

Ratio and Proportion



Ratio: A ratio is a way to compare two quantities of the same kind by division. It shows how many times one quantity is contained in another.

$$\text{Ratio} = \frac{\text{First Quantity}}{\text{Second Quantity}}$$

It is written using the symbol: and read as 'to'

Example: If there are 8 boys and 12 girls in a class, then the ratio of boys to girls

$$\text{is: } \frac{8}{12} = \frac{2}{3}$$

Properties of Ratio

1. Same Units: Ratios can only be formed between quantities that have the same unit and if the units are different, convert them to the same unit first.

Example: 5 m: 200 cm $\rightarrow$ Convert 5 m to cm = 500 cm. So, ratio = 500:200 = 5:2

2. No Units in Ratio: A ratio is a pure number. Once both quantities are in the same unit, the unit is not written in the final ratio.

3. Simplest Form: Ratios should always be written in simplest (lowest) terms.

$$\text{Example: } 15:25 = \frac{15}{25} = \frac{3}{5} \Rightarrow 3:5$$

4. Multiplying or Dividing Both Terms by the Same Number Doesn't Change the Ratio:

If $a : b$ is a ratio, then: $ka : kb = a : b$ (for any non-zero number k)

$$\text{Example: } 2 : 3 = 4 : 6 = 6 : 9$$

5. Order of Terms Matters: $a : b \neq b : a$ unless $a = b$

$$\text{Example: } 2:3 \neq 3:2$$

6. Ratios Can Be Compared (Equivalent Ratios): Just like equivalent fractions, you can compare two ratios by cross-multiplying.

Example: Is 2:3 equal to 4 : 6?

$$2 \times 6 = 12, 3 \times 4 = 12 \rightarrow \text{Yes, they are equal.}$$

Proportion: Proportion is a statement that two ratios or fractions are equal.

Example: If $2 : 3 = 4 : 6$, then 2, 3, 4, and 6 are in proportion.

Types of Proportion

1. Direct Proportion: When one quantity increases, the other also increases (or both decrease).

Example: If 2 pens cost ₹10, 4 pens cost ₹20.

2. Inverse Proportion: When one quantity increases, the other decreases.

Example: If 4 workers take 6 days, 8 workers take 3 days.

Practice Questions

1. The ratio of apples to oranges in a basket is 3:5. If there are 25 oranges, how many apples are there?

Sol: If ratio of apples to oranges in a basket is 3:5

Apple:Orange = 3:5 = x :25

$$\frac{3}{5} = \frac{x}{25}$$

$$3 \times 25 = 5 \times x$$

$$75 = 5 \times x$$

$$x = 15$$

2. Divide ₹1800 between A and B in the ratio 2:3.

Sol:

Step 1- Find the total number of parts

$$2 + 3 = 5 \text{ parts}$$

Step 2- Find the value of one part

$$1800 \div 5 = 360$$

Step 3- Calculate each share

$$\text{A's share} = 2 \times 360 = 720$$

$$\text{B's share} = 3 \times 360 = 1080$$