Forthcoming Curriculum (Draft) Progression Continua Milestones: D and E
Strand: Shape and Space
Learning Outcome Label(s): Shape, Transformation
Video examples: From 1st and 2nd class

Goals of this Activity:
Children will:

- Recognise the same shape in different orientations. *(Understanding and Connecting; Reasoning)*
- Combine tangram pieces to form a variety of shapes. *(Applying and Problem Solving)*
- Explain and justify how and why they combined shapes in different ways. (*Communicating, Reasoning*)
- Name, compare and describe the properties of tangram pieces (2D shapes) using appropriate mathematical language e.g., triangle, square, parallelogram, sides, corners, equal length, same, different. (*Communicating, Reasoning*)
- Engage in problem solving to construct squares using tangram pieces. (*Applying and Problem Solving*)

Key Mathematical Ideas:

- Shapes can be described and sorted by their geometric properties e.g., the number of sides, the size of their corners.
- Squares have certain properties: four sides of equal length, four equal (right) angles, opposite sides parallel.
- A shape might look different if you flip (reflect), slide (translate) or turn (rotate) it.
- A tangram puzzle consists of seven specific geometric pieces which can be combined to make a square (or a square cut into seven particular shapes). These pieces or 'tans' can be combined to make a variety of different shapes.

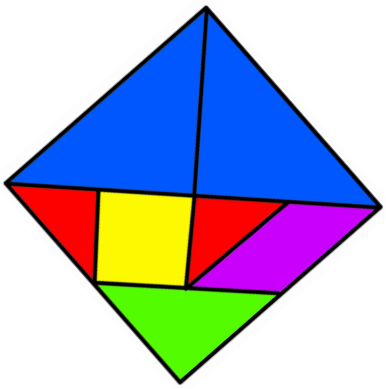
Further Information on Key Mathematical Ideas:

- **NzMaths** Key mathematical ideas
- **NzMaths Transformations**
- PDST Measures Manual

Relationship to (Forthcoming) Curriculum:

This table gives an overview of relevant content from the progression continua in the draft curriculum. The content most relevant to this lesson is shown in bold.				
Strand: Shape	Learning Outcome Labels			
	Shape		Transformation	
	Level D	Level E	Level D	Level E
Understanding and Connecting	**Identifies and describes simple properties of some shapes.**	**Identifies and describes properties of shapes using appropriate mathematical vocabulary.**	**Identifies shapes in a variety of different orientations.**	**Recognises and identifies the component parts of composite shapes.**
Communicating	**Discusses similarities and differences between shapes.**	**Compares and discusses representations of shapes e.g. orientations and sizes.**	**Uses appropriate language to describe movement and comparison of shapes e.g. turn, flip, slide, match, and fit.**	**Models and describes composite shapes using appropriate language. Gives and follows instructions relating to the movement of shapes.**
Reasoning	Justifies why shapes belong or do not belong to certain sets.	**Discriminates between examples and non-examples of a shape with reference to properties.**	**Makes and justifies predictions about shape movements and shape matching e.g., will it fit if I turn it this way? Will it match if I turn it over?**	**Makes and tests predictions about composite shapes and the movement of individual shapes.**

Applying and Problem Solving	Sorts, compares and classifies 2D and 3D objects into logical categories according to their attributes. Builds and creates structures using solid shapes	Classifies shapes into categories based on mathematical properties. Selects appropriate materials to represent shapes e.g., lollipop sticks for straight edges and string for curved edges.	**Selects and manipulates shapes to copy a pattern or structure.**	**Engages in spatial puzzles or construction activities which involve moving, comparing or combining shapes.**

1. Exploring Tangram Square and Naming Tangram Pieces	Key Questions
 Show children an image of a square made from the 7 tangram pieces. Allow them some time to talk to a partner about anything they notice about this and take feedback in whole class. Hand out a set of tangrams to each child. With a partner, have them try to name these shapes. Introduce new shape vocabulary as necessary.	What do you notice? Do you see any shapes that are the same? How do you know that they are the same? Can you name all of these shapes? What is the same and what is different about a square and a diamond?
2. Making Animal Shapes with Tangrams Provide children with illustrations of animal shapes made from sets of tangrams and ask them to work together to make these.	Why did you choose this shape to fit in here? What would happen if you flipped/rotated that shape? Do you notice anything about the length of the sides/size of the corners on these shapes?
3. Comparing Tangram Pieces Using pieces from their tangram sets, ask children to compare what is the same and contrast what is different about various pairs of shapes. Allow them some time to explore and discuss in pairs before taking feedback in whole-class. Good examples to compare: -Square and Parallelogram (both 4-sided with opposite sides parallel but different-sized corners) -Different-sized triangles (corresponding corners are the same size, i.e., all are right-angled triangles. Children may notice that two small triangles can be combined to make a medium-sized triangle. -Square and large triangle (both have a corner/angle that is the same size i.e., right angle.	What is the same about these shapes? What is different?

4. Making Squares Tangram pieces are made from a square cut into seven pieces. Can you make other squares using some, not all, of the pieces? Can you make five different squares? What is the smallest square you can make? What is the largest? Display solutions on the IWB or under the visualiser and have children identify what is similar and different across solutions. Ask them to justify how they know the combination of shapes makes a square.	Why did you choose this shape/this combination of shapes? What would happen if you turned/reflected/rotated that shape? Is there a different way to make a 3-piece square? Is there a different way you could do it? What is the same and different about your solutions? How do you know that the shape you made is definitely a square?

Assessment:

- Can children identify properties of shapes and use appropriate language to describe these?
- Can children identify the same shape in different orientations and use appropriate language to discuss shape movements?
- Can children combine tangram pieces to construct shapes of a given outline?

Points to Note:

- Ensure to show shapes in a variety of different orientations.
- Model vocabulary of translations (rotate, reflect, translate) but accept informal language too (turn, flip, slide).
- Questions should focus on connecting children's activities to key mathematical ideas.
- Children need support to move beyond thinking about shapes at a purely visual level (see accompanying videos). For more information and ideas for teaching activities, refer to this NRich article on organising teaching to support geometric thinking.
- In the final activity, encourage children to make squares with different numbers of pieces. Discuss 'same' or 'different' solutions based on orientation of shapes, i.e., have children identify that the following solutions are essentially the same:



Possible Next Steps:
Follow-up activities may focus on shape properties or look more closely at transformations.
Suitable activities focussing on **shape properties** include:
NRICH Exploratory shape reasoning activities
NZMaths Units of work on shape
Description of *What's my rule?* Activity Also on this website, see the Infant sorting activity plan and accompanying video which uses this *What's my rule?* as an activity to teach sorting and classifying.

Suitable activities for **transformations**
NzMaths Transformation Schemes of work

Further Tangrams Resources:
Tangram Channel: Website with links to printables, videos and other tangram activities
NRICH introduction to tangrams
NCTM Resources Interactive Tangrams