<u>Ratio</u>

Proportion

Unitary Method



<u>Ratio</u>

Ratio

When two quantities of same unit are compared by division it is known as **Ratio**. Ratios are denoted using a symbol ':'

For example:

4: 7, 1: 6, 10: 3 etc. are examples of ratio. Any ratio a: b can also be written as 'a is to b' or a/b.

Example:

A town, whose total population is 100, has 60 males, 40 females, and 20 children. Find the ratio of

a) Number of males to number of females

b) Number of females to number of children

c) Number of males to total population of town

d) Number of males to number of children

e) Number of females to total population of town

f) Number of children to total population of town

Solution:

In the example given is:

Total Population = 100 Number of Males = 60 Number of Females = 40 Number of Children = 20

The Required Ratio are calculated as :-

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a) Number of males to number of females = Number of Males : Number of Females =
60 : 40
and its lowest term = 3 : 2
Hence ,ratio of number of males to number of females = 3 : 2
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b) Number of females to number of children = Number of Females : Number of Children = 40 : 20
and its lowest term = 2 : 1
Hence, ratio of number of females to number of children = 2 : 1
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c) Number of males to total population of town = Number of Males : Total Population of Town = 60 : 100 and its lowest term = 3 : 5
Hence, ratio of number of males to total population of town = 3 : 5

d) Number of males to number of children = Number of Males : Number of Children = 60 : 20
and its lowest term = 3 : 1
Hence, ratio of number of males to number of children = 3 : 1

e) Number of females to total population of town = Number of Females : Total Population of Town = 40 : 100 and its lowest term = 2 : 5
Hence, ratio of number of females to total population of town = 2 : 5

f) Number of children to total population of town = Number of Children : Total Population of Town = 20 : 100 and its lowest term = 1 : 5
Hence, ratio of number of children to total population of town = 1 : 5

In ratio, the two quantities can be compared only if they are in the same unit. Let us look some examples.

Example:

Length of a pencil is 18 cm and its diameter is 8 mm. What is the ratio of the diameter of the pencil to that of its length?

Solution:

Since the length and the diameter of the pencil are given in different units, we first need to convert them into same unit.

Thus, length of the pencil = 18 cm= $18 \times 10 \text{ mm}$ = 180 mm.

The ratio of the diameter of the pencil to that of the length of the pencil = 8/180 = 2/45 = 2 : 25

Example:

Cost of a toffee is 50 paise and cost of a chocolate is Rs 10. Find the ratio of the cost of a toffee to the cost of a chocolate.

Solution:



Since the cost of toffee and chocolate are given in different units, we first need to convert them into same units.

Thus, the cost of the chocolate = Rs 10 = 10×100 paise = 1000 paise.

The ratio of the cost of a toffee to the cost of a chocolate = 50/1000 = 1/20 = 1:20

Example:

Give two equivalent ratios of 6 : 4.

Solution:

Ratio 6 : 4 = 6/4 = (6 x 2)/ (4 x 2) = 12/8 Therefore, 12: 8 is an equivalent ratio of 6 : 4

Similarly, The ratio 6: 4 = 6/4 = (6 ÷ 2)/ (4 ÷ 2) = 3/2 = 3 : 2 So, 3:2 is another equivalent ratio of 6 : 4.

Therefore, we can get equivalent ratios by multiplying or dividing the numerator and denominator by the same number.

Example:

Divide Rs 120 in the ratio 2: 4 between Mohan and Karan.

Solution:

The two parts are 2 and 4.

Therefore, sum of the parts = 2 + 4 = 6.

This means if there are Rs 6, Mohan will get Re 2 and Karan will get Rs 4.

Or, we can say that Mohan gets 2 parts and Karan gets 4 parts out of every 6 parts.

Therefore, Mohan's share = $(2/6) \times 120 = \text{Rs } 40$

And Karan's share = (4/6) x 120 = Rs 80



Proportion

When two Ratios are equal, they are said to be in **Proportion**. When two Ratios are in Proportion we use the symbol **':: ' or ' = '** to denote them.

Example:

Check and discuss whether the following ratios are in proportion.

1) 2 : 5 and 5 : 7 2) 7 : 3 and 56 : 24 3) 12 : 22 and 15 : 27

Solution:

The proceeds are as:

(1) 2 : 5 and 5 : 7 Here, both the ratios are in lowest form and 2 : $5 \neq 5$: 7

So, we can say that the given Ratios are not in proportion.

(2) (2) 7:3 and 56:24
Here, First Ratio(7:3) is in Lowest From: but Second Ratio(56:24) needs to be converted into Lowest Form:
56:24 = 7:3 (Lowest Form)
Lowest Forms of both ratios are equal,

So, 7:3::56:24 (both are in proportion)

(3) 12: 22 and 15: 27
Firstly, convert the ratios into Lowest Form
12: 22 = 6: 11(Lowest Form)
15: 27 = 5: 9 (Lowest Form)
Lowest Forms of both ratios are not equal,

So, $12:22 \neq 15:27$ (both are not in proportion)

If two ratios are not equal, then we say that they are not in proportion. In a statement of proportion, the four quantities involved when taken in order are known as respective terms. First and fourth terms are known as **extreme terms**. Second and



third terms are known as middle terms.

Example:

Are the ratios 25g : 30g and 40 kg : 48 kg in proportion?

Solution:

25 g: 30 g = 25/30 = 5:6

40 kg : 48 kg = 40/48 = 5 : 6

So, 25 : 30 = 40 : 48.

Therefore, the ratios 25 g : 30 g and 40 kg : 48 kg are in proportion,

i.e. 25 : 30 :: 40 : 48

The middle terms in this are 30, 40 and the extreme terms are 25, 48.

Example:

Are 30, 40, 45 and 60 in proportion?

Solution:

Ratio of 30 to 40 = 30/40 = 3 : 4.

Ratio of 45 to 60 = 45/60 = 3 : 4.

Since, 30: 40 = 45: 60.

Therefore, 30, 40, 45, 60 are in proportion.

Example:

Do the ratios 15 cm to 2 m and 10 sec to 3 minutes form a proportion?

Solution:

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Ratio of 15 cm to 2 m = 15 : 2 \times 100 (1 m = 100 cm)
= 3 : 40
Ratio of 10 sec to 3 min = 10 : 3 \times 60 (1 min = 60 sec)
= 1 : 18
Since, 3 : 40 \neq 1 : 18, therefore, the given ratios do not form a proportion.
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Unitary Method

The method in which first we find the value of one unit and then the value of required number of units is known as **Unitary Method**.

Here are some examples:

Example:

5 buses carry 200 passengers. How many passengers can 20 buses carry?

Solution: The process is as:-

5 buses carry passengers = 200

1 bus carry passenger = $(200 \div 5)$

20 bus carry passenger = $(200 \div 5) \times 20 = 40 \times 20 = 800$.

Example:

If the cost of 8 cans of juice is Rs 240, then what will be the cost of 15 cans of juice?

Solution:

Cost of 8 cans of juice = Rs 240

Therefore, cost of one can of juice $=240 \div 8 = \text{Rs } 30$

Therefore, cost of 15 cans of juice = Rs 30×15 = Rs 450.

Thus, cost of 15 cans of juice is Rs 450.

