ways can all be generalised to a formula. For example, students should fully understand how the formula for the area of a circle $A = \pi r^2$ is derived from other known facts.

Additionally, the concept of surface area will provide an ideal opportunity for students to make connections between two and three dimensions, and apply and consolidate their understanding of the area and properties of 3D shapes from Key Stage 2.

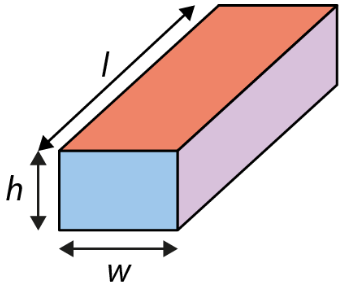
Key ideas

- Understand the derivation of, and use the formula for, the area of a circle*
- Solve area problems of composite shapes involving whole and/or part circles, including finding the radius or diameter given the area
- Understand the concept of surface area and find the surface area of 3D shapes in an efficient way*

Understand the concept of volume and use it in a range of problem-solving situations

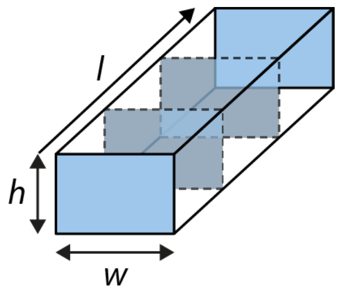
Students will be familiar with finding the volume of cubes and cuboids from Key Stage 2 and will have used the formula Volume = width × height × length (or similar) to calculate volumes. At Key Stage 3, these ideas are developed to include the volume of prisms more generally.

For example, when considering a cuboid, such as this:

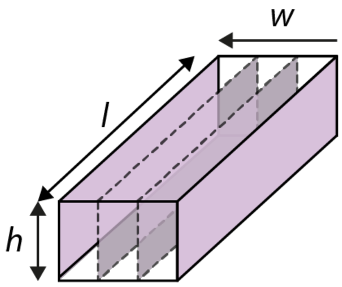


there are various ways of calculating the volume:

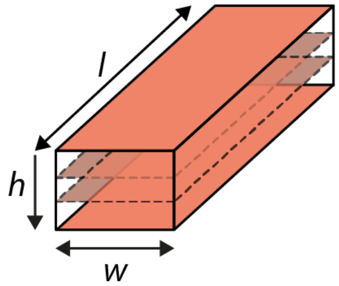
- Find the area of the blue face (h × w) and multiply by the length (l).



- Find the area of the purple face (h × l) and multiply by the width (w).



- Find the area of the red face (w × l) and multiply by the height (h).



Through this sort of analysis, students will realise that the volume of a cuboid is actually the area of one of the faces multiplied by the other dimension. This can then be generalised in Key Stage 3 to other prisms and to the formula Volume of a prism = area of cross-section × length.

Students will use and apply their knowledge of the area of 2D shapes to calculate the cross-sectional area of a variety of prisms.

Although a cylinder is not strictly a prism (a prism has a polygonal uniform cross-section), it is important for students to appreciate that it has the same structure as a prism (with the uniform cross-section being a circle) and its volume can be calculated in a similar way. Thereby, students will see the formula $v = \pi r^2 h$ as an example of a general geometrical property of cylinders that has meaning, and not just a collection of symbols to be memorised.

Key ideas

- Be aware that all prisms have two congruent polygonal parallel faces (bases) with parallelogram faces joining the corresponding vertices of the bases
- Use the constant cross-sectional area property of prisms and cylinders to determine their volume