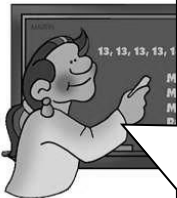# Ratio and Proportion

I can show how quantities that are related can be increased or decreased proportionally and apply this to solve problems in everyday contexts.   MNU 3-08a
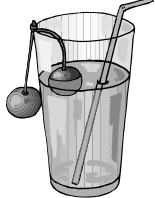
Ratio 1

When quantities are to be mixed together, the ratio, or proportion of each quantity is often given. The ratio can be used to calculate the amount of each quantity, or to share a total into parts.

Writing Ratios

Example 1

To make a fruit drink:
4 parts water is mixed with 1 part of cordial.
The ratio of water to cordial is 4:1
(said "4 to 1")
The ratio of cordial to water is 1:4.

Example 2

Order is important when writing ratios.

In a bag of balloons, there are 5 red, 7 blue and 8 green balloons.
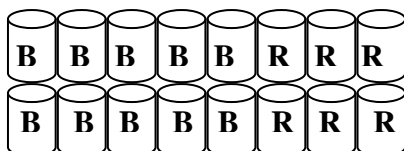The ratio of red : blue : green is   5 : 7 : 8

Simplifying Ratios

Ratios can be simplified in much the same way as fractions.

Example 1

Purple paint can be made by mixing 10 tins of blue paint with 6 tins of red. The ratio of blue to red can be written as 10 : 6

It can also be written as 5 : 3, each containing 5 tins of blue and 3 tins of red.

Blue : Red = 10 : 6
Blue : Red = 5 : 3

To simplify a ratio, divide each figure in the ratio by the **highest** common factor.

Ratio 2

Simplifying Ratios (continued)

Example 2
Simplify each ratio:
(a) 4:6   (b) 24:36   (c) 6:3:12

(a) 4:6   (b) 24:36   (c) 6:3:12
  = 2:3   = 2:3   = 2:1:4

Divide each figure by 2	Divide each figure by 12	Divide each figure by 3

Example

Concrete is made by mixing 20 kg of sand with 4 kg cement. Write the ratio of sand : cement in its simplest form

    Sand : Cement = 20 : 4
                  = 5 : 1

Using ratios

The ratio of fruit to nuts in a chocolate bar is 3 : 2. If a bar contains 15g of fruit, what weight of nuts will it contain?

Fruit	Nuts
3	2
x5	x5
15	**10**

So the chocolate bar will contain 10g of nuts.

Ratio 3

Sharing in a given ratio

Example

Lauren and Sean earn money by washing cars. By the end of the day they have made £90. As Lauren did more of the work, they decide to share the profits in the ratio 3:2. How much money did each receive?

Step 1   Add up the numbers to find the total number of parts

$$3 + 2 = 5$$

Step 2   Divide the total by this number to find the value of each part

$$90 \div 5 = 18$$

Step 3   Multiply each figure by the value of each part
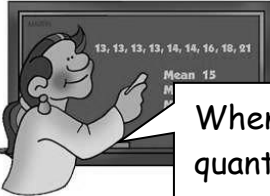
$$3 \times 18 = 54$$
$$2 \times 18 = 36$$

Step 4   Check that the total is correct

$$54 + 36 = 90 \checkmark$$

Lauren received £54 and Sean received £36

Proportion

When two quantities change in the same ratio, the quantities are said to be **directly proportional**.

It is often useful to make a table when solving problems involving proportion.

Example 1

A car factory produces 1500 cars in 30 days. How many cars would they produce in 90 days?

Days	Cars
30	1500
90	**4500**

×3 (Days) ×3 (Cars)

The factory would produce 4500 cars in 90 days.

Example 2

5 adult tickets for the cinema cost £27·50. How much would 8 tickets cost?

Find the cost of 1 ticket

Tickets	Cost
5	27·50
1	5·50
8	44·00

Working:

```
      5·50           5·50
5 ) 27·50           ×  8
                    44·00
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The cost of 8 tickets is £44