

Grade 6
Chapter 12
Ratio and Proportion

- ❖ In many situations in our daily life, we compare quantities of same type by taking the difference between them.

For example: If the age of Prateek and Sobhani are 20 years and 8 years respectively, then we can say that Prateek is $20 - 8 = 12$ years older than Sobhani or Sobhani is 12 years younger than Prateek.

- ❖ In many situations, a more meaningful comparison between quantities is made by using division i.e., by observing how many times one quantity is in relation to the other quantity. This comparison is known as ratio. We denote it by using the symbol ‘:’.

For example: In the above example, the ratio of Prateek’s age and Sobhani’s age is

$$\frac{20 \text{ years}}{8 \text{ years}} = \frac{20}{8} = \frac{5}{2} = 5:2$$

- ❖ A ratio may be treated as a fraction. For example, 3:11 can be treated as $\frac{3}{11}$.

- ❖ We can compare two quantities in terms of ratio, if these quantities are in the same unit. If they are not, then they should be expressed in the same unit before the ratio is taken.

For example: If we want to compare 70 paise and Rs 3 in terms of ratio, then we have to convert Rs 3 into paise.

$$\text{Rs } 3 = 300 \text{ paise}$$

$$\text{Hence, required ratio} = \frac{70}{300} = 7:30$$

- ❖ The same ratio may occur in different situations.

To understand this concept, let us consider the following situations.

- (a) Distances of Lata’s home and Ravi’s home from their school are 12 km and 21 km respectively. Therefore, the ratio of the distance of Lata’s home to the

$$\text{distance of Ravi’s home from their school is } \frac{12}{21} = \frac{4}{7} = 4:7$$

- (b) Neha has Rs 20 and Saroj has Rs 35. Therefore, the ratio of the amount of

$$\text{money that Neha has to that of Saroj is } \frac{20}{35} = \frac{4}{7} = 4:7$$

In this way, we can come across many situations where the ratio would be 4:7.

- ❖ The order of ratio cannot be changed.

For example, let us consider that the length and breadth of a rectangle are 80 m and 30 m respectively. The ratio of length to the breadth of rectangle is $\frac{80}{30} = 8:3$. This ratio cannot be written as 3:8. However, the ratio of breadth to the length of the rectangle is 3:8.

Therefore, the order in which quantities are taken to express their ratio is important.

- ❖ We can find equivalent ratios by multiplying or dividing the numerator and denominator by the same number.

Example: To find the equivalent ratios of 12:20, we proceed as follows.

$$12:20 = \frac{12}{20} = \frac{12 \div 2}{20 \div 2} = \frac{6}{10} = 6:10$$

$$12:20 = \frac{12}{20} = \frac{12 \div 4}{20 \div 4} = \frac{3}{5} = 3:5$$

$$12:20 = \frac{12 \times 2}{20 \times 2} = \frac{24}{40} = 24:40$$

$$12:20 = \frac{12 \times 3}{20 \times 3} = \frac{36}{60} = 36:60$$

Therefore, 6:10, 3:5, 24:40, 36:60 are the equivalent ratios of 12:20. In this way, we can find many equivalent ratios of 12:20.

- ❖ We can say that two ratios are equivalent, if the product of the numerator of the first ratio and the denominator of the other ratio is equal to the product of the denominator of first ratio and the numerator of the other ratio.

Example: To check the equivalence of the ratios, 14:49 and 6:21, we have to

check whether $\frac{14}{49}$ and $\frac{6}{21}$ are equivalent or not.

$$14 \times 21 = 294 = 6 \times 49$$

Therefore, $\frac{14}{49}$ and $\frac{6}{21}$ are equivalent fractions.

Hence, 14:49 and 6:21 are equivalent ratios.

- ❖ A ratio can be expressed in its lowest form. For this, we have to find the lowest form of the fraction corresponding to the given ratio.

For example,

The lowest form of 45:72 is given by,

$$45:72 = \frac{45}{72} = \frac{45 \div 9}{72 \div 9} \quad (\text{HCF of 45 and 72 is 9.})$$

$$= \frac{5}{8} = 5:8$$

$$\therefore 45:72 = 5:8$$

- ❖ Four quantities are said to be in proportion, if the ratio of first and second quantities is equal to the ratio of third and fourth quantities.

For example,

To check whether 8, 22, 12, and 33 are in proportion or not, we have to find the ratio of 8 to 22 and the ratio of 12 to 33.

$$8:22 = \frac{8}{22} = \frac{4}{11} = 4:11$$

$$12:33 = \frac{12}{33} = \frac{4}{11} = 4:11$$

Therefore, 8, 22, 12, and 33 are in proportion as 8:22 and 12:33 are equal.

- ❖ When four terms are in proportion, the first and fourth terms are known as extreme terms and the second and third terms are known as middle terms. In the above example, 8, 22, 12, and 33 were in proportion. Therefore, 8 and 33 are known as extreme terms while 22 and 12 are known as middle terms.

- ❖ If two ratios are equal, then we say that they are in proportion and use the symbol ‘::’ or ‘=’ to equate the two ratios.

For example: 8:36 and 14:63 are equal since $8:36 = \frac{8}{36} = \frac{2}{9}$ and $14:63 = \frac{14}{63} = \frac{2}{9}$

Since 8:36 and 14:63 are in proportion, we write it as 8:36 :: 14:63 or
8:36 = 14:63

- ❖ The method in which we first find the value of one unit and then the value of the required number of units is known as unitary method.

Example:

What is the cost of 9 bananas if the cost of a dozen bananas is Rs 20?

Solution:

1 dozen = 12 units

Cost of 12 bananas = Rs 20

$$\therefore \text{Cost of 1 banana} = \text{Rs } \frac{20}{12}$$

$$\therefore \text{Cost of 9 bananas} = \text{Rs } \frac{20}{12} \times 9 = \text{Rs } 15$$

This method is known as unitary method.