National Curriculum Links

Links to the National Curriculum in England

# Chapters 23–25: Angle, transformations, symmetry and classifying shapes

Pupils should be taught to:

## Year 1

* describe position, directions and movements, including whole, half, quarter and three-quarter turns
* recognize and name common 2-D and 3-D shapes, including:
	+ 2-D shapes [e.g., rectangles (including squares), circles and triangles]
	+ 3-D shapes [e.g., cuboids (including cubes), pyramids and spheres]

## Year 2

* order and arrange combinations of mathematical objects in patterns and sequences
* use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise)
* identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line
* identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces
* identify 2-D shapes on the surface of 3-D shapes [e.g., a circle on a cylinder and a triangle on a pyramid]
* compare and sort common 2-D and 3-D shapes and everyday objects

## Year 3:

* draw 2-D shapes and make 3-D shapes using modelling materials; recognize 3-D shapes in different orientations and describe them
* recognize angles as a property of shape or a description of a turn
* identify right angles, recognize that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle
* identify horizontal and vertical lines and pairs of perpendicular and parallel lines

## Year 4

* describe movements between positions as translations of a given unit to the left/right and up/down
* plot specified points and draw sides to complete a given polygon
* compare and classify geometric shapes, including quadrilaterals and triangles**,** based on their properties and sizes
* identify acute and obtuse angles and compare and order angles up to two right angles by size
* identify lines of symmetry in 2-D shapes presented in different orientations
* complete a simple symmetric figure with respect to a specific line of symmetry

## Year 5

* identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed
* identify 3-D shapes, including cubes and other cuboids, from 2-D representations
* know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
* draw given angles, and measure them in degrees (o)
* identify:
	+ angles at a point and one whole turn (total 360 o)
	+ angles at a point on a straight line and ½ a turn (total 180 o)
	+ other multiples of 90 o
* use the properties of rectangles to deduce related facts and find missing lengths and angles
* distinguish between regular and irregular polygons based on reasoning about equal sides and angles

## Year 6

* draw and translate simple shapes on the coordinate plane, and reflect them in the axes
* draw 2-D shapes using given dimensions and angles
* recognize, describe and build simple 3-D shapes, including making nets
* compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons
* recognize angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles
* solve problems involving similar shapes where the scale factor is known or can be found

Links to Curriculum for Excellence in Numeracy and Mathematics in Scotland

# Chapters 23–25: Angle, transformations, symmetry and classifying shapes

## Early

***Experiences and outcomes:*** *I enjoy investigating objects and shapes and can sort, describe and be creative with them.* ***MTH 0-16a***

*In movement, games, and using technology I can use simple directions and describe positions.* ***MTH 0-17a***

*I have had fun creating a range of symmetrical pictures and patterns using a range of media.* ***MTH 0-19a***

***Benchmark:***

* recognizes, describes and sorts common 2D shapes and 3D objects according to various criteria, for example, straight, round, flat and curved
* understands and correctly uses the language of position and direction, including in front, behind, above, below, left, right, forwards and backwards, to solve simple problems in movement games
* identifies, describes and creates symmetrical pictures with one line of symmetry

## First

***Experiences and outcomes:*** *I have explored simple 3D objects and 2D shapes and can identify, name and describe their features using appropriate vocabulary.* ***MTH 1-16a***

*I can explore and discuss how and why different shapes fit together and create a tiling pattern with them.* ***MTH 1-16b***

*I can describe, follow and record routes and journeys using signs, words and angles associated with direction and turning.* ***MTH 1-17a***

*I have developed an awareness of where grid reference systems are used in everyday contexts and can use them to locate and describe position.* ***MTH 1-18a***

*I have explored symmetry in my own and the wider environment and can create and recognize symmetrical pictures, patterns and shapes.* ***MTH 1-19a***

***Benchmark:***

* names, identifies and classifies a range of simple 2D shapes and 3D objects and recognizes these shapes in different orientations and sizes
* uses mathematical language to describe the properties of a range of common 2D shapes and 3D objects including side, face, edge, vertex, base and angle
* identifies 2D shapes within 3D objects and recognizes 3D objects from 2D drawings
* identifies examples of tiling in the environment and applies knowledge of the features of 2D shapes to create tiling patterns incorporating two different shapes
* uses technology and other methods to describe, follow and record directions using words associated with angles, directions and turns including, full turn, half turn, quarter turn, clockwise, anticlockwise, right turn, left turn, right angle
* knows that a right angle is 90°
* knows and uses the compass points, North, South, East and West
* uses informal methods to estimate, compare and describe the size of angles in relation to a right angle
* finds right angles in the environment and in well-known 2D shapes
* identifies where and why grid references are used
* describes, plots and uses accurate two figure grid references, demonstrating knowledge of the horizontal and vertical location
* identifies symmetry in patterns, pictures, nature and 2D shapes
* creates symmetrical pictures and designs with more than one line of symmetry

## Second

***Experiences and outcomes:*** *I have investigated angles in the environment, and can discuss, describe and classify angles using appropriate mathematical vocabulary.* ***MTH 2-17a***

*I can accurately measure and draw angles using appropriate equipment, applying my skills to problems in context.* ***MTH 2-17b***

*Through practical activities which include the use of technology, I have developed my understanding of the link between compass points and angles and can describe, follow and record directions, routes and journeys using appropriate vocabulary.* ***MTH 2-17c***

*Having investigated where, why and how scale is used and expressed, I can apply my understanding to interpret simple models, maps and plans.* ***MTH 2-17d***

*I can use my knowledge of the coordinate system to plot and describe the location of a point on a grid.* ***MTH 2-18a***

*I can illustrate the lines of symmetry for a range of 2D shapes and apply my understanding to create and complete symmetrical pictures and patterns.* ***MTH 2-19a***

*Having explored a range of 3D objects and 2D shapes, I can use mathematical language to describe their properties, and through investigation can discuss where and why particular shapes are used in the environment.* ***MTH 2-16a***

*Through practical activities, I can show my understanding of the relationship between 3D objects and their nets.* ***MTH 2-16b***

*I can draw 2D shapes and make representations of 3D objects using an appropriate range of methods and efficient use of resources.* ***MTH 2-16c***

***Benchmark:***

* uses mathematical language including acute, obtuse, straight and reflex to describe and classify a range of angles identified within shapes in the environment
* measures and draws a range of angles to within o ± 2
* knows that complementary angles add up to 90° and supplementary angles add up to 180° and uses this knowledge to calculate missing angles
* uses knowledge of the link between the eight compass points and angles to describe, follow and record directions
* interprets maps, models or plans with simple scales, for example, 1 cm:2 km
* describes, plots and records the location of a point, in the **first** quadrant, using coordinate notation
* identifies and illustrates line symmetry on a wide range of 2D shapes and applies this understanding to complete a range of symmetrical patterns, with and without the use of digital technologies
* describes 3D objects and 2D shapes using specific vocabulary including regular, irregular, diagonal, radius, diameter and circumference, and applies this knowledge to demonstrate understanding of the relationship between 3D objects and their nets
* identifies and describes 3D objects and 2D shapes within the environment and explains why their properties match their function
* knows that the radius is half of the diameter
* uses digital technologies and mathematical instruments to draw 2D shapes and make representations of 3D objects, understanding that not all parts of the 3D object can be seen

Links to Curriculum for Wales: Programme of Study for Mathematics, Key Stages 2–4

# Chapters 23–25: Angle, transformations, symmetry and classifying shapes

Learners should be taught to:

## Year 1

* recognize and name common 2D shapes (*square, triangle, rectangle, circle and semi-circle*) and 3D shapes (*cube, cuboid, cone and sphere*) in order to begin to compare and sort
* use 2D and 3D shapes and describe how they fit together
* recognize and complete a symmetrical picture or simple shape

## Year 2

* recognize half and quarter turns, clockwise and anti-clockwise
* recognize that a quarter turn is a right angle
* use mathematical vocabulary to describe position, direction and movement
* recognize and name regular and irregular 2D and 3D shapes, understand and use the properties of shape
* make increasingly more complex or accurate models with 3D shapes and tessellate 2D shapes
* identify a line of symmetry for 2D shapes and complete symmetrical pictures

## Year 3

* recognize and classify triangles, squares, rectangles, pentagons and hexagons, including irregular cases
* identify congruent shapes
* recognize 3D shapes, including prisms
* find areas by counting squares
* identify right angles
* recognize that two right angles make a half turn, and that four right angles make a full turn
* describe an angle as more or less than a right angle
* use the four compass points to describe directions
* recognize and classify triangles, squares, rectangles, pentagons and hexagons, including irregular cases
* identify congruent shapes
* recognize 3D shapes, including prisms
* draw lines to the nearest half centimetre
* identify lines of symmetry in 2D shapes
* draw horizontal and vertical lines of symmetry

## Year 4

* recognize and classify 3D shapes, using their own criteria
* recognize volume in practical contexts
* use a protractor to check if an angle is more or less than a right angle
* use eight compass points to describe direction
* recognize, classify and sketch polygons with up to eight sides, including irregular shapes
* recognize and classify 3D shapes, using their own criteria
* draw lines to the nearest millimetre
* recognize and draw perpendicular and parallel lines
* draw lines of symmetry
* draw the reflection of a shape in a horizontal or vertical line

## Year 5

* recognize and classify triangles, using their own criteria
* identify congruent shapes and justify whether two or more shapes are congruent
* calculate, estimate and compare the area of squares and rectangles using standard units
* find volumes by counting and other practical methods
* recognize acute and obtuse angles
* draw and measure acute angles in multiples of 10 degrees

## Year 6

* recognize tetrahedra and square based pyramids
* recognize and sketch different types of quadrilaterals
* explore the tessellation of different shapes
* identify a net of a cube
* calculate the area of squares and rectangles
* recognize reflex angles
* draw accurately and measure acute and obtuse angles in multiples of 5 degrees
* calculate a missing angle within a right angle, on a straight line or around a point
* recognize tetrahedra and square based pyramids
* recognize and sketch different types of quadrilaterals
* explore the tessellation of different shapes
* identify a net of a cube
* draw cubes and cuboids on isometric paper
* draw nets of cubes on square paper
* find all the lines of symmetry for a given shape
* identify rotational symmetry of shapes
* identify symmetrical properties of regular polygons

Australian Curriculum for Mathematics

This maps entries in the **Australian Mathematics Curriculum (from Foundation Stage to Year 7)** to the content of chapters of Haylock, *Mathematics Explained for Primary Teachers*, 6th edition.

# Chapters 23–25: Angle, transformations and symmetry, classifying shapes

## Foundation Year

* Sort, describe and name familiar two-dimensional shapes and three-dimensional objects in the environment
* Describe position and movement

## Year 1

* Recognize and classify familiar two-dimensional shapes and three-dimensional objects using obvious features
* Give and follow directions to familiar locations

## Year 2

* Describe and draw two-dimensional shapes, with and without digital technologies
* Describe the features of three-dimensional objects
* Interpret simple maps of familiar locations and identify the relative positions of key features
* Investigate the effect of one-step slides and flips with and without digital technologies
* Identify and describe half and quarter turns

## Year 3

* Make models of three-dimensional objects and describe key features
* Create and interpret simple grid maps to show position and pathways
* Identify symmetry in the environment
* Identify angles as measures of turn and compare angle sizes in everyday situations

## Year 4

* Compare and describe two-dimensional shapes that result from combining and splitting common shapes, with and without the use of digital technologies
* Use simple scales, legends and directions to interpret information contained in basic maps
* Create symmetrical patterns, pictures and shapes with and without digital technologies
* Compare angles and classify them as equal to, greater than or less than a right angle

## Year 5

* Connect three-dimensional objects with their nets and other two-dimensional representations
* Use a grid reference system to describe locations
* Describe routes using landmarks and directional language
* Describe translations, reflections and rotations of two-dimensional shapes
* Identify line and rotational symmetries
* Apply the enlargement transformation to familiar two-dimensional shapes and explore the properties of the resulting image compared with the original
* Estimate, measure and compare angles using degrees
* Construct angles using a protractor

## Year 6

* Construct simple prisms and pyramids
* Investigate combinations of translations, reflections and rotations, with and without the use of digital technologies
* Introduce the Cartesian coordinate system using all four quadrants
* Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles
* Use results to find unknown angles

## Year 7

* Establish the formulas for areas of rectangles, triangles and parallelograms and use these in problem solving
* Calculate volumes of rectangular prisms
* Draw different views of prisms and solids formed from combinations of prisms
* Describe translations, reflections in an axis, and rotations of multiples of 90° on the Cartesian plane using coordinates
* Identify line and rotational symmetries
* Identify corresponding, alternate and co-interior angles when two straight lines are crossed by a transversal
* Investigate conditions for two lines to be parallel and solve simple numerical problems using reasoning
* Classify triangles according to their side and angle properties and describe quadrilaterals
* Demonstrate that the angle sum of a triangle is 180° and use this to find the angle sum of a quadrilateral