PROPORTIONAL REASONING...
Ratio and Scale

What do I need to be able to do?

By the end of this unit you should be able to:
- Simplify any given ratio
- Share an amount in a given ratio
- Solve ratio problems given a part

Solutions should be modelled, explained and solved.

Keywords

Ratio: a statement of how two numbers compare

Equal Parts: all parts in the same proportion, or a whole shared equally
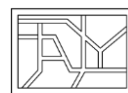
Proportion: a statement that links two ratios

Order: to place a number in a determined sequence

Part: a section of a whole

Equivalent: of equal value

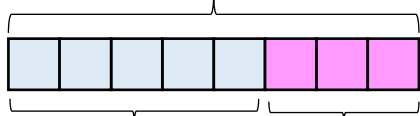**Factors:** integers that multiply together to get the original value

Scale: the comparison of something drawn to its actual size.

Representing a ratio

"For every 5 boys there are 3 girls"
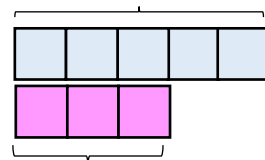
This is the "whole" — boys and girls together

$5:3$

This represents the 5 boys   This represents the 3 girls

Double Number Line

This represents the 5 boys

This is the "whole" — boys and girls together

This represents the 3 girls

Order is Important

"For every dog there are 2 cats"

Dogs : Cats

$1:2$

The ratio has to be written in the same order as the information is given.

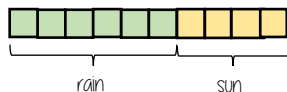e.g. 2:1 would represent 2 dogs for every 1 cat. ✗

Simplifying a ratio

Cancel down the ratio to its lowest form

"For every 6 days of rain there are 4 days of sun"

$6:4$

÷ by 2 ↓

rain   sun

$3:2$

Find the biggest common factor that goes into all parts of the ratio

For 6 and 4 the biggest factor (number that multiplies into them is **2**)

"For every 3 days of rain there are 2 days of sun" — when this happens twice the ratio becomes 6:4

Ratio 1:n (or n:1)

This is asking you to cancel down until the part indicated represents 1.

Show the ratio 4:20 in the ratio of 1:n

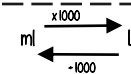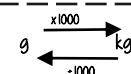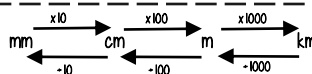The question states that **this part has to be** 1 unit. Therefore **Divide by 4**

$4:20$
$1:5$

This side has to be divided by 4 too — to keep in **proportion**

N.B. the n part does not have to be an integer for this type of question

Units are important:

When using a ratio — all parts should be in the same units

Useful Conversions

mm ⟷ cm ⟷ m ⟷ km   (×10 / ÷10, ×100 / ÷100, ×1000 / ÷1000)

g ⟷ kg   (×1000 / ÷1000)
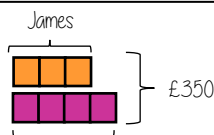
ml ⟷ L   (×1000 / ÷1000)

Sharing a whole into a given ratio

James and Lucy share £350 in the ratio 3:4. Work out how much each person earns

Model the Question

James : Lucy

$3:4$

James   Lucy   £350

Find the value of one part

Whole: £350
7 parts to share between (3 James, 4 Lucy)

£350 ÷ 7 = £50

☐ = one part = £50

Put back into the question

James : Lucy

×50 $3:4$ ×50

£150 : £200

£350

James = 3 × £50 = £150
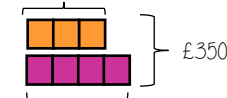
Lucy = 4 × £50 = £200
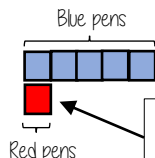
Finding a value given 1:n (or n:1)

Inside a box are blue and red pens in the ratio 5:1. If there are 10 red pens how many blue pens are there?
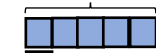
Model the Question

Blue : Red

$5:1$

☐ = one part = 10 pens

Blue pens

Red pens

One unit = 10 pens

Put back into the question

Blue : Red

×10 $5:1$ ×10

$50:10$

Blue pens = 5 × 10 = 50 pens

Red pens = 1 × 10 = 10 pens

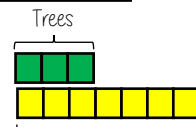There are 50 Blue Pens

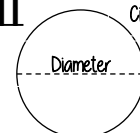## Ratio as a fraction

Trees : Flowers

$3:7$

Trees

Flowers

Ratio

There are **3** parts for trees

$$\frac{\text{Number of parts of in group}}{\text{Total number of parts}}$$

Fraction of trees

$\frac{3}{10}$

Fraction

Tree parts **3** + Flower parts **7** = **10**

Pi Π

Circumference

Diameter

The ratio of a circles circumference to its diameter