Lesson plan
Surface area and volume

1. Lesson objectives

- To identify properties of common 3D shapes.
- Through exploration, calculate volume and surface area of common 3D shapes.
- Use knowledge of volume and surface area for problem solving questions.

2. GCSE curriculum

Geometry and measures
Properties and constructions
G12 identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids.
G17 know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes; surface area and volume of pyramids and composite solids.

3. Lesson plan

This is an overview of the lesson. More notes can be found in the notes in the lesson slides.

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Introduction	To assess prior knowledge and recap the properties of 3D shapes, including their cross sections and areas of these	15	Introduce the lesson through a poster activity. Share the worksheet with learners and distribute 3D shapes (or 3D models) to pairs. Learners complete the poster for their shape and then feed back key points to the class. While peers feed back, learners are to record properties of all shapes down on both sides of the worksheet.	Starter task worksheet (3D solid shapes or models) Slides 2–6
Introduce	To introduce the context	5	The context of an ice-cream factory is introduced along with the aim of reducing the costs in the factory, starting off by looking at different container sizes.	Slide 7
Activity	To discuss how different dimensions of cuboid with a constant volume result in different surface areas	10	The company are changing their packaging for 900 ml containers of ice-cream. What dimensions can they come up with? Discussion about using factors to determine shape dimensions. Learners roughly sketch three different cuboid containers.	Slide 8
Discuss	To discuss volume of prisms and cylinders	5	Learners think about how they calculate the volume of prisms and share with the class. Key ideas slide to reinforce this.	Slides 9 and 10

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Explore and feedback	Learners are to explore volume and surface area of different shapes and the effect that dimensions have on surface area	30	Tutor introduces the explorative task and develop the concept of surface area (if not previously addressed). Key ideas slide reinforces this. Tutor hands out the worksheet. Scaffolding has been provided in some cases. Learners see whether they come to any conclusions about the effect of dimensions on the surface area. Which shape is best for minimal chocolate? Possible discussion about other factors: ease of eating, melting, strength, name etc. Lower ability learners could just explore cuboids (not triangular prisms/cylinders).	Slides 11–15 Explore worksheet Explore answers
Exam Practice and review	To consolidate lesson objectives	20	Ask learners complete some of the exam questions that vary in difficulty. Refer to the initial table if required and for support. Review objectives.	Slides 16–20 Exam-style questions worksheet
Review	To recap key learning points and re-visit learning objectives	5	Tutor to draw from the learners the key learning points and misconceptions. Review learning objectives.	Slide 21