DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

Geometry – Shape and Space

Level 4 (Year 7/8)

Teacher Booklet

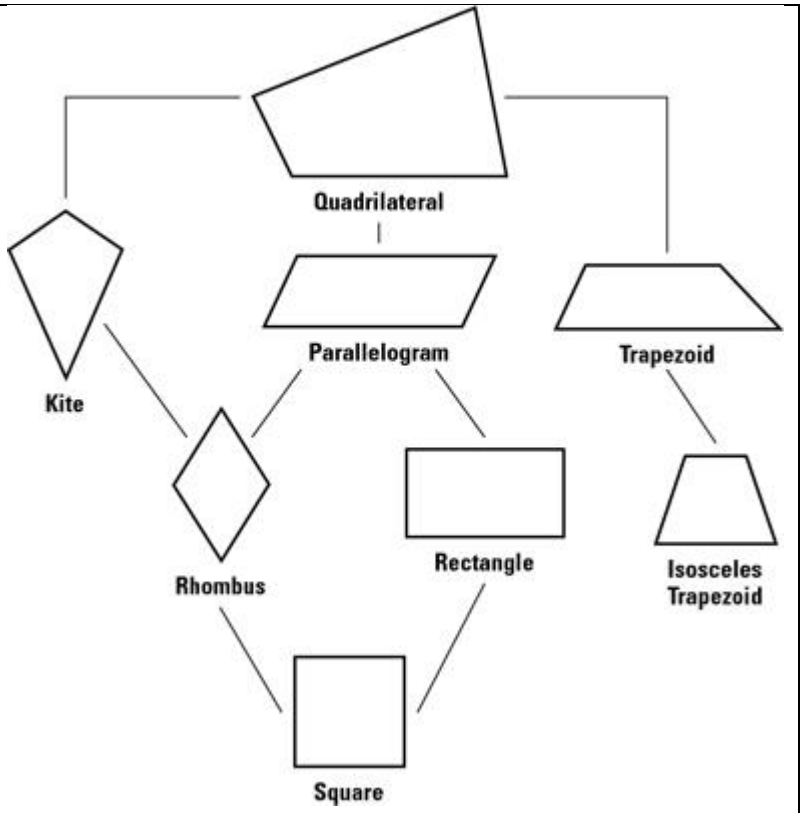
Level 4 Year 7/8: Geometry – Space and Shape

Task 1	1. Can you sort these shapes into different groups? As you sort them, talk with your group about what you notice about them. What properties do they have that are the same? Different? 2. Randomly place a shape in the middle. Take turns to find other shapes which have properties the same as the first shape. The rule is that you have to name the properties of each new shape as it is added, and the properties that match the first shape. Do this again, starting with a different shape.
Big ideas	Two-and-three dimensional objects with or without curved surfaces can be described, classified, and analysed by their attributes. Shapes have sides that are parallel, perpendicular, or neither. Shapes have line symmetry, rotational symmetry, or neither. Shapes are similar, congruent, or neither.
Curriculum links	**GM2-3:** Sort objects by their spatial features, with justification. **GM2-4:** Identify and describe the plane shapes found in objects. **GM3-3:** Classify plane shapes and prisms by their spatial features. **GM3-4:** Represent objects with drawings and models. **GM4-5:** Identify classes of two-and-three-dimensional shapes by their geometric properties. **GM4-6:** Relate three-dimensional models to two dimensional representations, and vice versa.
Learning Outcomes: Students will be able to:	• Identify classes of shapes in a range of different ways using geometrical language to explain and justify. • Sort and classify plane shapes into classes and sub classes according to defined geometrical properties such as number and relationship of sides; number and nature of angles- including types of lines and size of angles and the properties of each; number, nature, and shape of faces and surfaces (for 3D objects). • Use commonly shared rules to communicate ideas about defining shapes.
Mathematical language	Properties, square, rectangle, attribute, 2-dimensional, 3-dimensional, shape, side, equal, size, smaller than, straight, parallel, congruent, collinear, angles, vertices, vertex, sides, vertical, horizontal, diagonal, symmetrical, face, curved, edge, corner, sphere, cylinder, cube, cuboid, rectangular prism, triangle, quadrilateral, hexagon, equilateral triangle, square corner, right angle, rhombus, parallelogram, kite, trapezoid, isosceles trapezoid, polygon, regular, irregular, pentagon, hexagon, heptagon, octagon, equilateral, scalene, acute angle, obtuse angle
Sharing back/Connect	Select students to share who have used different properties to group the shapes and have begun to generalise across the properties of the different shapes.

Level 4 Year 7/8: Geometry – Space and Shape

	Connect: If you put all these shapes together and called them rectangles, what properties have you noticed? What properties do all rectangles have? What about if you put all these shapes together and called them quadrilaterals, what properties have you noticed? What properties do all quadrilaterals have?
Teacher Notes	• Have sets of shapes cut and available for students to use for grouping and regrouping. These should include a range of different rectangles/squares but also other quadrilaterals (See Copy Master Task 1). • Have students complete the first activity and discuss and connect to the big idea of properties of a rectangle before moving to the second activity. Following the second activity have the students generalise about the properties of quadrilaterals. In the connect ensure that the focus is on generalising the class of shapes rather than individual shapes • Facilitate the students to notice that shapes fall into classes of shapes. This is a marker for Level 1 for Van Hiele. By placing focus on a class of shapes, for example rectangles, they should be able to describe what makes a rectangle a rectangle. (four sides, opposite sides parallel, opposite sides same length, four right angles, congruent diagonals). Notice that all quadrilaterals have 4 sides, and 4 angles but these are different according to their special case of quadrilateral. Here are the 8 types of quadrilaterals.

Level 4 Year 7/8: Geometry – Space and Shape

	 • Monitor for students who use sophisticated descriptions of shapes and revoice using geometric terms. (For example, if a student says square corners revoice as right angle) • Notice students who use terms to describe classes of shapes. For example, the term rectangles to mean not just the shape in hand but all shapes which have the same properties which make them rectangles. • For the independent task, have available short sticks of the same length.
Independent Tasks	1. Make 2 squares with your sticks. How many sticks did you need? 2. Make a rectangle with the sticks which is made up of 2 squares joined together. 3. Make 4 squares with your sticks. How many sticks did you need? 4. Make a 2 by 2 large square with the sticks which is made of 4 squares joined together to make one large square. How many sticks did you need this time? Why do you need less? 5. On your paper draw a rectangle made of 2 squares. 6. On your paper draw a 2 by 2 large square made up of the 4 smaller squares.
Anticipations	

Level 4 Year 7/8: Geometry – Space and Shape

Level 4 Year 7/8: Geometry – Space and Shape

Task 2	Clever experts are you ready to develop lists of properties for quadrilaterals. Your job is to look at all the shapes on your sheet and list as many properties as you can that apply to all of the shapes on the sheet. Make sure that you use tools to check such things as angles, side lengths, angle congruence, and line symmetry. Hint: Use the terms 'at least…', 'only…', 'at most…', and 'because…'.
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Sharing back/Connect	Select students to share who are able to share across the different properties the different shapes they have examined share. Use these to develop a class list of properties. **Connect:**

Level 4 Year 7/8: Geometry – Space and Shape

	Can you discuss this **if** statement and make others like it: **If** all four angles are right angles, then it is a rectangle. **If** it is a square all angles are right angles. **If** it is a square, it is a rectangle.
Teacher Notes	• Have available the 4 sheets for students to work with. Also have available cards to check right angles, and lengths of sides, mirrors to check symmetry, and tracing paper to check for angle congruence. • Have students prepare their property lists using these specific headings: Sides, Angles, Diagonals, Symmetries. • Facilitate the students to notice that the properties apply to all the shapes in the category and can be extended into such thinking as squares, square metre, square centimetre. • For the independent task, have dotty and/or squared paper available.
Independent Tasks	1. Draw what you think a 4 by 3 shape looks like which is made of 12 squares which are all the same. Check whether you are right. If you need to, keep drawing it until you are right. 2. Use the grid and/or dotty paper to draw the 4 by 1 shape, the 4 by 2 shape and the 4 by 3 shape. Can you make these larger and smaller? Use the dotty and/or squared paper to draw squares and rectangles which are made up of many different smaller squares. Record what you notice about the lines.
Anticipations	

Level 4 Year 7/8: Geometry – Space and Shape

Task 3	Ready again to be property sorter? We are going to look at polygons. The word polygon is from Greek, poly means many. So, you have to be ready to be able to sort by properties across cases of shapes which are all polygons! Here you have a set of polygons all mixed up. With your group can you sort these polygons into different groups by their properties. What do you notice about their properties? Can you come up with a list of attributes you have decided are shared by **all** the polygons in each set? As a property sorter be ready to explain and justify your list of attributes shared by the polygons in each set. What about across the whole set of polygons? Can you make up **if** statements about the whole set of polygons?
Big ideas	Two-and-three dimensional objects with or without curved surfaces can be described, classified, and analysed by their attributes. Shapes have sides that are parallel, perpendicular, or neither. Shapes have line symmetry, rotational symmetry, or neither. Shapes are similar, congruent, or neither.
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<table>
<tr><td></td><td>polygon, regular, irregular, pentagon, hexagon, heptagon, octagon, equilateral, scalene, acute angle, obtuse angle</td></tr>
<tr><td>Sharing back/Connect</td><td>Select students to share who are able to sort and classify according to the properties of polygons.

Connect:

We know that polygons are 2D shapes but what would you say if someone told you that all 2D shapes are polygons? What if statement can you make about polygons.</td></tr>
<tr><td>Teacher Notes</td><td>

Have sets of the polygons ready for sorting and grouping use from task 3 L5/6
Facilitate the students to notice that all polygons are 2D closed plane figures with three or more sides that are all straight. Poly means many and that there are infinite number of polygons, some as listed below

<table>
<tr><th>Polygon</th><th>No. of Sides</th><th>No. of Diagonal</th><th>No. of vertices</th><th>Interior Angle</th></tr>
<tr><td>Triangle</td><td>3</td><td>0</td><td>3</td><td>60</td></tr>
<tr><td>Quadrilateral</td><td>4</td><td>2</td><td>4</td><td>90</td></tr>
<tr><td>Pentagon</td><td>5</td><td>5</td><td>5</td><td>108</td></tr>
<tr><td>Hexagon</td><td>6</td><td>9</td><td>6</td><td>120</td></tr>
<tr><td>Heptagon</td><td>7</td><td>14</td><td>7</td><td>128.571</td></tr>
<tr><td>Octagon</td><td>8</td><td>20</td><td>8</td><td>135</td></tr>
<tr><td>Nonagon</td><td>9</td><td>27</td><td>9</td><td>140</td></tr>
<tr><td>Decagon</td><td>10</td><td>35</td><td>10</td><td>144</td></tr>
<tr><td>Hendecagon</td><td>11</td><td>44</td><td>11</td><td>147.273</td></tr>
<tr><td>Dodecagon</td><td>12</td><td>54</td><td>12</td><td>150</td></tr>
<tr><td>Triskaidecagon</td><td>13</td><td>65</td><td>13</td><td>158.308</td></tr>
<tr><td>Tetrakaidecagon</td><td>14</td><td>77</td><td>14</td><td>154.286</td></tr>
<tr><td>Pentadecagon</td><td>15</td><td>90</td><td>15</td><td>156</td></tr>
</table>
</td></tr>
</table>

Level 4 Year 7/8: Geometry – Space and Shape

	• Notice students who identify the number of sides of the polygon, the angles between the sides of the polygon and the length of the sides of the polygon. Use their observations to name them as regular or irregular. • For the independent task, have a set of tangrams or 2D shapes available. (See earlier resources).
Independent Tasks	Did you know that mathematics and art are closely related? Use 2-dimenional shapes to design and make a drawing. Describe your drawing using the properties of shapes. For example: In my drawing of a cat, I have used two circles for the eyes. I inserted two rectangles for the pupils of each eye. I used a hexagon for the main body of the cat. This hexagon has 6 sides and 2 right-angles…etc.
Anticipations	

Level 4 Year 7/8: Geometry – Space and Shape

Task 4	Today as a property sorter you are going to sort a special sort of polygons. Your challenge is to sort the whole set into three groups. But wait! There is an important rule you need to follow as you do this. **No triangle is allowed to belong to two groups.** When you have sorted them into three groups record the properties of each group. Now start again. Re-sort the set into another three groups which are different from your first set. Record the properties of this new group. Start to develop some **if** statements.
Big ideas	Two-and-three dimensional objects with or without curved surfaces can be described, classified, and analysed by their attributes. Shapes have sides that are parallel, perpendicular, or neither. Shapes have line symmetry, rotational symmetry, or neither. Shapes are similar, congruent, or neither.
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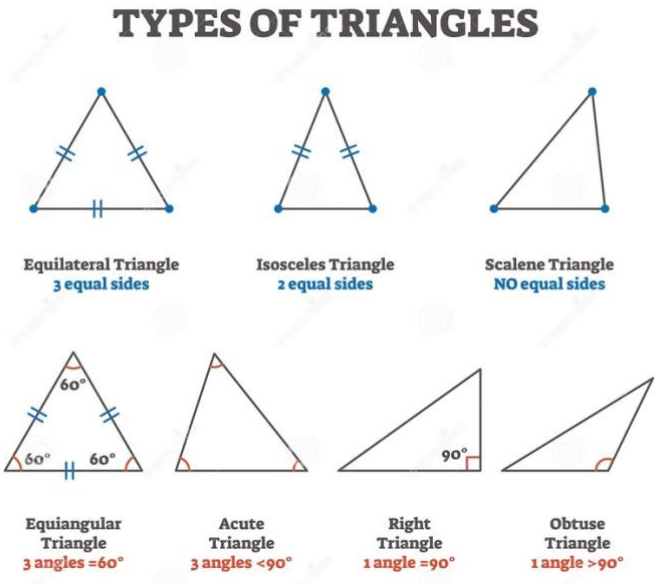
	trapezoid, polygon, regular, irregular, pentagon, hexagon, heptagon, octagon, equilateral, scalene, acute angle, obtuse angle
Sharing back/Connect	Select students to share who can explain and justify their groupings of triangles according to their properties. **Connect:** How could you give a description that covers all the properties of triangles? Make an **if** statement that covers all the properties of triangles? What about making an **if** statement that concerns isosceles triangles?
Teacher Notes	• During the launch, challenge the students with a "Can you make it?" activity in which they draw what is described. A shape with only one square corner and four sides. A shape with two square corners A shape with two lines of symmetry A shape with two pairs of parallel lines A shape with two pairs of parallel lines and no right angles • Have the sets of the different triangles cut out and available for the students to sort. • Facilitate the students to notice that triangles are classified by their sides and/or their angles.  • Notice students who use the term triangles rather than the singular triangle. The use of the plural denotes that they are able to generalise what makes all triangles, triangles. • For the independent task, have the following sheet prepared.
Independent Tasks	What do you notice about all the shapes on the placemat that are the same? That are different?

Level 4 Year 7/8: Geometry – Space and Shape

	Look closely. What do you notice?  Sort the shapes into classes and sub classes according to geometrical properties. Record your explanation and justification.
Anticipations	

Level 4 Year 7/8: Geometry – Space and Shape

Task 5	Talk with your buddy about what you notice about the shape of these different things. Can you sort them into groups which you think are the same? Can you sort them into groups which you think are different? Be ready to explain and justify why you sorted them into the different groups.
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Sharing back/Connect	Select students to share who can explain and justify using the language of geometry how the different objects are the same and/or different.

Level 4 Year 7/8: Geometry – Space and Shape

	Connect: Can you use 2D shapes to describe the properties of 3D shapes? Think about the properties of a square and the properties of a cube. How are these related? Make **if** statements about the properties of classes of 3D shapes. What about cylinders?
Teacher Notes	• Provide students in groups with a collection of structured 3D shapes and a collection of common objects from their environment and have them talk with each other about what they notice about them. Have them sort by special categories including Edges and vertices; Faces and surfaces; Cylinders; Cones. • Have available a large collection of common objects including some that are similar to cubes, cuboids, cylinders and spheres (e.g., boxes, dice, cans, balls, glad wrap roll, building blocks, lego). • Facilitate the students to notice 3D aspects of the shapes including flat faces, curved faces, faces form an edge, corner, vertices when they come together, horizontal and vertical lines etc. Also notice that objects which are shaped like balls have a single curved surface. They are called a sphere; objects shaped like a can or glass jar have two circular ends and a curved surface between them and are called cylinders; objects shaped like bricks and dice have 6 rectangular faces and are called cuboids. Have students sort by properties including edges and vertices, faces and surfaces as well as 2D features. (See Copy Masters Task 5). • Monitor for students who recognise that 3D shapes are solid shapes or figures that have three dimensions. Generally, length, width, and height are the dimensions of 3D shapes. Have students recognise the relationships between these aspects as well as edges, vertices, faces and surfaces. • For the independent task, have the following sheet prepared.
Independent Tasks	Are all the three-sided shapes on this piece of ngatu triangles?

	 Why or why not? Be ready to explain and justify your answer using all the three-sided figures on this piece of ngatu.
Anticipations	

Level 4 Year 7/8: Geometry – Space and Shape

Task 6	Now that you are becoming an expert in geometry I think that you are ready to develop a mathematical argument. • You have to decide whether the following statements could be described as: Always true. Sometimes true. Never true. 1. A hexagon has six equal length sides. 2. Triangles have a line of symmetry 3. Squares have two diagonals that meet at right angles 4. Cutting a corner off a square makes a pentagon 5. The base of a pyramid is a square 6. When you cut off a piece from a 2D shape, you reduce the area and perimeter 7. The number of lines of symmetry in a regular polygon is equal to the number of sides 8. Quadrilaterals can be cut into two equal triangles Make sure that you can justify your reasoning for each decision you make. Now, for the sometimes statements can you develop an explanation of when the statements are true…or rewrite them so that they are always true… or never true.
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Level 4 Year 7/8: Geometry – Space and Shape

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Sharing back/Connect	Select students to share who have developed arguments which draw on generalised properties of geometric figures. **Connect:** Can you make a statement which is always true about regular triangles, or regular quadrilaterals or another regular shape of your choice.
Teacher Notes	• During the launch, use the geometry quick images. (See quick images PDF for ideas). • Monitor for students using vocabulary which relates to wider classes of geometric shapes and which support them making generalisations. • Notice students who use gesturing as part of their explanations and justification. • Expect students to represent to justify their statements • For the independent task, have the following sheet prepared.
Independent Tasks	Regular polyhedrons are shapes that have all sides equal in length and all inside angles are equal. Irregular polyhedrons are 2-D shapes that have straight sides that are not equal to each other and angles that are not equal to each other. Fill in the missing details. Draw examples of what the following might look like.

Level 4 Year 7/8: Geometry – Space and Shape

	number of sides & angles	name	Draw an example of regular polygon	Draw an example of irregular polygon
	3	triangle		
	3	triangle		
		Kite		
	4	Quadrilateral		
	5	Pentagon		
		Hexagon		
		Square		
	7			
		Octagon		
		Nonagon		
	10			
Anticipations				

Level 4 Year 7/8: Geometry – Space and Shape

Task 7	When the box makers were designing these cuboids, they drew a 2D representation of their net. What 2D shapes did they draw? Look carefully at one of the cuboids and imagine what it would look like flattened out as a net. Talk about how many faces it will have and how many will be congruent. Draw what you think it will look like as a net. Remember that when you fold the net up it needs to make a 3D cuboid and so you need to draw all the faces.
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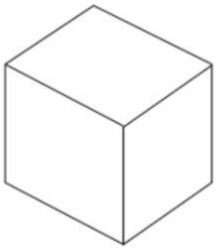
Mathematical language	Properties, square, rectangle, attribute, 2-dimensional, 3-dimensional, shape, side, equal, size, smaller than, straight, parallel, congruent, collinear, angles, vertices, vertex, sides, vertical, horizontal, diagonal, symmetrical, face, curved, edge, corner, sphere, cylinder, cube, cuboid, rectangular prism, triangle, quadrilateral, hexagon, equilateral triangle, square corner, right angle, rhombus, parallelogram, kite, trapezoid, isosceles trapezoid, polygon, regular, irregular, pentagon, hexagon, heptagon, octagon, equilateral, scalene, acute angle, obtuse angle

Level 4 Year 7/8: Geometry – Space and Shape

<table>
<tr><td>Sharing back/Connect</td><td>Select students to share who are able to explain and justify the attributes of a cuboids and can approximate these as a net.

Connect:
 
What are all the possibilities for nets for a cube?</td></tr>
<tr><td>Teacher Notes</td><td>• During the launch, use the geometric quick images. (See quick images PDF for ideas).
• Have available a wide range of cuboid shaped boxes collected from home.
• Tell the students not to draw the flaps just the faces. This activity will need to be repeated so that they have the opportunity to get closer and closer to drawing the net. As they complete an iteration have them open the box and compare their net with the net of the box.
• Facilitate the students to notice that despite the different dimensions of the boxes they all have six rectangular faces, and the opposite faces are congruent (the same). Note also that all corners are square (right angles).
• Notice the students who are able to draw six faces and approximate a net for a cuboid. These students will often be different from those who are able to compute. Also notice the students who use gesturing for the number of faces needed.
• For the independent task, have the following sheet prepared.</td></tr>
<tr><td>Independent Tasks</td><td>Draw and describe the properties of the following triangles:

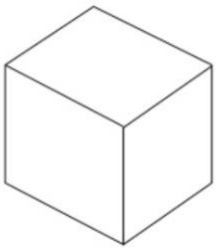
<table><tr><td>Type of triangle</td><td>Drawing</td><td>Properties</td></tr><tr><td>Obtuse</td><td></td><td></td></tr><tr><td>Isosceles</td><td></td><td></td></tr><tr><td>Scalene</td><td></td><td></td></tr><tr><td>Right Angle</td><td></td><td></td></tr><tr><td>Equilateral</td><td></td><td></td></tr><tr><td>Equiangular</td><td></td><td></td></tr><tr><td>Acute</td><td></td><td></td></tr></table></td></tr>
</table>

Level 4 Year 7/8: Geometry – Space and Shape

Anticipations	

Level 4 Year 7/8: Geometry – Space and Shape

Task 8	James is in a soccer shop with his mother and while he waits for her he starts looking closely at the soccer balls and imagining what their net might look like.  Have a close look at these soccer balls. What do you notice about the 2D shapes which would be used in the net of a soccer ball? Draw a miniature net and test it out to see if your net makes a miniature soccer ball.
Big ideas	Two-and-three dimensional objects with or without curved surfaces can be described, classified, and analysed by their attributes. Shapes have sides that are parallel, perpendicular, or neither. Shapes have line symmetry, rotational symmetry, or neither. Shapes are similar, congruent, or neither.
Curriculum links	**GM2-3:** Sort objects by their spatial features, with justification. **GM2-4:** Identify and describe the plane shapes found in objects. **GM3-3:** Classify plane shapes and prisms by their spatial features. **GM3-4:** Represent objects with drawings and models. **GM4-5:** Identify classes of two-and-three-dimensional shapes by their geometric properties. **GM4-6:** Relate three-dimensional models to two dimensional representations, and vice versa.
Learning Outcomes: Students will be able to:	• Identify classes of shapes in a range of different ways using geometrical language to explain and justify. • Sort and classify plane shapes into classes and sub classes according to defined geometrical properties such as number and relationship of sides; number and nature of angles-including types of lines and size of angles and the properties of each; number, nature, and shape of faces and surfaces (for 3D objects). • Draw objects that can take the form of plane views. • Use commonly shared rules to communicate ideas about defining shapes. • Create 2-dimensional drawings of 3-dimensional models. • Draw objects which can take the form of plane views of nets.
Mathematical language	Properties, square, rectangle, attribute, 2-dimensional, 3-dimensional, shape, side, equal, size, smaller than, straight,

	parallel, congruent, collinear, angles, vertices, vertex, sides, vertical, horizontal, diagonal, symmetrical, face, curved, edge, corner, sphere, cylinder, cube, cuboid, rectangular prism, triangle, quadrilateral, hexagon, equilateral triangle, square corner, right angle, rhombus, parallelogram, kite, trapezoid, isosceles trapezoid, polygon, regular, irregular, pentagon, hexagon, heptagon, octagon, equilateral, scalene, acute angle, obtuse angle
Sharing back/Connect	Select students to share who have recognised that there are two separate 2D shapes used in the net of the soccer ball. **Connect:** Why is a ball described as a spherical shape? Can you explain their connection between 2D and 3D shapes?
Teacher Notes	• During the launch use the geometry quick images. • Have available soccer balls • Facilitate the students to notice that you need to consider the height, length and width of 2D shapes to make 3D shapes. Have students consider how the angles change according to the shapes. • A ball is spherical, it's shaped like a sphere-a 3D version of a 2D circle. Traditional soccer balls are made from two 2D shapes, pentagons and hexagons as part of their 32 panel design. • For the independent task, have paper, scissors, glue available.
Independent Tasks	 Draw all the possibilities for nets for a cube. Test to see whether all of your nets make cubes.
Anticipations	

Task 9	You are a constructor. 1. Can you draw a net for a pyramid? 2. Can you draw a net to make a triangular packet to hold six tennis balls? 3. Can you draw a net for this chocolate box?  4. Can you draw a net for this Toblerone bar?  Draw a net for another shape of your choice.
Big ideas	Two-and-three dimensional objects with or without curved surfaces can be described, classified, and analysed by their attributes. Shapes have sides that are parallel, perpendicular, or neither. Shapes have line symmetry, rotational symmetry, or neither. Shapes are similar, congruent, or neither.
Curriculum links	**GM2-3:** Sort objects by their spatial features, with justification. **GM2-4:** Identify and describe the plane shapes found in objects. **GM3-3:** Classify plane shapes and prisms by their spatial features. **GM3-4:** Represent objects with drawings and models. **GM4-5:** Identify classes of two-and-three-dimensional shapes by their geometric properties. **GM4-6:** Relate three-dimensional models to two dimensional representations, and vice versa.
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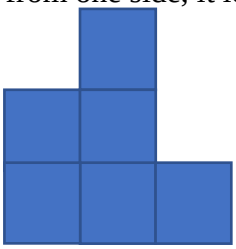
Level 4 Year 7/8: Geometry – Space and Shape

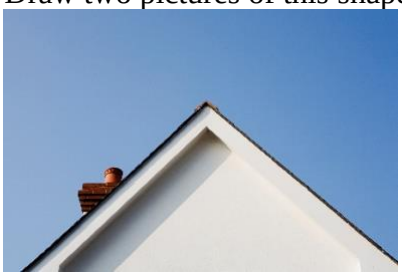
	Draw objects which can take the form of plane views of nets.
Mathematical language	Properties, square, rectangle, attribute, 2-dimensional, 3-dimensional, shape, side, equal, size, smaller than, straight, parallel, congruent, collinear, angles, vertices, vertex, sides, vertical, horizontal, diagonal, symmetrical, face, curved, edge, corner, sphere, cylinder, cube, cuboid, rectangular prism, triangle, quadrilateral, hexagon, equilateral triangle, square corner, right angle, rhombus, parallelogram, kite, trapezoid, isosceles trapezoid, polygon, regular, irregular, pentagon, hexagon, heptagon, octagon, equilateral, scalene, acute angle, obtuse angle
Sharing back/Connect	Select students to share who are able to predict and draw a variety of nets. **Connect:** Explain the 2D shapes which were used for the nets of 3D shapes. Justify why these were important.
Teacher Notes	• During the launch, use the geometry quick images • Facilitate the students to notice that all 3D shapes are composed of different 2D shapes • For the independent task, use the task below.
Independent Tasks	If you cut these objects in half, what would the slice look like for each? Would they look different at other angles? 
Anticipations	

Level 4 Year 7/8: Geometry – Space and Shape

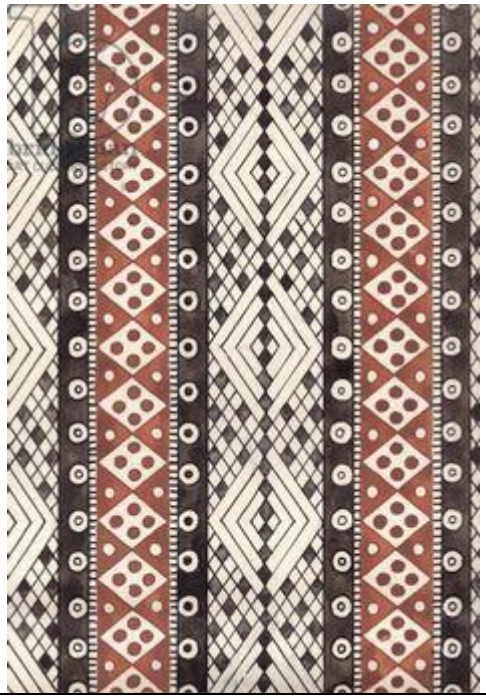
Level 4 Year 7/8: Geometry – Space and Shape

Task 10	Constructors ready for another challenge? Here is a shape made with linking cubes. When you look at it from one side, it looks like this.  What do you think the whole structure looks like? Before you explore and experiment with your cubes can you visualise what you think it looks like. Make a drawing of what you think it might look like on isometric paper and then build it with the cubes. Now look at your construction from a different view. Draw this view on isometric paper. How many different views of the construction can you draw on isometric paper?
Big ideas	Two-and-three dimensional objects with or without curved surfaces can be described, classified, and analysed by their attributes. Shapes have sides that are parallel, perpendicular, or neither. Shapes have line symmetry, rotational symmetry, or neither. Shapes are similar, congruent, or neither.
Curriculum links	**GM2-3:** Sort objects by their spatial features, with justification. **GM2-4:** Identify and describe the plane shapes found in objects. **GM3-3:** Classify plane shapes and prisms by their spatial features. **GM3-4:** Represent objects with drawings and models. **GM4-5:** Identify classes of two-and-three-dimensional shapes by their geometric properties. **GM4-6:** Relate three-dimensional models to two dimensional representations, and vice versa.
Learning Outcomes: Students will be able to:	• Identify classes of shapes in a range of different ways using geometrical language to explain and justify. • Sort and classify plane shapes into classes and sub classes according to defined geometrical properties such as number and relationship of sides; number and nature of angles-including types of lines and size of angles and the properties of each; number, nature, and shape of faces and surfaces (for 3D objects). • Draw objects that can take the form of plane views.

Level 4 Year 7/8: Geometry – Space and Shape

	• Use commonly shared rules to communicate ideas about defining shapes. • Create 2-dimensional drawings of 3-dimensional models. Draw objects which can take the form of plane views of nets.
Mathematical language	Properties, square, rectangle, attribute, 2-dimensional, 3-dimensional, shape, side, equal, size, smaller than, straight, parallel, congruent, collinear, angles, vertices, vertex, sides, vertical, horizontal, diagonal, symmetrical, face, curved, edge, corner, sphere, cylinder, cube, cuboid, rectangular prism, triangle, quadrilateral, hexagon, equilateral triangle, square corner, right angle, rhombus, parallelogram, kite, trapezoid, isosceles trapezoid, polygon, regular, irregular, pentagon, hexagon, heptagon, octagon, equilateral, scalene, acute angle, obtuse angle
Sharing back/Connect	Select students to share who have realised that there can be more than six cubes and have drawn and built structures to match. **Connect (See Copy Masters):** Draw two pictures of this shape that look different  Be ready to describe each view using the language of geometry.
Teacher Notes	• Have linking cubes or other cubes available. • Facilitate the students to notice the multiple perspectives of structures. Some students will assume that the structure has only the six obvious cubes in it whereas others will realise that there are more possibilities with additional cubes which cannot be seen from this view. • Monitor for students using vocabulary which identifies relationships between the different perspectives • For the independent task, have the picture of the siapo available and ensure students know how to make a table.
Independent Tasks	Look at this siapo. Make a table and describe all the attributes of the different geometric shapes you see.

Level 4 Year 7/8: Geometry – Space and Shape

	
Anticipations	

Level 4 Year 7/8: Geometry – Space and Shape

Task 11 (optional)	Ready for a new challenge? Shuffle the cards and place four of them horizontally and four of them vertically on the grid. Your challenge is to draw a quadrilateral in each empty square, so that the quadrilateral has both the properties at the top of the column and at the start of the row. There might be some that may not be possible! Use squared paper and isometric paper to help you find areas and angles. Can you make a 5 by 5 grid that fit the cards and that the students can draw the quadrilateral in the empty space?
Big ideas	Two-and-three dimensional objects with or without curved surfaces can be described, classified, and analysed by their attributes. Shapes have sides that are parallel, perpendicular, or neither. Shapes have line symmetry, rotational symmetry, or neither. Shapes are similar, congruent, or neither.
Curriculum links	**GM2-3:** Sort objects by their spatial features, with justification. **GM2-4:** Identify and describe the plane shapes found in objects. **GM3-3:** Classify plane shapes and prisms by their spatial features. **GM3-4:** Represent objects with drawings and models. **GM4-5:** Identify classes of two-and-three-dimensional shapes by their geometric properties. **GM4-6:** Relate three-dimensional models to two dimensional representations, and vice versa.
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Mathematical language	Properties, square, rectangle, attribute, 2-dimensional, 3-dimensional, shape, side, equal, size, smaller than, straight,

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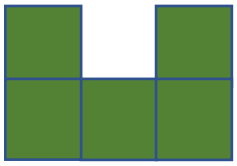
Sharing back/Connect	Select students to share who are able to explain their drawings and and justify each aspect of their representations **Connect:** Make another set of cards which could be used on a triangle grid.
Teacher Notes	• During the launch, use the geometric quick images • Have copies of the grid and the sets of cards available. • For the independent task, have dotty paper available and interlinking cubes or similar.
Independent Tasks	Here is a shape made with linking cubes. When you look at it from one side, it looks like this.  What do you think the whole structure looks like? Before you explore and experiment with your cubes can you visualise what you think it looks like. Make a drawing of what you think it might look like on isometric paper and then build it with the cubes. Now look at your construction from a different view. Draw this view on isometric paper. How many different views of the construction can you draw on isometric paper?
Anticipations	

Level 4 Year 7/8: Geometry – Space and Shape

Task 12 (optional)	Final constructor challenge: Draw these different polygons and keep noticing what changes and what stays the same. 1. This polygon has four sides. 2. This polygon has four right angles. 3. The length of this polygon is twice its width. 4. The area of the polygon is 18 cm^2. 5. This polygon has two congruent sides. 6. The interior angles of this polygon have the sum of 180 degrees. 7. One side of this polygon is double the length of another side. 8. This polygon has a perimeter of 40 centimetres. 9. The shortest side is half the length of the longest side. 10. The two longest sides of this polygon meet in a 30 degree angle.
Big ideas	Two-and-three dimensional objects with or without curved surfaces can be described, classified, and analysed by their attributes. Shapes have sides that are parallel, perpendicular, or neither. Shapes have line symmetry, rotational symmetry, or neither. Shapes are similar, congruent, or neither.
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Level 4 Year 7/8: Geometry – Space and Shape

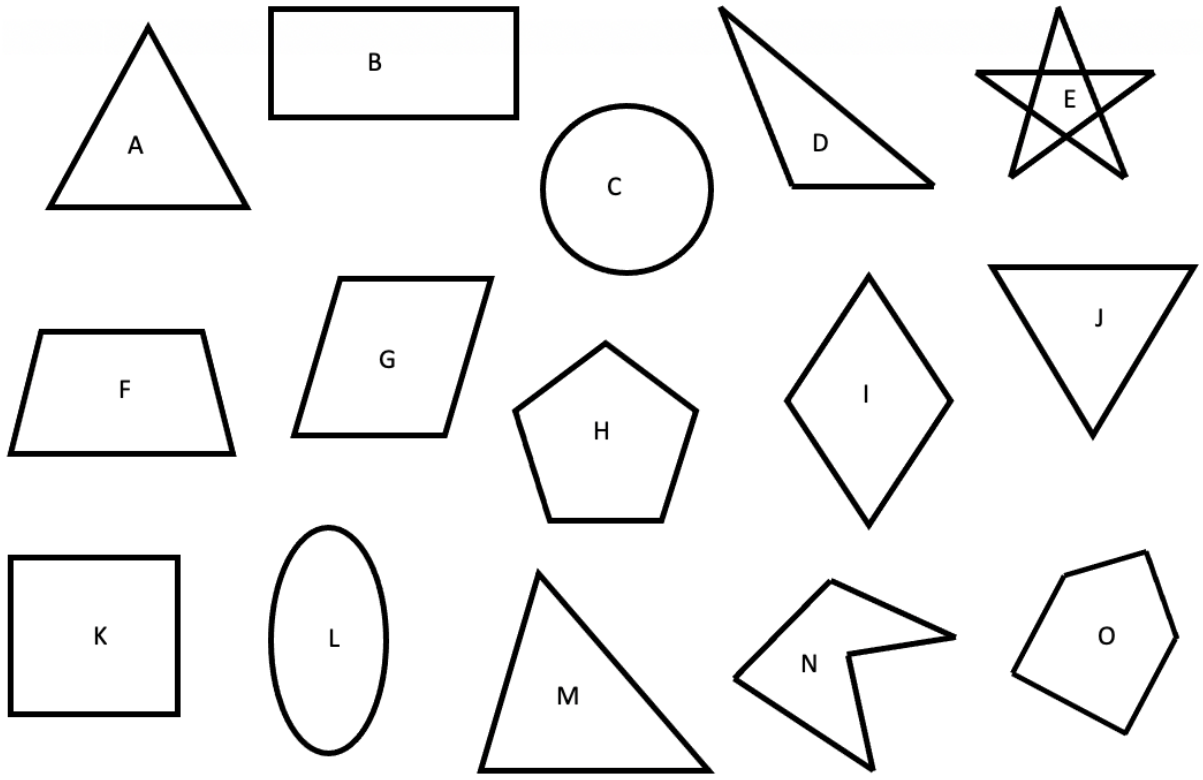
	corner, sphere, cylinder, cube, cuboid, rectangular prism, triangle, quadrilateral, hexagon, equilateral triangle, square corner, right angle, rhombus, parallelogram, kite, trapezoid, isosceles trapezoid, polygon, regular, irregular, pentagon, hexagon, heptagon, octagon, equilateral, scalene, acute angle, obtuse angle
Sharing back/Connect	Select students to share who are able to explain their drawings and and justify each aspect of their representations **Connect:** Make some **if** statements about some of your polygons.
Teacher Notes	• Facilitate students to notice and describe the relationships between their shapes using geometrical language. • Facilitate students to use precise geometrical terms to define the properties of each shape. • Monitor for students using precise vocabulary which identifies and defines each shape and classes of shapes. • For the independent task complete one of the assessment tasks attached at the end of the document.
Independent Tasks	Complete the one of the following assessment tasks (attached at the end of the document) as the independent activity: • GS5A : Geometry – Shape • GS8 : Geometry - Shape
Anticipations	

DMIC

DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

GEOMETRY: SHAPE: LEVEL 3-4 Task GS5A

Here is a set of shapes. Sort them into groups and provide a description of the properties of the groups using geometrical language. This could include types of lines, angles, and sides.



DMIC

DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

GEOMETRY: SHAPE: LEVEL 3-4 Task GS8

At school prize-giving all the students will receive a gift presented in a square or rectangle box. Draw as many different nets as you can for the boxes.