A4 *Ratio and Proportion* Introduction

Learning objectives

The work in this unit deals with the important topic of *ratio* (or *proportion*) and its application to map scales and proportional division of quantities. After completing Unit A4 you should be able to

- find and simplify ratios
- apply ratios to problems in context
- find and use map scales
- divide quantities into given ratios (or proportions).

Introduction

This is the fourth and final unit in Strand A, **Computation**. It brings together the concepts from the earlier units of this strand and culminates in the application of ratio to map scales.

Map scales can vary greatly but it was agreed at an international conference in Paris in 1913 that countries should be encouraged to use the scale

$$1 : 1\,000\,000$$

for their country maps. For further information, see website

http://geography.about.com/od/historyofgeograhy/a/millionthmap.htm?p=1

This means that

$$1 \text{ cm on map} \equiv 1\,000\,000 \text{ cm in reality}$$

$$\equiv 10\,000 \text{ m in reality}$$

that is,

$$\boxed{1 \text{ cm on map} \equiv 10 \text{ km distance}}$$

This can be changed to 'inches' and 'miles' so that the scale becomes approximately

$$\boxed{1 \text{ inch on map} \approx 15.8 \text{ miles distance}}$$

Of course, maps showing more detailed information need a different scale; the UK Ordnance Survey Explorer maps use a scale of 1 : 25 000; a town street map might use 1 : 10 000.

Large scale maps (for example, 1 : 1250, which show individual buildings on a small area of land) might be used by architects whereas a *small scale* map (for example, 1 : 25 000, covering large areas of land) would be useful when travelling by car or walking.

Key points and principles

- The ratio $m : n$ is equivalent to $1 : \frac{n}{m}$ or $\frac{m}{n} : 1$

A4 *Ratio and Proportion* Introduction

- To divide a quantity in the ratio $m : n$, you need to calculate the fractions $\frac{m}{n+m}$ and $\frac{n}{n+m}$ of the quantity.
- As a map scale *increases,* the map length representing the distance between two points *decreases*; that is, the larger the number in the scale, the smaller the scale of the map will be.

Facts to remember

- The ratios $m : n$, $1 : \frac{n}{m}$, $\frac{m}{n} : 1$, etc. are all equivalent.
- A map scale, say of 1 : 50 000, means 1 cm on the map represents the actual distance 50 000 cm (= 500 m = $\frac{1}{2}$ km).

Glossary of terms

Equivalent ratios $m : n$ is equivalent to $1 : \frac{m}{n}$ or $\frac{m}{n} : 1$

For example, $5 : 2$ is equivalent to $1 : \frac{2}{5}$ or $\frac{5}{2} : 1$

Dividing a quantity in the ratio $m : n$ means dividing the quantity into two parts, that is, the fractions

$\frac{m}{(m+n)}$ and $\frac{n}{(m+n)}$ of the quantity.

For example, Divide £40 in the ratio 3 : 2.

The two parts are

$\frac{3}{5} \times £40 = £24$

and $\frac{2}{5} \times £40 = £16$

Map scale A map scale of $1 : n$ means that 1 cm on the map represents an actual distance of n cm.

For example, What distance does 2 cm represent on a map with scale 1 : 50 000 ?

2 cm on the map represents a distance of

$2 \times 50\,000$ cm

$= 100\,000$ cm $=$ 100 m $=$ 1 km