# 4.8 Similarity ratios and mixed practice

Name: _____ Class: _____ Date: _____ **Total: 29 marks**

**KEY WORDS** scale factor • similar

## Similarity ratios and mixed practice

## Objective

Use length : area : volume ratios $k : k^2 : k^3$ in both directions, on similar figures and solids, with maps and models, alongside mixed geometry and trigonometry chains (objectives Foundation 4.11 and Higher 4.11 A–C).

## 1 Key knowledge and worked examples

**The ratio ladder.** Similar figures: corresponding lengths scale by $k$, areas by $k^2$, volumes by $k^3$. Read backwards: an area ratio $4 : 9$ gives a length ratio $2 : 3$; a volume ratio $64 : 1$ gives $4 : 1$ for lengths. June 2024 2HR Q24's similar cone-plus-hemisphere solids gave $k^3 = 125/8$, so $k = 2.5$.

## 2 Practice

**2.1** Two similar jugs have height ratio $2 : 5$. Write down their volume ratio. [2]

**2.2** Two similar photographs have areas 18 cm$^2$ and 50 cm$^2$. Find the ratio of their widths. [3]

**2.3** On a $1 : 25\,000$ map a road is 6 cm. Find the real length in km. [2]

**2.4** A model car is built at $1 : 48$. The real car is 4.2 m long. Find the model length in cm. [3]

**2.5** Similar cones have base radii 3 cm and 6 cm. The smaller has volume $12\pi$ cm$^3$. Find the larger's volume. [3]

## 3 Exam-style questions

**3.1** *(Edexcel 4MA1 2HR June 2024 Q24 family, adapted.)* Solid $B$ is similar to solid $A$, with every length of $B$ equal to $k$ times the corresponding length of $A$. The volumes satisfy $V_B = \frac{125}{8}V_A$. (a) Find $k$. (b) A third solid $C$ has every length 4 times solid $A$'s. Write down $V_C : V_A$. [4]

**3.2** *(Original.)* Two similar tins of soup have heights 8 cm and 12 cm. The larger tin holds 486 $cm^3$. (a) Find the volume of the smaller tin. (b) The larger tin's label wraps its curved surface, area 150 $cm^2$. Find the label area of the smaller tin. [6]

**3.3** *(Original, mixed transfer.)* A rectangular paddock measures 40 m by 25 m on a plan drawn at $1 : 1000$. (a) Find the plan's dimensions in cm. (b) A scale model of a prize cow is $1 : 20$; the real cow has volume-equivalent body mass 640 kg and the model uses material of the same density. Find the model's mass in grams. [6]