Spring Scheme of Learning

Year 2/3

#MathsEveryoneCan

2019-20
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**

Year 1 (Aut B2, Spr B1)
- How many left? (1)
- How many left? (2)
- Counting back
- Subtraction - not crossing 10
- Subtraction - crossing 10 (1)
- Subtraction - crossing 10 (2)

Year 2 (Aut B2, B3)
- Subtract 1-digit from 2-digits
- Subtract with 2-digits (1)
- Subtract with 2-digits (2)
- Find change - money

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><strong>Autumn</strong></td>
<td></td>
<td></td>
<td></td>
<td>Number: Addition and Subtraction Year 2: Numbers within 100 (including money) Year 3: Numbers within 1,000 (including money)</td>
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<td></td>
<td></td>
<td>Number: Multiplication</td>
<td></td>
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<tr>
<td></td>
<td>Number: Place Value Y2 – Numbers to 100 Y3 – Numbers to 1,000</td>
<td>Number: Division</td>
<td>Statistics</td>
<td>Measurement: Length and Height</td>
<td>Geometry: Year 2: Shape, Position and Direction Year 3: Shape and Perimeter</td>
<td></td>
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<td><strong>Spring</strong></td>
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<td></td>
<td></td>
<td>Number: Year 2: Fractions &amp; Consolidation Year 3: Fractions</td>
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<td></td>
<td>Consolidation and Investigations</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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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.
Both year groups recognise and describe 2-D and 3-D shapes. This block incorporates perimeter for Year 3 when they are looking at 2-D shapes. Year 2 have separate learning on symmetry and teachers may decide to recap this with Year 3. Year 3 are introduced to more specific mathematical vocabulary to describe different types of lines.
Children use language ‘forwards’, ‘backwards’, ‘up’, ‘down’, ‘left’ and ‘right’ to describe movement in a straight line.

Children will practically follow and give directions with a partner before writing directions for routes and recording routes on 2-D grids. Teachers need to discuss the direction objects are facing, in order to correctly complete left and right movements.

**Mathematical Talk**

How far have you/has your partner moved?
In what direction have you/has your partner moved?

What direction are we facing in at the start? Why is this important?

Can you describe the movements made by ____?

How could we record these movements?

**Describing Movement**

**Notes and Guidance**

**Varied Fluency**

Using the words forwards, backwards, left and right, give your partner some instructions to follow when moving around the classroom/playground.

Complete the stem sentences to describe the movements made.

The            has moved 1 square ______.

The            has moved ___ squares ______.

The _____ has moved 2 squares up.

The ___ has moved ___ squares down.

Record these movements on the grid using arrows.

The    moves 1 square right.

The    moves 3 squares forward.

The    moves 1 square down.

The    moves 1 square up.
Amir is incorrect. The sheep has moved 2 squares to the left because of the way it was facing to begin with.

How many different routes can you write for the bee to get to the hive?

Use the words forwards, backwards, left and right.

Possible answers:
- Forward 3, Right 1.
- Right 1, Forward 3.
- Right 2, Forward 3, Left 1.
- Right 1, Forward 3.
- Right 2, Forward 2, Left 1, Forward 1.

There are more routes for the children to find.

Is Amir correct? Explain your reasoning.
Describing Turns

Notes and Guidance


It is important to encourage the children to take into consideration which direction the object/person is facing to begin with.

Mathematical Talk

What direction was the turn?

Describe the turn that the number shapes have made?

Could there be more than one answer? Why?

Varied Fluency

Turn a figure.

Ask your partner to describe the turn using the language, ‘full turn’, ‘half turn’, ‘quarter turn’, ‘three-quarter turn’, ‘clockwise’ and ‘anticlockwise’.

Match the turn to the description.

A full turn.

A quarter turn clockwise.

A half turn anticlockwise.

Describe how the triangle has turned each time.

The triangle has made a _____ turn _______.

The triangle has made a _____ turn _______.

The triangle has made a _____ turn _______.

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Look at the number shape below:

How could the number shape have turned?

Describe all possibilities.

Possible answers:
- No turn
- Quarter/half/three-quarter or full turn clockwise.
- Quarter/half/three-quarter or full turn anticlockwise.

Always, Sometimes, Never

If two objects turn in different directions they will not be facing the same way.

Sometimes. It depends on how far the objects are turned – quarter, half, three quarters or full.
Describing Movement & Turns

Notes and Guidance

Children use their knowledge of movement and turns to describe and record directions.

They need to be aware of the direction the object is facing before it is turned.

Children may explore movement and turns further using ICT or during P.E.

Mathematical Talk

Which direction is ____ facing to begin with? Why is this important?
Is ____ moving or just changing direction? How do you know?

How can we record the directions given?

Are there any other routes that could be taken?

Varied Fluency

Describe the route Dennis takes to school.

Draw the route to show these directions.
Forward 1 square. Turn left.
Forward 1 square, quarter turn anti-clockwise.
Forward 1 square. Make a quarter turn clockwise.
Forward 1 square. Make a three quarter turn anti-clockwise. Forward 3 square.

Write directions for Dennis to get to each place on the map.
How many different routes can you find to get from start to finish. Use the words ‘forwards’, ‘backwards’, ‘clockwise’, ‘anti-clockwise’ and ‘quarter turn’.

Children will find a range of routes. For example:

- Turn a quarter anticlockwise.
- Forward 1
- Turn a quarter clockwise.
- Forward 1
- Turn a quarter clockwise.
- Forward 3
- Turn a quarter anticlockwise.
- Forward 1

Is Whitney correct?

Possible answer: Whitney is correct.

A quarter turn clockwise is the same as a three-quarter turn anticlockwise.

Convince me.

Children may use objects/small people to show their reasoning.
Turns and Angles

**Notes and Guidance**

Children recognise angles as a measure of a turn. They practice making $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ and whole turns from different starting points in both clockwise and anti-clockwise directions in practical contexts. They should listen to/follow instructions and also give instructions using the correct mathematical language in different contexts. Children understand that an angle is created when 2 straight lines meet at a point.

**Mathematical Talk**

If we start by facing _______ and make a ______ turn, what direction will we be facing?
If we face _______ and turn to face ______, what turn have we made?
If we face north and make a quarter turn clockwise, which direction will we be facing? What if we turn anti-clockwise? What would the time be if the minute hand started at 1, then made a quarter of a turn?
Can you see any angles around the classroom?

**Varied Fluency**

Take children outside or into the hall where they can practice moving in turns themselves. Label 4 walls/points (for example: North, South, East, West).
Give children instructions to encourage them to make $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ and whole turns from different starting points. Allow children the opportunity to give instructions too.

Look at the hands of the clock.
Turn the minute hand one quarter of a turn clockwise.
Where is the large hand pointing?
What is the new time?

What turn has the minute hand made?

Tick the images where you can see an angle.
Explain your choices.
Turns and Angles

Reasoning and Problem Solving

The arrow on a spinner started in this position.

After making a turn it ended in this position.

Jack says,

Alex says,

Who do you agree with?

The arrow has moved a quarter turn anti-clockwise.

The arrow has moved a three-quarter turn clockwise.

Both children are correct.

The letter ‘X’ has four angles.

Write your name in capital letters. How many angles can you see in each letter? How many angles are there in your full name?

Answers will vary depending on the children’s names.
Right Angles in Shapes

Children recognise that a right angle is a quarter turn, 2 right angles make a half-turn, 3 right angles make three-quarters of a turn and 4 right angles make a complete turn.

Children need to see examples in different orientations so that they understand that a right angle does not have to be made up of a horizontal and vertical line.

Mathematical Talk

How many right angles make a half turn/three-quarter turn/full turn?
Where can you see a right angle in the classroom/ around school/ outside?
Which shapes contain right angles?
Can you think of a shape which doesn’t have any right angles?
How many right angles does a _________ have?
Can you draw a shape with _____ right angles?
What headings would we place in our table?

Varied Fluency

Give children a clock each so they can practice making turns. Start with the hands showing 12 o’clock, move the minute hand one quarter of a turn.

The angle between the hands is called a _________ angle.
One quarter turn is equal to a _________ angle.

Children can create a ‘Right Angle Tester’ E.g.

They can then go on a right angle hunt around school. Find and draw at least 3 right angles you have seen around your school.

Sort the shapes based on the number of right angles they have. Record your answer in a table.
**Right Angles in Shapes**

**Reasoning and Problem Solving**

Draw a line along the dots to make a right-angle with each of these lines:

For example (see red lines):

How many right angles can you see in this image?

True or False?

This shape has two right-angles.

False.

Children could show this by using the corner of a page to show there aren't any right angles.

Can you create your own image with the same number of right angles?

There are 34 right angles.
Children identify whether an angle is greater than or less than a right angle in shapes and turns, by measuring, comparing and reasoning in practical contexts.

Children are introduced to the words ‘acute’ and ‘obtuse’ as a way of describing angles.

What is an acute? (Give 3 examples of acute angles and ask them to identify what’s the same about them. Draw out that they are all smaller than a right-angle). What’s an obtuse angle? (Repeat activity by giving 3 examples of obtuse angles).

Can you give me a time where the hands on the clock make an acute/obtuse angle?
Can you see an acute/obtuse angle around the classroom?
Can you draw me a shape that contains acute/obtuse angles?

The angle between the hands is ________ than a right angle.
This is called an ________ angle.

Explore other times where the hands make an acute/obtuse angle.

Find 3 acute angles and 3 obtuse angles in your classroom.
Use your ‘Right Angle Tester’ to check.

Label any acute or obtuse angles in these images.
Label the acute angles (A) and obtuse angles (O) on the diagram below.

Teddy describes a shape.

My shape has 3 right angles and 2 obtuse angles.

What could Jack’s shape look like?

Describe a shape in terms of its angles for a friend to draw.
Children identify and find horizontal and vertical lines in a range of contexts.

They identify horizontal and vertical lines of symmetry in shapes and symbols.

What can you use to help you remember what a horizontal line looks like? (The horizon)
Can you see horizontal and vertical lines around the classroom?
What do we call a line that is not horizontal or vertical?
Which shapes/symbols/letters have a horizontal/vertical line of symmetry?
Which have both?
Can you draw your own shape that has a horizontal and vertical line of symmetry?

A line that runs from left to right across the page is called a __________________ line.

A line that runs straight up and down the page is called a __________________ line.

Find 3 horizontal and 3 vertical lines in the classroom.

Label the horizontal and vertical lines in each of these images.

Sort the shapes/symbols/letters depending on whether they have a horizontal line of symmetry, a vertical line of symmetry or both.
Eva completeness the table by drawing shapes.

Can you spot and correct her mistake?

<table>
<thead>
<tr>
<th>Horizontal line of symmetry</th>
<th>Vertical line of symmetry</th>
<th>Horizontal and vertical lines of symmetry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Eva thinks the star has both lines of symmetry, but it only has a vertical line of symmetry.</td>
</tr>
</tbody>
</table>

There are 5 horizontal lines and 8 vertical lines.

How many horizontal and vertical lines can you spot in this image by Mondrian?

Create your own piece of art work using only horizontal and vertical lines.
Parallel & Perpendicular

Notes and Guidance

Children identify and find parallel and perpendicular lines in a range of practical contexts. They use the arrow notation to represent parallel lines and the right angle notation for perpendicular lines. Ensure that children are presented with lines that are not horizontal and vertical. Children may need to use their right-angle tester to help them check that lines are perpendicular.

Mathematical Talk

Where might you see sets of parallel lines in the environment?

Can you see sets of parallel and perpendicular lines around the classroom?

Which shapes have only parallel lines?
Which shapes have perpendicular lines?
Which shapes have both parallel and perpendicular lines?

Varied Fluency

Lines that never meet are called ____________ lines.

Straight lines that meet at a right angle are called ____________ lines.

Find 3 sets of parallel and perpendicular lines in the classroom.

Draw a line that is parallel to this one.

Draw a line that is perpendicular to this one.

Use arrows to show the parallel lines in these shapes.
Use the right angle notation to show the perpendicular lines.
True or False?

True False

Line AB is parallel to line CD.
Line AC is parallel to line BD.
Line AC is perpendicular to line CD.

Redraw the shape so that line BD is perpendicular to line CD.

These lines are NOT parallel.

Convince me.

Mark 3 sets of parallel lines and 3 sets of perpendicular lines in this flag.

Design your own flag containing parallel and perpendicular lines.

For example.
Before learning about their properties, children need to recognise and name both 2-D and 3-D shapes and to be able to differentiate between them. They begin to understand that 2-D shapes are actually flat and the manipulatives they handle in class are representations of the shapes. Children also need to be able to recognise 2-D shapes in different orientations and proportions.

What is the difference between a 2-D and 3-D shapes? What shape is this? If I turn it around, what shape is it now? Can you draw around any of the faces on your 3-D shapes? Which 2-D shapes can you make?

Match the names of the shapes to the pictures.

Square          Triangle          Rectangle          Circle

Put a combination of 3-D shapes in a feely bag. Can you find the cube, the cone, the cylinder? What do you notice about each shape? How did you know that was the right shape? What were you feeling for?

Go on a shape hunt around school. Create a tally of the shapes you see. Can you see any pentagons? Can you see any octagons? Can you see any hexagons? What was the most common shape?
Which shape is the odd one out? Explain why.

- Square
- Cylinder
- Triangle
- Sphere
- Cube

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

Possible examples:
- Square
- Rectangle
- Pentagon
- Hexagon
- Octagon

I'm thinking of a 2-D shape with more than 3 sides.

What shape could Whitney be thinking of?
Are there any other shapes it could be?
What shape is Whitney definitely not thinking about? How do you know?

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.

Three of the shapes are triangles.

Use true or false to say which shapes are triangles.

True, false, true, true, true, true, false, false, false
Children should be encouraged to develop strategies for accurate counting of sides, such as marking each side as it has been counted.

Children also need to understand that not all same-sided shapes look the same, such as irregular 2-D shapes.

**Mathematical Talk**

What is a side?
How can you check that you have counted all the sides?
Do all four-sided shapes look the same?
Why do you think the shapes have the names that they do?

**Varied Fluency**

- Match the shapes to the number of sides.
  - Six
  - Four
  - Three

- Colour the four-sided shapes.

- Complete the table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Shape</th>
<th>Number of sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentagon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectangle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Square</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triangle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexagon</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Here are 18 lollipop sticks. How many hexagons can you make?

Using one stick per side:
3 hexagons, 2 octagons with 2 lollipop sticks spare, 6 triangles, 4 squares or 3 pentagons. May also create shapes with more than one stick on each side.

If I put these shapes into order from the smallest number of sides to the largest, which shape would come third?

Mo makes a rectangle using the sticks. How many identical rectangles could he make with 18 sticks?

Mo could make 3 rectangles using 6 sticks. Talk about how rectangles can look differently.

Where would a hexagon come in the list? Why?

A hexagon would come after the pentagon and before the octagon because it has 6 sides which is more than 5 and less than 8.

The pentagon would be third.

triangle, quadrilateral, pentagon, octagon

May also create shapes with more than one stick on each side.

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Count Sides on 2-D Shapes

Reasoning and Problem Solving
Children are introduced to the terms vertex and vertices. They understand that a vertex is where two lines meet at a point. They recognise that corners are vertices and will be able to identify and count them on shapes.

Ensure from this point forwards the word vertex is used in place of corner throughout all content.

**Mathematical Talk**

Show me a vertex.
Can you identify the vertices in this shape?
Would this be a vertex? Explain why.
If my shape has ___ vertices, what could my shape be?
What couldn’t it be?

**Varied Fluency**

Match the shapes to the number of vertices.

<table>
<thead>
<tr>
<th>Number of vertices</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td><img src="image1.png" alt="Shape" /></td>
</tr>
<tr>
<td>Four</td>
<td><img src="image2.png" alt="Shape" /></td>
</tr>
<tr>
<td>Three</td>
<td><img src="image3.png" alt="Shape" /></td>
</tr>
</tbody>
</table>

Colour the shapes with 4 vertices.

Complete the table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Shape</th>
<th>Number of vertices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentagon</td>
<td><img src="image4.png" alt="Shape" /></td>
<td></td>
</tr>
<tr>
<td>Rectangle</td>
<td><img src="image5.png" alt="Shape" /></td>
<td></td>
</tr>
<tr>
<td>Square</td>
<td><img src="image6.png" alt="Shape" /></td>
<td></td>
</tr>
<tr>
<td>Triangle</td>
<td><img src="image7.png" alt="Shape" /></td>
<td></td>
</tr>
<tr>
<td>Hexagon</td>
<td><img src="image8.png" alt="Shape" /></td>
<td></td>
</tr>
</tbody>
</table>
### Count Vertices on 2-D Shapes

#### Reasoning and Problem Solving

<table>
<thead>
<tr>
<th>Amir says:</th>
<th>Square Rectangle</th>
<th>Jack has created a pattern using shapes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>My shape has half the number of vertices as an octagon.</td>
<td></td>
<td>Possible answer: 4, 7, 11</td>
</tr>
<tr>
<td>What shape could he have?</td>
<td></td>
<td>The next step could have another square (15 vertices) or another triangle (14 vertices).</td>
</tr>
<tr>
<td>Put these shapes in order based upon the number of vertices they have.</td>
<td>Triangle, rectangle, pentagon, hexagon</td>
<td></td>
</tr>
<tr>
<td><img src="image1" alt="Shape images" /> <img src="image2" alt="Shape images" /> <img src="image3" alt="Shape images" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square</td>
<td>Rectangle</td>
<td></td>
</tr>
</tbody>
</table>

Can you predict how many vertices the next step in the pattern will have?

What do you notice?

Is there more than one way to continue the pattern?

Can you create your own pattern and explore how the vertices change?
Draw 2-D Shapes

Notes and Guidance

Children use their knowledge of properties of shape to accurately create 2-D shapes. Children could use geo-boards to make shapes with elastic bands and look carefully at the number of sides and vertices.

Using geo-boards is a practical step to take before children draw their own shapes on dotted or squared paper.

Mathematical Talk

Compare your shape with a friend's shape. Is it in the same position? Is it the same size?

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

Why is it important to use a ruler?

Is your shape an exact copy? How do you know?

Varied Fluency

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

Can you draw a rectangle on dotted 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.

Try drawing other shapes in the same way.

Choose a 2-D shape. Build it on a geo-board. Can you copy the shape onto dotted paper and squared paper?
### Draw 2-D Shapes

#### Reasoning and Problem Solving

<table>
<thead>
<tr>
<th>Using geoboards, how many different rectangles can you make?</th>
<th>Possible answer:</th>
</tr>
</thead>
<tbody>
<tr>
<td>What's the same about the rectangles? What's different?</td>
<td></td>
</tr>
<tr>
<td>Has your friend made any different rectangles?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What shape could be hiding under the spilt paint?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prove your answer by drawing it.</td>
</tr>
</tbody>
</table>

| Draw a large rectangle on squared paper or dotted paper.     |
| Draw a square inside the rectangle.                         |
| Draw a triangle below the rectangle.                        |
| Draw a pentagon that is bigger than the square.             |

<table>
<thead>
<tr>
<th>Could be any 2-D shape.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encourage children to think about irregular pentagons,</td>
</tr>
<tr>
<td>hexagon, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Can you give instructions to your partner to help them draw different shapes?</th>
</tr>
</thead>
</table>

Children may end up with a different picture from above however they should have four shapes drawn.
Sort 2-D Shapes

Notes and Guidance

Children recognise and sort 2-D shapes including circle, square, triangle, rectangle, pentagon, hexagon and octagon using a range of different orientations. Children should be encouraged to sort the shapes in more than one way. They can then describe how they have sorted them using key language including side, vertex and symmetrical.

Mathematical Talk

How have you sorted your shapes?
How do you know you have sorted your shapes correctly?
Can you sort the shapes in a different way?
Can you find a shape which is in the wrong place?
Can you see how these shapes have been sorted?

Varied Fluency

Sort the 2-D shapes into the correct group:

- Rectangle
- Triangle
- Pentagon

How have the shapes been sorted?

Whitney sorted her shapes by the number of sides. What shapes could belong to each group?

<table>
<thead>
<tr>
<th>4 sides</th>
<th>Not 4 sides</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ron sorted the shapes in order of the number of sides. Has he ordered them correctly? Explain why.

No because the square should be before the pentagon.

Which shape is in the wrong set? Explain why.

The circle is in the wrong set because it does have a vertical line of symmetry.

<table>
<thead>
<tr>
<th>Vertical line of symmetry</th>
<th>No vertical line of symmetry</th>
</tr>
</thead>
<tbody>
<tr>
<td>△</td>
<td>□</td>
</tr>
<tr>
<td>■</td>
<td>●</td>
</tr>
<tr>
<td>□</td>
<td>△</td>
</tr>
<tr>
<td>●</td>
<td>■</td>
</tr>
</tbody>
</table>

Where should these shapes go in the Venn diagram?

Create your own labels and sort the shapes in a different way.

Possible labels:
Blue
Less than 4 vertices.
Children recognise, describe and draw 2-D shapes accurately. They use properties including types of angles, lines, symmetry and lengths of sides to describe the shape. They could be given opportunities to identify/draw a hidden shape from a description given and also describe a shape for a friend to identify/draw.

Mathematical Talk

How many angles does a ______ have?
What types of angles does a ______ have?
How many lines of symmetry does a ______ have?
What kind of lines of symmetry does a ______ have? (vertical/horizontal)
What types of lines can you spot in a ______? (perpendicular/parallel)
Can you guess the shape from the description given?
Can you draw a shape from the description given?

Describe this quadrilateral.

- It has _____ angles.
- It has _____ right angles.
- It has _____ obtuse angle.
- It has _____ acute angle.
- It has _____ lines of symmetry.

Choose one of these 2-D shapes and describe it to a friend thinking about the angles, types of lines it is made up of and whether it has any lines of symmetry. Can your friend identify the shape from your description?

Draw the following shapes.
- A square with sides measuring 2 cm
- A square that is larger the one you have just drawn
- A rectangle with sides measuring 4 cm and 6 cm
- A triangle with two sides of equal length
Rosie describes a 2-D shape.

My shape has 2 pairs of parallel sides. The lengths of the sides are not all equal.

Draw the shape that Rosie is describing.

Could this square be Rosie's shape?

No this can't be Rosie's shape, because the lengths of the sides are equal.

Explain why.

What is the same and what is different about these shapes?

Possible answers:
All have at least 1 line of symmetry. They have different number of sides/angles. Only the triangle has a pair of perpendicular sides.

Draw at least one shape in each section of the diagram.

Many possible answers.
Children measure and draw straight lines accurately in centimetres and millimetres. They also practice rounding measurements to the nearest centimetre. Make sure the children correctly position the ruler when measuring/drawing the line, by lining up the 0 with the start of the line.

Where should we position the ruler when measuring each line? Why?

How long is each line in millimetres?

Why does 9 cm and 9 mm round to 10 cm and not 9 cm? Look at the ruler/number line to explain your answer.

Do we round 10 cm and 5 mm to 10 cm or 11 cm? Why?

Measure these lines. Record your measurements in cm and mm.

_____ cm and _____ mm

_____ cm and _____ mm

_____ cm and _____ mm

Draw straight lines that measure exactly:

12 cm
8 cm and 5 mm
9 cm and 8 mm
14 cm and 2 mm

This line measures 9 cm and 9 mm

It measures ____ cm to the nearest centimetre.

Draw a line for each of the measurements.

5 cm and 2 mm
13 cm and 8 mm
0 cm and 9 mm
10 cm and 3 mm

What would each line measure to the nearest centimetre?
Alex measures the line.

She says it is 10 cm 4 mm

Is Alex correct? Explain why.

Alex is not correct because she has started measuring the line from the end of the ruler instead of from ‘0’.

Possible answer:

The length of the route will depend on the size of the maze used.

Use straight lines to show the route the car could take to get out of the maze.

Work out the length of the route to the nearest cm

Is this the shortest route?
Measure Perimeter

Notes and Guidance

Children are introduced to perimeter for the first time. They explore what perimeter is and what it isn’t.

Children measure the perimeter of simple 2-D shapes. They may compare different 2-D shapes which have the same perimeter.

Children make connections between the properties of 2-D shapes and measuring the perimeter.

Mathematical Talk

What is perimeter?
Which shape do you predict will have the longest perimeter?
Does it matter where you start when you measure the length of the perimeter? Can you mark the place where you start and finish measuring?
Do you need to measure all the sides of a rectangle to find the perimeter? Explain why.

Varied Fluency

- Using your finger, show me the perimeter of your table, your book, your whiteboard etc.
- Tick the images where you can find the perimeter.
  
  Explain why you can’t find the perimeter of some of the images.
- Use a ruler to measure the perimeter of the shapes.
Amir is measuring the shape below. He thinks the perimeter is 7 cm.

Can you spot his mistake?

Amir has only included two of the sides. To find the perimeter he needs all 4 sides. It should be 14 cm.

Whitney is measuring the perimeter of a square. She says she only needs to measure one side of the square.

Do you agree? Explain your answer.

Whitney is correct because all four sides of a square are equal in length so if she measures one side she can multiply it by 4.

Here is a shape made from centimetre squares.

Find the perimeter of the shape.

Can you use 8 centimetre squares to make different shapes?

Find the perimeter of each one.

The perimeter is 14 cm.

There are various different answers depending on the shape made.
Calculate Perimeter

Notes and Guidance

Children use their understanding of the properties of shape to calculate the perimeter of simple 2-D shapes.

It is important to note they will not explore the formula to find the perimeter of a rectangle at this point.

They explore different methods for calculating the perimeter of a shape. For example, they may use repeated addition or they may make connections to multiplication.

Mathematical Talk

How can we calculate the perimeter of each shape?
Can we calculate the perimeter using a different method?
What is the same about the two methods? What is different?
How can we work out the length of the missing side? What other information do we know about the rectangle? Can we write on the lengths of all the sides?

Varied Fluency

Calculate the perimeter of the shapes.

Use two different methods to calculate the perimeter of the squares.

What is the length of the missing side?

Can you find more than one way to calculate the perimeter?

Perimeter = 16 cm
Teddy says,

You only need to know the length of one side for the square and the pentagon as all the sides are the same. However, Teddy is wrong because for the rectangle you need to know two lengths and for the triangle you need to know all of them.

Do you agree with Teddy? Explain your answer.

Each side of this shape is of equal length. The perimeter is 60 cm. How long is each side?

How many different rectangles can you draw with a perimeter of 20 cm?

There are 5 different rectangles.

1 cm by 9 cm
2 cm by 8 cm
3 cm by 7 cm
4 cm by 6 cm
5 cm by 5 cm
Children are introduced to the concept of vertical lines of symmetry. They should be exposed to examples that are symmetrical and also examples that are not.

Children use a range of practical resources (mirrors, geoboards, paper folding) to explore shapes being halved along their vertical line of symmetry.

**Mathematical Talk**

Where is the 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**

- Can you fold these shapes to find a vertical line of symmetry?
- Draw the vertical lines of symmetry on these shapes.
- Circle the shape with an incorrect line of symmetry. Can folding help you prove your answers.
### Lines of Symmetry

#### Reasoning and Problem Solving

<table>
<thead>
<tr>
<th>Question</th>
<th>Possible answers:</th>
<th>Question</th>
<th>Possible answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you draw more than one four-sided shape that has a vertical line of symmetry?</td>
<td>square, rectangle, kite.</td>
<td>Which 2-D shapes can be made when a vertical line of symmetry is drawn on a square?</td>
<td>Rectangle and triangle.</td>
</tr>
</tbody>
</table>

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

![Image of a five-sided shape with a vertical line of symmetry](image)

Can you complete the other half of the shape?
Before learning about their properties, children need to recognise and name both 2-D and 3-D shapes and to be able to differentiate between them. They begin to understand that 2-D shapes are actually flat and the manipulatives they handle in class are representations of the shapes. Children also need to be able to recognise 2-D shapes in different orientations and proportions.

What is the difference between a 2-D and 3-D shapes?
What shape is this? If I turn it around, what shape is it now?
Can you draw around any of the faces on your 3-D shapes?
Which 2-D shapes can you make?

Match the names of the shapes to the pictures.

Square  Triangle  Rectangle  Circle

Put a combination of 3-D shapes in a feely bag. Can you find the cube, the cone, the cylinder? What do you notice about each shape?
How did you know that was the right shape?
What were you feeling for?

Go on a shape hunt around school.
Create a tally of the shapes you see.
Can you see any pentagons?
Can you see any octagons?
Can you see any hexagons?
What was the most common shape?
Which shape is the odd one out?
Explain why.

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

Which shape 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.

I’m thinking of a 2-D shape with more than 3 sides.

What shape could Whitney be thinking of?
Are there any other shapes it could be?
What shape is Whitney definitely not thinking about? How do you know?

Use true or false to say which shapes are triangles.

Possible examples: square rectangle pentagon hexagon octagon
Whitney is not thinking of a triangle because it only has 3 sides.

True, false, true, true, true, false, false, false
Count Faces on 3-D Shapes

Notes and Guidance

Children use their knowledge of 2-D shapes to identify the shapes of faces on 3-D shapes. To avoid miscounting the faces children need to mark each face in some way. Children identify and visualise 3-D shapes from 2-D representations. 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 2-D shapes can you see on different 3-D shapes?
How can you make sure that you don’t count the faces more than once?

Varied Fluency

Look at these 3-D shapes:

Which 2-D shapes can you see on the surface of each one?

Complete the table:

<table>
<thead>
<tr>
<th>Shape</th>
<th>Name of shape</th>
<th>Number of flat faces</th>
<th>Draw the faces</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Cube" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Rectangular Prism" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Pyramid" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Prism" /></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Count Faces on 3-D Shapes

Reasoning and Problem Solving

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

No because Teddy could have a cube or a cuboid.

Annie has sorted these 3-D shapes. Can you spot her mistake? Can you add another shape to each set?

The can should be in the ‘both’ set because it has flat faces and a curved surface.

Whitney says, I have a 3-D shape with 2 square faces and 4 rectangular faces.

What shape does Whitney have?

Play this game with a friend. Describe the faces of a 3-D shape and they need to guess what it is.

Whitney has a cuboid.
Count Edges on 3-D Shapes

Notes and Guidance

Children use their knowledge of faces and curved surfaces to help them to identify edges on 3-D shapes. They learn 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 identify and visualise the 3-D shape from a 2-D representation.

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

Look at these 3-D shapes:

How many edges does each shape have?

Complete the table:

<table>
<thead>
<tr>
<th>Shape</th>
<th>Name</th>
<th>Edges</th>
<th>Faces</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

How many edges does this shape have?
Ron has sorted these shapes according to the number of edges. Which shape is in the wrong place? Explain why.

- 1 edge
  - Pyramid
- More than 1 edge
  - Cube, cuboid, square-based pyramid

Eva says her 3-D shape has 12 edges.
Dora says she could have a cube, cuboid or square-based pyramid.

Is Dora correct? Explain your answer.

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

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

Compare these 3-D shapes.

What is the same and what is different?

Same – both have square faces, 6 faces, 12 edges, don’t roll, can stack, no curved edges.
Different – name, colour, size, one only has square faces the other has squares and rectangles….
Children use their knowledge of edges to help them to identify vertices on 3-D shapes. They understand that a vertex is where 2 or more edges meet. To avoid over-counting the vertices children need to mark each vertex in some way.

The point at the top of a cone can be referred to as an apex or a vertex.

What is the difference between vertex and vertices?

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 3-D shape?

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

Look at these 3-D shapes:

How many vertices does each shape have?

Complete the table:

<table>
<thead>
<tr>
<th>Shape</th>
<th>Name</th>
<th>Faces</th>
<th>Edges</th>
<th>Vertices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Place 3-D shapes in order starting with the shape with the fewest vertices.
## Count Vertices on 3-D Shapes

### Reasoning and Problem Solving

<table>
<thead>
<tr>
<th>What is the same about these 2 shapes?</th>
<th>Example answer:</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is different about them?</td>
<td>Same – both have a triangular face, both have 5 faces.</td>
</tr>
<tr>
<td>Talk about faces, edges and vertices in your answer.</td>
<td>Different – name, colour, size, one has 6 vertices the other has 5 vertices, one has a rectangular face, one has a square face….</td>
</tr>
</tbody>
</table>

**Jack says:**

- All 3-D shapes have at least one vertex.

**Is this true or false?**

- False.
  - A sphere has no vertices.
  - Could also be an opportunity to talk about the words apex and vertex.

**Alex has a shape with 8 vertices.**

**What 3-D shape could it be?**

- Cube or cuboid.
Children use their knowledge of shape properties to sort 3-D shapes in different ways e.g. faces, shapes of faces, edges, vertices, if they roll, if they stack...

They should have access to a range of real life objects to sort and compare. Before sorting it may be useful to give children the opportunity to match the object e.g. a can of pop to a cylinder etc.

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 your friend guess how you have sorted them?
Can you group your solids by shape, type of faces and size?
Annie is sorting 3-D shapes. She puts a cube in the cuboid pile.

A cube is a type of cuboid.

Do you agree? Why?

Annie is right.
They both have 6 faces.
They both have 12 edges.
A cube is a special kind of cuboid where all faces are squares.

Jack is investigating which shapes stack and which shapes roll.

He says:

Some shapes will stack and roll.

Is he correct?

Sort your shapes using the Venn diagram. Explain what you notice about each set. Do all shapes with flat surfaces stack?

Some shapes with flat faces will stack – they will need to have flat faces on opposite sides. (cubes, cylinders, cuboids)

Shapes with a curved surface will roll. (cone, sphere, cylinder)

Some shapes with a flat face cannot be stacked (square based pyramid, cone)
3-D Shapes

Notes and Guidance

Children recognise and describe 3-D shapes in different orientations. They use properties including the number of faces, edges and vertices to describe the shape. Where a shape has a curved surface, children should know that this is not called a face. E.g. a cylinder has 2 circular faces and a curved surface. Teachers should explore the difference between a prism, which has the same shape all the way through, and a pyramid, which tapers to a point.

Mathematical Talk

How many faces/edges/vertices/curved surfaces does a ______ have?
What shape are the faces of a ______?
What types of lines can you see on a ______?
Can you spot objects around the classroom that are cubes/cuboids etc.?
Can you guess the shape from the description given?

Varied Fluency

Describe this 3-D shape.

This shape is a _______.
It has ____ faces.
It has ____ edges.
It has ____ vertices.

Choose one of these 3-D shapes and describe it to a friend thinking about the number and shape of faces it has and the number of edges and vertices. Can your friend identify the shape from your description?

What is the same and what is different about these two shapes?

Choose two other shapes and say what is the same and what is different about them.
### 3-D Shapes

#### Reasoning and Problem Solving

**Mo has a 3-D shape, he says,**

**Possible answers:**
- Cube
- Cuboid
- Square based pyramid

**What could Mo’s shape be?**

**Alex says,**

**All 3-D shapes are prisms.**

**Do you agree with Alex? Explain why.**

- I do not agree with Alex e.g. cones, pyramids, spheres are not prisms.

**Sort a selection of 3-D shapes using the criteria in the table.**

<table>
<thead>
<tr>
<th>At least one triangular face</th>
<th>No triangular faces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prism</td>
<td></td>
</tr>
<tr>
<td>Not a prism</td>
<td></td>
</tr>
</tbody>
</table>

**Change the headings of the table and re-sort your shapes.**

**Various possibilities depending on the shapes used.**
Construct 3-D Shapes

Notes and Guidance

Children make 3-D shapes (cubes, cuboids, prisms, cylinders, pyramids, cones, spheres) using construction materials.

They use correct mathematical language to describe the shapes they have made (edges, faces, vertices, curved surfaces).

Mathematical Talk

Can you describe your shape using edges, faces, vertices, curved surfaces?
What is the same and what is different about your shape compared to your partner’s?
What do the straws represent?
What does the Play-Doh represent?
How many straws/balls of Play-Doh do you need to create a _________?
Why can’t you create a sphere or cylinder using this technique?

Varied Fluency

Children make a 3-D shape using Play-Doh/clay/plasticine/polydron.
Ask them to make a different one to their partner.
Write down the similarities and differences between them.
Discuss what the properties of each shape are.

Use straws and Play-Doh to create a model of a cube.

What other 3-D shapes can you create?

Cut and fold these into 3-D shapes.

What shapes have you created?
Construct 3-D Shapes

I have 9 straws and 6 balls of Play-Doh.

What 3-D shape can I create using all of the straws and Play-Doh? Have a go at making it.

**True or false?**

- You can cut out lots of equal squares and make a 3-D shape from them.  
  True – for example a cube.

- You can cut out some circles and rectangles and make a 3-D shape from them.  
  True – a cylinder.

Rosie says,

I can create a model of a square-based pyramid using 3 straws and 3 balls of Play-Doh.

Explain the mistake Rosie has made.

How many straws and balls of Play-Doh would you need to create a pyramid?

Rosie thinks that because a pyramid has some triangular faces she will only need 3 straws/balls of Play-Doh.

You would need 8 straws and 5 balls of Play-Doh to make a square-based pyramid, and 6 straws and 4 balls of Play-Doh to make a triangle based pyramid.
Make Patterns with 2-D Shapes

Notes and Guidance

Children use their knowledge of the properties of 2-D shapes to create patterns.

They are encouraged to place the shapes in different orientations when making patterns and recognise that it is still the same shape. In particular, squares do not become diamonds when turned sideways.

Mathematical Talk

Can you explain the pattern? How does circling the set of shapes that repeat help you see the pattern?

Continue the pattern. Which shape will be next?

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

How can you work out which shape will come \( \text{___}^{\text{th}} \)?

Varied Fluency

Continue this pattern:

Can you circle the set of shapes that repeat?

What is the next shape in the pattern? What is the \( 9^{\text{th}} \) shape in the pattern?

Draw pictures to represent this pattern:

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

How many times does the pattern repeat?

Which shape would be \( 10^{\text{th}} \)?

Can you make your own repeating patterns using only one shape?
There are many ways to make different repeating patterns. Encourage children to orally describe the pattern they have created.

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

Possible answer:
Square, square, triangle or pentagon, pentagon, circle.

Clap, clap, snap, clap, clap, snap, clap, clap ……
Make Patterns with 3-D Shapes

Notes and Guidance

Children use their knowledge of the properties of 3-D shapes to create patterns. They are encouraged to place the shapes in different orientations.

A wide range of examples of shapes should be used, including, construction shapes, cereal boxes, different sized balls etc.

Mathematical Talk

Where can you see real life patterns with 3-D 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

- Use some different coloured cubes to make a repeating pattern. Can you describe the pattern to your partner?
  - Using colours? Using letters? Using sounds?

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

- How many times does the pattern repeat?
  - What will the 10th cylinder look like?
  - Can you make your own repeating patterns using only one 3-D shape?
Make Patterns with 3-D Shapes

Reasoning and Problem Solving

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

The first and second patterns use two shapes. Colour is a difference to note. In the 3rd pattern, one shape is used in different orientations. In the 2nd pattern, the shape is used twice each time.

Choose two 3-D shapes. What different repeating patterns could be made?

Possible answer: Cube, cylinder, cube....
Cube, cube, cylinder...

Using the 3-D shapes:

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

Answer will depend on the shapes used.
Children build on previous knowledge of patterns and repeating patterns from Year 1.

They now describe and create patterns that involve direction and turns.

Children use the language ‘clockwise’, ‘anti-clockwise’, ‘quarter’, ‘half’ and ‘three quarters’ to describe patterns.

**Mathematical Talk**

What is happening in the pattern?

What would the next shape look like?

How would you describe its position?

How can we work out the missing shape?

**Notes and Guidance**

- Continue these patterns by adding the next 3 shapes.
- Fill in the missing shapes to complete the patterns.
- Describe the turn for each pattern.
### Making Patterns with Shapes

#### Reasoning and Problem Solving

**How many different patterns can you create using this shape?**

<table>
<thead>
<tr>
<th>Possible answers:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Pattern Examples" /></td>
</tr>
</tbody>
</table>

**Eva and Rosie could both be correct as no direction is given. Eva may be turning clockwise and Rosie anticlockwise.**

**Who is correct?**

- **Eva:** The rule is turn the shape a quarter turn.
- **Rosie:** The rule is turn the shape three quarters.

**Spot the mistake in each pattern. Explain why they are incorrect.**

- **The 4th shape should be pointing right.**
- **Or the 8th shape should be pointing left.**
- **The 5th shape has not made half a turn.**

**The rule is turn the shape three quarters.**

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