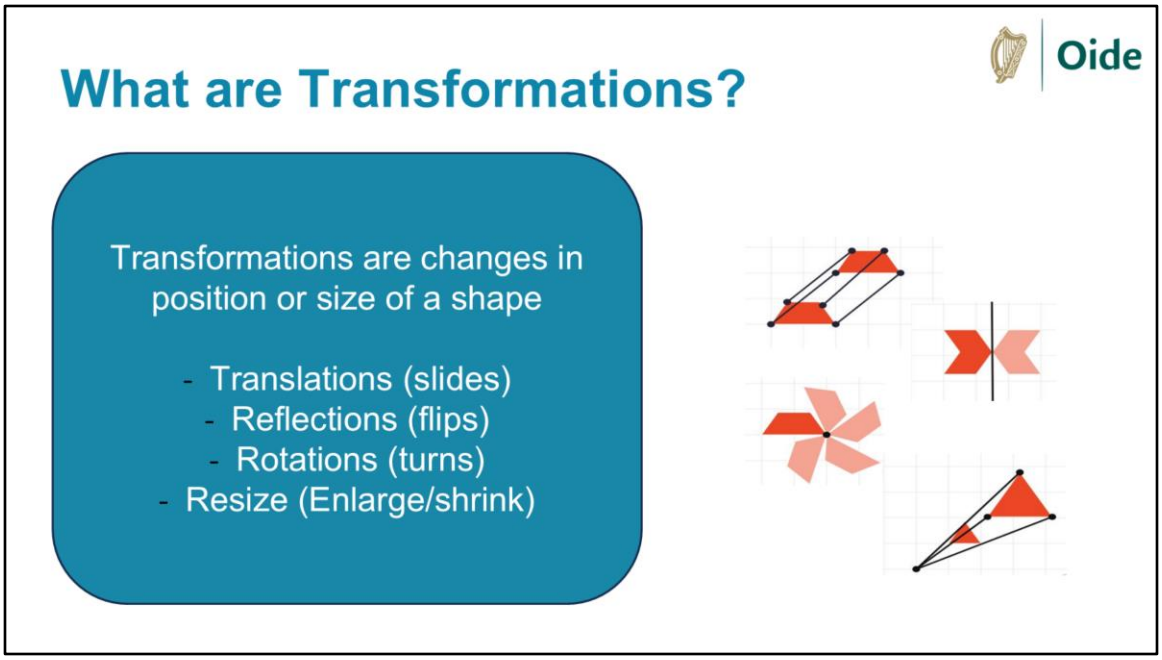
Purpose of slide:
To engage participants in a maths task that promotes maths talk based on Shape and Space.

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

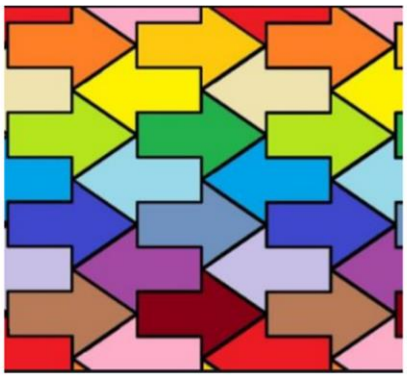
Notes for teachers:

- In Stage 3 we use formal mathematical language to describe transformation.
- Transformations are changes in the position or size of a shape.
    - Translations (slides) when a shape slides (without rotation or reflection). To translate a shape, every point of the shape must move in the same distance, in the same direction.
    - Reflections (flips) when we flip the shape by picking it up and turning it OVER.
    - Rotations (turns) when a shape is turned AROUND.
    - Resize (Enlarge/ Shrink) when a shape becomes bigger or smaller.

Transformation
Tessellations

Oide

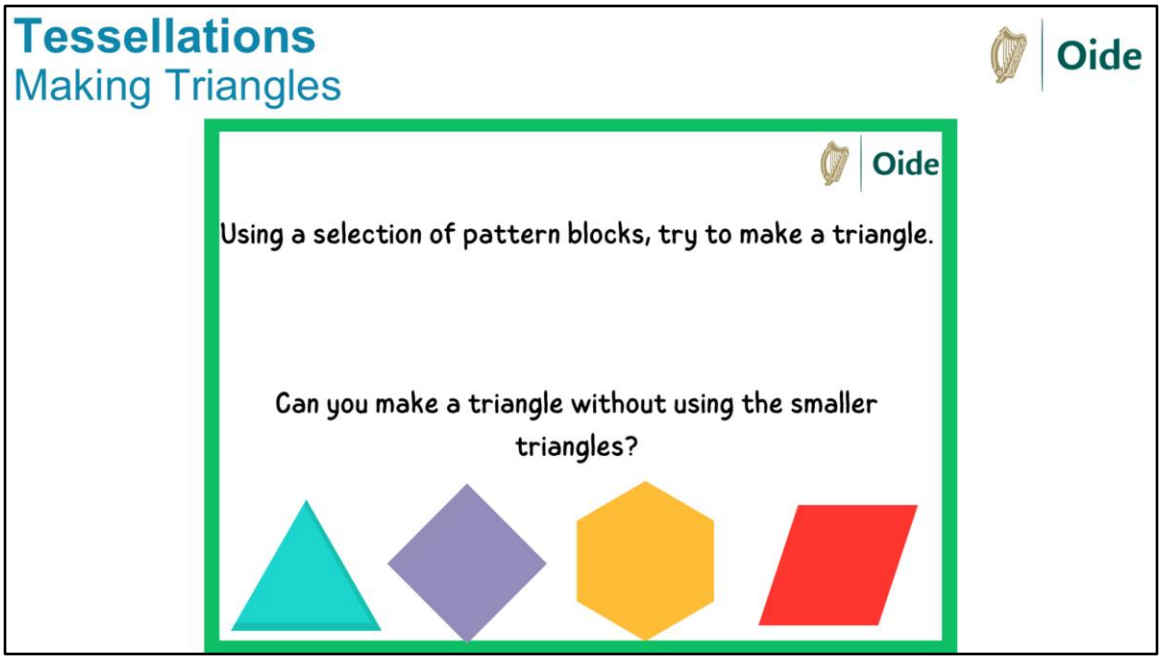
Tessellation involves covering a surface with no gaps or overlaps using one or more geometric shapes



Purpose of slide:
An introduction to Tessellation and using the language of transformation.

Notes for teachers:

- Tessellation involves covering a surface with no gaps or overlaps using one or more geometric shapes.
- Look at the image on the slide of the tessellating arrows. Ask the pupils, “What do you notice? Can you describe how the arrows tessellate?”
- Encourage the use of the language of transformation to describe what they see– translates, slides, reflects, flips, rotates, turns.
- This activity provides an opportunity for the use of maths language. The children are introduced to the language "just in time" "not just in case“- children are learning and using this language where and when it’s needed.



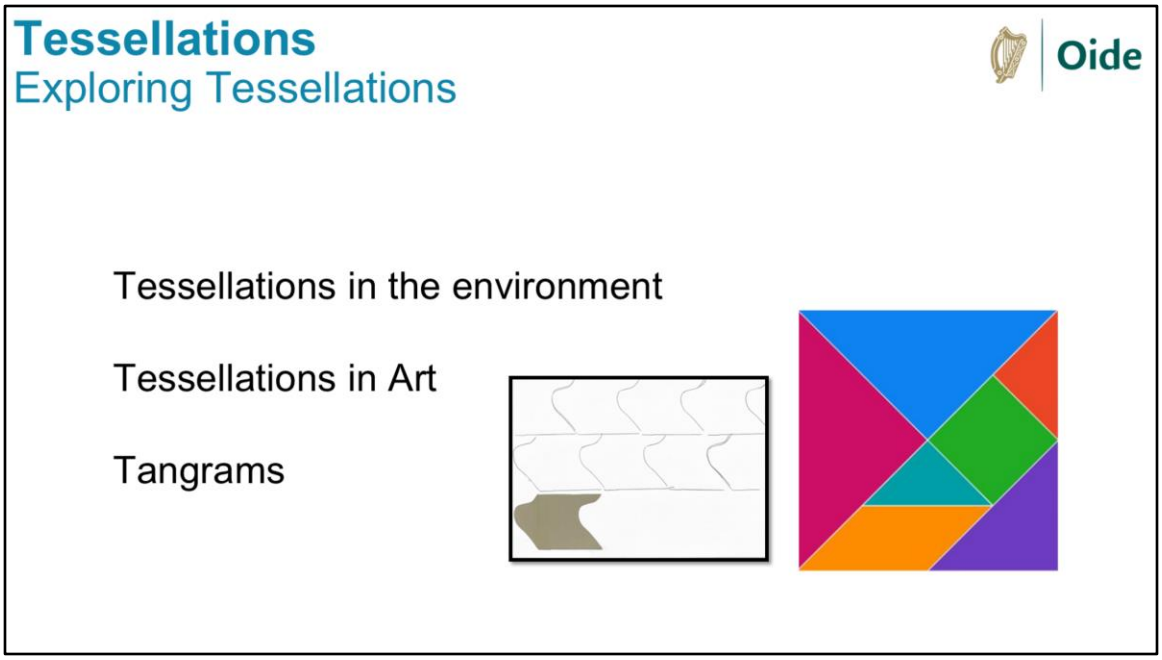
Purpose of slide :
To demonstrate a Stage 3 Tessellation task 'Making Triangles'.

Notes for teachers:

- Regular tessellations are tessellations of regular polygons. There are three types of regular tessellations: triangles, squares and hexagons.
- This is an open-ended task to explore tessellation of regular triangles. An open-ended task is one where there are a range of ‘correct’ solutions and/or a range of ways to achieve one or more solutions.
- Pupils can use either pattern blocks or online manipulatives to make a triangle.
- Prompts for discussion following the activity:
  - What do you notice about your triangle?
  - Did you use other triangles to make your triangle?
  - Can you make a large triangle without using smaller triangles? This can be used as an extension activity.

Resource:
The following links to Tessellation Creator and Amplify Polypad may be useful:

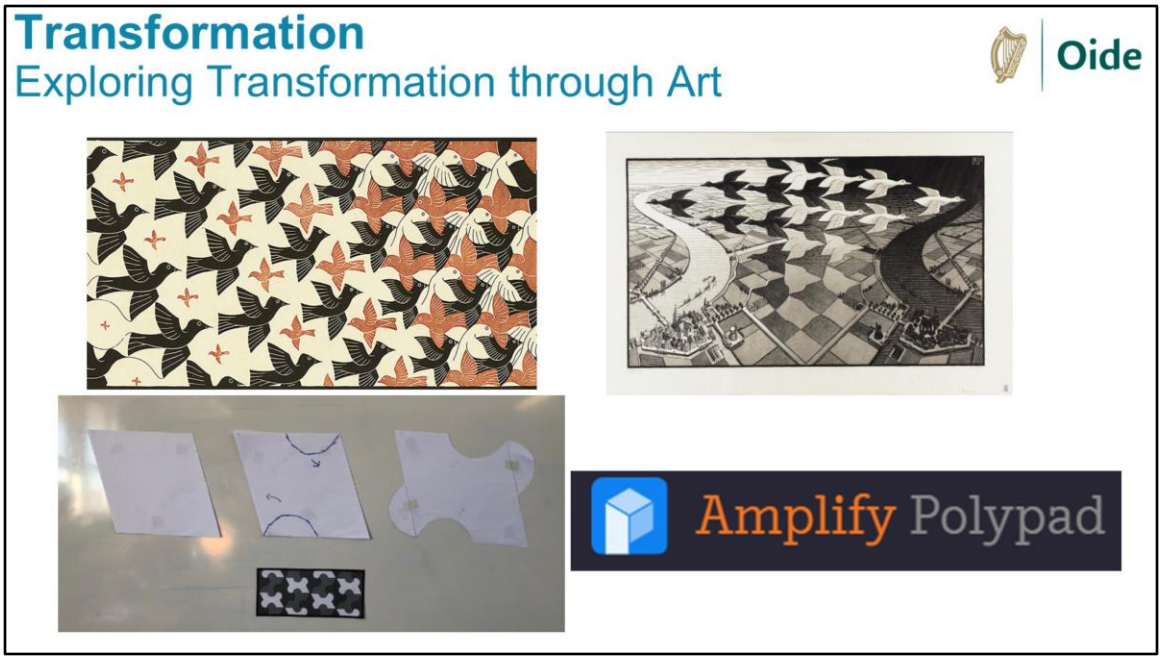
- https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Tessellation-Creator/
- https://mathigon.org/polypad/bWBzcIp87jGfA



Purpose of Slide:
To highlight additional learning experiences teachers can use to explore and develop tessellation.

Notes for teachers:

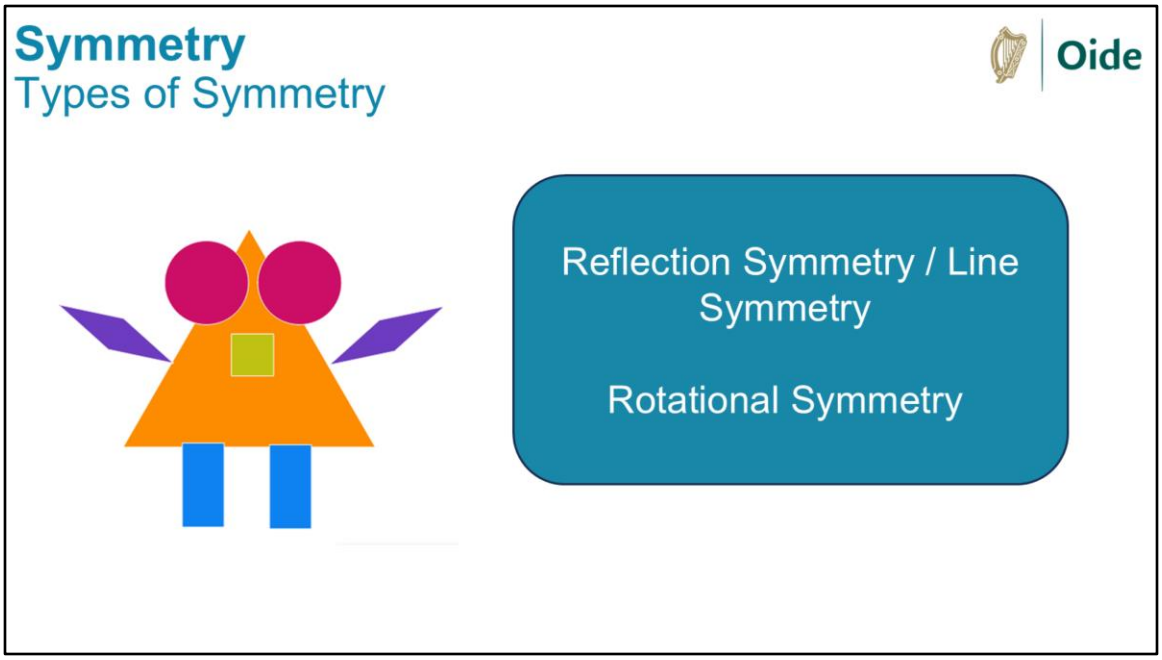
- This slide provides ideas about additional learning experiences teachers can use to explore and develop tessellation. These activities are a great way to create rich, meaningful and engaging learning experiences for children when exploring shape and space. When we choose these types of learning experiences for the pupils, we ensure that they are engaging with the four elements and that we are using the five pedagogical practices.
- Tessellation in the environment: Have you got Maths Eyes? Home - Have You Got Maths Eyes
- Tessellation in Art Op art — Google Arts & Culture
- Tangrams Polypad – Virtual Manipulatives
- Open-ended tasks for Tessellation on pmc.oide.ie: Open-Ended-Tasks-Shape-and-Space-1.pdf; Tessellating-Shapes-Stage-3-Transformations-.pdf
- Look at videos of children working on tessellation in the classroom: https://pmc.oide.ie/resources/pmc-videos/



Purpose of slide:
To demonstrate integration with other subject areas such as art.

Notes for teachers:

- Tessellation involves covering a surface with no gaps or overlaps using one or more geometric shapes.
- Escher often explored symmetric tessellations that were formed by repeatedly duplicating and rearranging only a single tile through translation, rotation and reflection. On the screen we can see two examples of his work.
- What examples of transformation do you see?
- Encourage the use of the language of transformation– translates, slides, reflects, flips, rotates, turns
- This activity provides an opportunity for the use of maths language. The children are provided with the language "just in time" "not “just in case".
- In class you could just use paper like you can see in the image. Digital tools such as Amplify Polypad are also very useful.

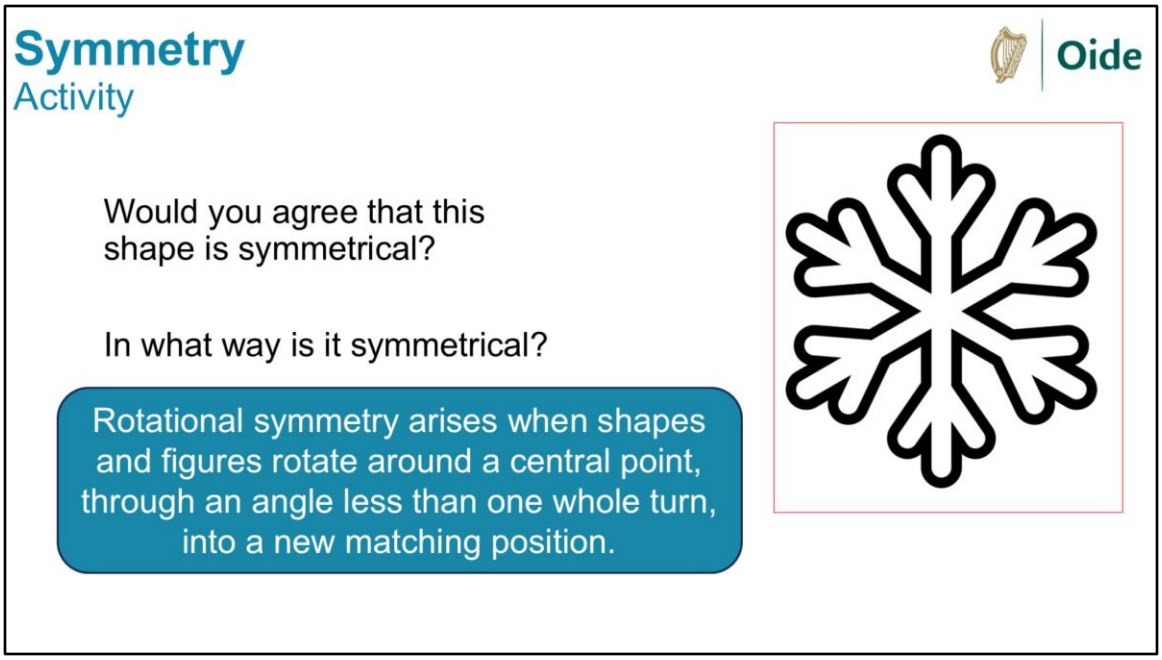


Purpose of slide:

To provide an overview of Symmetry and the different types of symmetry.

Notes for teachers:

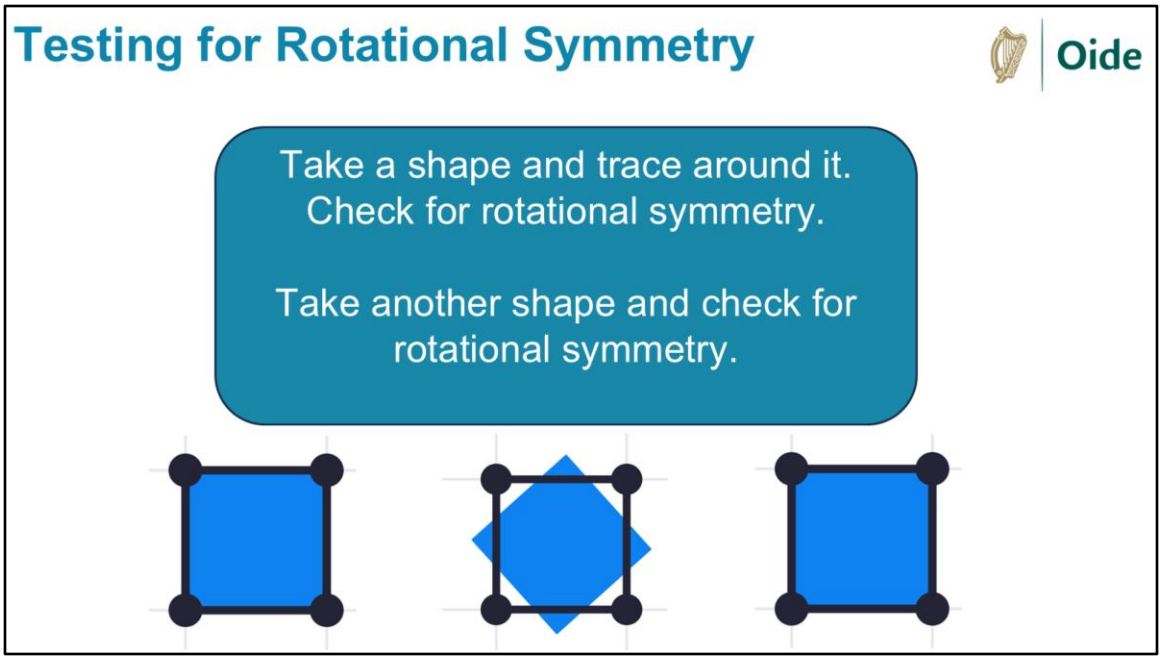
- Reflection Symmetry, sometimes called Line Symmetry or Mirror Symmetry, is when one half of the image or shape is the reflection of the other half.
- Rotational symmetry arises when shapes and figures rotate around a central point, through an angle of less than one whole turn, into a new matching position.



Purpose of slide:
To explore the concept of rotational symmetry.

Notes for teachers:

- Ask the pupils the following questions: “Would you agree that this shape is symmetrical? In what way is it symmetrical?"
- Do the pupils suggest rotational symmetry? If not, ask them to predict what would happen if you turned that shape around. Would it ever look like itself (or match onto itself) before a full turn is made?
- Using a duplicate of the shape to check predictions.



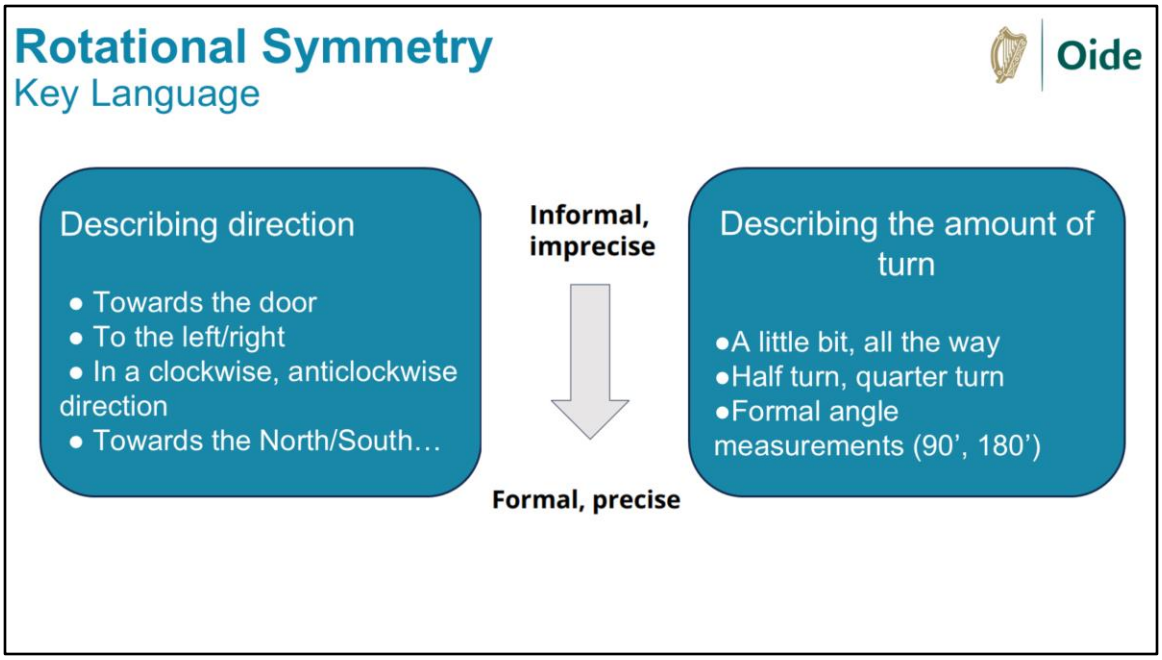
Purpose of Slide:
To demonstrate an activity to test for rotational symmetry.

Notes for teachers:

- Using pattern blocks or shapes on Amplify Polypad, pupils choose a shape to test for rotational symmetry. Encourage the children to predict if the shape will have rotational symmetry or not.
- They trace around the shape using a pencil/online marker. They will then rotate the shape to see how many times it matches with the line that was traced around it.
- Pupils can test a range of shapes.
- Encourage the children to use the language of transformation to describe what it happening as they rotate the shape. Discuss what they notice as they engage in the task.
- Consider how this task encourages children to engage with the elements. How are you using the pedagogical practices.

Resources required:
Pattern blocks, pencil, paper, Amplify Polypad

https://polypad.amplify.com/p

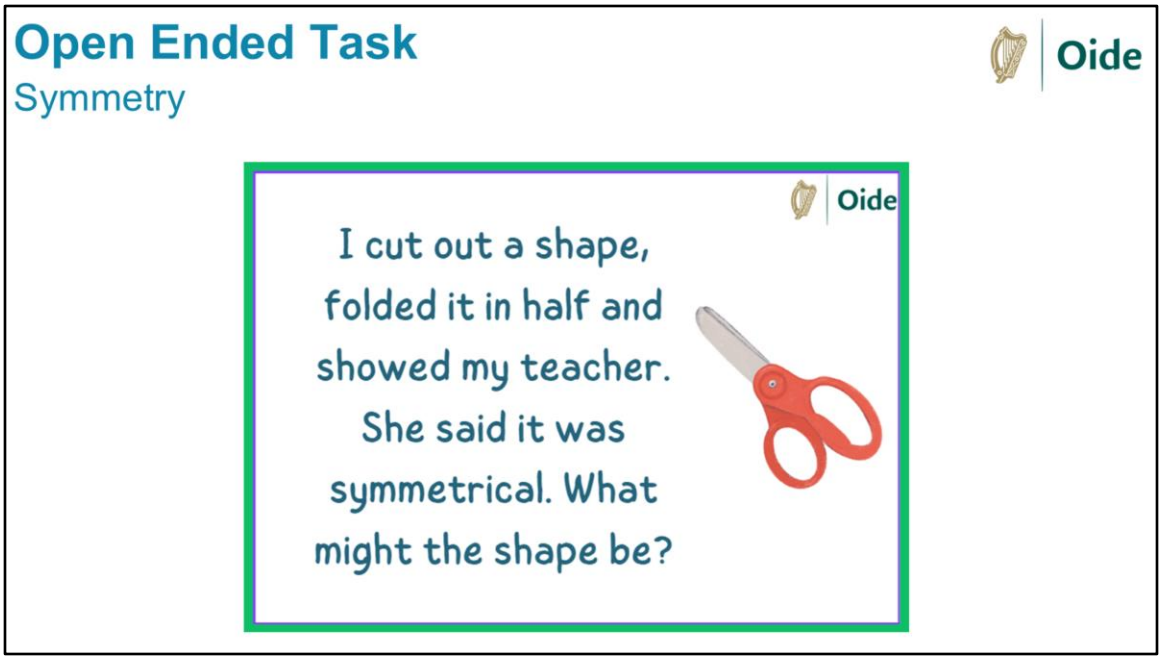


Purpose of slide:

- To give participants an overview of the language for describing rotational symmetry.

Notes for teachers:

- Language progresses from informal to formal when describing rotational symmetry e.g. towards the door, left and right, clockwise anti-clockwise etc.
- Here is a sample trajectory for the language children might use around rotational symmetry. Children may begin using informal language and gradually move towards the formal language of angles and degrees.
- When describing direction, children may begin to talk about direction using informal language such as “towards the door” and progress to using more formal language of “the door is to the north”.

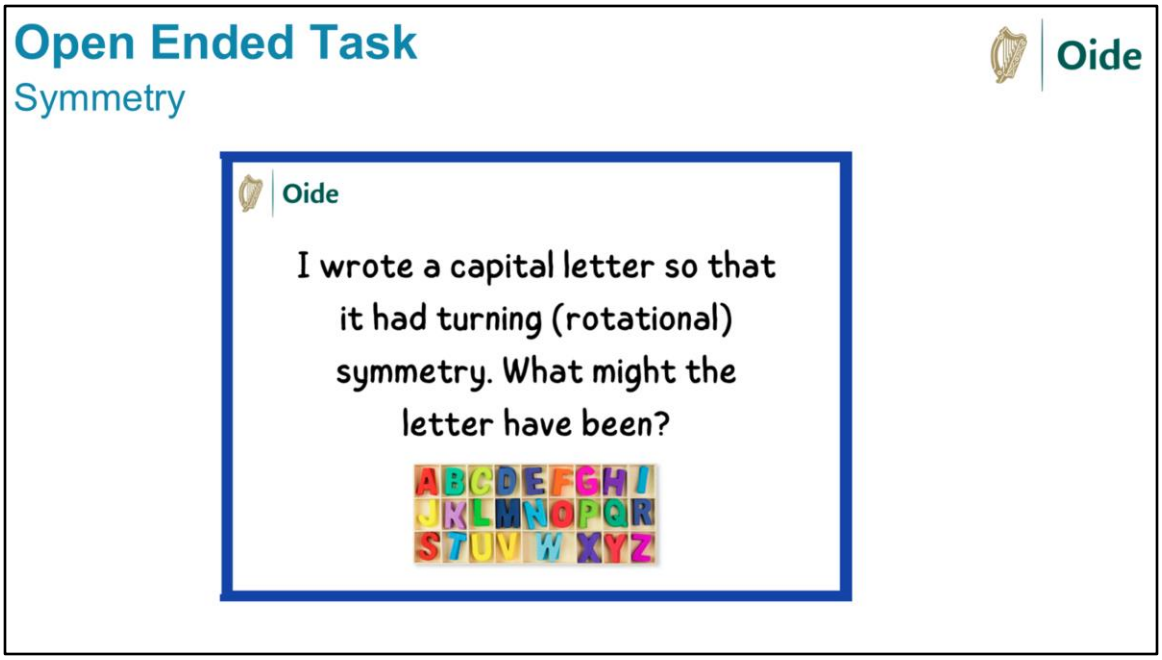


Purpose of slide

- To explore an open-ended task based on line/reflective/mirror symmetry.

Notes for teachers:

- Inform pupils that they are going to engage in an open ended task i.e. a task that has a particular goal where there are multiple solutions and multiple solution pathways.
- Pupils can draw, use concrete materials or digital manipulatives i.e. Amplify Polypad giving them agency in their approach to solving the task.
- Give the pupils the opportunity to discuss what they have discovered with their partners and as a whole class. Think of ways to extend this activity to use in other strand units such as fractions or in other subject areas such as art.

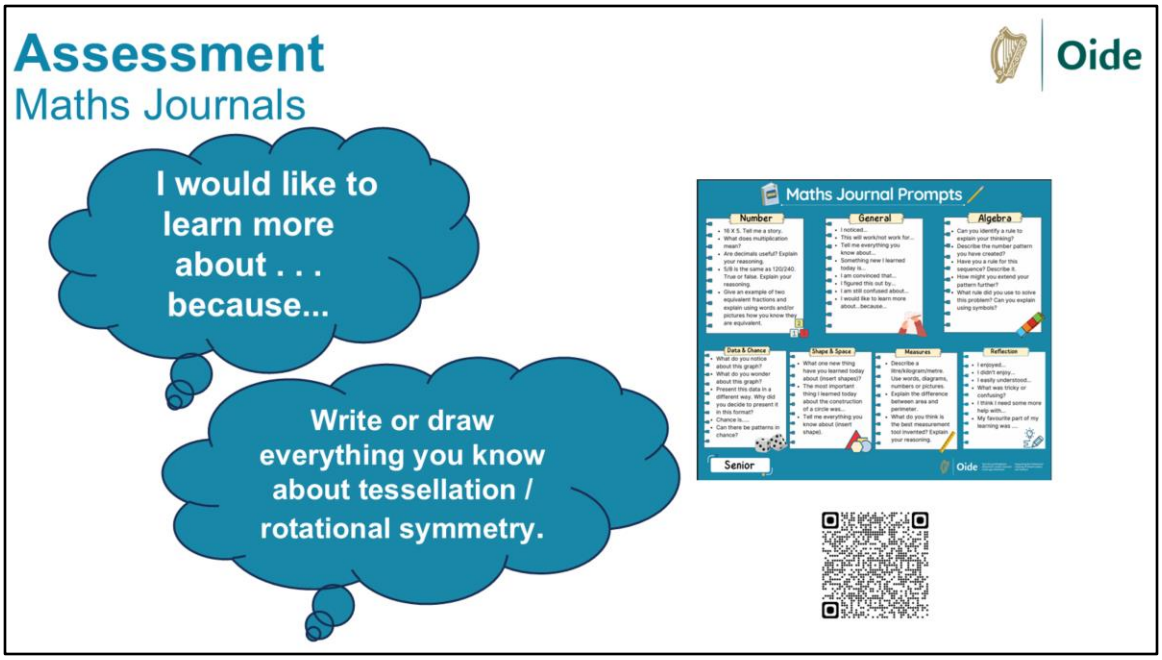


Purpose of slide

- To explore an open ended task based on rotational symmetry.

Notes for teachers:

- The pupils can work in pairs or groups to test each letter. They could start with the first letter of their name.
- Encourage the pupils to come up with a plan on how they will test the letters for rotational symmetry. How will they record their findings?
- The link here can be used as an alternative activity or to extend this activity Soup-n-Such-Cafe-Stage-2-Transformation.pdf



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

Notes for teachers:

- Journals are useful for both teachers and learners to assess attitudes, knowledge and skills.
- Pupils 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.
    - This first one focuses on the child's disposition and can be used across all strand units. “I would like to learn more about…… because….”
    - Specific strand-based prompts….”write or draw everything you know about tessellation/rotational symmetry”.
- Use the QR Code on the slide to find the above journal prompts on the PMC Hub.