Mayflower FEDERATION

Mathematics Year 6 Summer Term

Block 1 Shape	
Step 1 Measure and classify angles	In Year 4, children encountered the classifications of angles as acute, right and obtuse. In Year 5, this learning was extended to include the use of degrees, as well as reflex angles. This small step revisits that learning by classifying angles and measuring them with a protractor. Begin by recapping the types of angles. Move on to using a protractor to measure an angle, taking care when modelling which scale to use. Encourage children to estimate the size of an angle before measuring it, as they are then less likely to read the wrong scale on the protractor. For example, if an angle is seen to be less than a right angle, its size will be less than 90°. Children should practise estimating angles by comparing them to known fractions of a turn. Similarly, classifying angles first can support children in reading the correct scale. For example, if an angle is acute, then the size of the angle in degrees must be less than 90
Step 2 Calculate angles	In Year 5, children learnt that angles on a straight line add up to 180° and angles around a point add up to 360°. That learning is revisited in this small step, with children calculating missing angles from given information. Children also need to know the symbol for a right angle, and that an angle marked with this symbol measures 90°. They should recognise that without this symbol the size of the angle cannot be assumed. Children start by calculating missing angles within a right angle, using mental or written strategies to subtract the given angle(s) from 90°. They then revisit angles on a straight line and angles around a point. Children should explore both methods: subtracting each known part from the whole in turn; and adding the known parts together and subtracting this from the whole.
Step 3 Vertically opposite angles	In this small step, children learn that vertically opposite angles are equal. Begin by showing what vertically opposite angles are. By drawing two straight lines that intersect at a point, four angles are created. Through investigation, children see that there are two pairs of equal angles. They need to understand that vertically opposite angles are formed when two straight lines cross, and if either of the lines are not straight, then the angles formed are not vertically opposite. Secure this understanding by comparing vertically opposite angles to pairs of angles around a point that are opposite each other, but not vertically opposite, i.e. they are not formed by two straight lines intersecting. Once children understand that vertically opposite angles are equal, they can use this fact alongside the rules they already know to work out missing angles.
Step 4 Angles in a triangle	In this small step, children learn that the interior angles of a triangle always sum to 180°. Get children to measure each angle of a triangle and add them together, doing this for a number of different triangles, in order to discover the rule. Discuss that, when using a protractor, there is the possibility of small inaccuracies causing the total to be slightly different from 180°. When the rule is established, children work out unknown angles in triangles. They should see each angle as a "part" and 180° as the "whole". The three parts add to make the whole. This means that they can work out one of the missing parts by subtracting each of the known parts from the whole, or adding the known parts together before subtracting this from the whole. This step is a good opportunity to revisit mental and written calculation methods, as well as using inverse operations to check answers.
Step 5 Angles in a triangle- special cases	In Year 4, children learnt to classify triangles as equilateral, isosceles or scalene, based on the lengths of their sides. They also know that a right-angled triangle has one angle of 90°. In this small step, children extend this learning to include the angles of triangles. Using their knowledge of angles in specific triangles, as well as the total of the angles, children work out missing angles in different types of triangles. Starting with equilateral triangles, as all the angles are equal, children learn that each angle must be 180° ÷ 3 = 60°. They then move on to investigating isosceles triangles. Children learn that not only do isosceles triangles have two equal sides, but they also have two equal angles. They need to identify which two angles are equal in order

	to find the sizes of unknown angles in the triangles. Children may need reminding of hatch mark notation to show that sides of shapes are equal in length.
Step 6 Angles in a triangle-missing angles	In this small step, children combine what they have learnt so far in this block to solve a variety of missing angle questions. By thinking about angles in different types of triangles, as well as in right angles, on a straight line and around a point, children should be able to work out the sizes of missing angles in increasingly complex problems. Begin by recapping the rules of angles they have learnt so far, and then share a problem with the class and discuss what methods are available based on the facts they know. Work through missing angle problems that begin with one focus, but move on to examples that require knowledge of more than one rule. At each stage, ask children to explain what rules they have used to solve the problem. They will find that there are multiple ways of solving most problems, and this will consolidate their understanding of the rules.
Step 7 Angles in quadrilaterals	In Year 4, children explored the properties of different quadrilaterals and they should be familiar with the words "trapezium", "rhombus", "square", "rectangle", "parallelogram" and "kite". They learnt about the equal and parallel sides in quadrilaterals, as well as which ones have right angles. In this small step, that learning is extended to include the properties of the angles in these quadrilaterals. For a square and a rectangle, the fact that the angles add up to 360° can be worked out quickly. For other quadrilaterals, children can investigate by measuring the angles with a protractor. Show that, as any quadrilateral can be split into two triangles, the sum of the interior angles is twice that of a triangle and compare this with the totals found by measuring. Children then move on to explore the relationships between angles in a rhombus and a parallelogram, where opposite angles are equal.
Step 8 Angles in polygons	In this small step, children develop their understanding of interior angles in 2-D shapes by looking at polygons with five or more sides. Building on the fact that a quadrilateral can be split into two triangles, so the interior angles add up to $180 \times 2 = 360°$, children explore how many triangles polygons with a greater number of sides can be split into using a vertex of the polygon. They learn that the number of triangles is two fewer than the number of sides. Multiplying the number of triangles by 180° gives the sum of the interior angles in the polygon. Using this information, they can find unknown angles for any polygon. The main focus of this step is on regular polygons, where children can divide the total by the number of sides to work out the size of each angle.
Step 9 Circles	Children used circles in pie charts in the Statistics block in the Spring term. In this small step, they develop their learning to ensure understanding of the words "radius", "diameter" and "circumference". Children need to understand the importance of the centre of a circle: it is the point that is an equal distance from every part of the edge of the circle. They then move on to looking at the connection between the radius and the diameter. It is important that they realise that both of these are related to the centre. Showing examples and non-examples of radii and diameters will help to reinforce this understanding. At this stage, children do not need to be able to calculate the circumference. It may be useful to discuss that using a piece of string around the outside of a circle, then measuring it, will give an approximate measure for this.
Step 10 Draw shapes accurately	In this small step, children use skills learnt so far in this block to accurately draw shapes when given specific dimensions. Children begin drawing simple shapes that can be done on squared paper, such as rectangles and right-angled triangles where the base and height are given. This could be extended to drawing shapes where the perimeter and some of the sides are known. Children then produce an accurate drawing of a shape with known angles. They may need to begin by practising using a protractor. Children should work systematically, starting with a side and then drawing the angle(s) from the correct end(s). They should also use their understanding of the features of different quadrilaterals and triangles to recreate these accurately. This step is a good opportunity to revisit converting between centimetres and millimetres.
Step 11 Net of 3D shapes	In the final small step of this block, children learn that they can make a 3-D shape using knowledge of the 2-D shapes that make up its faces. Children should be familiar with 3-D shapes from earlier years, but you may need to remind them how to describe these shapes using edges, faces, vertices and curved surfaces. They should explore this step practically, starting with nets of a cube, made up of six squares, and investigating which arrangements will and will not fold to make a cube. Children can then move on to looking at other 3-D shapes and what 2-D shapes are needed to make their nets. Again, they first need to explore this with cut-out nets, which will help them to become more adept at visualising how nets fold up. Children can then work from a 3-D shape to decide how the net will look.

Block 2 Position and Direction	
Step 1 The first quadrant	Children were first introduced to a coordinate grid in Year 4. That learning is revisited in this small step, with children looking at the first quadrant, where both the x- and y-coordinates are positive. Begin by recapping what the coordinate grid is and the names of the two axes, x and y. Then consider points on the grid. Discuss how children can find the coordinates for a given point, reading the first value on the x-axis and the second value on the y-axis. Children then move on to plotting points with given coordinates. Ensure that children understand the importance of the order of the values. Children draw shapes on a coordinate grid, suggesting possible coordinates for vertices of different shapes. Finally, they solve problems in the first quadrant without the support of grid lines, using given coordinate information to find the coordinates of other points.
Step 2 Read and plot points in four quadrants	In this small step, children extend their understanding of the coordinate grid to include all four quadrants. It may be helpful to refer to these as the first (top-right), second (top-left), third (bottom-left) and fourth (bottom-right) quadrants. Show children that the x- and y-axes can both be extended through zero into negative numbers. Children plot points in each of the "new" quadrants in turn. Model that the process is the same as for the first quadrant, and emphasise that the axes behave in the same way as number lines with positive and negative numbers, which children are already familiar with. Children should recognise the pattern of positive and negative coordinates that belong in each quadrant. When children are comfortable with points in each of the quadrants, they move on to drawing shapes in the coordinate grid, using all of the quadrants. Finally, they determine which quadrant a point with given coordinates is in, without the use of a grid to support them.
Step 3 Solve problems with coordinates	In this small step, children use their knowledge of coordinates in four quadrants to solve problems, such as working out the coordinates of vertices of polygons. Children need to be secure in reading and plotting coordinates in all four quadrants. They consider horizontal and vertical lines that go through a known coordinate, using the fact that if they know the x-coordinate of a point on a vertical line, then every point on that line will have the same x-coordinate. Similarly, every point on a horizontal line will have the same y-coordinate. Children then use this information to help find missing coordinates on shapes, both on grids with gridlines and on those without. Finally, they use the properties of shapes to solve problems on coordinate grids, for example using the fact that the opposite sides of a rectangle are equal in length.
Step 4 Translation	Now that children have a good understanding of coordinates in all four quadrants, in this small step they move on to translating points and shapes on a coordinate grid. They first experienced translation on a coordinate grid in Year 4, and that learning is now extended to translate in all four quadrants. Begin by recapping that translating points means to move them. Look first at translations in one direction, either left/right or up/down, before moving on to translations in both directions. Once children have recapped translating single points on a grid, they explore translating shapes, applying the same translation to each vertex of the shape. They should see that the shape looks identical after being translated, but is in a different position on the coordinate grid. Give children opportunities to describe translations as well as perform them. Encourage children to explore the effect of translations on the coordinates.
Step 5 Reflections	Children reflected shapes in the first quadrant of coordinate grids in Year 5, both with gridlines and without, using lines parallel to the x- or y-axis. In this small step, that learning is revisited and extended to include reflections across all four quadrants. It can be useful to use mirrors to explore reflection and to see that a reflected image looks identical to the original image, but faces the opposite direction. Start with reflecting points and shapes on a coordinate grid in the x- or y-axis. Children should count how far away each vertex is from the axis and use this to work out the coordinates of each vertex in the reflected shape. They could then be stretched to reflect shapes in lines that are parallel to each axis. This should be done both with gridlines and without, giving children the opportunity to work out reflections both by counting squares and by calculation.
Block 3 Themed projects, consolidation and problem solving	
White Rose Bakery	Scaling of recipes depending on how many of the final quantity are needed.

White Rose Tours	This section looks at comparing the climates of different countries throughout the year to help choose a holiday destination. Interpreting line graphs and bar charts are explored here.
White Rose Futures	This section introduces some important vocabulary linked to jobs and pay e.g. salary, gross pay, income tax and take-home pay. Monthly take-home pay is calculated from an annual salary following income tax deductions using percentages and different strategies for division.