Modelling the Spitfire

Key Learning Content

This film shows a 1:72 scale model of the World War Two Spitfire plane, still so popular with children and modelling enthusiasts. The scale factor is explained in terms of lengths of the original and model. The length scale factor is then squared to give the area scale factor, and then cubed to give the volume scale factor.

Familiarity with area and volume calculations would be useful prior to watching the film.

Core Outcomes

Learning Points

- Be able to use ratio notation in the form $1:n$.
- Be able to understand that areas of similar figures are in the ratio of the square of corresponding sides.
- Be able to understand that volumes of similar figures are in the ratio of the cube of corresponding sides.
- Be able to calculate squares, square roots, cubes and cube roots.

Suggested Activities

- Work out the amount of paint needed to paint a cruise ship based on a scale model.
- Work out the displacement of a cruise ship based on a scale model.

Extension Outcomes

Learning Points

- Be able to carry out calculations using standard units of mass, length, area, volume and capacity.
- Be able to convert measurements within the metric system to include linear, area and volume units $cm^2 \rightarrow m^2$ and vice versa, $cm^3 \rightarrow$ litres and vice versa.

Suggested Activities

- Calculate the surface area of a space rocket in m^2 based on a scale model measured in mm.
- Calculate the volume of the earth in km^3 based on a scale model measured in cm.

Scale is used to represent the proportions of a given object.

Related Films

To use before the lesson plan:

Queen Hatshepsut's Ship	This film explains how a scale drawing was used to recreate a boat built thousands of years ago for Egypt's only female Pharaoh.

To use after the lesson plan:

Painting By Numbers	This film shows how mathematics is used to give drawings a sense of depth.
The Incredible Strength of Ants	This film looks at how their small size means large relative strength for ants.

Guide Lesson Plan

Introduction

Set students the following problem: two boys were collecting apples from a tree. One had a bag that was twice as big as the other. Both filled their bags with apples. If the boy with the small bag had 12 apples, how many did the other boy have? Give three different answers, justifying each.

Show Film

Modelling the Spitfire

Main Activity

Foundation

Recap on the relationship between length, area and volume scale factors then set length/area/volume scale problems, e.g. Suppose you had a scale model of the cruise liner Titanic built to a scale of 1:900. Your model required 10ml of paint; how much paint would be needed for the actual ship? If the weight of the actual ship was 45,000 tonnes and the steel it was made of weighed 20 times more per unit than the plastic in your model, how heavy is your model?

Advanced

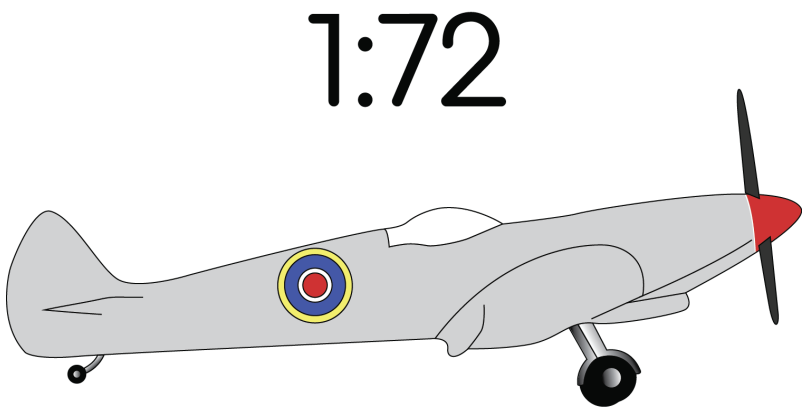
As above, but set questions involving conversion of units, e.g: You build a model of a space rocket to a scale of 1:1500. The secondary fuel tank of your model is a cylinder of radius 4cm and height 12cm; how many litres of fuel are carried in the actual rocket's secondary fuel tank? If you have a globe constructed to a scale of 1:10,000,000, what would be its surface area in mm^2?

Extension Activity

Set more complex scale factor questions, e.g.: You want to build a model of a pyramid so that the model's surface area in mm^2 is exactly the same as its actual surface area in m^2; what is the scale of the model? What is the relationship between the model volume in mm^3 and its actual volume in m^3?

Optional Extra

You build an exact replica of your car to the scale 1:10. How much brighter are the car's headlights compared to the model's? How much louder is the horn? How much more petrol does it consume on a journey where the wheels turn 1000 times?



The Spitfire has a scale factor of 1:72.