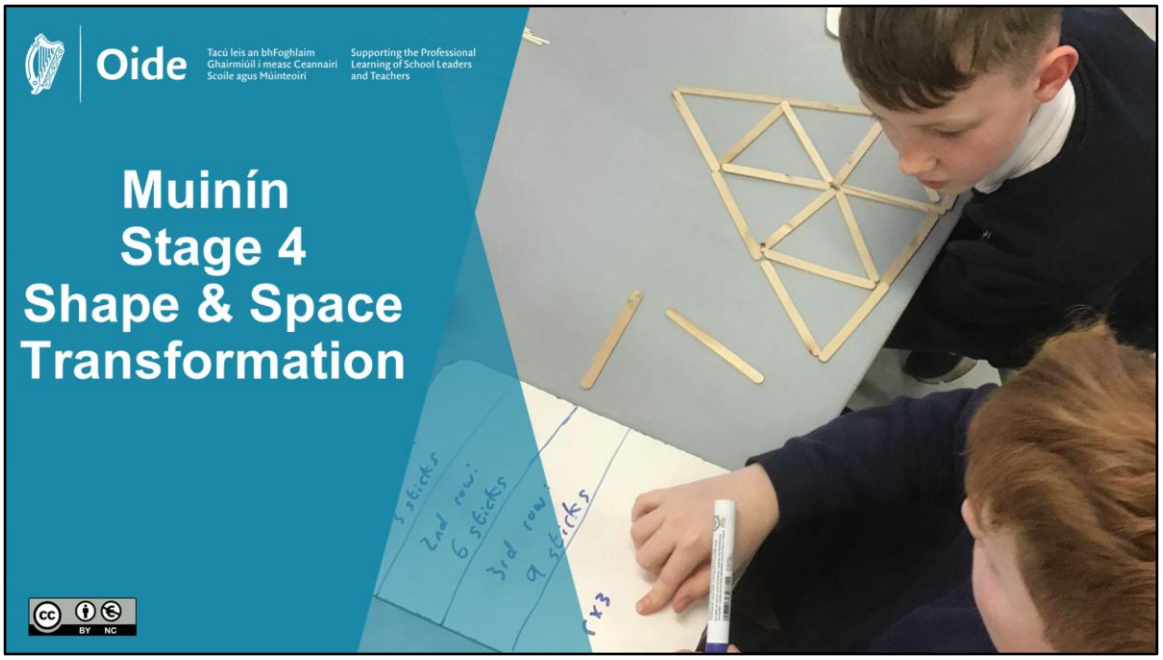
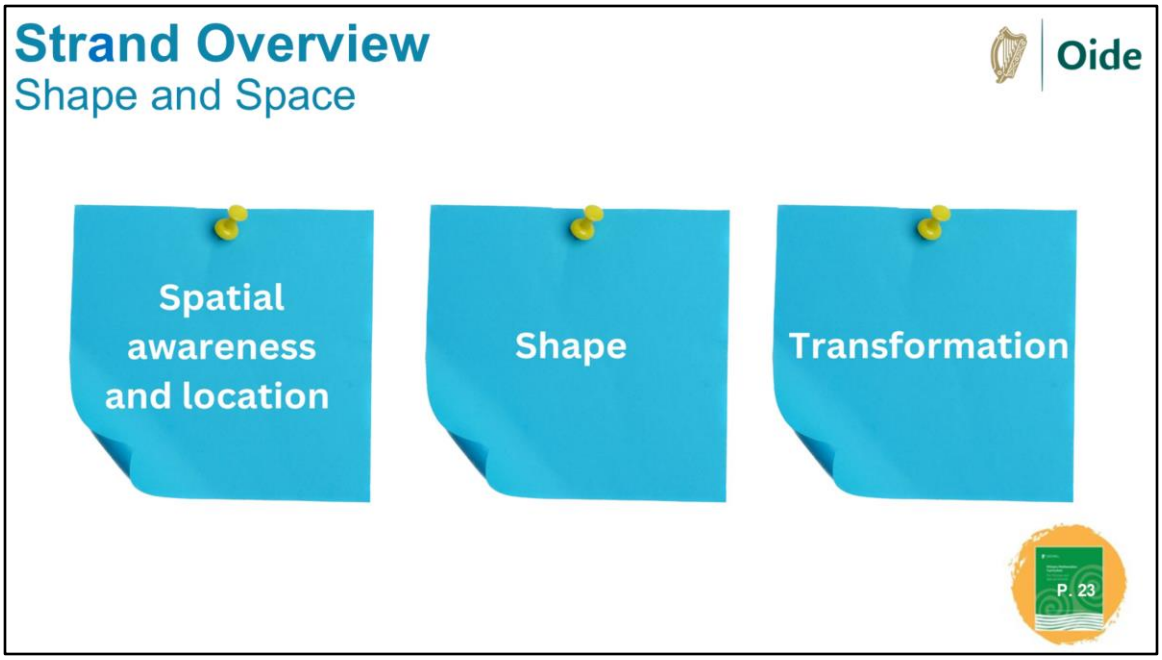


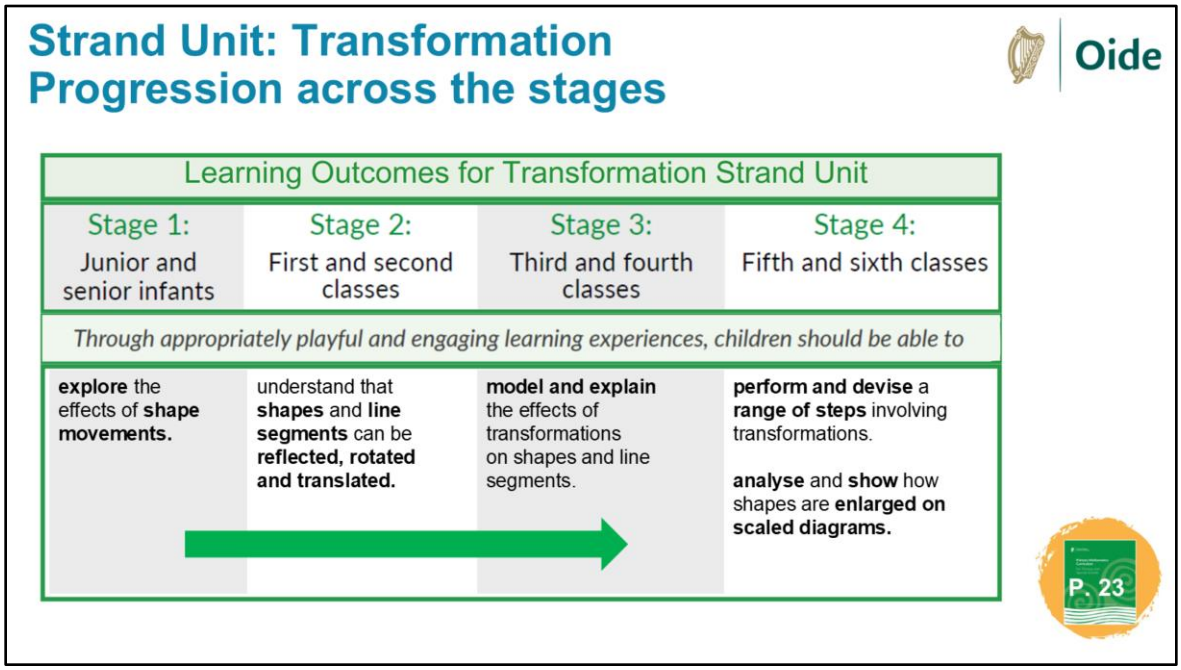
Purpose of slide:
Introductory slide for presentation of Stage 4 Shape & Space - Transformation.



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:

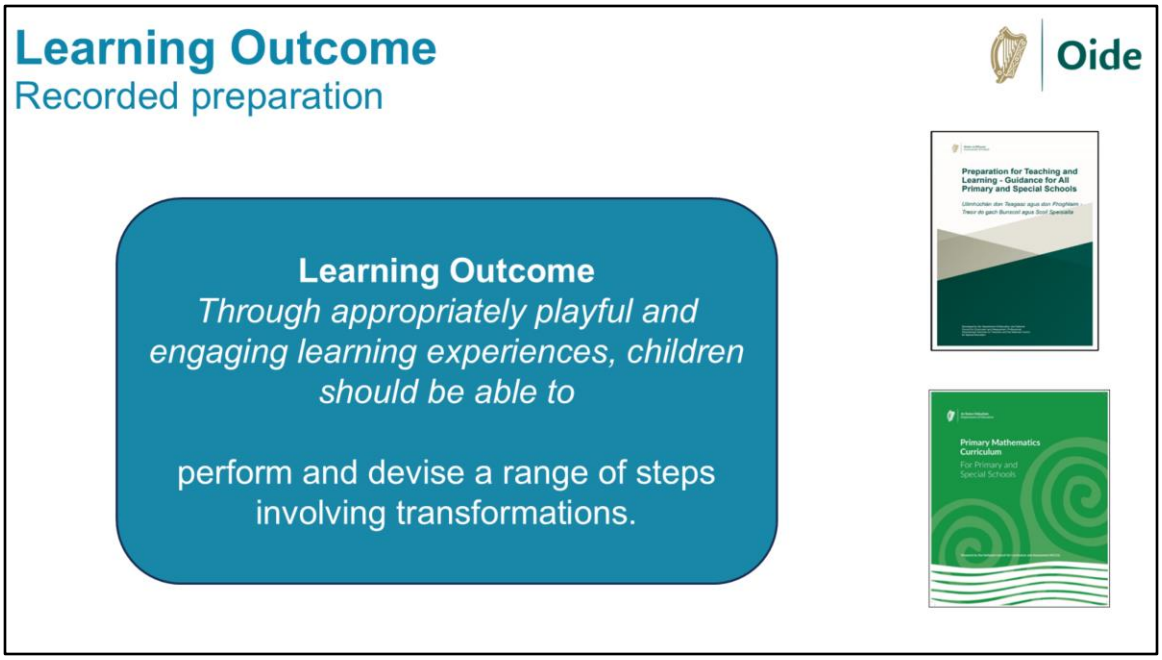
To explore the progression across the stages in the strand unit Transformation.

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.

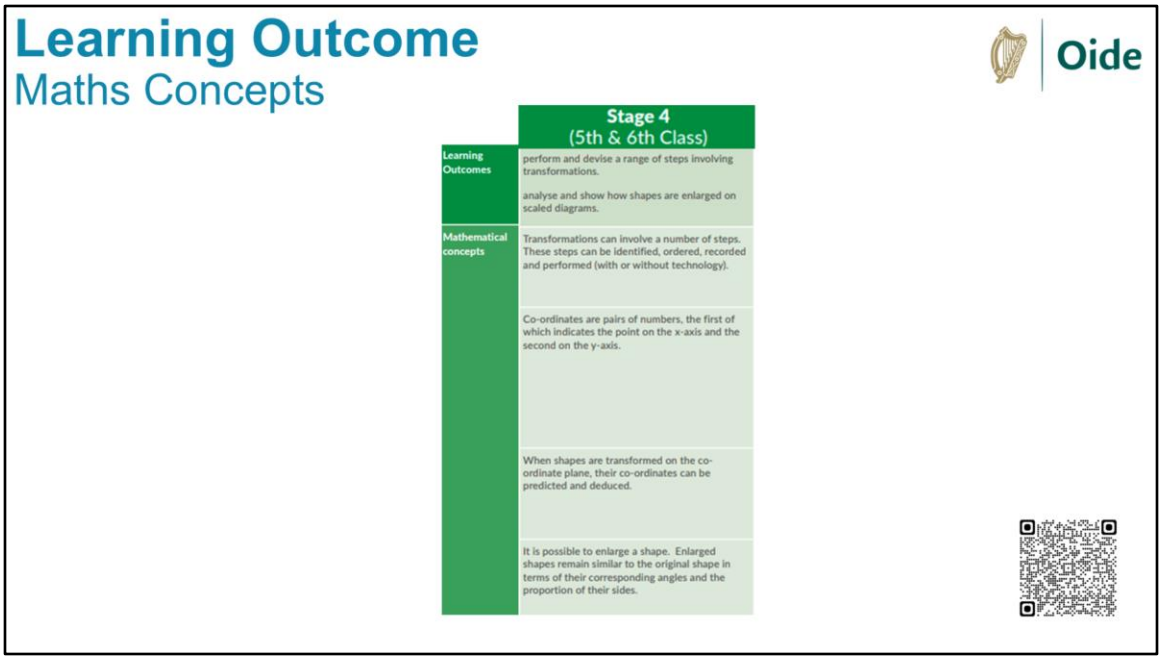
- In Stage 3, pupils **model transformations and explain their effects on shapes and line segments**. They begin to articulate their understanding, using appropriate terminology to describe how transformations alter the shapes' positions and properties.
- In Stage 4, pupils not only perform various transformations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



Purpose of slide:
To highlight the Maths Concepts which underpin the learning outcome for Stage 4 Transformation.

Notes for teachers:

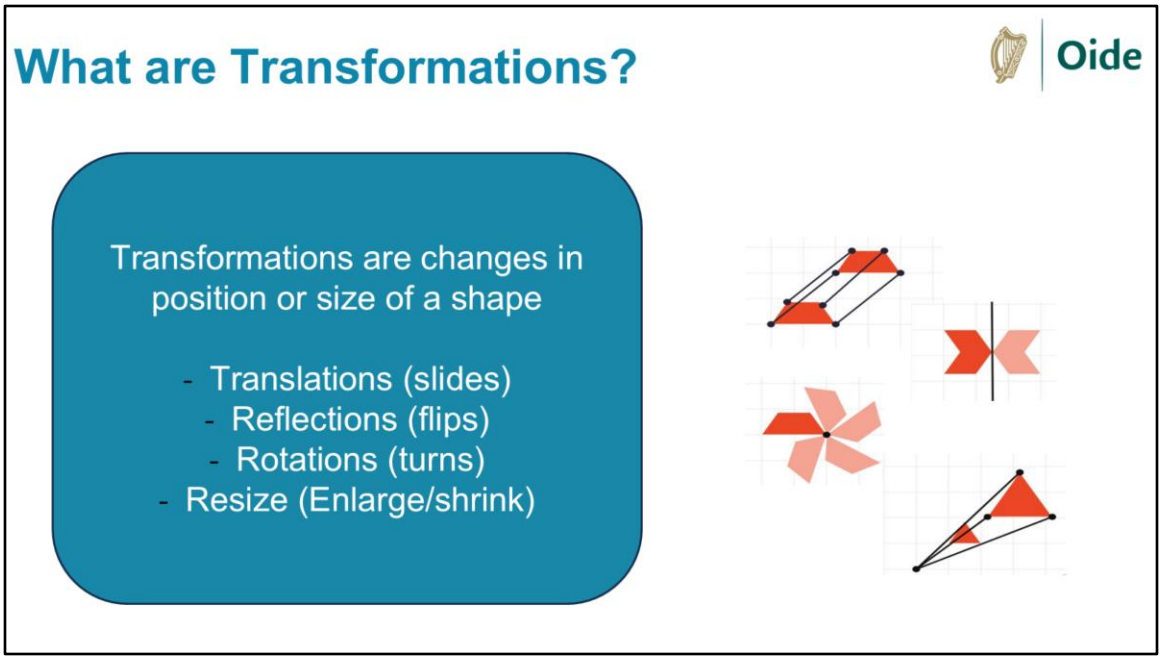
- The Maths Concepts are the key mathematical ideas that underpin each learning outcome.
- The Maths Concepts may be useful in identifying a Focus of New learning when preparing for teaching and learning.
- Take a few moments to explore the Learning Outcomes and the Maths Concepts on the NCCA Maths Toolkit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

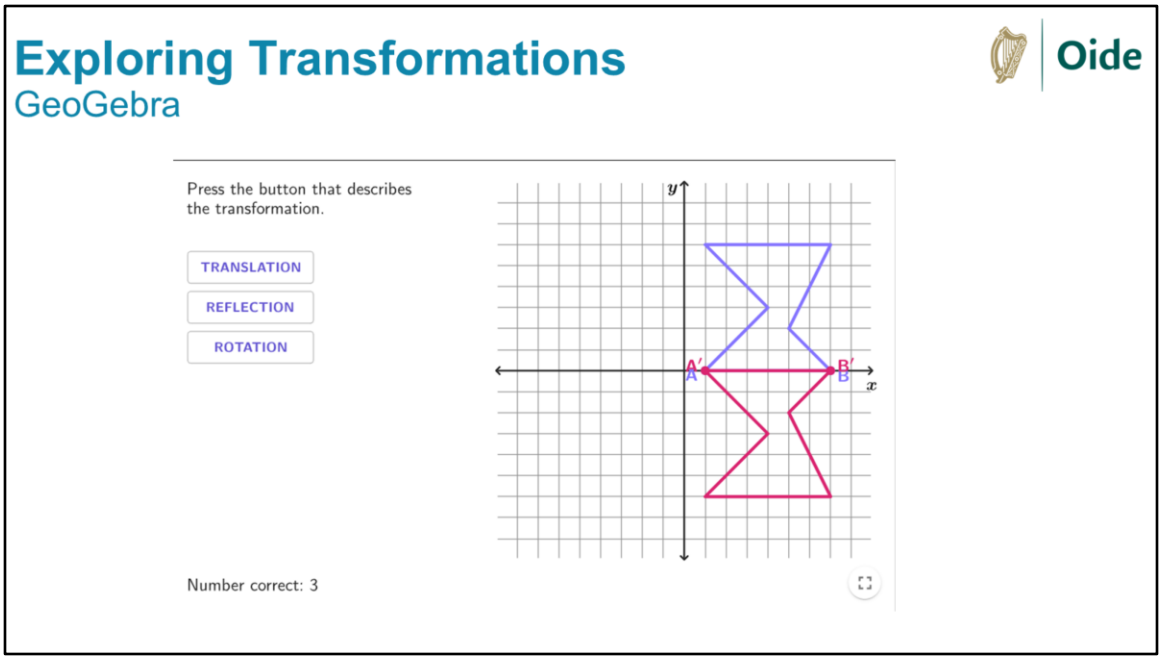
- Ask pupils to take a moment to look at the images on the slide and think about which one they think is the odd one out and why?
- Ask pupils to turn to the person beside them and tell them which one they think is the odd one out and why.
- Encourage pupils to share their thinking with the whole class.
- Bring pupils attention to symmetry if this has not been previously mentioned.
- In this task we have a number of logos which can undergo various transformations. (ABBA reflection, Mitsubishi Reflection and rotation, Olympics translation, VW reflection)



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

Notes for teachers:

- In Stage 4 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.

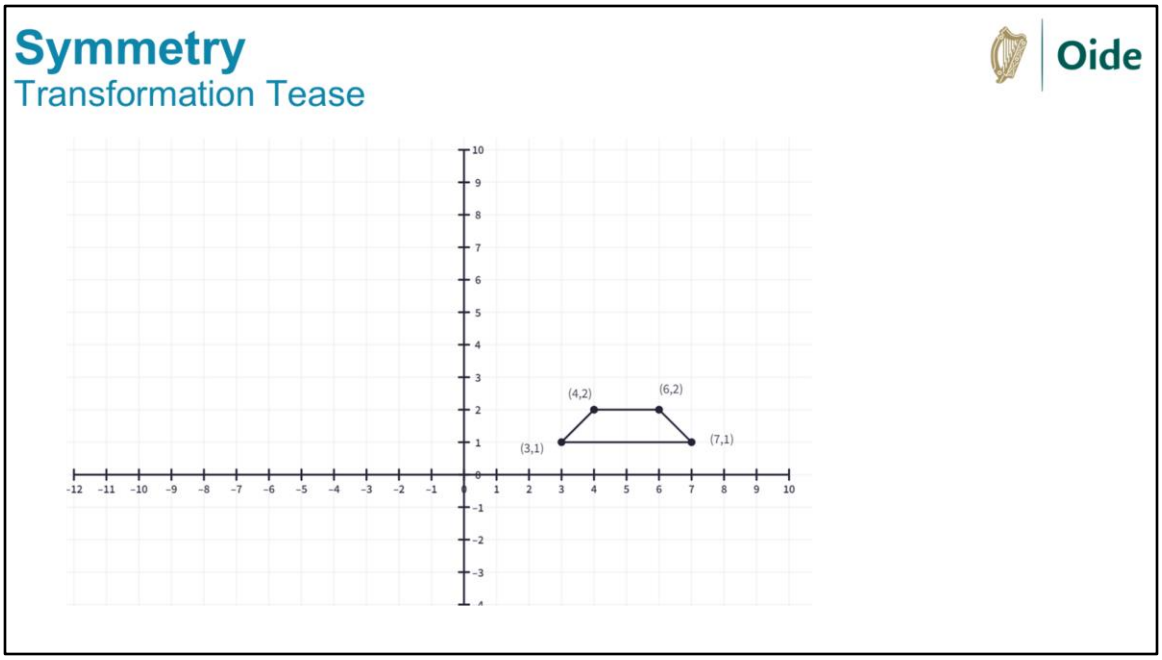


Purpose of slide:

Explore how shapes can be transformed on a coordinate plane.

Notes for teachers:

- GeoGebra is a digital tool that supports teachers and helps children to learn and practice the concepts of transformation on a co-ordinate plane.
- Use models or points in the coordinate plane to illustrate, recognize, or describe rigid transformations (translations, reflections, and rotations) of plane figures.
- This will help the pupil to test their prior knowledge of transformations or assess their knowledge once they have engaged with learning about transformations.
- This link will bring you to the website: https://www.geogebra.org/m/sqac9vjv



Purpose of slide:

To explore how co-ordinates can be predicted and deduced when shapes are transformed on the co-ordinate plane.

Notes for teachers:

- The maths concepts states: “When shapes are transformed on the co-ordinate plane, their co-ordinates can be predicted and deduced.”
- This activity is adapted from nRich Maths and is called Transformation Tease. https://mathigon.org/polypad/7GcwgG0sIqxw1w
- Using the trapezium on the slide, pose the following questions to the pupils:
    - What are the coordinates of the points A, B, C and D which form the corners of the shape?
    - Translate (or slide) the shape 10 squares to the left. What are its new coordinates?

    - Compare these with the original coordinates. What do you notice about the numbers?
- Start with the shape above again. This time reflect it in the x axis. This means going to x axis and out the same distance again to get the co-ordinates.
    - What are the coordinates of the corners now?
    - What do you see when you compare these coordinates with the original ones?
    - Predict what the new coordinates would be after a reflection in the y axis.
- Can you think of other ways to transform the trapezium? Are there opportunities to adapt or extend this task for the pupils?

Enlarging a shape.

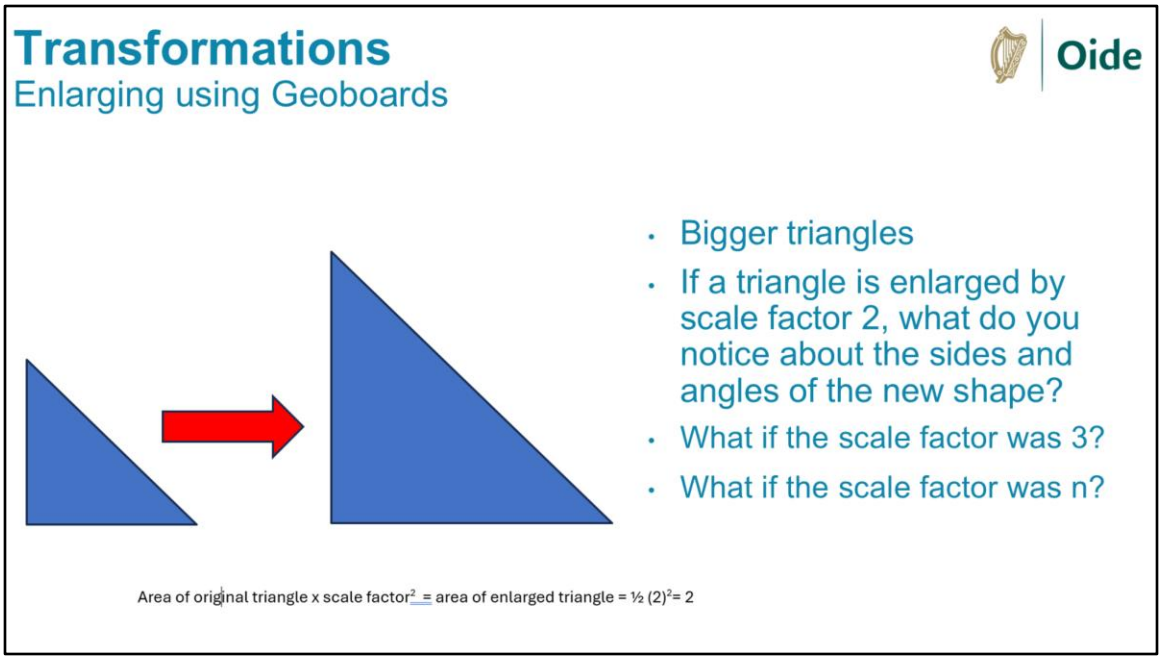
Oide

It is possible to enlarge a shape. Enlarged shapes remain similar to the original shape in terms of their corresponding angles and the proportion of their sides.

Purpose of slide:
To explore the concept of enlarging.

Notes for teachers:

- The final type of transformation we are going to look at is Enlarging.
- This can sometimes be called dilations.
- Enlarged shapes remain similar to the original shape in terms of their corresponding angles and the proportion of their sides.
- Examples of enlarging in the real world are the movies “Ant Man”, “Honey, I Blew Up the Kids!”, movie screens, overhead projectors, photographs, pinching and zooming on a digital device etc.

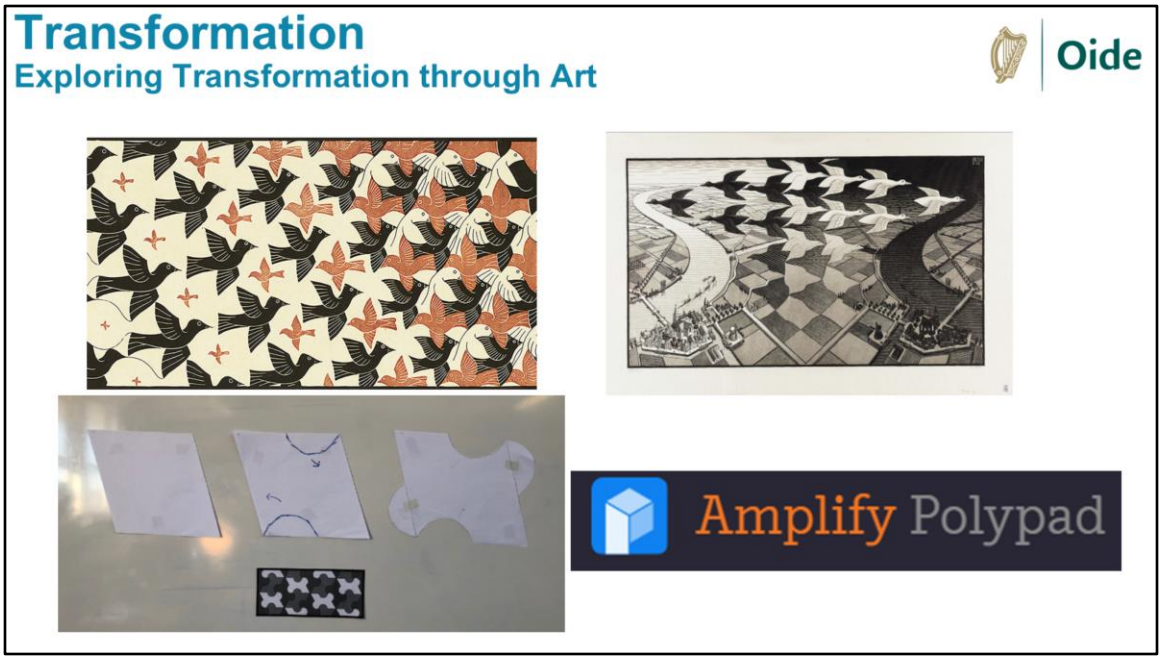


Purpose of slide:
To explore the learning outcome: analyse and show how shapes are enlarged on scaled diagrams.

Notes for teachers:

- These are some activities that encourage pupils to investigate how scale (ratios) is used to enlarge shapes.
- The pupils can use a digital tool on this link to explore the concept of enlarging shapes using the scale factor. https://apps.mathlearningcenter.org/geoboard/
- Model how to create a small right angled triangle base 1 and height 1.
- Create new enlarged triangle base 2 and height 2 (scale factor 2)
- Elicit from pupils what they notice about the sides and angles. (scale factor)
- Area
    - There is an opportunity here to show how area is connected. How many of the small triangles can you fit in the new one you just made.
    - To help pupils to find and understand the area of the enlarged triangle, ask them HOW MANY original/small triangle fit into the new enlarged triangle?

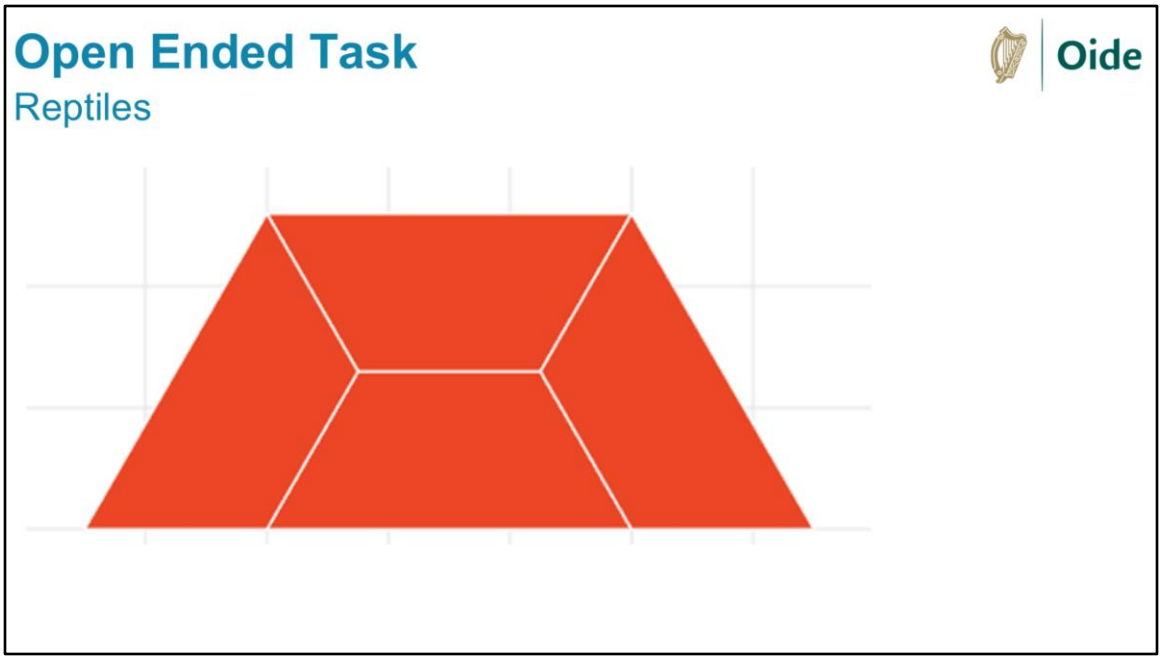
    - Area of original triangle – ½ of base x perpendicular height – ½ (1)(1) = ½
    - Area of enlarged triangle - ½ of base x perpendicular height – ½ (2)(2) = 2
    - Area of original triangle x scale factor = area of enlarged triangle = ½ (2) to be squared = 2
- If a triangle is enlarged by scale factor 2, what is its increase in area? What if the scale factor was 3? What if the scale factor was n?
- This activity also gives the opportunity to teach students of how to use side lengths to calculate areas of rectangles and triangles.
- The problem is sufficiently open ended to allow the pupils freedom of choice in their approach. It may be scaffolded with guidance that leads to a solution, and/or the students might be given the opportunity to solve the problem independently.



Purpose of slide:
To see how we can integrate with other subjects such as art.

Notes for teachers:

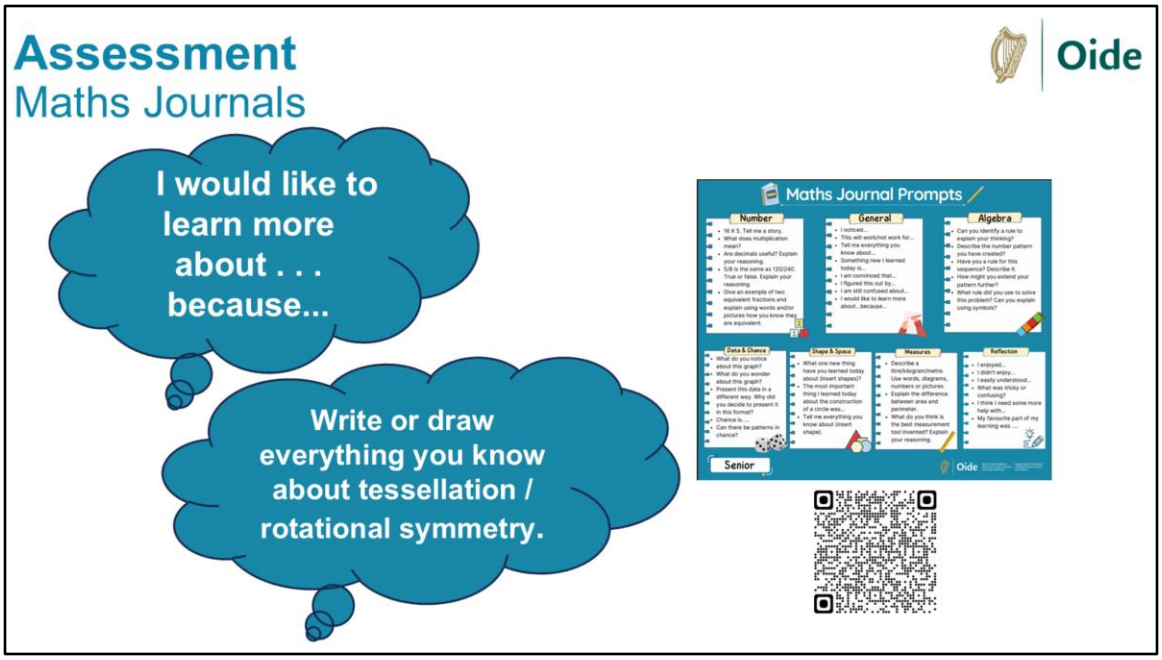
- Tessellation involves covering a surface with no gaps or overlaps using one or more geometric shapes.
- Escher often explored symmetric tessellations that were formed by repeatedly duplicating and rearranging only a single tile through translation, rotation and reflection. On the screen we can see two examples of his work. What examples of transformation do you see?
- Encourage the use of the transformation language – translates, slides, reflects, flips, rotates, turns.
- This activity provides an opportunity for the use of maths language. The pupils are provided with the language "just in time" "not just in case" i.e., as they learn and in context.
- The pupils can use paper like you can see in the image or the digital tool such as Amplify: https://polypad.amplify.com/p#polygons



Purpose of slide
To explore an open ended task based on tessellations

Notes for teachers:

- Reptiles are shapes that tile to make a larger version of themselves. Here is an example of a trapezium. Notice how the whole is made up of four identical parts.
- Pupils can draw, use concrete materials or digital manipulatives i.e. Mathigon to complete the task https://polypad.amplify.com/p/cxY31Q45qngUNA
- Notice that these shapes are Rep-4 because you need four copies to make a larger whole of the same shape.
- Can you find some other Rep-4 shapes?
- Ask the pupils to consider how they are transforming each shape and to use transformational language to describe what they are doing.



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….”
    - The second is a 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.