

B.Com 4th Semester (CBCS), 2024
Subject: Business Mathematics
Topic: Ratio & Proportion

Concept of Ratio:

Suppose in an examination marks of A & B in Mathematics paper is 80 & 40 respectively.

We can compare the marks of A & B in the following manner.

1. Marks of A is twice than B i.e $\frac{80}{40} = \frac{2}{1}$
2. Marks of B is half that of A i.e $\frac{40}{80} = \frac{1}{2}$

From above it is observed that the two quantities are compared in the form of divide i.e if we take these two quantities as 'a' and 'b' then we can write $\frac{a}{b}$. This is called the ratio between 'a' and 'b' and it is expressed by a: b .

Types of Ratio:

There are various types of ratio. They are-

1. Greater Ratio
2. Lesser Ratio
3. Inverse ratio
4. Compound ratio
5. Duplicate ratio
6. Sub- Duplicate ratio
7. Triplicate ratio etc.

Greater ratio:

If the antecedent part is greater than the consequent part, then that ratio is called Greater Ratio.

For example: $\frac{7}{3}$, here the antecedent > consequent.

Lesser ratio:

If the antecedent part is less than the consequent part, then that ratio is called lesser Ratio.

For example: $\frac{7}{11}$, here the antecedent < consequent.

Inverse ratio:

Two ratios are said to be inverse to one another if the antecedent and consequent of one ratio are respectively equal to the consequent and antecedent of another ratio.

For example : 5 : 7 is the inverse ratio of 7 : 5

Compound Ratio:

The ratio formed by multiplying the corresponding antecedents and consequents of two or more ratios are called their Compound Ratio.

For example: the compound ratio of 5 : 7 , 14 : 10 and 10 : 30 is $= \frac{5 \times 14 \times 10}{7 \times 10 \times 30} = \frac{1}{3}$

Duplicate Ratio:

Compound ratio of a : b and a : b is $a^2 : b^2$ which is called the Duplicate ratio of a : b.

Triplicate Ratio:

Compound ratio of a : b , a : b and a : b is $a^3 : b^3$ which is called the triplicate ratio of a : b.

Sub- Duplicate Ratio:

Square root of 'a' : Square root of 'b' is called sub-duplicate ratio of a : b.

Types of Proportion:

1. **Continued Proportion:** Three quantities a , b and c are said to be continued proportion

if ratio of the first to the 2nd is equal to ratio of the second to the third i.e $\frac{a}{b} = \frac{b}{c}$

2. If a, b, c and d are in proportion then we can write $\frac{a}{b} = \frac{c}{d}$

Some solved examples:

Question: Can you determine the ratio of the following quantities? Give reasons.

i. Rs. 20 and 50 metre.

ii. 5 metre and 25 cm

iii. Rs. 3 and 500 paise

iv. 6 kg and 12 meter

Solutions:

i. Cannot form ratio because Rs. And metre are different units.

ii. 5 metre = 5 X 100 cm and 25 cm can be formed ratio because they are same units.

iii. Rs. 3 = 300 paise and 500 paise can be formed ratio because they are same units.

iv. 6 kg and 12 metre cannot be formed ratio because they are different units.

Question: Find the compound ratio of the following-

i. 4 : 11, 5 : 18, 33 : 20

ii. 7 : 16 and duplicate ratio of 3 : 5

Solutions:

i. Compound Ratio = $\frac{4 \times 5 \times 33}{11 \times 18 \times 20} = \frac{1}{6}$

ii. Compound Ratio = $\frac{7 \times 9}{16 \times 25} = \frac{63}{400}$

Question: Which one is greater ratio?

i. 9 : 11 and 7 : 13

ii. 17 : 27 and 21 : 31

Solutions:

$$\text{i. } \frac{9}{11} = \frac{9 \times 13}{11 \times 13} = \frac{117}{143}$$

$$\frac{7}{13} = \frac{7 \times 11}{13 \times 11} = \frac{77}{143}$$

From the above two it is clear that $\frac{9}{11} > \frac{7}{13}$

$$\text{ii. } \frac{17}{27} = \frac{17 \times 31}{27 \times 31} = \frac{527}{837}$$

$$\text{iii. } \frac{21}{31} = \frac{21 \times 27}{31 \times 27} = \frac{567}{837}$$

From the above two it is clear that $\frac{21}{31} > \frac{17}{27}$

Question: Find the mean Proportion of 64 and 121

Solutions: Let the mean proportion be x

Therefore, 64, x, 121 are in proportion

$$\text{Therefore, } \frac{64}{x} = \frac{x}{121}$$

$$\text{i.e } x^2 = 64 \times 121$$

$$\text{i.e } x = 8 \times 11$$

$$\text{i.e } x = 88$$

Required mean proportion is 88.

Question: Find the fourth proportion of 8m, 18m and Rs. 15

Solution: Let the fourth proportion be x

Therefore, 8m, 18m, Rs. 15 and Rs. X are in proportion.

$$\text{i.e } \frac{8}{18} = \frac{15}{x}$$

$$\text{i.e } 8x = 15 \times 18$$

$$x = \frac{15 \times 18}{8} = 33.75$$

Therefore, the fourth proportion will be Rs. 33.75 //