RICH MATHEMATICAL TASK BOOKLET



GEOMETRY

YEAR 2

Teacher Booklet

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Sort these shapes into different groups. What do you notice? How are the shapes the same? How are the shapes different?

Teacher Notes

Before starting this task ensure that you have sorted the shapes required – either using foam shapes or printing the copy masters.

Have the students sort and re-sort until they are sorting the shapes by number of sides. Introduce the correct terms of triangle, quadrilateral and hexagon as 3-sided, 4-sided and 6-sided shapes.

Facilitate the students to notice that shapes can have a different number of sides. They also have different sized corners and that these can be sharp or blunt corners.

Monitor for students using vocabulary which is everyday maths language and revoice using the language of geometry.

For the independent activity have shapes for the students to match.

Shareback

Select groups to share back that are able to describe an attribute of the group of shapes.

Connect

Place one of each shape on the board or modelling book.

Generate a list of rules to identify each shape. Focusing on the shape name and one attribute.

This is a _____ because it has ____.

Eg. This is a circle because it has curved sides.

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

Identify, describe, and sort 2D and 3D shapes, including ovals, semicircles, polygons (e.g., hexagons, pentagons), rectangular prisms (cuboids), pyramids, hemispheres, and cones, using the attributes of shapes.

Suggested Learning Outcomes

Group similar shapes together and explain why they are similar using everyday and geometrical language.

Group different shapes together and explain why they are different using everyday and geometrical language.

Independent Tasks

Find the matching shapes.

Name the shapes.

Mathematical Language

Sides, curved, circle, square, rectangle, triangle, hexagon, pentagon, ovals, cemi circles, polygons, smaller, bigger

Is this shape a rectangle? Why, why not?

Is this shape a square? Why, why not?

Is this shape a triangle? Why, why not?

Teacher Notes

Before starting this task, ensure that you have the required shapes or copy masters for this task. You may like to draw these shapes on the board.

Starter: draw or hold up the first circle image: asking the question – is this a circle? Followed by ... Why or why not?

A circle is a 2D shape, which only has one side and no corners.

Expect the students to verbally or nonverbally (through gesture) describe why the shape is or is not a circle.

Task: Provide the students with the series of rectangles and ask them to group the rectangles and the ones that are not. Ask students to provide a justification each time a shape is presented.

Notice the students that are using clear geometric language to sort the shapes.

Shareback the reasoning around rectangles before repeating this task with the triangles.

Notice the students who may have misconceptions about triangles due to the orientation e.g. students who think this is not a triangle:

For the independent task have shapes avaliable for the students to sort.

Shareback

Select students who can justify why a shape is or is not a rectangle, square or triangle.

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

Identify, describe, and sort 2D and 3D shapes, including ovals, semicircles, polygons (e.g., hexagons, pentagons), rectangular prisms (cuboids), pyramids, hemispheres, and cones, using the attributes of shapes.

Connect

Discuss and refine the rules for a rectangle, square, and a triangle.

Rectangle: a 2D shape with four straight sides, two pairs of parallel sides, and four right angles.

Square: a 2d shape with four sides of the same length and four right angles.

Triangle: a 2d shape with three straight sides and three angles.

Challenge the students during their explanations to argue whether or not shape definitions need to discuss colour, orientation, material (attributes that do not matter).

Suggested Learning Outcomes

Explain the attributes of a circle, triangle and rectangle.

Use geometrical language to compare shapes.

Independent Tasks

Match these shapes - what is the same what is different?

Mathematical Language

Sides, curved, circle, square, rectangle, triangle, smaller, bigger, sides, corners,

Find these shapes in our classroom. Find these shapes in our school. (see copy masters)

Teacher Notes

Starter: Have 2D shapes available to use and put them in the middle of the circle of students. Build the train across the floor each student taking a turn by naming the attributes that is different.

For example - if a rectangle is the first shape, you could put a square down after and say :a square is different to a rectangle because the sides are all the same length.

This task could be done whole class.

Provide the students the Copy Masters table.

Ask the students what they notice in the 3D shapes.

Explain that they are going to look for objects that resemble these shapes in their classroom first and then the school filling in the table as they go.

Notice for students using vocabulary which is everyday maths language and revoice using the language of geometry.

For the independent task have a variety of 3D objects for the students.

Shareback

Select students to share who can make justifications for why their object resembles the 3d shape.

Connect

Make connections between 2D and 3D shapes.

Discuss the attributes of cubiods, pyramids, hemispehere and cone.

- Cubes have 6 square-shaped faces, all edges are equal.
- Pyramids have triangluar-shaped faces and a polygon base.
- Hemispheres have a flat circular base and a curved surface.
- Cones have a flat circular base, with sides that narrow to a point.

Be explicit in the geometrical language used to descibe these shapes.

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

Identify, describe, and sort 2D and 3D shapes, including ovals, semicircles, polygons (e.g., hexagons, pentagons), rectangular prisms (cuboids), pyramids, hemispheres, and cones, using the attributes of shapes.

Suggested Learning Outcomes

Recognise shapes in their environment.

Discuss the attributes of 3D shapes.

Independent Tasks

Does it roll?

Test out these objects to see if these objects roll or stand still. What do you notice?

Mathematical Language

Sides, curved, circle, square, rectangle, triangle, smaller, bigger, corners. sphere, cylinder, cube, edge, face, 3D, 2D

What do you notice about the shape of these different things?

Sort them into groups which you think are the same.

Sort them into groups which you think are different.

Teacher Notes

Provide students in pairs with a collection of common objects from their environment and have them talk with each other about what they notice about them.

Then have the students sort the objects into groups that are the same and have them justify why they are the same. Repeat with how they are different.

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

Monitor for students using vocabulary related to 3D shape.

For the independent task, have available a wide collection of different 3D shapes.

Shareback

Select students to share who can explain and justify using everyday language and the language of geometry how the different objects are the same and/or different.

Connect

Use a set of different objects to explore different properties. Ask:

What objects are large?

What objects are small?

What objects are solid?

What objects are hollow?

What objects roll?

What objects have sharp edges?

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

Identify, describe, and sort 2D and 3D shapes, including ovals, semicircles, polygons (e.g., hexagons, pentagons), rectangular prisms (cuboids), pyramids, hemispheres, and cones, using the attributes of shapes.

Suggested Learning Outcomes

Recognise shapes in their environment.

Identify and sort objects in a variety of ways.

Group and classify similar shapes together and explain and justify why they are similar using non-geometrical and geometrical language.

Independent Tasks

Sort the objects into sets. How are they the same? How are they different?

Draw pictures of each different shape.

Choose a new set of objects and repeat the activity.

Mathematical Language

Sides, curved, circle, square, rectangle, triangle, smaller, bigger, corners. sphere, cylinder, cube, edge, face, 3D, 2D

Choose a big shape.

What smaller shape will make the bigger shape? Use the smaller shapes to check whether they will make the bigger shape.

Choose another big shape.

What smaller shape will make the bigger shape? Use the smaller shapes to check whether they will make the bigger shape.

Choose another big shape.

What smaller shape will make the bigger shape? Use the smaller shapes to check whether they will make the bigger shape.

Teacher Notes

To launch the task, have sets of pattern blocks and ask the students to experiment with making shapes out of the pattern blocks.

Have large shapes in and smaller shapes from either pattern blocks or cut out from the Copy Masters booklet (note large shapes are provided, use smaller shapes from previous lessons).

Ask students to predict what smaller shapes they can use to make the larger shape first.

Notice students who use the language of geometry when predicting and making the shapes.

For the independent task, have a range of larger shapes and smaller shapes available.

Shareback

Select students to share who can explain in different ways how they constructed bigger shapes using the smaller shapes and can describe the attributes they notice.

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

Anticipate which smaller shapes might be used to compose a target shape, and then check by making the shape.

Connect

Show large shapes on the whiteboard and ask students to predict what smaller shape and how many they would need to make the larger shape. Test their predictions.

Suggested Learning Outcomes

Decompose and recompose shapes.

Use geometrical language to describe their shapes.

Independent Tasks

Choose a big shape.

What smaller shape will make the bigger shape?

Use the smaller shapes to check whether they will make the bigger shape.

Choose another big shape.

What smaller shape will make the bigger shape?

Use the smaller shapes to check whether they will make the bigger shape.

Choose another big shape.

What smaller shape will make the bigger shape?

Use the smaller shapes to check whether they will make the bigger shape.

Mathematical Language

Square, rectangle, attribute, 2-dimensional, 3-dimensional, shape, sort, describe, side, equal, size, colour, big, small, bigger than, smaller than, straight, congruent, half, corners, angles, sides, vertical, horizontal, symmetrical, halves, quarters, column, row, array

Make a hexagon with the pattern blocks.

Copy the hexagon so that you have a pair.

Describe the shapes that you used for each part of the hexagon.

Draw the hexagon that you made with the pattern blocks.

Make a polygon with the pattern blocks. Copy the polygon so that you have a pair. Describe the shapes that you used for each part of the polygon. Draw the polygon that you made with the pattern blocks.

Make a different shape with the pattern blocks. Copy the shape so that you have a pair. Describe the shapes that you used to make a different shape. Draw the shape that you made with the pattern blocks.

Teacher Notes

Have pattern blocks available or copy masters of shapes from earlier tasks.

Discuss the idea that shapes are made up of other shapes and that shapes can be decomposed and composed to make the target shape.

Ask students to duplicate what they have made multiple times.

For the independent task, have pattern blocks available.

Shareback

Select students to share who can explain using geometrical language the shapes that they used to make the animals.

Connect

Demonstrate that shapes can be composed in a variety of ways e.g.

Squares: two triangles or two recangles of the same size

Hexagon: made up of just triangles or two quadrilaterals or a combination of

both

Rectangles: made up of squares, or right angle triangles.

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

Anticipate which smaller shapes might be used to compose and decompose a target shape, and then check by making the shape.

Suggested Learning Outcomes

Connect and decompose shapes to make other shapes or images.

Independent Tasks

Make a house with the pattern blocks.

Copy the house so that you have a pair.

Describe the shapes that you used for each part of the house.

Draw the house that you made with the pattern blocks.

Make a flower with the pattern blocks.

Copy the flower so that you have a pair.

Describe the shapes that you used for each part of the flower.

Draw the flower that you made with the pattern blocks.

Make a spaceship with the pattern blocks.

Copy the spaceship so that you have a pair.

Describe the shapes that you used for each part of the spaceship.

Draw the spaceship that you made with the pattern blocks.

Mathematical Language

Sides, curved, circle, square, rectangle, triangle, smaller, bigger, corners, decompose, construct.

With your buddy discuss and explore which pictures, letters and numbers have mirror symmetry?

Be ready to explain and justify their lines of symmetry.

Think about which letters or numbers reverse, and which ones invert, and which ones stay the same? Be ready to explain why.

Teacher Notes

As the starter show students the images in the copy masters and ask:

How are your pictures the same? How are they different?

Prompt the students to use the mirror so that half of your picture is a reflection of the other half in the mirror. Monitor for symmetrical language and revoice to model language if needed.

Have available an assortment of pictures some symmetrical, some not, small mirrors, and sets of different numbers and letters.

Facilitate the students to notice that when the two halves of a picture are the same, they are congruent. Have them notice that they are also reversed because one side has to be flipped over.

Have the students describe how one half is a reflection of the other and this can be seen by using a mirror. This is termed mirror symmetry and the mirror line is the line of symmetry. Have them note that letters like A are not reversed in a vertical mirror but are inverted in a horizontal mirror.

Numbers and letters that stay the same in one or both directions when the mirror line runs through the centre of the shape are symmetrical.

In the connect, have students explore how a rectangular sheet of paper has mirror symmetry by folding or drawing the mirror line. Discuss how it has two mirror lines and likewise their drawings may have more than one line of symmetry.

For the independent task have printed 2D shapes available (see copy masters) for students to explore symmetry

Big Ideas

A transformation is a way of moving a shape, and a shape that remains unchanged under a transformation is said to have symmetry.

Transformations provide a significant way to think about the ways properties change or do not change when a shape is moved on a plane.

Curriculum Links

Recognise lines of symmetry in patterns or pictures, and create or complete symmetrical pictures or patterns.

Shareback

Select students to share who are able to identify numbers or letters that show reflection around a central line of symmetry, and can identify the location of the line of symmetry.

Connect

Fold your rectangular piece of paper in half. Now draw a simple picture on one half of the paper. Use the mirror to check what the other half will look like and then draw it. Draw in the mirror line to show symmetry on your rectangular piece of paper. Talk about what you notice about the mirror lines.

Suggested Learning Outcomes

Describe a symmetrical shape including lines of symmetry.

Describe how a shape that stays the same under transformation has symmetry.

Independent Tasks

Draw the lines of symmetry on each shape.

Sort the letters and numbers into these two different groups.

(see copy masters)

Mathematical Language

flip, slide, turn, pattern, left, right, line of symmetry, same, mirror image,

Arrange the shapes into a picture.

Place the string next to your shapes (like a mirror).

Arrange the shapes on the otherside of the string.

What do you notice?

Teacher Notes

Starter: draw half shapes onto the board and ask students to discuss what the complete shape would be. If needed provide students with whiteboards or paper to copy and draw the shapes.

For the task. have the students work in pairs. Give each pair a piece of string and assortment of shapes (each pair need two of the same shapes).

Using half of the shapes have one of the pair make a pattern/arrangement on the carpet e.g..

Instruct the students to place a piece of string next to the arrangement of shapes. Have the other student to mirror the arrangement.



Monitor for students who use geometrical language when explaining how they are mirroring the image.

Increase complexity by providing the students with more shapes to use.

Shareback

Select students who can explain how the shape has transformed.

Connect

How does placing the string (mirror) in different places change how you make the image: or (for example).

Big Ideas

A transformation is a way of moving a shape, and a shape that remains unchanged under a transformation is said to have symmetry.

Transformations provide a significant way to think about the ways properties change or do not change when a shape is moved on a plane.

Curriculum Links

Recognise lines of symmetry in patterns or pictures, and create or complete symmetrical pictures or patterns.

Suggested Learning Outcomes

Explain transformation as a way of moving a shape.

Complete symmetical images.

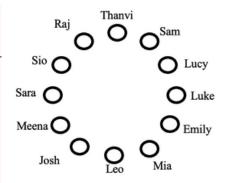
Independent Tasks

Complete the symmetrical patterns (see copy masters)

Mathematical Language

flip, slide, turn, pattern, left, right, line of symmetry, same, mirror image,

The children are playing Duck, Duck, Goose in the playground.



Sam walks clockwise around the circle to the 3rd person. Who does he choose to chase him?

Meena walks anticlockwise around the circle to the $7^{\rm th}$ person. Who does she choose to chase her?

Luke stands and turns a quarter turn to the left. Who is he now facing?

Meena stands and turns a quarter turn to the right, who is she now facing?

Leo stands to face Mia and then turns a half turn - and walks to the 5th person. Who does he choose?

Teacher Notes

As a starter Play the Robot Game using commands which require the students to walk forwards and backwards. For example: Face the front then walk one step forward.

Face the front then walk 3 steps backwards.

Turn to the left then walk one step forwards.

Turn to the right then walk one step backwards.

Reinforce left and right if needed.

Facilitate the students to notice that Face the left and walk one step forward is the same if you were to face the right then step one step backwards.

For this task ensure that you change the names to reflect the students in your class.

Ask each question one at a time and shareback after each question.

Notice students who are able to follow the instructions and provide clear explanations for where the person choose.

Big Ideas

Shapes can be described in terms of their location in a plane or space.

Coordinate systems can be used to describe these locations precisely.

The coordinate view of shape offers another way to understand certain properties of shapes.

Curriculum Links

Follow and give instructions to move people or objects to a different location, using direction, distances (e.g., number of steps), and half and quarter turns.

Interpret diagrams to describe the positions of objects and places in relation to other objects and places.

Shareback

Select students to share who are able to explain and justify their reasoning.

Connect

Sam wants to chase Meena. What does he need to do? Does it matter if he goes clockwise or anticlockwise? Why?

Suggested Learning Outcomes

Follow and interpret simple instructions involving turns and direction.

Independent Tasks

Draw a game of duck duck goose.

Draw 8 people in a circle and give them names.

Now with your buddy take turns giving directions of someone walking and picking someone to chase them in the game.

Mathematical Language

forward, backwards, right, left, front, back, clockwise, anticlockwise, full turn, half turn, quarter turn.

Give your buddy instructions to move around the classroom.

Represent your pathway.

Teacher Notes

Starter: Robot Game. Tell all the students that they are robots and have to follow each command. Use commands like:

Face the front, then turn to the right.

Face the front then turn half way around.

Face the left, then turn to your right.

Ensure that the students understand the turn commands. For example have them point to their right and then turn in that direction. To turn all the way around to the left they turn to the left until they are back at the starting position but to turn half way around they face the opposite direction.

Notice students who confuse the direction they face with the direction they turn. Ensure that they understand that face the right is different from turn to your right. It might help to have left and right label in your classroom.

For the task: Students are to practice giving each other instructions to move around the classroom. Student A= instructor B= mover and then swap.

Include obstacles in the class for students to go under or over - a chance to use positional language (for example a chair might be a hill or you may mark out an error students can not go through - to increase complexity).

Provide the students with multiple opportunities to be the instructor and the mover.

Then provide students with a grid to represent a path of their journey. Encourage the use of arrows and numbers (to represent the number or steps).

Shareback

Select students to share who are able to explain (either)

- clearly the instructions they gave their partner,
- · which direction they are facing after they have turned,
- their representation of their instructions.

Big Ideas

Shapes can be described in terms of their location in a plane or space.

Coordinate systems can be used to describe these locations precisely.

The coordinate view of shape offers another way to understand certain properties of shapes.

Curriculum Links

Follow and give instructions to move to a familiar location or locate an object.

Use pictures, diagrams, or stories to describe the positions of objects and places.

Connect

If students need more support using representations, using one groups instructions, represent the students instructions/movements using arrows and number of steps on a grid.

Give the students a chance to consolidate/practice what these representations could look like.

Discuss: What happens if you take two steps forwards and then two steps backwards?

Is the more than one way to move from here to the other side of the classroom?

Suggested Learning Outcomes

Give and follow simple instructions.

Represent your instructions using a grid or arrows.

Independent Tasks

Work together with a buddy playing the robot game. Give directions to each other of turns you want them to make.

- 1. Walk 3 steps forward and then 2 steps backwards.
- 2. Walk 1 step forward and then 2 steps backwards.
- 3. Walk 3 steps backwards and then 1 step forwards.
- 4. Walk 3 steps backwards and then 4 steps forwards.
- 5. Walk 4 steps forwards and then 4 steps backwards. What do you notice?

Mathematical Language

forward, backwards, right, left, front, back, clockwise, anticlockwise, full turn, half turn, quarter turn.

You are pirates!

Design your own Treasure Island - it may look like this:



Your island needs to have hills, a swamp, trees and be surrounded by the sea. Pick a landing place on the edge of the island and mark it as your shipwreck.

Bury your treasure somewhere on the Island - but you need to write instructions for how you are going to find it again.

Give instructions for another pirate crew to find the treasure.

Teacher Notes

Give each pair either a blank treasure map or their own grid paper to design an Island.

Each pair is to follow the instructions to design their own Treasure Island.

You may need to introduce each object one at a time for students to add to their map.

Remind students of the arrow and numbers they could use to represent their instructions.

Once the instructions are written, students are to join another group and see if they can follow the instructions.

Notice students that can use a variety of directions and instructions to get to the treasure.

Notice students using accurate directionality langauge.

For the independent activity, have either a blank treasure map in copy masters or grid paper for the students to make their own maps.

Shareback

Select students who can explain their instructions/have clear representations.

Big Ideas

Shapes can be described in terms of their location in a plane or space.

Coordinate systems can be used to describe these locations precisely.

The coordinate view of shape offers another way to understand certain properties of shapes.

Curriculum Links

Follow and give instructions to move to a familiar location or locate an object.

Use pictures, diagrams, or stories to describe the positions of objects and places.

Connect

Discuss the different pathways/representations.

What was easy to follow, what was tricky when giving directions.

Get the students to stand and discuss the following: Stand and face the front. Turn all the way around to the left. What do you notice about which direction you are facing? Why?

Stand and face the front. Take one step foward and then one step back. What do you notice?

Suggested Learning Outcomes

Give simple instructions.

Follow simple instructions.

Represent simple instructions.

Independent Tasks

Design a treasure map and write instructions for someone to follow.

Mathematical Language

forward, backwards, right, left, front, back, clockwise, anticlockwise, full turn, half turn, quarter turn, direction, path, instructions.

Look at the map of your school. What do you notice? Find our classroom. Explain where our classroom is.

Give instructions to move from your class to the office. Give instructions to move from your class to the playground.

Teacher Notes

Provide each pair with a birds eye image of your school, these can be taken off Google Maps.

Facilitate the students to notice the way in which they need to orient their map of the school. Then focus on the following:

- Direction which way?
- Distance how far?
- Location where?
- Identification what objects?

Support students to locate the classroom if this is not obvious. Expect students to use left, right, or beside, between when discussing where the class can be located on the map. They may use landmarks to identify where their class is.

Set the students with the task of representing instructions to move around the school. Adjust these prompts in the task to best suit the environment.

Shareback

Select students who are able to eplain their instructions. Test out these instructions walking around the school.

Connect

What do you notice when walking around the school and what you can not see on your map?

Provide the students with a map that incorporates the school and local area. What do you notice?

What landmarks are in the community?

Big Ideas

Shapes can be described in terms of their location in a plane or space.

Coordinate systems can be used to describe these locations precisely.

The coordinate view of shape offers another way to understand certain properties of shapes.

Curriculum Links

Follow and give instructions to move to a familiar location or locate an object.

Use pictures, diagrams, or stories to describe the positions of objects and places.

Suggested Learning Outcomes

Use a map to give instructions.

Identify landmarks on a map.

Independent Tasks

Asssessment Tasks -

One: Sort Shapes

Two: Describe the playground - NOTE: you may want to use a photo of your own playground or school.

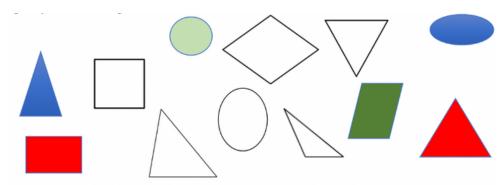
Mathematical Language

forward, backwards, right, left, front, back, clockwise, anticlockwise, full turn, half turn, quarter turn.

Assessment Task 1 - Shape - Year 2

GEOMETRY: SHAPE:

Here is a set of shapes. Sort them into groups and explain why you have grouped them together



Teacher note: Could use attribute shapes or randomly coloured, laminated pre-cut shapes.

Assessment Task 2 - Position and Orientation - Year 2

GEOMETRY: Describe how to get around the playground

