Spring Scheme of Learning

Year 4/5

#MathsEveryoneCan

2019-20
How to use the mixed-age SOL

In this document, you will find suggestions of how you may structure a progression in learning for a mixed-age class.

Firstly, we have created a yearly overview.

Each term has 12 weeks of learning. We are aware that some terms are longer and shorter than others, so teachers may adapt the overview to fit their term dates.

The overview shows how the content has been matched up over the year to support teachers in teaching similar concepts to both year groups. Where this is not possible, it is clearly indicated on the overview with 2 separate blocks.

For each block of learning, we have grouped the small steps into themes that have similar content. Within these themes, we list the corresponding small steps from one or both year groups. Teachers can then use the single-age schemes to access the guidance on each small step listed within each theme.

The themes are organised into common content (above the line) and year specific content (below the line). Moving from left to right, the arrows on the line suggest the order to teach the themes.
How to use the mixed-age SOL

Here is an example of one of the themes from the Year 1/2 mixed-age guidance.

**Subtraction**

<table>
<thead>
<tr>
<th>Year 1 (Aut B2, Spr B1)</th>
<th>Year 2 (Aut B2, B3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many left? (1)</td>
<td>Subtract 1-digit from 2-digits</td>
</tr>
<tr>
<td>How many left? (2)</td>
<td>Subtract with 2-digits (1)</td>
</tr>
<tr>
<td>Counting back</td>
<td>Subtract with 2-digits (2)</td>
</tr>
<tr>
<td>Subtraction - not crossing 10</td>
<td>Find change - money</td>
</tr>
<tr>
<td>Subtraction - crossing 10 (1)</td>
<td></td>
</tr>
<tr>
<td>Subtraction - crossing 10 (2)</td>
<td></td>
</tr>
</tbody>
</table>

In order to create a more coherent journey for mixed-age classes, we have re-ordered some of the single-age steps and combined some blocks of learning e.g. Money is covered within Addition and Subtraction.

The bullet points are the names of the small steps from the single-age SOL. We have referenced where the steps are from at the top of each theme e.g. Aut B2 means Autumn term, Block 2. Teachers will need to access both of the single-age SOLs from our website together with this mixed-age guidance in order to plan their learning.

**Points to consider**

- Use the mixed-age schemes to see where similar skills from both year groups can be taught together. Learning can then be differentiated through the questions on the single-age small steps so both year groups are focusing on their year group content.
- When there is year group specific content, consider teaching in split inputs to classes. This will depend on support in class and may need to be done through focus groups.
- On each of the block overview pages, we have described the key learning in each block and have given suggestions as to how the themes could be approached for each year group.
- We are fully aware that every class is different and the logistics of mixed-age classes can be tricky. We hope that our mixed-age SOL can help teachers to start to draw learning together.
<table>
<thead>
<tr>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Week 7</th>
<th>Week 8</th>
<th>Week 9</th>
<th>Week 10</th>
<th>Week 11</th>
<th>Week 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autumn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Measurement: Length, Perimeter and Area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number: Place Value</td>
<td>Number: Addition and Subtraction</td>
<td>Number: Multiplication and Division</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Spring</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Number: Decimals (including Y5 Percentages)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number: Multiplication and Division</td>
<td>Number: Fractions</td>
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</tr>
</tbody>
</table>
In this section, content from single-age blocks are matched together to show teachers where there are clear links across the year groups. Teachers may decide to teach the lower year’s content to the whole class before moving the higher year on to their age-related expectations. The lower year group is not expected to cover the higher year group’s content as they should focus on their own age-related expectations.

In this section, content that is discrete to one year group is outlined. Teachers may need to consider a split input with lessons or working with children in focus groups to ensure they have full coverage of their year’s curriculum. Guidance is given on each page to support the planning of each block. The themes should be taught in order from left to right.
Year 4/5 | Summer Term | Week 6 to 8 – Properties of Shape

Properties of Shape

Common Content

Measure, compare and order angles
Year 4 (Sum B5)
• Identify angles
• Compare and order angles
Year 5 (Sum B2)
• Measuring angles in degrees
• Measuring with a protractor (1)
• Measuring with a protractor (2)

Year 4 focus on naming, comparing and ordering angles whilst Year 5 move on to drawing and measuring with a protractor.

Teachers may decide to split lessons as there is a lot of differing content between the year groups to match the National Curriculum objectives.

Teachers may cover symmetry with both classes to prepare Year 5 for their reflection work in Position and Direction.

2-D shapes
Year 4 (Sum B5)
• Triangles
• Quadrilaterals
Year 5 (Sum B2)
• Regular and irregular polygons

Draw lines and angles
Year 5 (Sum B2)
• Drawing accurately

Angles
Year 5 (Sum B2)
• Angles on a straight line
• Angles around a point
• Lengths and angles in shapes

Symmetry
Year 4 (Sum B5)
• Lines of symmetry
• Complete a symmetric figure

3-D shapes
Year 5 (Sum B2)
• Reasoning about 3-D shapes

Year Specific

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Block 4 – Shape

Theme 1- Measure, compare and order angles
A right angle is ____ degrees.
Acute angles are ____ than a right angle.
Obtuse angles are ____ than a right angle.

Sort the angles into acute, obtuse and right angles.

Label the angles. O for obtuse, A for acute and R for right angle.

Children develop their understanding of obtuse and acute angles by comparing with a right angle. They use an angle tester to check whether angles are larger or smaller than a right angle.

Children learn that an acute angle is more than 0 degrees and less than 90 degrees, a right angle is exactly 90 degrees and an obtuse angle is more than 90 degrees but less than 180 degrees.

How many degrees are there in a right angle?

Draw an acute/obtuse angle.

Estimate the size of the angle.
Who is correct? Explain your reasons.

Teddy: I know the angle is not obtuse.
Alex: I know the angle is acute.
Whitney: I think the angle is roughly 45°.

All are correct. Children may reason about how Whitney has come to her answer and discuss that the angle is about half a right angle. Half of 90 degrees is 45 degrees.

Is the angle acute, obtuse or a right angle? Can you explain why?

The angle is a right angle. Children may use an angle tester to demonstrate it, or children may extend the line to show that it is a quarter turn which is the same as a right angle.

Find the sum of the largest acute angle and the smallest obtuse angle in this list:

87° + 98° = 185°
Compare & Order Angles

Notes and Guidance

Children compare and order angles in ascending and descending order.

They use an angle tester to continue to help them to decide if angles are acute or obtuse.

Children identify and order angles in different representations including in shapes and on a grid.

Mathematical Talk

How can you use an angle tester to help you order the angles?

How many obtuse/acute/right angles are there in the diagrams?

Compare the angles to a right angle. Does it help you to start to order them?

Rotate the angles so one of the lines is horizontal. Does this help you to compare them more efficiently?

Varied Fluency

Circle the largest angle in each shape or diagram.

Order the angles from largest to smallest.

Can you draw a larger obtuse angle? Can you draw a smaller acute angle?

Order the angles in the shape from smallest to largest. Complete the sentences.

Angle ____ is smaller than angle ____.
Angle ____ is larger than angle ____.
Do you agree with Ron? Explain your thinking.

Angle A and Angle B are the same size. Ron has mixed up the lengths of the lines with the size of the angles.

Angle B is bigger than Angle A because it has longer sides.

Ron

Here are five angles. There are two pairs of identically sized angles and one odd one out. Which angle is the odd one out? Explain your reason.

Angle e is the odd one out.

Angle b and c are both right angles.

Angle a and d are both half of a right angle or 45 degrees.

Angle e is an obtuse angle.
Children recap acute and obtuse angles. They recognise a full turn as 360 degrees, a half-turn as 180 degrees and a quarter-turn (or right angle) as 90 degrees. They consider these in the context of compass directions. Children also deduce angles such as 45 degrees, 135 degrees and 270 degrees. Reflex angles are introduced explicitly for the first time. Children define angles in terms of degrees and as fractions of a full turn.

Mathematical Talk

What is an angle?
Can you identify an acute angle on the clock?
Can you identify an obtuse angle?
What do we call angles larger than 180° but smaller than 360°?
What angles can you identify using compass directions?
What is the size of the angle?
What fraction of a full turn is the angle?

Use the compass to complete the table.

<table>
<thead>
<tr>
<th>Turn</th>
<th>Degrees</th>
<th>Type of angle</th>
<th>Fraction of a turn</th>
</tr>
</thead>
<tbody>
<tr>
<td>North-East to South-East Clockwise</td>
<td>90°</td>
<td>Right angle</td>
<td>(\frac{1}{4}) of a turn</td>
</tr>
<tr>
<td>North-West to North-West Clockwise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South-West to South-East Anti-clockwise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South-West to South-East Clockwise</td>
<td>180°</td>
<td></td>
<td>(\frac{1}{2}) of a turn</td>
</tr>
<tr>
<td>North-East to East Clockwise</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Measuring Angles in Degrees

Reasoning and Problem Solving

Which angle is the odd one out?

- 180°
- 45°
- 79°
- 270°

Multiple responses e.g. 79° is the odd one out because the others are multiples of 45 degrees; 270 degrees is the only reflex angle etc.

Could another angle be the odd one out for a different reason?

Always, sometimes or never true?

- If I turn from North-East to North-West, I have turned 90°
- If I turn from East to North-West, I will have turned through an obtuse angle.
- If I turn from South-West to South, my turn will be larger than 350°

All are sometimes true, depending on whether you turn clockwise or anti-clockwise or even more than one turn.

Pick a starting point on the compass and describe a turn to your partner. Use the mathematical words to describe your turns:

- Clockwise
- Anti-clockwise
- Degrees
- Acute
- Obtuse
- Reflex
- Right angle

Can your partner identify where you will finish?

Lots of possibilities. Children can be challenged further e.g. I turn three right angles. I start at North-West and turn clockwise, where do I finish?
Put these angles in order of size. Explain how you know.

What's the same? What's different?

Estimate the size of the angles and then use a protractor to measure them to the nearest degree. How close were your estimates?

What unit do we use to measure angles?

How can we tell whether an angle is acute?

How do we know which scale to use on a protractor?

Where will you place your protractor when measuring an angle?

Does moving the paper help you to measure an angle?
Measuring with a Protractor (1)

Reasoning and Problem Solving

Who do you agree with? Explain why.

Teddy: I have measured the angle correctly because my protractor is the right way round.

Whitney: I have measured the angle correctly because my protractor is on the line accurately.

They are both correct. It doesn’t matter which way the protractor is as long as it is placed on the angle correctly.

Three children are measuring angles. Can you spot and explain their mistake?

Mo hasn’t recognised his angle is acute, so his measurement is wrong.

Alex has not placed one of her lines on 0. Her angle measures 25°.

Dora has misread the scale. Her angle measures 25°.

My angle measures 135°

My angle measures 55°

My angle measures 35°
Measuring with a Protractor (2)

Notes and Guidance

Children continue to learn how to use a protractor and focus on measuring obtuse angles. They use their knowledge of right angles to help estimate the size of obtuse angles e.g. “It’s just over a right angle, so about 100°.”

Children need to develop their understanding of using both the inside and outside scales of the protractor, and need to be taught how to decide which to use.

Mathematical Talk

How do you know an angle is obtuse?

Can you see where obtuse angles would be measured on the protractor?

Can you estimate the size of this angle?

What is the size of the angle? What mistake might someone make?

Where will you place your protractor first?

Varied Fluency

- Measure the angles shown on the protractors.

- Estimate the size of the angles and then use a protractor to measure them to the nearest degree.

- Identify obtuse angles in the image. Estimate the size of the angles, and then measure them.
Rosie is measuring an obtuse angle. What’s her mistake?

Rosie has not placed the 0 line of the protractor on one of the arms of the angle.

How many ways can you find the value of the angle?

Children may:
• subtract 150 – 13 = 137°
• add up on the protractor as a number line e.g. +7 +100 +30 = 137°
• place the protractor correctly.

Use a cut out of a circle and place a spinner in the centre.

• Point the arrow in the starting position above.
• Move the spinner to try to make the angles shown on the cards below.
• Check how close you are with a protractor.

40° 72° 154°
Children need to draw lines correct to the nearest millimetre. They use a protractor to draw angles of a given size, and will need to be shown this new skill.

Children continue to develop their estimation skills whilst drawing and measuring lines and angles. They also continue to use precise language to describe the types of angles they are drawing.

How many millimetres are in a centimetre?

How do we draw a line that measures ___?

Explain how to draw an angle.

What’s the same and what’s different about drawing angles of 80˚ and 100˚?

How can I make this angle measure ___ but one of the lines have a length of ___?

### Varied Fluency

Draw lines that measure:

- 4 cm and 5 mm
- 45 mm
- 4.5 cm

What’s the same? What’s different?

Draw:
- angles of 45˚ and 135˚
- angles of 80˚ and 100˚
- angles of 20˚ and 160˚

What do you notice about your pairs of angles?

Draw:
- an acute angle that measures 60˚ with the arms of the angle 6 cm long
- an obtuse angle that measures 130˚ but less than 140˚ with the arms of the angle 6.5 cm long

Compare your angles with your partner’s.
**Drawing Accurately**

<table>
<thead>
<tr>
<th>Reasoning and Problem Solving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draw a range of angles for a friend. Estimate the sizes of the angles to order them from smallest to largest. Measure the angles to see how close you were.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Always, sometimes or never true?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two acute angles next to each other make an obtuse angle.</td>
</tr>
<tr>
<td>Half an obtuse angle is an acute angle.</td>
</tr>
<tr>
<td>180° is an obtuse angle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sometimes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
</tr>
<tr>
<td>Never</td>
</tr>
</tbody>
</table>

Use Kandinsky’s artwork to practice measuring lines and angles. Create clues for your partner to work out which line or angle you have measured. For example, “My line is horizontal and has an obtuse angle of 110° on it.”
Children build on their knowledge of a right angle and recognise two right angles are equivalent to a straight line, or a straight line is a half of a turn. Once children are aware that angles on a straight line add to 180 degrees, they use this to calculate missing angles on straight lines. Part-whole and bar models may be used to represent missing angles.

How many degrees are there in a right angle? How many will there be in two right angles? If we place two right angles together, what do we notice? How can we calculate the missing angles? How can we subtract a number from 180 mentally?

Is there more than one way to calculate the missing angles?
Here are two angles.

\[ a \]
\[ b \]

Angle \( b \) is a prime number between 40 and 50

Use the clue to calculate what the missing angles could be.

Jack is measuring two angles on a straight line.

His angles total more than 180°.

My angles measure 73° and 108°

Explain why at least one of Jack’s angles must be wrong.

- The total of angle \( f \) and \( g \) are the same as angle \( e \)
- Angle \( e \) is 9° more than the size of the given angle.
- Angle \( f \) is 11° more than angle \( g \)

Calculate the size of the angles.

Create your own straight line problem like this one for your partner.

| \( b = 41° \), \( a = 139° \) |
| \( b = 43° \), \( a = 137° \) |
| \( b = 47° \), \( a = 133° \) |
| \( e = 63° \) |
| \( f = 37° \) |
| \( g = 26° \) |
Complete the sentences.

\[
\begin{align*}
\frac{1}{4} \text{ of a turn} &= 1 \text{ right angle} = 90^\circ \\
\frac{1}{2} \text{ of a turn} &= \_ \text{ right angles} = \_ \degree \\
\frac{3}{4} \text{ of a turn} &= 3 \text{ right angles} = \_ \degree \\
\text{A full turn} &= \_ \text{ right angles} = \_ \degree
\end{align*}
\]

Calculate the missing angles.

How many right angles are there in \(\frac{1}{4}, \frac{1}{2}, \frac{3}{4}\) of a full turn?

If you know a half turn/full turn is 180/360 degrees, how can this help you calculate the missing angle?

What is the most efficient way to calculate a missing angle? Would you use a mental or written method?

When you have several angles, is it better to add them first or to subtract them one by one?
Write other sentences about this picture.

Two sticks are on a table. Without measuring, find the three missing angles.

Various answers e.g.

\[ a + b + c = e + d \]
\[ 360° - e - d = 180° \]

\[ d + e = 180° \]

e etc.

Eva says,

My protractor only goes to 180 degrees, so I can’t draw reflex angles like 250 degrees.

Rosie says,

I know a full turn is 360 degrees so I can draw 110 degrees instead and have an angle of 250 degrees as well.

Use Rosie’s method to draw angles of:

- 300°
- 200°
- 280°
Children look at squares and rectangles on a grid to identify right angles. Children use the square grids to reason about length and angles, for example to deduce that half a right angle is 45 degrees. Children should be confident in understanding parallel and perpendicular lines and right angles in relation to squares and rectangles.

Look at the rectangle and square, where can you see parallel lines? How many right angles do they have?

What can you say about the lengths of the sides in a rectangle or in a ______?

If I fold a square in half diagonally to make a triangle, what will the size of each of the angles in the triangle be?

Using what you know about squares and rectangles, how can you calculate the sizes of the angles?

Look at the square and the rectangle. What’s the same? What’s different?

Calculate the size of the angles in each shape.

What’s the same? What’s different?

Here is a square cut into two triangles.

Use the square to calculate the size of the angle.
Whitney is calculating the missing angles in the shape.

She says,

The missing angles are 60 degrees because \(180 \div 3 = 60\)

Do you agree? Explain why.

Whitney is wrong. The angles are not equal.

The angles will be worth 45°, 90° and 45° because the line shows a square being split in half diagonally. This means 90° has been divided by 2.

Alex has this triangle.

She makes this composite shape using triangles identical to the one above.

- Calculate the perimeter of the shape.
- Calculate the missing angles.
- Use your own triangle, square or rectangle to make a similar problem?

\[
\text{Perimeter} = 57 \times 9 = 513 \text{ mm} \\
a = 60 \times 4 \\
b = 60 \times 2 \\
c = 60 \times 3 \\
a = 240° \\
b = 120° \\
c = 180°\]
Triangles

Notes and Guidance

Teachers might start this small step by recapping the definition of a polygon. An activity might be to sort shapes into examples and non-examples of polygons. Children will classify triangles for the first time using the names ‘isosceles’, ‘scalene’ and ‘equilateral’. Children will use rulers to measure the sides in order to classify them correctly. Children will compare the similarities and differences between triangles and use these to help them identify, sort and draw.

Mathematical Talk

What is a polygon? What isn’t a polygon? What are the names of the different types of triangles? What are the properties of an isosceles triangle? What are the properties of a scalene triangle? What are the properties of an equilateral triangle? Which types of triangle can also be right-angled? How are the triangles different? Do any of the sides need to be the same length?

Varied Fluency

Label each of these triangles: isosceles, scalene or equilateral.

Are any of these triangles also right-angled?

Look at these triangles. What is the same and what is different?

Using a ruler, draw:
• An isosceles triangle
• A scalene triangle
Here is a square. Inside the square is an equilateral triangle. The perimeter of the square is 60 cm. Find the perimeter of the triangle.

The perimeter of the triangle is 45 cm.

Eva

If I use 6 straws to make a triangle, I can only make an equilateral triangle.

Investigate whether Eva is correct.

Draw two more sides to create:
- An equilateral triangle
- A scalene triangle
- An isosceles triangle

Which is the hardest to draw?

Eva is correct. 2, 2, 2 is the only possible construction. 1, 1, 4 and 1, 2, 3 are not possible.

Children will draw a range of triangles. Get them to use a ruler to check their answers. Equilateral will be difficult to draw accurately because the angle between the first two sides drawn, must be 60°.
Quadrilaterals

Children name quadrilaterals including a square, rectangle, rhombus, parallelogram and trapezium. They describe their properties and highlight the similarities and differences between different quadrilaterals.

Children draw quadrilaterals accurately using knowledge of their properties.

Teachers could use a Frayer Model with the children to explore the concept of quadrilaterals further.

Notes and Guidance

Mathematical Talk

What’s the same about the quadrilaterals?

What’s different about the quadrilaterals?

Why is a square a special type of rectangle?

Why is a rhombus a special type of parallelogram?

Varied Fluency

Label the quadrilaterals using the word bank.

- square
- rhombus
- parallelogram
- trapezium

Use the criteria to describe the shapes.

- four sides
- 2 pairs of parallel sides
- four equal sides
- polygon
- 1 pair of parallel sides
- 4 right angles

Which criteria can be used more than once?

Which shapes share the same criteria?

- a rhombus
- a parallelogram
- 3 different trapeziums

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### Quadrilaterals

#### Reasoning and Problem Solving

Complete each of the boxes in the table with a different quadrilateral.

<table>
<thead>
<tr>
<th>4 equal sides</th>
<th>2 pairs of equal sides</th>
<th>1 pair of parallel sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 right angles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No right angles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Which box cannot be completed? Explain why.

Children can discuss if there are any shapes that can go in the top right corner. Some children may justify it could be a square or a rectangle however these have 2 pairs of parallel sides.

You will need:

- Some 4 centimetre straws
- Some 6 centimetre straws

How many different quadrilaterals can you make using the straws?

Calculate the perimeter of each shape.

**Square:** Four 4 cm - perimeter is 16 cm or four 6 cm - perimeter is 24 cm

**Rectangle:** Two 4 cm and two 6 cm - perimeter is 20 cm

**Rhombus:** Four 4 cm - perimeter is 16 cm

Four 6 cm straws - perimeter is 24 cm

**Parallelogram:**

Two 4 cm and two 6 cm - perimeter is 20 cm

**Trapezium:** Three 4 cm and one 6 cm - perimeter is 18 cm
Regular & Irregular Polygons

Notes and Guidance
Children distinguish between regular and irregular polygons. They need to be taught that “regular” means all the sides and angles in a shape are equal e.g. an equilateral triangle and a square are regular but a rectangle with unequal sides and an isosceles triangle are irregular polygons. Once they are confident with this definition they can work out the sizes of missing angles and sides.

Mathematical Talk

What is a polygon?
Can a polygon have a curved line?
Name a shape which isn’t a polygon.
What makes a polygon irregular or regular?
Is a square regular?
Are all hexagons regular?

Varied Fluency

- Sort the shapes in to irregular and regular polygons.
- Draw a regular polygon and an irregular polygon on the grids.
- Look at the 2D shapes. Decide whether the shape is a regular or irregular polygon. Measure the angles to check.

What’s the same? What’s different?
Always, sometimes or never true?

- A regular polygon has equal sides but not equal angles.
- A triangle is a regular polygon.
- A rhombus is a regular polygon.
- The number of angles is the same as the number of sides in any polygon.

- Never true – equal sides and equal angles.
- Sometimes true – equilateral triangles are, scalene are not.
- Sometimes true – if the rhombus has right angles and is a square.
- Always true.

How many regular and irregular polygons can you find in this picture?

Cut out lots of different regular and irregular shapes. Ask children to work in pairs and sort them into groups. Once they have sorted them, can they find a different way to sort them again? Children could use Venn diagrams and Carroll diagrams to deepen their understanding, for example:

<table>
<thead>
<tr>
<th>Properties</th>
<th>Regular polygon</th>
<th>Irregular polygon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has at least one right angle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has no right angles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Block 4 – Shape

Theme 5 – Symmetry
Lines of Symmetry

Notes and Guidance

Children find and identify lines of symmetry within 2-D shapes. Children explore symmetry in shapes of different sizes and orientations. To help find lines of symmetry children may use mirrors and tracing paper.

The key aspect of symmetry can be taught through paper folding activities. It is important for children to understand that a shape may be symmetrical, but if the pattern on the shape isn’t symmetrical, then the diagram isn’t symmetrical.

Mathematical Talk

Explain what you understand by the term ‘symmetrical’. Can you give any real-life examples?
How can you tell if something is symmetrical?
Are lines of symmetry always vertical?
Does the orientation of the shape affect the lines of symmetry?
What equipment could you use to help you find and identify lines of symmetry?
What would the rest of the shape look like?

Varied Fluency

Using folding, find the lines of symmetry in these shapes.

Sort the shapes into the table.

<table>
<thead>
<tr>
<th>1 line of symmetry</th>
<th>More than 1 line of symmetry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 4 sides</td>
<td></td>
</tr>
<tr>
<td>More than 4 sides</td>
<td></td>
</tr>
</tbody>
</table>

Draw the lines of symmetry in these shapes (you could use folding to help you).

What do you notice?
### Lines of Symmetry

#### Reasoning and Problem Solving

How many symmetrical shapes can you make by colouring in a maximum of 6 squares?

<table>
<thead>
<tr>
<th>There are a variety of options. Some examples include:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="shapes.png" alt="Shapes" /></td>
</tr>
</tbody>
</table>

Is Jack correct? Prove it.

**Jack**

A triangle has 1 line of symmetry unless you change the orientation.

**Always, Sometimes, Never.**

- A four-sided shape has four lines of symmetry.
- Sometimes, provided the shape is a square.

Jack is incorrect. Changing the orientation does not change the lines of symmetry. Children should prove this by drawing shapes in different orientations and identifying the same number of lines of symmetry.
Symmetric Figures

Notes and Guidance

Children use their knowledge of symmetry to complete 2-D shapes and patterns.

Children could use squared paper, mirrors or tracing paper to help them accurately complete figures.

Mathematical Talk

What will the rest of the shape look like?

How can you check?

How can you use the squares to help you?

Does each side need to be the same or different?

Which lines need to be extended?

Varied Fluency

- Colour the squares to make the patterns symmetrical.
- Complete the shapes according to the line of symmetry.
- Reflect the shapes in the mirror line.
Symmetric Figures

Reasoning and Problem Solving

Dora

When given half of a symmetrical shape I know the original shape will have double the amount of sides.

Do you agree with Dora? Convince me.

Dora is sometimes correct. This depends on where the mirror line is. Encourage children to draw examples of times where Dora is correct, and to draw examples of times when Dora isn't correct.

How many different symmetrical shapes can you create using the given sides?

Children will find a variety of shapes. For example:
Reasoning about 3-D Shapes

Notes and Guidance

Children identify 3-D shapes, including cubes and cuboids, from their 2-D nets. They should have a secure understanding of language associated with the properties of 3-D shapes, for example, faces, curved surfaces, vertices, edges etc.

Children also look at properties of 3-D shapes from 2-D projections, including plans and elevations.

Mathematical Talk

What’s the difference between a face and a curved surface?

Name some 3-D solids which have curved surfaces and some which don’t.

What faces can we see in the net? What shape will this make?

Which face will be opposite this face? Why?

Can we spot a pattern between the number of faces and the number of vertices a prism or pyramid has?

Varied Fluency

Look at the different nets. Describe the 2-D shapes used to make them and identify the 3-D shape.

Use equipment, such as Polydron or 2-D shapes, to build the 3-D solids being described.

• My faces are made up of a square and four triangles.
• My faces are made up of rectangles and triangles.

Can the descriptions make more than one shape?

Draw another dot on the nets so the dots are on opposite faces when the 3D shape is constructed.
### Reasoning about 3-D Shapes

#### Reasoning and Problem Solving

<table>
<thead>
<tr>
<th>Amir says,</th>
<th>No e.g. a square-based pyramid and a triangular prism. Children could investigate this and look for a pattern.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amir says,</strong></td>
<td><strong>Do you agree? Explain why.</strong></td>
</tr>
<tr>
<td><strong>Create cubes and cuboids by using multilink cubes. Draw these on isometric paper. Would it be harder if you had to draw something other than squares or rectangles?</strong></td>
<td><strong>Multiple responses.</strong></td>
</tr>
</tbody>
</table>

Using different 3-D solids, how can you represent them from different views? Work out which representation goes with which solid.

**For example,**

- **Front view**
- **Side view**
- **Plan view**

Children may explore a certain view for a prism and discover that it could always look like a cuboid or cube due to the rectilinear faces.

If two 3-D shapes have the same number of vertices, then they also have the same number of edges.