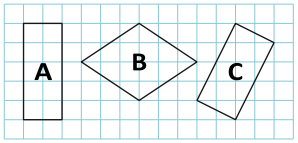
Knowledge Progression in Shape

Early Learning Goals	Can describe his/her relative position such as 'behind' or 'next to'• Recognises, creates and describes patterns •Explores characteristics of everyday objects and shapes and uses mathematical language to describe them.

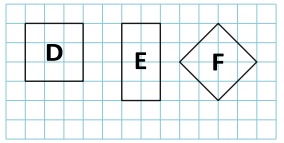
Year Group	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Properties of 2D shape	•Recognise and name common 2-D shapes (e.g. Square, circle, triangle) •Recognise and name shapes regardless of orientation and size	•Identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line. •Compare and sort common 2-D and 3-D shapes and everyday objects. •Draw shapes with straight edges using a ruler	•Compare and classify geometric shapes, including quadrilaterals and triangles, based on properties and sizes •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. •Draw 2D shapes to measure a straight line using a ruler •Identify horizontal and vertical lines and pairs of perpendicular and parallel lines	•Become confident in identifying an increasing number of 2D shapes focusing on quadrilaterals and different types of triangles •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	•Draw 2-D shapes using given dimensions and angles compare and classify geometric shapes based on their properties and sizes •Calculate missing angles in triangles and quadrilaterals	•Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius

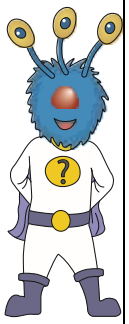
				equal sides and angles. •Identify horizontal and vertical lines and pairs of perpendicular and parallel lines •Complete patterns or shapes with one horizontal, vertical or diagonal line of symmetry where the figure may not touch the line.		
Year 1 examples	**Working at** Just knowing the correct mathematical names of shapes doesn't constitute mastery. Pupils should be able to recognise shapes and describe their properties. Check that pupils: a) can recognise shapes in different orientations; b) are able to describe what is special about certain shapes (e.g. a triangle has 3 sides and 3 corners or vertices). Have a range of shapes in a 'feely bag'. Can you feel for the triangle, the square, the rectangle? Explain how you know. *Children should describe the shapes, using their properties.*			**Greater Depth** Provide children with a variety of 3-D shapes and ask: What's the same and what's different between these shapes?		

<table>
<tr>
<td>Year 2 examples</td>
<td>Working at
Carry out activities that direct pupils' attention to properties and do not just ask them
to state the name of shapes in order to allow them to demonstrate working at.
Asking questions like 'How do you know the shape is a triangle?' can also support
pupils to develop understanding of this topic.

Captain Conjecture says, 'All of these shapes are rectangles because they have four sides.'
Do you agree?
 

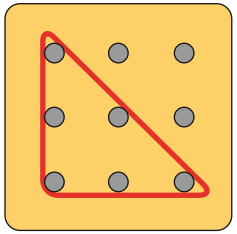
Explain your reasoning.
  </td>
<td>Greater Depth
Cut a square piece of paper into 4 triangles. Rearrange the pieces to make different shapes. What different shapes can you make?
Describe the properties of the shapes you make.
Can you make some shapes which have at least one line of symmetry?

Captain Conjecture says, 'All of these shapes are rectangles because they have four sides.'
Do you agree?
 

Explain your reasoning.
 
Children should appreciate that a square is a rectangle because it has
4 right angles and opposite sides are of equal length.</td>
</tr>
<tr>
<td>Year 3 examples</td>
<td>Working at

Can you draw a triangle with:
■ 1 right angle?
■ 2 right angles?

Can you draw a quadrilateral with:
■ 1 right angle?
■ 2 right angles?
■ 5 right angles?
■ No right angle?

If some of these are impossible, can you explain why?</td>
<td>Greater Depth
How many different triangles can you find on a 3×3 pin geoboard? How do you decide that they are different?
 
How many different quadrilaterals can you find on a 3×3 pin geoboard?
How do you decide that they are different?</td>
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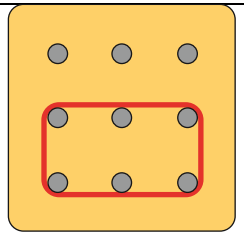
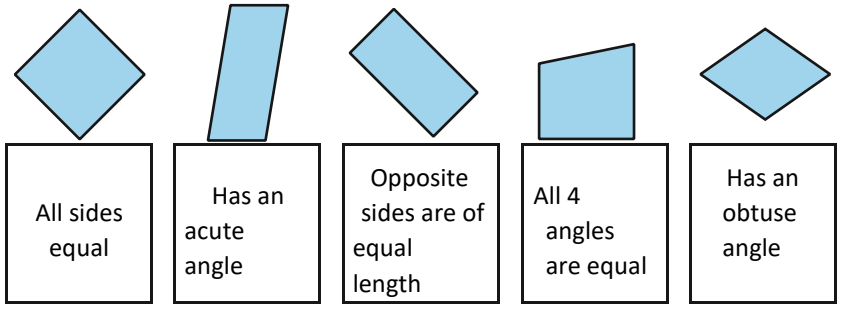
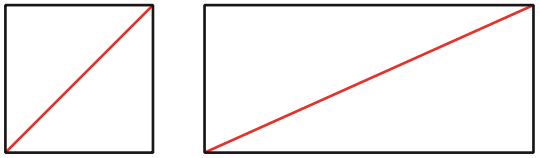
		
Year 4 examples	Below are five quadrilaterals: a rectangle, a rhombus, a square, a parallelogram and an unnamed quadrilateral. Write the names of each of the quadrilaterals. Draw lines from each shape to match the properties described in the boxes below.  Draw some 2-D shapes that have: no lines of symmetry 1 line of symmetry 3 lines of symmetry.	A rectangle is a regular shape because it has four right angles. Do you agree? Explain your reasoning. A quadrilateral can sometimes only have three right angles. Do you agree? Explain your reasoning. Tom says, 'In each of these shapes the red line is a line of symmetry.' Do you agree? Explain your reasoning. 

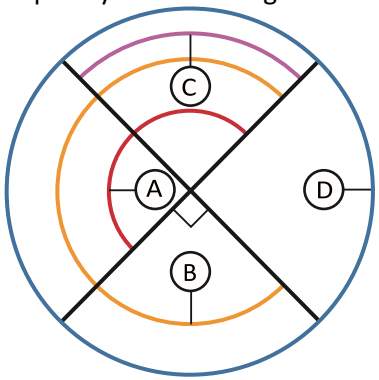
Year 5 examples

The circle is divided into quarters by the two diameter lines and four angles A, B, C and D are marked.

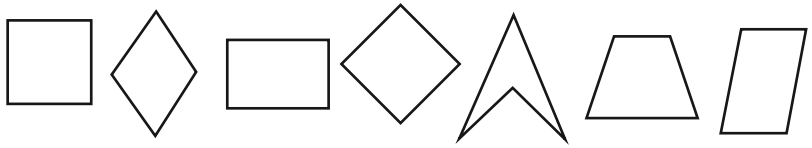
Are the statements below true or false?

- Angle C is the smallest angle.
- Angle D is the largest angle.
- All the angles are the same size.
- Angle B is a right angle.
- Angle B is an obtuse angle.

Explain your reasoning.



Identify the regular and irregular quadrilaterals.



Pupils should recognise that a square is the only regular quadrilateral and there are two within this set.

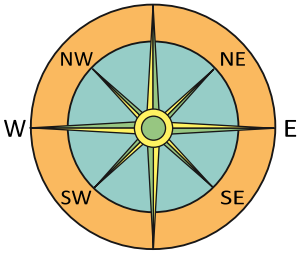
In the questions, below all of Harry's movement is in a clockwise direction.

If Harry is facing North and turns through 180 degrees, in which direction will he be facing?

If Harry is facing South and turns through 180 degrees, in which direction will he be facing?

What do you notice?

If Harry is facing North and wants to face SW how many degrees must he turn? From this position how many degrees must he travel through to face North again?



Which of these statements are correct?

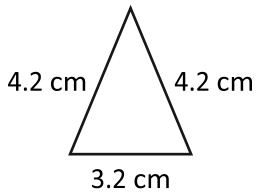
- A square is a rectangle.
- A rectangle is a square.
- A rectangle is a parallelogram.
- A rhombus is a parallelogram.

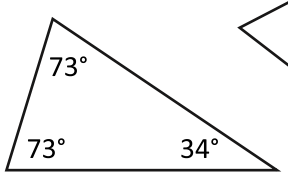
Explain your reasoning.

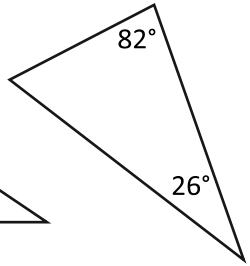
Year 6 examples

Which of these triangles are isosceles?

Explain your decisions.







A square has two vertices at (0,0) and (3,3).
Work out and explain the coordinates where the other two vertices could be.

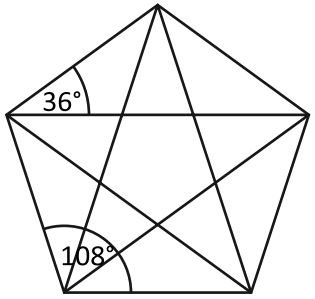
A square has two vertices at (–3,0) and (3,0).
Work out and explain the coordinates where the other two vertices could be.

Captain Conjecture says, 'The diameter of a circle is twice the length of its radius.'

Do you agree?
Explain your answer.

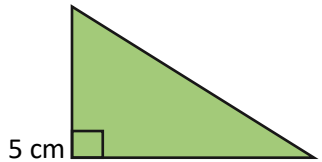
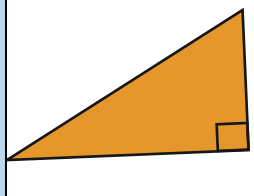
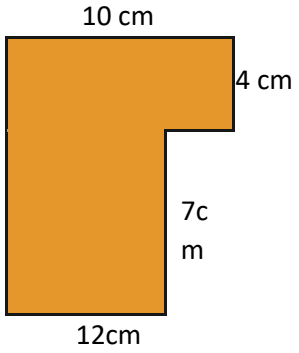
This is a regular pentagon.
Two angles (108° and 36°) are shown.

Which other angles can you work out?
Explain your reasoning.

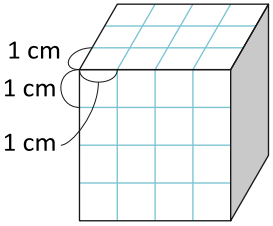
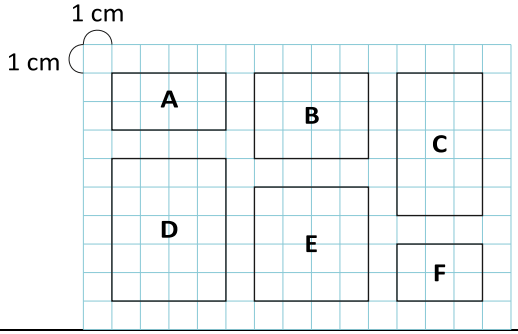
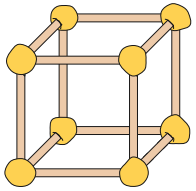


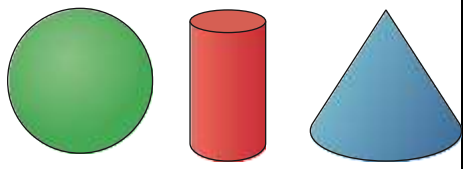
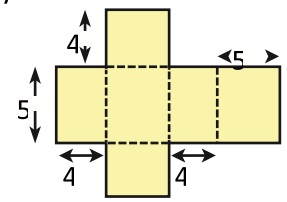
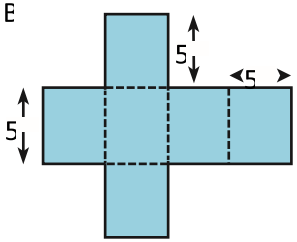
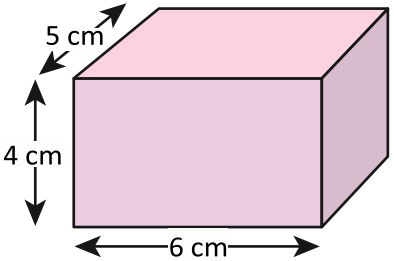
An isosceles triangle has two vertices at (–3,2) and (3,2).

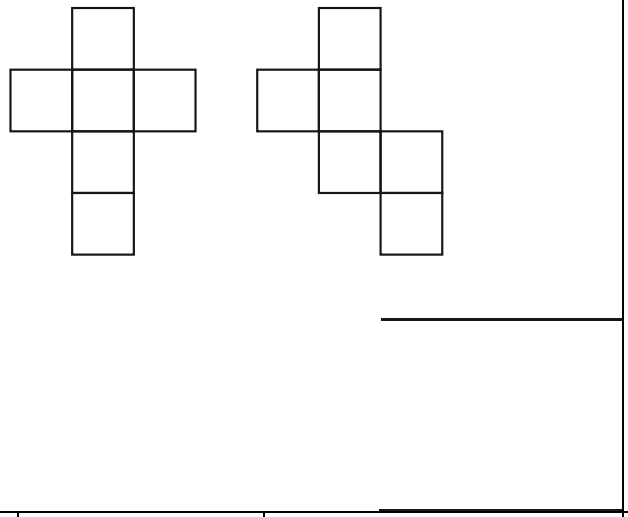
Explore where the third vertex could be.

	‘All circles with a radius of 4 cm have circumferences that are the same length.’ Do you agree? Explain your answer. Which of these right-angled triangles have an area of cm^2?  8 cm  Think about these rectangles:	Compare a circle and an oval. What’s the same and what’s different? Sami worked out the area of the orange shape as $10 \times 4 + 8 \times 7 = 96\ cm^2$. Razina worked out the area as $12 \times 7 + 3 \times 4 = 96\ cm^2$. Lukas worked out the area as $10 \times 10 - 2 \times 2 = 96\ cm^2$.  Are you convinced by Sami, Razina or Lukas’s reasoning? Explain your answer.

	a 4 cm by 6 cm rectangle a 12 cm by 2 cm rectangle a 3 cm by 8 cm rectangle. What's the same? What's different?			Liping says, 'If you draw two rectangles and the second one has a greater perimeter than the first one, then the second one will also have a greater area.' Do you agree or disagree with her? Explain your reasoning.		
Properties of 3D shape	•Recognise and name common 3-D shapes (e.g. Cubes, cuboids, pyramids & spheres)	•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. • Compare 2D and 3D shapes, identifying similarities and differences	•Make 3-D shapes using modelling materials recognise 3-D shapes in different orientations and describe them •Identify 3-D shapes, including cubes and other cuboids, from 2-D representations		•Recognise, describe and build simple 3-D shapes, including making nets •Find unknown angles in any triangles, quadrilaterals, and regular polygons	•Investigate and make the nets of a range of 3D shapes
Year 1 examples	**Working at** Sort a range of 3-D objects into groups.			**Greater Depth** What's the same and what's different about these shapes? Which could be the odd one out and why?		

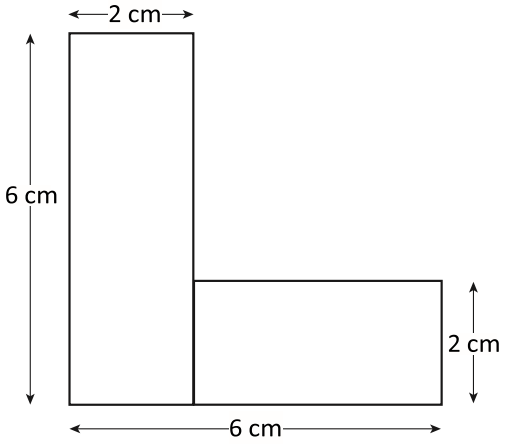
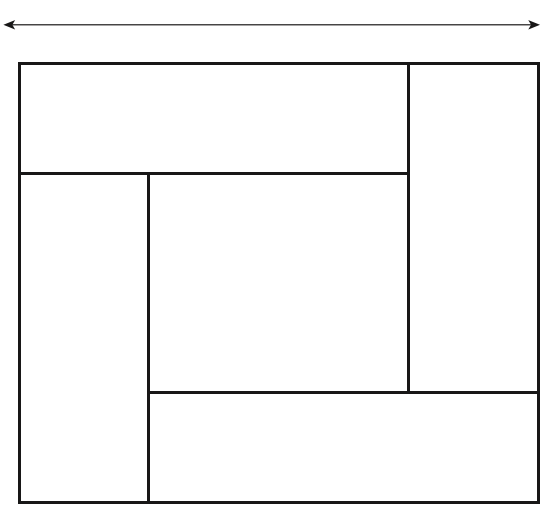
	Explain how you have sorted them using mathematical names for the shapes. Have a range of shapes in a 'feely bag'. Can you feel for the cone, the cube, the cylinder? Explain how you know. *Children should describe the shapes, using their properties.*	Could each one be the odd one out? Explain your reasoning. Provide children with a variety of 3-D shapes and ask: What's the same and what's different between these shapes? Children make comparisons, drawing out the properties of shape and using language such as straight, curved, number of vertices. Tom says, 'My shape has 4 rectangular faces and 2 square faces. What is my shape?' Sam says, 'My shape has 2 triangular faces and 3 rectangular faces. How many vertices does my shape have?'
Year 2 examples	We are going to make a box as shown.  Which quadrilaterals shown below do we need? How many of each do we need?  	Jack has made a cube using 12 sticks and 8 balls of modelling clay.  What shape could he make with: 6 sticks and 4 balls of clay? 4 long sticks, 8 short sticks 8 balls of clay?
Year 3 examples	Have a range of 3-D shapes in a 'feely bag'. Can you feel for the cube, the cuboid, the pyramid, the cylinder and the cone?	True or false? The shape of a cross section of a sphere is always a circle. The shape of

	Explain how you know. Describe what you are feeling to your classmates and see if they guess what the shape is.	a cross section of a cylinder is always a circle. The shape of a cross section of a cone is always a circle.  Explain your reasoning. sphere cylinder cone Can you identify a 3-D shape where the cross section is always a square
Year 5 examples	What shapes do you make when these 2-D representations (nets) are cut out and folded up to make 3-D shapes? A  B  	Draw the 2-D representation (net) that will make this cuboid when cut out and folded up 
Year 6 examples	The diameter of a golf ball is 4 cm. I want to make a box which will hold six golf balls. What size could my box be?	Can you find two or more different cuboids each with a volume of 64 cm^3? What's the same and what's different about your cuboids?

	Is there more than one answer? Which of these could be the net of a cube? Explain your choices. 			Pascal says that any net made with six squares can be folded to make a cube. Do you agree with him? Explain your reasoning.		
Angles			•Recognise angles as a property of shape or a description of a turn •Identify right angles, recognise 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 or less than right angle	•Identify acute and obtuse angles and compare and order angles up to two right angles by size	•Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles •Draw given angles, and measure them in degrees (°) •Identify angles at a point and one whole turn (total 360°); at a point on a straight line and ½ a turn (total 180°) •Identify other multiples of 90°	•Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles

Position and direction	•Describe position, direction and movement, including whole, half, quarter and three-quarter turns.	•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 ¾ turns •Describe positions on a 2-D grid as coordinates in the first quadrant		•Begin to read co-ordinates in all 4 quadrants •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 •Describe movements between positions as translations of a given unit to the left/right and up/down.	•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 •Reflect shapes in 4 quadrants and in a diagonal line •Find missing co-ordinates of shapes in all 4 quadrants	•Draw and translate simple shapes on all four quadrants, reflect them in the axes and express this algebraically (e.g. translating vertex (a,b) to (a-2, b+3)

Year 1 example	**Working at** Show children a picture of 3 rows of 5 drawers, each with an object in Identify the position of each item. Top, middle or bottom? First, second or third? Left or right?			**Greater depth** Show children a picture of 3 rows of 5 drawers, each with an object in Which drawer will Ziggy open? You may ask him four questions to identify the drawer. He can only answer 'Yes' or 'No'. Which four questions would you ask? Explain your reasoning.		
Area and perimeter			•Measure the perimeter of simple 2-D shapes	•Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres •Find the area of rectilinear shapes by counting squares	•Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres •Calculate and compare the area of rectangles (including squares)and compound shapes including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes	•Recognise that shapes with the same areas can have different perimeters and vice versa •Recognise when it is possible to use formulae for area and volume of shapes •Calculate the area of parallelograms and triangles •Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm3) and cubic metres (m3), and extending to other units.

<table>
<tr>
<td>Year 4 examples</td>
<td>The shape below is made from two rectangles.
Identify the perimeter of each of the two rectangles.
How many 1 cm squares would fit into the smaller rectangle?
How many more squares fit into the larger rectangle?
 
</td>
<td>The rectangular tiles here are three times as long as they are wide.
What is the perimeter of the centre square?
  </td>
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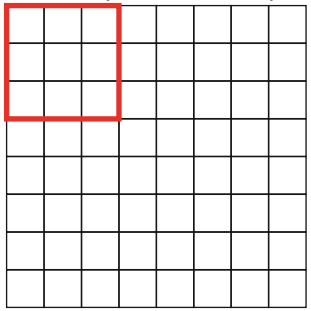
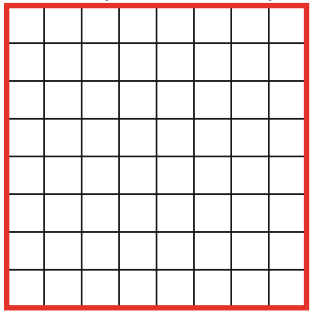
<tr>
<td>Year 5 examples</td>
<td>Here is a picture of a square drawn on cm^2 paper.
 
Draw another rectangle with the same perimeter as this square.
Do the two rectangles have the same area?
Is this always, sometimes or never true of other pairs of rectangles with the same perimeter?

Explain your reasoning.</td>
<td>Here is a picture of a square drawn on cm^2 paper.
 
How many other rectangles are there with the same perimeter as the square, where the sides are a whole number of cm?

Show your workings.</td>
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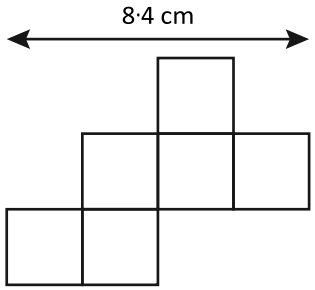
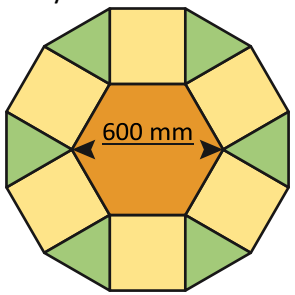
Year 6 examples	Here is a tiled floor pattern. It is made from squares. Work out the perimeter of the design. Give your answer in metres.  	Here is a tiled floor pattern. It is made from equilateral triangles, squares and a regular hexagon. Work out the perimeter of the design. Give your answer in metres. 

New vocabulary for each year group is in bold	Progression in vocabulary - Shape			
	Properties of shape Area and perimeter	2D shape	3D shape	Position and direction Angles
EYFS	shape, pattern, flat, curved, straight, round, hollow, solid sort ,make, build, draw, size, bigger, larger, smaller symmetrical pattern, repeating pattern, match	corner, side ,rectangle (including square) circle, triangle	face, edge, cube, pyramid, sphere, cone, flat, curved	Position, over, under, above, below, top, bottom, side, on, in outside, inside, around, in front, behind, front, back beside, next to opposite, apart between, middle, edge corner direction, left, right up, down forwards, backwards, sideways, across next to, close, near, far along through to, from, towards, away from, movement, slide, roll, turn stretch, bend whole turn, half turn

Year 1	shape, pattern, flat, curved, straight, round, hollow, solid sort, make, build, draw, size bigger, larger, smaller symmetry, symmetrical, symmetrical pattern, pattern, repeating pattern, match	corner, side point, pointed rectangle (including square) circle triangle	face, edge, *vertex, vertices cube, cuboid, pyramid, sphere cone, cylinder, flat, curved *If needed although focus on language is curved/flat face and identifying 2D shapes on 3D shapes	Position, over, under, underneath, above, below, top, bottom, side on, in outside, inside, around, in front, behind front, back beside, next to opposite, apart, between, middle, edge, centre, corner, direction, journey, left, right up, down, forwards, backwards, sideways, across
Year 2	shape, pattern, flat, curved, straight, round, **hollow**, solid sort, make, build, draw, surface, size, bigger, larger, smaller symmetry, symmetrical, symmetrical pattern, **line symmetry**, pattern, repeating pattern match	corner, side point, pointed rectangle (including square), **rectangular**, circle, , **circular** triangle, **triangular, pentagon hexagon, octagon**	face, edge, **vertex, vertices** cube, cuboid, pyramid, sphere cone, cylinder, flat, curved	Position, over, under, underneath, above, below top, bottom, side on, in outside, inside, around, in front, behind front, back beside, next to, opposite, apart, between middle, edge, centre, corner direction, journey, **route** left, right, up, down, **higher, lower** forwards, backwards, sideways across next to, close, near, far along through to, from, towards, away from, **clockwise, anticlockwise** movement, slide, roll, turn, stretch, bend, whole turn, half turn, quarter turn, three-quarter turn, **right angle, straight line**
Year 3	shape, pattern, flat, curved, straight, round, hollow, solid sort, make, build, draw **perimeter,** surface, size, bigger, larger, smaller, symmetry, symmetrical, symmetrical pattern, line symmetry, pattern, repeating pattern, match,	**angle** ,side, point, pointed rectangle (including square), rectangular circle, circular triangle, triangular pentagon, **pentagonal**, hexagon, **hexagonal**, octagon, **octagonal quadrilateral** ,right-angled parallel, perpendicular	face, edge, vertex, vertices, flat, curved cube, cuboid, pyramid, sphere, **hemisphere,** cone, cylinder **prism, triangular prism,**	Position, over, under, underneath above, below top, bottom, side on, in outside, inside around in front, behind front, back beside, next to opposite apart between middle, edge centre corner direction journey, route left, right up, down higher, lower

				forwards, backwards, sideways across next to, close, near, far along through to, from, towards, away from clockwise, anticlockwise **acute angle, obtuse angle** ,straight line, **compass point north, south, east, west, N, S, E, W horizontal, vertical, diagonal,** movement slide roll turn stretch, bend, whole turn, half turn, quarter turn, three-quarter turn ,**angle … is a greater/smaller angle than right angle, set square, angle measurer**
Year 4	shape, pattern flat, line, curved, straight round hollow, solid sort make, build, **construct,** draw, sketch, , **centre**, surface, **right-angled base, square-based** , size, bigger, larger, smaller symmetry, symmetrical, symmetrical pattern, line symmetry, **reflect, reflection** ,pattern, repeating pattern, match ,**regular, irregular** perimeter, **area, covers, square centimetre (cm2)**	**2-D, two-dimensional** , side, corner, (including square), rectangular **Oblong, rectilinear,** circle, circular, triangle, triangular **equilateral triangle, isosceles triangle, scalene triangle,** pentagon, pentagonal hexagon, hexagonal, **heptagon,** octagon, octagonal, **quadrilateral parallelogram, rhombus, trapezium, kite polygon,** right-angled parallel, perpendicular	3-D, three-dimensional face, edge, vertex, vertices cube, cuboid pyramid sphere, hemisphere, spherical cone cylinder, cylindrical prism, triangular prism tetrahedron, polyhedron octahedron **dodecahedron ,**net, **open, closed**	position over, under, underneath above, below top, bottom, side on, in outside, inside around in front, behind front, back beside, next to opposite apart between middle, edge centre corner direction journey, route left, right up, down higher, lower forwards, backwards, sideways across next to, close, near, far along, through to, from, towards, away from clockwise, anticlockwise compass point north, south, east, west, N, S, E, W, **north-east, north-west, south-east, south-west, NE, NW, SE, SW,** horizontal, vertical, diagonal **translate, translation,** movement slide roll turn stretch, bend whole

				turn, half turn, quarter turn, three-quarter turn **rotate, rotation,** angle, is a greater/smaller angle than, **degree,** right angle, acute angle, obtuse angle reflection straight line ruler, set square angle measurer, compass
Year 5	Shape, pattern, flat, line curved, straight, round, hollow, solid, sort, make, build, construct, draw, sketch, centre, surface angle, right-angled congruent base, square-based size bigger, larger, smaller symmetry, symmetrical, symmetrical pattern, line symmetry, reflect, reflection, **reflective symmetry,** pattern, repeating pattern ,match, regular, irregular polygon, right -angled ,parallel, perpendicular, **x-axis, y-axis, quadrant** (all four) perimeter, area, covers, square centimetre (cm2) **square metre (m2), square millimetre (mm2)**	2-D, two-dimensional, corner, side,rectangle (including square), rectangular, oblong, rectilinear, circle, circular, triangle, triangular equilateral triangle, isosceles triangle, scalene triangle pentagon, pentagonal hexagon, hexagonal, heptagon, octagon, octagonal ,quadrilateral ,parallelogram, rhombus, trapezium	3-D, three-dimensional face, edge, vertex, vertices cube, cuboid pyramid sphere, hemisphere, spherical cone cylinder, cylindrical prism, triangular prism, **tetrahedron, polyhedron, octahedron, net**	position ,over, under, underneath, above, below top, bottom, side on, in outside, inside around in front, behind front, back beside, next to opposite apart between middle, edge centre corner direction journey, route left, right up, down, higher, lower forwards, backwards, sideways across next to, close, near, far along through to, from, towards, away from clockwise, anticlockwise, compass point north, south, east, west, N, S, E, W north-east, north-west, south-east, south-west, NE, NW, SE, SW horizontal, vertical, diagonal, translate, translation **coordinate,** movement, slide roll, turn ,stretch, bend ,whole

				turn, half turn, quarter turn, three-quarter turn, rotate, rotation angle, is a greater/smaller angle than, degree , angle, acute angle, obtuse angle, **reflex** reflection straight line, ruler, set square angle measurer, **protractor,**
Year 6	shape, pattern flat, line, perimeter, area, covers, square centimetre (cm2) curved, straight ,round, hollow, solid sort, make, build, construct, draw, sketch, perimeter, centre, **radius, diameter circumference, concentric, arc** net, open, closed surface angle, right-angled, congruent **intersecting, intersection plane** base, square-based ,size ,bigger, larger, smaller symmetry, symmetrical, symmetrical pattern line symmetry reflect, reflection axis of symmetry, reflective symmetry pattern, repeating pattern, match regular, irregular	2-D, two-dimensional corner, side point, pointed rectangle (including square), rectangular, oblong rectilinear circle, circular triangle, triangular equilateral triangle, isosceles triangle, scalene triangle pentagon, pentagonal ,octagon, octagonal, quadrilateral, parallelogram, rhombus, trapezium, kite ,polygon right-angled, parallel, perpendicular x-axis, y-axis, quadrant **,radius, diameter circumference, concentric, arc**	3-D, three-dimensional face, edge, vertex, vertices cube, cuboid pyramid sphere, hemisphere, spherical cone cylinder, cylindrical prism, triangular prism tetrahedron, polyhedron octahedron **dodecahedron,** net, **open, closed**	position ,over, under, underneath, above, below top, bottom, side on, in outside, inside around in front, behind front, back beside, next to opposite apart between middle, edge centre corner direction journey, route left, right up, down higher, lower forwards, backwards, sideways across next to, close, near, far along through to, from, towards, away from clockwise, anticlockwise compass point north, south, east, west, N, S, E, W north-east, north-west, south-east, south-west, NE, NW, SE, SW horizontal, vertical, diagonal translate, translation coordinate movement slide roll turn stretch, bend whole turn,

				half turn, quarter turn, three-quarter turn rotate, rotation angle, is a greater/smaller angle than degree right angle acute angle obtuse angle reflex angle reflection straight line ruler, set square angle measurer, compass, protractor

Position and Direction	Mathematics	**Three and Four-Year-Olds** • Understand position through words alone – for example, "The bag is under the table," – with no pointing. • Describe a familiar route. • Discuss routes and locations, using words like 'in front of' and 'behind'.
	Understanding the World	**Reception** • Draw information from a simple map.

Patterns	Mathematics	Three and Four-Year-Olds • Talk about and identify the patterns around them. For example, stripes on clothes, designs on rugs and wallpaper. Use informal language like 'pointy', 'spotty', 'blobs', etc. • Extend and create ABAB patterns – stick, leaf, stick, leaf. • Notice and correct an error in a repeating pattern.
	Mathematics	Reception • Continue, copy and create repeating patterns.