

Unit 9: Properties of shapes

Recognising 2D and 3D shapes

→ pages 75–77

- Children should have coloured:
 - three triangles (1st, 2nd and 4th shapes)
 - three squares (in bottom row left, centre and right)
- There are 16 cuboids. This includes the 2 cubes, since cubes are special types of cuboids.
There is 1 pyramid.
There are 6 spheres.
- Sara will draw a circle.
Ibrahim will draw a triangle.
- Children should have matched children to pictures as follows:
 - 1st child → 2nd picture
 - 2nd child → 3rd picture
 - 3rd child → 1st picture
 - 4th child → 4th picture

Reflect

Children could have named different 2-D and 3-D shapes, e.g.

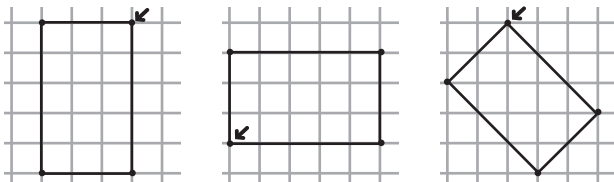
2-D shapes: square, rectangle, circle, triangle, semi-circle

3-D shapes: cube, cuboid, sphere, pyramid

Drawing 2D shapes

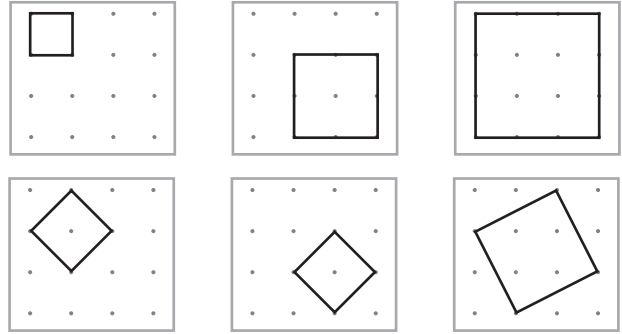
→ pages 78–80

- Children should have joined the dots to complete the following shapes:
 - Top row: triangle, triangle, square
 - Bottom row: square, triangle, rectangle
- Children should have positioned the missing dots as follows to complete the rectangles:



- Children should have drawn rough copies of the triangles. The first triangle should be right-angled. The second triangle should be roughly equilateral. The third triangle should be roughly isosceles.

- There are many possible squares that can be drawn on the grids, e.g.



Reflect

Children could have given different instructions, e.g.

First, draw a dot on the page and another dot 2 squares to the right of it.

Then, find the place exactly in the middle of them and draw a dot 2 squares above this.

Finally, join the dots to make the triangle.

Counting sides on 2D shapes

→ pages 81–83

- Children should have completed the table as follows:
 - triangle, 3
 - pentagon, 5
 - square, 4
 - rectangle, 4
 - hexagon, 6
- Children should have filled in answers as follows: 3, 4, E, C, A or B.
- Children should have completed the shapes and written in the number of sides as follows:
 - A, 5
 - B, 4
 - C, 3
 - D, 4
- 15
 - 25
 - Different answers are possible, e.g.
 - 3 squares which have a stick of the same length on each side
 - A triangle, a quadrilateral and a pentagon
 - Two triangles and a hexagon

Reflect

Children could have suggested different answers, e.g.

The second shape is the odd one out because the others all have 5 sides.

The first shape is the odd one out because it is symmetrical but the others are not.

Counting vertices on 2D shapes

→ pages 84–86

- Children should have matched the shapes (from left to right) as follows:
Top row: 3 vertices, 4 vertices, 4 vertices, 5 vertices
Bottom row: 4 vertices, 5 vertices, 3 vertices, 4 vertices
- Children should have completed the table from top to bottom as follows: 4, 3, 6, 6
- Pentagon, square/rectangle, rectangle/square, triangle, hexagon
- Children could have explained Toby's mistake in different ways, e.g.
A vertex is a point where two sides of a shape meet. This is true for 3 of the points which Toby's shape touches but not the fourth one, so this point is not a vertex.
Toby has drawn a triangle and triangles have 3 vertices.
- Children could have drawn any two quadrilaterals and then any two pentagons.

Reflect

Children might have written different similarities and differences, e.g.

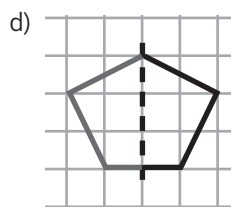
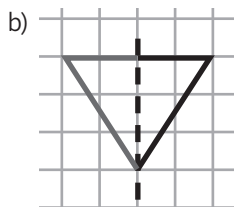
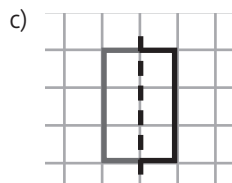
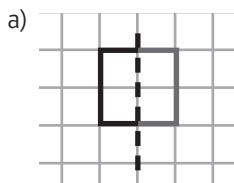
The same: A and B both have 6 sides. A and B both have 6 vertices. A and B are both hexagons.

Different: The sides of A are all the same length but this is not true for B. A is symmetrical but B is not symmetrical.

Finding lines of symmetry

→ pages 87–89

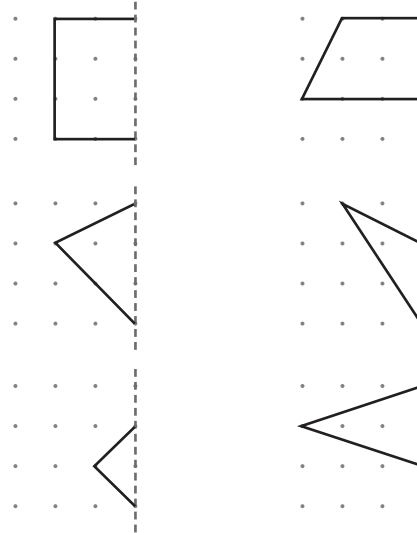
- Children should have drawn a vertical line down the middle of each shape.
- Children should have completed the shapes as follows:



- Children should have matched shapes as follows:
Top row 1st shape → bottom row 3rd shape
Top row 2nd shape → bottom row 4th shape
Top row 3rd shape → bottom row 2nd shape
Top row 4th shape → bottom row 1st shape

- Children should have ticked the 1st, 2nd and 5th shapes.

- Different answers are possible, e.g.



- There are many possible answers. Children should have drawn a shape with at least one line of symmetry.

Reflect

There are many different triangles and quadrilaterals children could have visualised and described which fit the criteria e.g. isosceles or equilateral triangles, kite, arrow-head, rhombus, square or other rectangle.

Some children might have included shapes with curved sides e.g. a circle or semi-circle.

Sorting 2D shapes

→ pages 90–92

- Children should have matched the shapes to the descriptions from left to right as follows:
Polygons, Not polygons, Polygons, Not polygons, Polygons, Not polygons
- Children should have ordered the shapes as follows: F, E, B, A, C, D
- Children could have labelled the groups in different ways but the most likely labels are: pentagons, polygons (or triangles and quadrilaterals) and shapes with a curved side.
- Different answers are possible, e.g.
Odd number of vertices: triangles, pentagons
Even number of vertices: quadrilaterals, hexagons, octagons



5. a) Different answers are possible. In the first group, children could have drawn any 2-D shape which is shaded with vertical stripes. In the second group, children could have drawn any quadrilateral (or polygon).
- b) Children should have drawn a pentagon which has a vertical line of symmetry.

Reflect

Children could have sorted the shapes into two equal groups using different criteria, e.g.

Polygons with an odd number of sides (triangle and two pentagons) and polygons with an even number of sides (square, hexagon and rectangle)

Polygons oriented so that they have a horizontal line of symmetry (square, hexagon and rectangle) and polygons oriented so that they do not have a horizontal line of symmetry (triangle and two pentagons).

Making patterns with 2D shapes

→ pages 93–95

1. Children should have drawn loops round the following number of objects to show the repeating pattern:
 - a) 3 (done for them)
 - b) 4
 - c) 4
 - d) 5
2. Children should have circled the following set of shapes:
 - a) 2nd set (square, triangle, triangle)
 - b) 2nd set (circle ... circle)
3. Children should have drawn the following shapes:
 Top pattern: shape 10 – circle, shape 20 – circle
 Middle pattern: shape 10 – rhombus, shape 20 – circle
 Bottom pattern: shape 10 – rhombus, shape 20 – rhombus
4. Children should have drawn the following four shapes:

Top sequence:



Bottom sequence:



5. Children should have drawn the following shapes into the grids:
 - a) Third row 2nd shape – small, shaded square (oriented so sides are at 45 degrees to horizontal)
Fourth row 1st shape – small, unshaded pentagon
Fourth row 4th shape – large, shaded pentagon
 - b) Second row 2nd shape – large, unshaded pentagon
Third row 4th shape – small, shaded square (oriented so sides are at 45 degrees to horizontal)
Fourth row 3rd shape – large, shaded triangle

Reflect

Children could have completed many different pattern questions, e.g.

Complete the pattern ○ □ ○ ◇ ○ ? ○ ◇ ○ □
using A: ○ B: □ C: ◇ D: □

Counting faces on 3D shapes

→ pages 96–98

1. Children should have drawn a sphere and completed the shape names and number of faces in the table as follows:
 cube, 6
 pyramid, 5
 cuboid, 6
 pyramid, 4
 sphere, 0
2. Children should have matched shapes to their faces as follows:
 cube → 2nd set of faces (6 squares)
 cuboid → 4th set of faces (2 squares and 4 non-square rectangles)
 square-based pyramid → 3rd set of faces (1 square and 4 triangles)
 tetrahedron (triangle-based pyramid) → 1st set of faces (4 triangles)
3. Children should have written the following letters:
 First child: A, A and A
 Second child: C, C and C
 Third child: A, C and D
4. Children should have filled in the missing words and numbers as follows:
 cylinder, 1
 sphere, 1
 hemisphere, cone
5. a) 30
 b) cylinder, as a cylinder has 2 circular faces (it also has one curved **surface**)

Reflect

Answers will depend on the children's choice of shape, e.g. a cube has 6 square faces.

Counting edges on 3D shapes

→ pages 99–101

- 8, 12, 6
- B, D, A, C
- cube, triangular prism, square-based pyramid
- 15, 18, 12, 9
- a) 30
b) 5

Reflect

Children could have described the difference between a face and an edge in different ways, e.g. The faces of a shape are flat surfaces. The edges of a shape are the lines where the faces meet.

Counting vertices on 3D shape

→ pages 102–104

- 4, 0, 5
- 6, 8, 10, 12
- Children should have matched the shape to the number of vertices as follows:
hemisphere, cylinder and cone → < 5 vertices
cube, cuboid and triangular prism → > 5 vertices
square-based pyramid → = 5 vertices
- Children should have circled the following shapes:
a) cube and triangular prism
b) cube, square-based pyramid and tetrahedron (triangle-based pyramid)
- Children should have completed the number of faces, edges and vertices as follows:

Faces = 5	Faces = 6	Faces = 7
Edges = 8	Edges = 10	Edges = 12
Vertices = 5	Vertices = 6	Vertices = 7

Reflect

Answers will vary depending on the shape children have chosen, e.g. My favourite shape is a triangular prism. It has 6 vertices.

Sorting 3D shapes

→ pages 105–107

- Children should have circled the following shapes:
Has a curved surface: square-based pyramid
Has more than one square face: tetrahedron (triangle-based pyramid)
Has fewer than five vertices: both shapes
- Children should have ticked the square-based pyramid.
- Children should have ticked the sphere.
- Children could have sorted the shapes in different ways, e.g.
Has a curved surface (sphere); Does not have a curved surface (all other shapes)
Has an odd number of vertices (square-based pyramid); Does not have an odd number of vertices (all other shape).
- Children should have written the shapes in order as follows:
Fewest to most edges: D, A, E, B and C
Fewest to most vertices: D, A, E, B, C

Reflect

Children could have sorted the shapes in different ways, e.g.

Has at least 1 triangular face (tetrahedron and triangular prism); Has no triangular faces (cube and cylinder)

Every face is the same shape (cube and tetrahedron);
Not every face is the same shape (cylinder and triangular prism)

Making patterns with 3D shapes

→ pages 108–110

- Missing shapes from left to right:
a) cylinder
b) cone
c) sphere, cube
- Answers will vary depending on the pattern children have made.
a) The cone should be numbered 4.
The numbers below identical shapes should total 8.
b) The cuboid should be numbered 4.
The numbers below the cubes should total 8.
Numbers below the square-based pyramids should consist of two pairs that total 8.
- a) and b) Answers will vary depending on the pattern children have made. One of the spheres should be labelled 4. The numbers below the other spheres should total 8.
- Answers will vary.

5. a) and b) The following answers are possible:

cube, tetrahedron (triangle-based pyramid), cube – 30 edges in pattern

cuboid, tetrahedron (triangle-based pyramid), cuboid – 30 edges in pattern

square-based pyramid, cube, square-based pyramid – 28 edges in pattern

square-based pyramid, cuboid, square-based pyramid – 28 edges in pattern

Reflect

Children could have explained the difference between a symmetrical and a repeating pattern in different ways, e.g. In a symmetrical pattern, the shapes have to be the same on each side around the middle of the pattern. In a repeating pattern, a group of shapes is repeated again and again.

End of unit check

→ pages 111–112

My journal

If children cut off one of the square's corners, they produce a pentagon and a triangle. Children could then cut off a corner from the triangle to create a smaller triangle, a quadrilateral and a pentagon.

Alternatively, children could cut the square from side to side to produce two quadrilaterals. By cutting a corner off from either quadrilateral, children will end up with a pentagon, a quadrilateral and a triangle.

Power puzzle

With 24 cubes, children could create a $1 \times 1 \times 24$ cuboid, a $1 \times 2 \times 12$ cuboid, a $1 \times 3 \times 8$ cuboid, a $1 \times 4 \times 6$ cuboid, a $2 \times 2 \times 6$ cuboid or a $2 \times 3 \times 4$ cuboid. In order to find all the possibilities, children need to understand that cuboids need to have six faces and that the faces can be square or oblong.

With 27 cubes, children can create a $1 \times 1 \times 27$ cuboid, a $1 \times 3 \times 9$ cuboid or a $3 \times 3 \times 3$ cuboid. To find all 3, children need to understand that a cube is a special type of cuboid.