Year ②

Small Steps Guidance and Examples

Block 3: Properties of Shape

White Rose Maths

Year 2 – Yearly Overview

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place value			Number: Addition and Subtraction					Measurement: Money		Number: Multiplication and Division	
Spring	Number: Multiplication and Division		Statistics		Geometry: Properties of Shape			Number: Fractions			Measurement: length and height	Consolidation
Summer	Position and direction			Problem solving and efficient methods	Measurement: Time		Measurement: Mass, Capacity and Temperature			Investigations		

Overview

Small Steps

Recognise 2D and 3D shapes

Count sides on 2D shapes

Count vertices on 2D shapes

Draw 2D shapes

Lines of symmetry

Sort 2D shapes

Make patterns with 2D shapes

Count faces on 3D shapes

Count edges on 3D shapes

Count vertices on 3D shapes

Sort 3D shapes

Make patterns with 3D shapes

NC Objectives

Identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line.

Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces.

Identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid.]

Compare and sort common 2-D and 3-D shapes and everyday objects.

Recognise 2D and 3D Shapes

Notes and Guidance

Before learning about their properties, children need to recognise and name both 2D and 3D shapes and to be able to differentiate between them. They need to begin to understand that 2D shapes are actually flat and so cannot be handled or picked up.

Children also need to be able to recognise 2D shapes in different orientations..

Mathematical Talk

What shape is this? If I turn it around, now what shape is it?

Can you draw around any of the faces on your 3D shapes? Which 2D shapes can you make? Are there any you can't draw around?

Varied Fluency

1 Match the names of the shapes to the pictures.

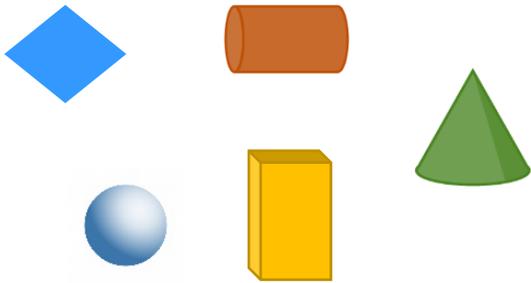Square   Triangle   Rectangle   Circle

2 Put a combination of 3D shapes in a feely bag. Can you find the cube, the cone, the cylinder? etc.

3 Go on a shape hunt around school. Can you see any pentagons? Can you see any octagons? Can you see any hexagons?

Recognise 2D and 3D Shapes

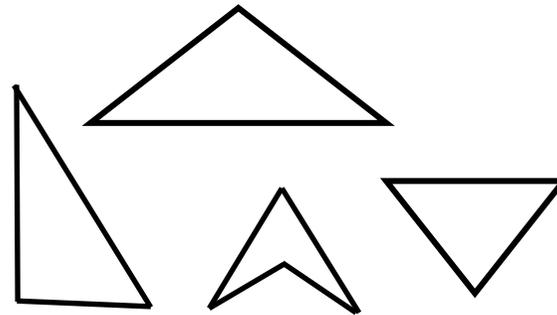## Reasoning and Problem Solving

Which is the odd one out?

The square is the odd one because it is the only 2D shape or the only flat shape.

Which is the odd one out? Explain your reasoning.

Three of the shapes are triangles, one is not. Three of them have three sides, one has four.

Other answers can be accepted with a clear explanation.

Count Sides on 2D Shapes

Notes and Guidance

In this step, children need to recognise that there are both straight sides and curved sides. Children should be encouraged to develop strategies for accurate counting of sides, such as by marking each side as it has been counted. Children also need to understand that not all same-sided shapes look the same, such as with irregular 2D shapes.
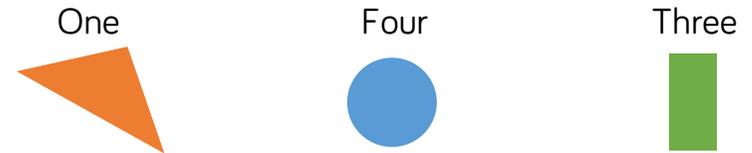
Mathematical Talk

What is a side?

Are all sides straight?

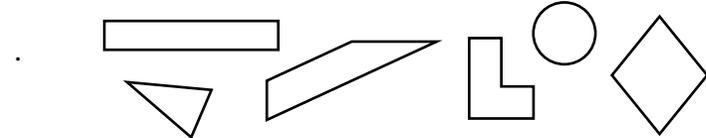How can you check that you have counted all sides?

Do all four-sided shapes look the same?

Varied Fluency

1 Match the shapes to the number of sides.

One   Four   Three

2 Colour the four-sided shapes in red.

3 Complete the table.

Name	Shape	Number of sides
Pentagon		
Circle		
Square		
Triangle		
Hexagon		

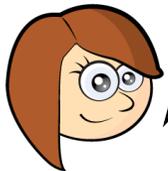# Count Sides on 2D Shapes

Reasoning and Problem Solving

Here are 18 lollipop sticks. How many octagons can you make?

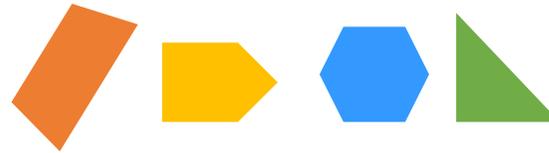18 octagons with 2 lollipop sticks spare. 8 + 8 = 16 sticks.

Beth says:

"My shape has one curved side and one straight side. What could it be?"

Beth's shape is a semi-circle.

Put these shapes into order based upon the number of sides that they have.

Triangle, quadrilateral, pentagon, hexagon.

Count Vertices on 2D Shapes

Notes and Guidance

Children are introduced to the term vertices. They will understand that a vertex is where two lines meet at a point. By exploring the non-concept, e.g. a perpendicular line, they will recognise that corners are vertices and be able to count them in real-life 2D shapes.

Mathematical Talk

Show me a vertex.

Can you identify the vertices in this shape?

Would this be a vertex? Explain why.

If I have ____ vertices, what could my shape be? What won't it be?

Varied Fluency

1 Match the shape to the correct number of vertices.

3 Vertices   5 Vertices   4 Vertices

2 Chris says:

My shape has 3 vertices.

What shape could he have?

3 Put these shapes in order based upon the number of vertices they have.

Count Vertices on 2D Shapes

Reasoning and Problem Solving

Bob says:

> All squares have 5 vertices.

Do you agree? Convince me.

No, squares have 4 vertices.

Which 2d shape has half the amount of vertices as a hexagon?

What 2d shape has twice as many vertices as a square?

Triangle.

Octagon.

Which shape has more vertices?

	Number of vertices
2 squares	
4 triangles	
2 pentagons	

(8, 12, 10)

4 Triangles

Draw 2D Shapes

Notes and Guidance

Children use their knowledge of properties of shape to accurately draw 2D shapes. Starting with geoboards, children make shapes with elastic bands to look carefully at the number of sides and vertices.

They then use rulers and straight edges to draw the shapes on squared or dotty paper.
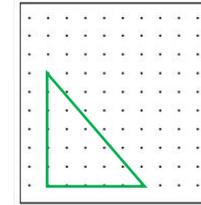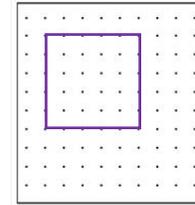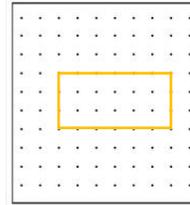
Mathematical Talk

Where are you going to start drawing the shape? In the middle of a side? At a vertex? Which is the most efficient way?

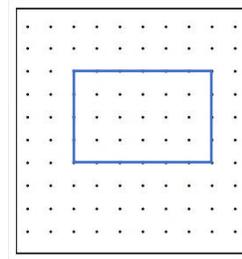Can you make the shape on a geoboard? How many sides has the shape got?

Can you draw a rectangle? Can you now draw a larger rectangle?

Varied Fluency

1. Use a geoboard to make different 2D shapes. Can you make a rectangle? Can you make a square? Can you make a triangle?

2. Can you draw a rectangle on dotty paper? Start at a vertex and use a ruler to draw your first straight side. How many straight sides will you need? Rotate the paper to help you draw the shape more accurately.

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3. Use a geoboard to make different 2D shapes. Can you make a rectangle? Can you make a square? Can you make a triangle?

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Draw 2D Shapes
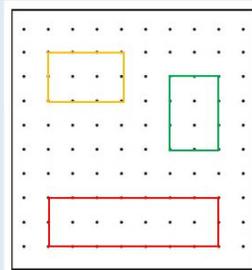
Reasoning and Problem Solving

Using geoboards, how many different rectangles can you make?

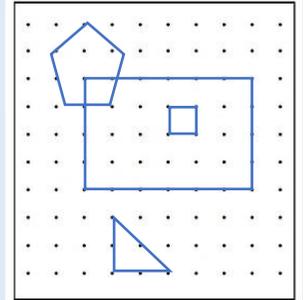What's the same about the rectangles? What's different?

Has your friend made any different rectangles?

Here are three possible rectangles. The green and the yellow rectangles are the same size but has been rotated. The red rectangle is longer than the others. They all have four sides and four vertices.

Draw a large rectangle on squared paper. Draw a square inside the rectangle. Draw a triangle underneath the rectangle. Draw a pentagon that is bigger than the square.

Can you give instructions to your partner to help them draw different shapes?

Children may end up with a different picture from above however they should have four shapes drawn.

Children will make up their own instructions.

Lines of Symmetry

Notes and Guidance

In the previous small steps, children have identified and described 2D shapes according to the number of sides and vertices. They now need to be introduced to the concept of symmetry. There are a range of practical resources that would introduce them to the concept of shapes being halved on their vertical line of symmetry, such as mirrors, GeoBoards and paper folding.

Mathematical Talk

What is a vertical line of symmetry?

What does vertical mean?

Which is the odd shape out? How do you know?

What resources could you use to check if a shape has a vertical line of symmetry?
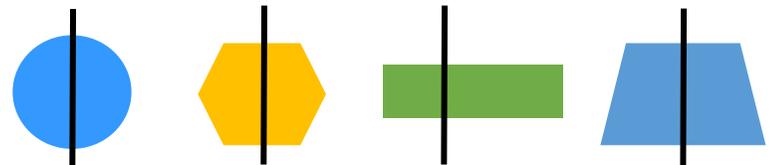
Varied Fluency

1. Can you fold these shapes to find a vertical line of symmetry? Rotate the shape, can you find a Horizontal line of symmetry?

2. Draw the vertical lines of symmetry on these shapes.

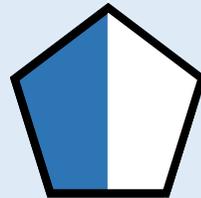3. Circle the shape with an incorrect line of symmetry. Explain why.

Lines of Symmetry

Reasoning and Problem Solving

Can you draw more than one four-sided shape that has a vertical line of symmetry?

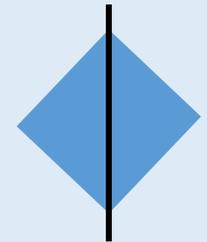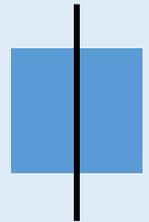E.g. square, rectangle, kite

Caroline has placed a mirror on the vertical line of symmetry. This is what she sees:

Can you complete the other half of the shape?

Which 2D shapes can be made when a vertical line of symmetry is drawn on a square?

Rectangle and triangle

Sort 2D Shapes

Notes and Guidance

Children need to be able to recognise and name 2D shapes including circle, square, triangle, rectangle, pentagon, hexagon and octagon using a range of different orientations and real life objects. Children need to be able to count the number of sides and vertices on 2D shapes including circle, square, triangle, rectangle, pentagon, hexagon and octagon. Children may have been introduced to the Venn diagram in cross curricular work so they can focus on the shapes within this step.
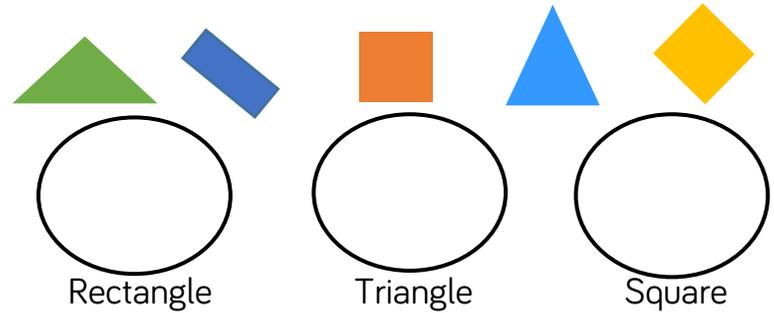
Mathematical Talk

How have you sorted your shapes?

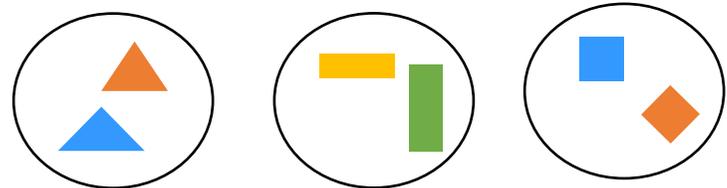How do you know you have sorted your shapes correctly?

Which method have you used to sort your shapes?

Varied Fluency

1. Sort these 2D shapes into the correct group:

Rectangle   Triangle   Square

2. Give children prepared groups of 2D shapes and labels. Match the labels to the groups and justify how they have been sorted. How are the shapes sorted?

3. Sophie sorted the shapes by the number of vertices. What shapes belong to each group?

4 vertices	More than 4 vertices

Sort 2D Shapes
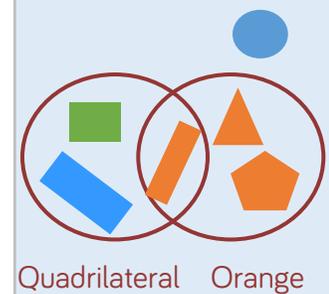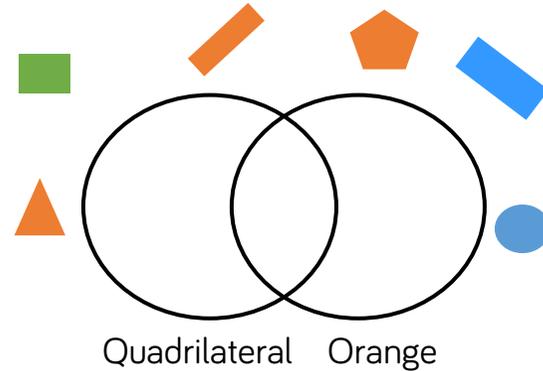
Reasoning and Problem Solving

Ben sorted the shapes in order of the number of sides. Has he ordered them correctly?

No because the square should be before the pentagon.

Sort shapes with line of symmetry and not a line of symmetry

Where should these shapes go in the Venn diagram?

Quadrilateral   Orange

Quadrilateral   Orange

Make Patterns with 2D Shapes

Notes and Guidance

At this stage children should be able to name and draw 2D shapes and be familiar with their properties. Children should recognise symmetry within shapes and be shown shapes in different orientations. Children should be encouraged to place the shapes in different orientations when making patterns and recognise that it is still a square, triangle etc. Squares do not become diamonds when turned sideways.

Mathematical Talk

Can you explain the pattern? How many time does the pattern repeat?

How are these patterns similar? How are these patterns different?

How can you work out which shape will come ___th?

Varied Fluency

1 Continue this pattern:

2 Draw pictures to represent this pattern:

Square, circle, triangle, triangle, square, circle, triangle, triangle.

3 Make repeating patterns using only one shape

Make Patterns with 2D Shapes

Reasoning and Problem Solving

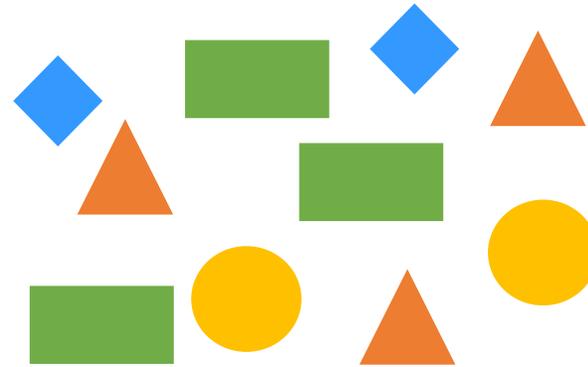Catherine says that the 12th shape in this pattern will be a triangle.

Is she correct?
How do you know?

The 12th shape will be a triangle. Children may physically continue the pattern to find the answer or recognise that the triangle is the 3rd and count in 3s.

How many different ways can you arrange these shapes to make a repeating pattern?

There are many ways to make different repeating patterns. Encourage children to orally describe the pattern they have created.

Create a pattern that only uses shapes with 4 vertices.

Children will use squares and rectangles in different orientations to make different patterns.

Count Faces on 3D Shapes

Notes and Guidance

Children will use their knowledge of 2D shapes to identify the shapes of faces on 3D shapes. To avoid over counting the faces children need to mark each face in some way. Children need to be able to visualise the 3D shape from a 2D representation on paper. Cones should be described as having 1 face and 1 curved surface; cylinders as having 2 faces and 1 curved surface and spheres having 1 curved surface.

Mathematical Talk

What do we mean by the 'face' of a shape?

What is the difference between a face and a curved surface?

What real life objects have 6 faces like a cube?

Does a cuboid always have 2 square faces and 4 rectangular faces?

Which 2D shapes can you see on different 3D shapes?

How can you make sure that you don't count the faces more than once?

Varied Fluency

1. Look at these 3D shapes:

   Which 2D shapes can you see on each one?
   How many 2D shapes can you see on each one?

2. Complete the table:

Shape	Name	Flat Faces	Curved Surfaces

3. I am a 3D shape with 2 square faces and 4 rectangular faces. What am I?
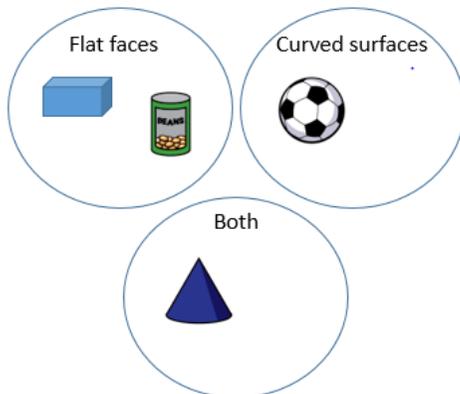
Count Faces on 3D Shapes

Reasoning and Problem Solving

Samir says my 3D shape has 6 faces.
Jolene says he must have a cube.
Is Jolene correct?
Explain your answer.

Samir could have a cube or a cuboid.

Hannah has sorted these 3D shapes.
Can you spot her mistake?
Can you add another shape to one of the circles?

The cylinder is in the wrong place, it should be in 'Both'.

You could add a cube, pyramid, triangular prism.

Sam is drawing all the 2D shapes she finds on 3D shapes. She draws 8 squares for a cube. Is she right?

Prove it!

Sam is incorrect because a cube has 6 square faces.

Count Edges on 3D Shapes

Notes and Guidance

Children will use their knowledge of faces and curved surfaces to help them to identify edges on 3D shapes. They need to be discretely taught that an edge is where 2 faces meet or where a face and a curved surface meet. To avoid over counting the edges children need to mark each edge in some way. Children need to be able to visualise the 3D shape from a 2D representation on paper.

Mathematical Talk

What do we mean by the 'edge' of a shape?

How can you make sure that you don't count the edges more than once?

What do you notice about the shapes with ____ edges?

Varied Fluency

1 Look at these 3D shapes:

How many edges can you see on each one?

2 Complete the table:

Shape	Name	Faces	Edges

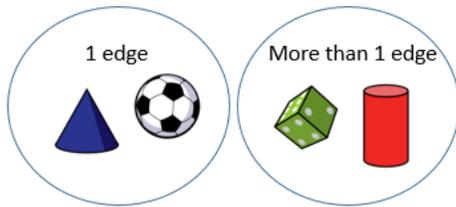3 Sort your shapes depending on the number of edges and/ or faces.

Count Edges on 3D Shapes

Reasoning and Problem Solving

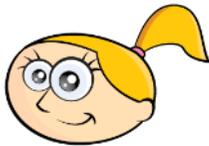Josh has sorted these shapes according to the number of edges.
Which shape is in the wrong place?
Explain why.

The sphere (football) is in the wrong place because it doesn't have any edges, it has one curved surface.

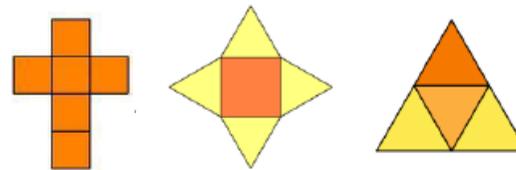Anna says my 3D shape has 12 edges.

Lilly says she could have a cube, cuboid or square based pyramid.

Is Lilly correct?
Explain your answer.

Lilly is not correct, because a square based pyramid has 8 edges.

Abigail is folding paper to make a 3D shape.

Work out the shapes she has made by looking at her folded papers.
How many faces and edges has each one got?

Cube – 6 faces, 12 edges

Square based pyramid – 5 faces, 8 edges

Triangular based pyramid – 4 faces, 6 edges.

Count Vertices on 3D Shapes

Notes and Guidance

Children will use their knowledge of edges to help them to identify vertices on 3D shapes. They need to be discretely taught that a vertex is where 2 or more edges meet. Note – a cone has an apex not a vertex, because it has one curved surface. To avoid over counting the vertices children need to mark each edge in some way. Children need to be able to visualise the 3D shape from a 2D representation on paper.

Mathematical Talk

What do we mean by the 'vertices' of a shape?

How can you make sure that you don't count the vertices more than once?

How many edges meet to make a vertex on a 3D shape? How many sides meet to make a vertex on a 2D shape?

Varied Fluency

1. Look at these 3D shapes:

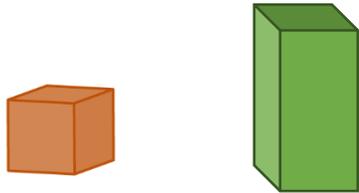How many Vertices can you see on each one?

2. Complete the table:

Shape	Name	Faces	Edges	Vertices

3. Alex has a shape with 8 vertices. What 3D shape could it be?

Count Vertices on 3D Shapes

Reasoning and Problem Solving
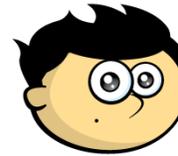
What is the same about these 2 shapes?

What is different about these 2 shapes? Talk about faces, edges and vertices in your answer.

Example answer:

Both shapes have the same number of vertices, faces and edges.

The cube only has square faces, but this cuboid has 2 square faces and 4 rectangular faces.

Jack says:

All 3D shapes have at least one vertex.

Is this true or false?
Explain why

False, because a cone has an apex not a vertex. A sphere also has no vertices.

Sort 3D Shapes

Notes and Guidance

Children need to be able to recognise and name 3D shapes including cube, sphere, cuboid, cone, cylinder, triangular prism and square-based pyramid using a range of different orientations and real life objects. Children need to be able to count the number of sides and vertices on 3D shapes including cube, sphere, cuboid, cone, cylinder, triangular prism and square-based pyramid. In this small step, children should have access to a range of real life objects to sort and compare.

Mathematical Talk

How have you sorted your shapes?

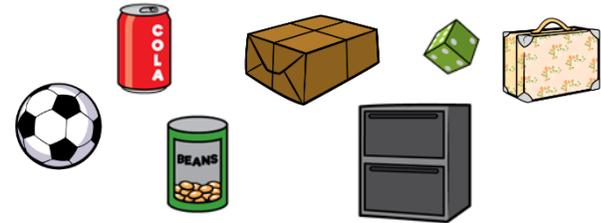How do you know you have sorted your shapes correctly?

Which method have you used to sort your shapes?

Can you sort your shapes in a different way?

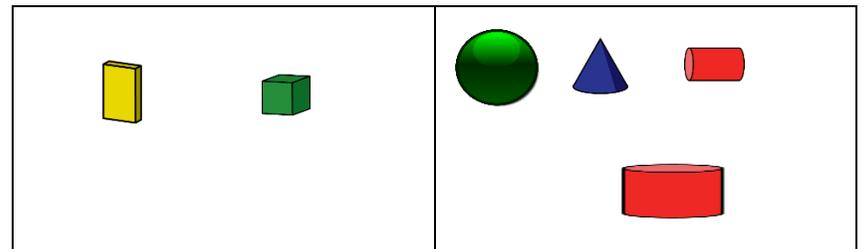Can you group your solids by shape, type of faces and size?

Varied Fluency

① Group the following real life objects by their 3D shape name.

② Sort the 3D shapes on your table. How have you grouped them? Label the groups.

③ How are these shapes grouped? Tell your partner.

Has your partner grouped them in a different way?

Sort 3D Shapes

Reasoning and Problem Solving

Hamish is sorting 3D shapes.
He puts a cube in the cuboid pile.

> A cube is a type of cuboid.
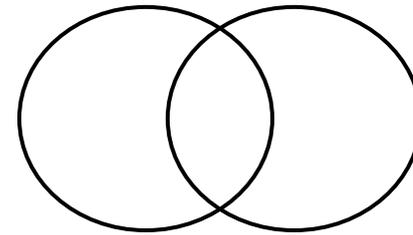
Do you agree? Why?

Answer: Yes it is.

They both have 6 faces.
They both have 12 edges.

A cube is a particular kind of cuboid where all faces are squares.

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Can you arrange the shapes in your table into a Venn Diagram?

What titles could you give it?

Hamza has sorted some 3D shapes.
He has placed a cube and a cuboid in the same group.

How could he have sorted his shapes?

Make Patterns with 3D Shapes

Notes and Guidance

Children should be familiar with the names and properties of 3D shapes at this stage. This step allows opportunities to justify choices in pattern making and reinforce shape vocabulary. Discussion around the orientation of the shape should be encouraged by making patterns with the same shape as per the example with the cones below. A wide range of examples of shapes should be used, including, Polydron, cereal boxes, different sized balls, food cans etc.

Mathematical Talk

Where can you see real life patterns with 3D shapes?

Can you explain your pattern to a partner?

Does the shape always have to be a certain way up?

Can you work out what shape would be the ___th?

Varied Fluency

1. Use some different coloured cubes to make a repeating pattern. Can you describe the pattern to your partner?

2. Make a sequence of 3D shapes with real life objects. You could use food cans, boxes, balls, or other things in your classroom. Describe the pattern.

3. Here is a pattern of 3D shapes:

Add a 3D shape into the sequence after the cube. If you continued the pattern, what will the 10th shape in the sequence be?
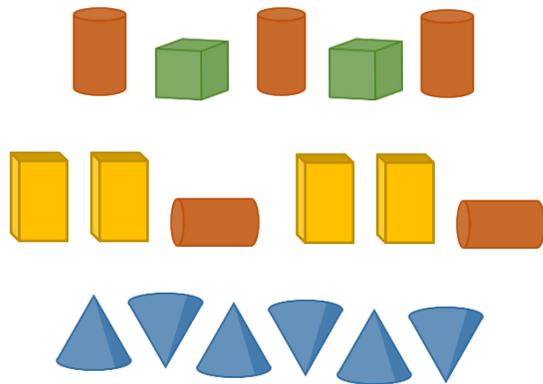
Can you make a different pattern with the same shapes? What's the same, what's different?

Make Patterns with 3D Shapes

Reasoning and Problem Solving

What is the same about these patterns?
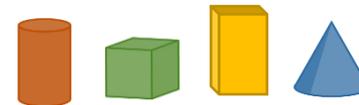What is different about these patterns?

First and second patterns are repeating alternate. Colour is a difference to note. Orientation of shapes is different.

Take a selection of 3D shapes where you have 2 different types.
What different repeating patterns could be made?

Use 4 different types of 3D shapes like the ones below.

Make a repeating pattern where there are more cones than cuboids.
Try to make a repeating pattern where the third shape is always a cylinder.

Answer will depend on the shapes used.