

After studying this chapter you will be able to understand,

- ✱ the concept of ratio.
- ✱ how to divide a given amount according to a given ratio.
- ✱ how to apply ratio to make day -to -day work easy.

Let us revise what you learned about ratio and rates in Grade 6.

A ratio is a comparison of two or more quantities given in the same units.

### When writing a ratio,

- ✱ The units of the relevant quantities should be the same.
- ✱ units are not written.
- ✱ it is written in the simplest form.



### Example 1

Let us find the ratio of 75cm and 1 m.

That is,

$$\begin{array}{rcl}
 75 \text{ cm} & \text{and} & 1 \text{ m} \\
 75 \text{ cm} & \text{and} & 100 \text{ cm (writing in the same unit)} \\
 75 & : & 100 \\
 \hline \hline
 3 & : & 4
 \end{array}
 \quad \text{(Simplest form)}$$

A relation that compares quantities measured in different units is known as a rate.

**Examples:**

- ✱ 200 metres in 10 seconds.
- ✱ 280 runs in 40 overs.

**Rate**

- ★ is a relation between two quantities in different units.
- ★ The second quantity is always given as one unit.



**Examples:**




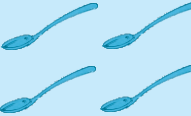
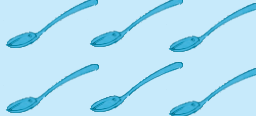

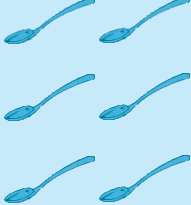
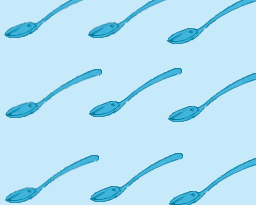

- ✱ 20 m in 1 second
- ✱ 7 runs in 1 over

**Exercise 18.1**

- (1) Write each of the following as a ratio and give it in the simplest form.
  - (i) 50 cm and 20 cm
  - (ii) 750 m and 2 km
  - (iii) 250 g and 1 kg
  - (iv) 350 ml and 1 l
  - (v) 45 seconds and 1 minute
  - (vi) 45 minutes and 2 hours
- (2) There are 20 boys and 24 girls in a class. Find the ratio of the number of boys to girls.
- (3) "The speed of a vehicle is 40 kilometres per hour". Is this a ratio or a rate?

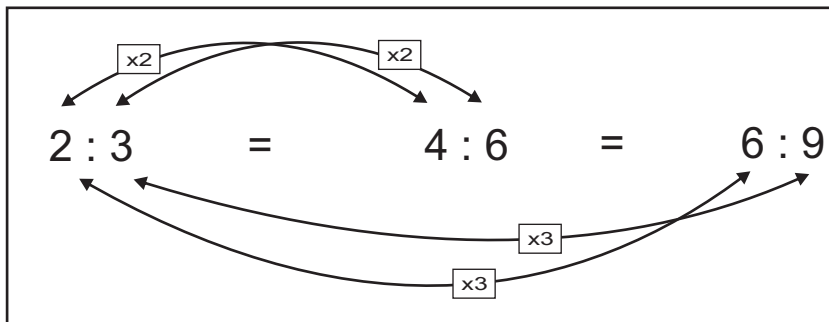
## 18.1 Equivalent ratio

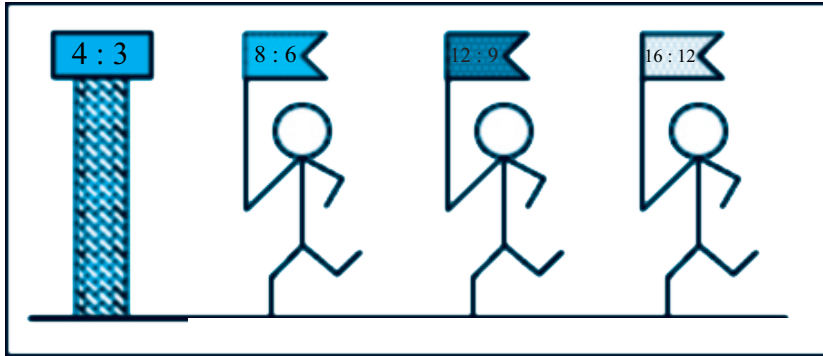
2 spoons of sugar and 3 spoons of milk powder are mixed to prepare a cup of tea. Study the following table.

Spoons of Sugar	Spoons of milk powder	Cups of Tea	Ratio of sugar to milk powder
			2 : 3
			4 : 6
			6 : 9

- ★ What can you say about the taste of the cups of tea in the above three occasions?
- ★ You will realize that the taste of the cups of tea prepared on the three occasions above is the same. According to this, all the three ratio above should be equal.

★ Ratio which are equal to one another are called equivalent ratio.





Do you notice that the ratio written on the flags are equivalent ratio?  
How do we find an equivalent ratio?



By multiplying or dividing the terms of a ratio by the same number, equivalent ratio can be obtained.

### Exercise 18.2

- (1) Connect the equivalent ratios.
 

(a)	7 : 3	18 : 15
(b)	18 : 12	6 : 9
(c)	6 : 5	21 : 9
(d)	4 : 7	3 : 2
(e)	24 : 36	20 : 35
  
- (2) Write three ratio equivalent to 3:5.
  
- (3) The ratio of the ages of a father and a son is 7:2. If the age of the father is 35 years, find the age of the son.
  
- (4) The ratio of the weight of two parcels is 3 : 2. If the weight of the heavier parcel is 6 kg, what is the weight of the lighter parcel?

(5) In each of the following groups there is one ratio which is not equivalent. Use your knowledge to find it.

(a)  $2:5$  ,  $8:20$  ,  $6:15$  ,  $10:35$

(b)  $24:30$  ,  $5:4$  ,  $12:15$  ,  $4:5$

(c)  $5:3$  ,  $30:18$  ,  $10:6$  ,  $12:20$

(6) In a class the ratio of the number of girls to the number of boys is  $5:7$ . If there are 28 boys, how many girls are there in the class?

### 18.2 Division according to a ratio (when there are two terms)

During various activities in day-to-day life, we face situations where we have to divide material or money according to a ratio.

Such a situation is given below.

Mahesh and Mohomad are two friends. They started a yoghurt business by investing Rs. 7500 and Rs. 10 000 respectively. They decided to divide the net income they got at the end of a month in the ratio of the money they invested.



Let us now find the ratio of the money they invested.

Mahesh      Mohomad  
7500      :      10000

When the ratio is written in the simplest form it is 3 : 4.

Accordingly, the profit should be divided in the ratio 3 : 4.

The method of calculating the amount of money each is getting according to that ratio is given below.

### Example 2

If the total income of the above business in January is Rs. 4 200, find the money that Mahesh and Mohomad recieved.

Profit	Mahesh	Mohomad
Rs. 7	As a fraction $\frac{3}{7}$	As a fraction $\frac{4}{7}$
Rs. 4200	Amount Rs. $4\ 200 \times \frac{3}{7}$ = Rs. 1 800	Amount Rs. $4\ 200 \times \frac{4}{7}$ = Rs. 2 400

For Mahesh to get 3 and Mohomad to get 4, total profit should be 7.

### Exercise 18.3

- For a concrete mixture, sand and cement are mixed in the ratio 4:1. The steps of finding the number of pans of cement and the number of pans of sand needed for 60 pans of the mixture are given on the next page. Write it in your exercise book and complete it.

The ratio of sand to cement in the mixture	= 4 : 1
The quantity of sand in 5 pans of the mixture as a fraction	= $\frac{4}{5}$
The quantity of sand in 60 pans of the mixture	= $\square \times \frac{4}{5}$
	= $\square$ pans
The quantity of cement needed to prepare 5 pans of the mixture as a fraction	= $\frac{1}{5}$
The quantity of cement needed for 60 pans of the mixture	= $\square \times \frac{1}{5}$
	= $\square$ pans

(2) Papers in two colours are used to print a book. The book is printed with 216 pages using pink and white papers in the ratio 5:4. The way that a student counted the number of pages in each colour is as shown below. Copy it into your exercise book and complete it.

Total number of pages	= 5 + 4 = $\square$
The number of pink colour pages as a fraction	= $\frac{5}{\square}$
Number of pink colour pages	= $\square \times \frac{5}{\square}$
The number of white pages as a fraction	= $\frac{\square}{\square}$
Number of white pages	= $\square \times \frac{\square}{\square}$

(3) Find separately the amount of money each gets when Rs. 600 is divided between Malitha and Kumuditha in the ratio 2:3.

- (4) A housewife prepared drinks from orange juice, by mixing orange juice and water in the ratio 1 : 4. If 2 litres of drinks were prepared, how many millilitres of orange juice were used?
- (5) There are elders and children in an orphanage in the ratio 5 : 4. If the total number in it is 72, find the number of children and the number of elders in the orphanage.
- (6) A necklace has been made using lead and gold in the ratio 1 : 11. Find the weight of lead in a necklace of weight 60 grammes.
- (7) If a father divides his land of  $2\,400\text{m}^2$  between the son and the daughter in the ratio 5 : 3, how many square metres will the daughter get?
- (8) The number of students in two sections of a college are given below.
- | Section        | Number of students |
|----------------|--------------------|
| Grades 6 - 11  | 450                |
| Grades 12 - 13 | 150                |
- The college received 280 new chairs, which were to be distributed between the two sections in the ratio of students in each section.
- (i) Write the ratio of the students of Grades 6- 11 and 12 - 13 in the simplest form.
- (ii) If the chairs were divided in the above ratio, find the number of chairs each section received.
- (9) The ratio of the length to the breadth of a rectangle is 7 : 5. If its perimeter is 48 cm, find its length and breadth.
- (10) A kind of hydrocarbon fuel is made up of hydrogen and carbon. If the ratio of the weight of carbon to hydrogen in it is 5 : 1, what is the weight of carbon in 900 grammes of fuel?

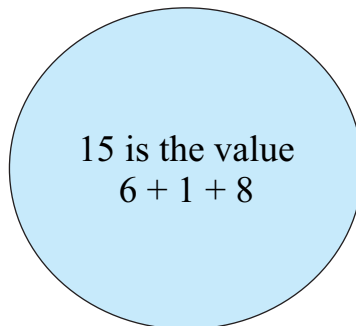


### 18.3 Division according to a ratio (when there are three terms)

#### Example 3

The ratio of the weights carbon to hydrogen to oxygen in a certain component of food is 6 : 1 : 8. Find separately how many grammes of each of the above are there in 720 g of that food component.

	Carbon		Hydrogen		Oxygen
	6	:	1	:	8
As a fraction of the whole quantity	$\frac{6}{15}$	:	$\frac{1}{15}$	:	$\frac{8}{15}$



$$\begin{aligned} \text{Quantity of Carbon in 720g of the} \\ \text{food component} &= 720 \times \frac{6}{15} \end{aligned}$$

$$= 288 \text{ g}$$

$$\begin{aligned} \text{Quantity of Hydrogen in 720 g of the} \\ \text{food component} &= \frac{1}{15} \times 720 \end{aligned}$$

$$= 48 \text{ g}$$

$$\begin{aligned} \text{Quantity of Oxygen in 720 g of the} \\ \text{food component} &= 720 \times \frac{8}{15} \end{aligned}$$

$$= 384 \text{ g}$$



- (6) The amount of money allocated for quality inputs for the three sections in the advanced level Science, Arts and Commerce classes of a school is Rs. 3600. The ratio of the number of students in the three sections is 5 : 4 : 3 . If money is allocated according to the ratio of the number of students,
- what is the amount of money allocated for the Science section?
  - how much more money did the Science section get than the commerce section?
- (7) The ‘Grama-niladari’ of a village received Rs. 4500 to be divided among three houses damaged by floods. The ratio of the members of the three families is 2 : 3 : 4. If the money was divided according to this ratio, find separately the amount of money each family got.
- (8) In a box of imported fruits, there are pears, apples and oranges in equal numbers. The value of it in Sri Lankan Rupees is Rs. 1840. The ratio of the price of a pear, an apple and an orange is 6 : 8 : 9.
- Find separately, the value of each type of fruit in the box.
  - If there were 50 of each kind, find the price of a pear, an apple and an orange separately.

### Summary

- ◆ A **ratio** is a numerical relationship between two or more quantities measured using the same unit.
- ◆ The numerical relationship between two or more quantities in different units is known as a **rate**.
- ◆ Ratio which are equal to one another are **equivalent ratio**.
- ◆ Equivalent ratio can be obtained by multiplying or dividing the terms of a ratio by the same number.
- ◆ A ratio can be written as a fraction.