

Ratio and Proportion

Ratio: "Ratio is a relationship between two numbers of the same kind"

To express the ratio use symbol " : "

Ex: 1) The ratio of two weights of rama to that of krishna is 16 : 23 read of 16 is to 23

2) The ratio a to b is the fraction in a/b it is written as a:b

In a:b, a = antecedent b = consequent

Rule:

i) The ratio exists b/w Quantities of the same kind

ii) They express in the same units

iii) Ratio being a fraction has no units

iv) A Ratio doesn't alter if its first and second terms are multiplied (or) divided by the same non-zero number.

Ratio in simplest form:

" A ratio a:b is said to be in simplest form the HCF of a and b divide each of its terms a&b.

Ex: 14:16

$$\frac{14}{2} : \frac{16}{2} \quad \text{Simplest form } 7:8$$

Inverse Ratio:

"In a given ratio interchanging of the antecedent and consequent is known as inverse ratio"

Ex: i) The inverse ratio of a:b is b:a (also known as Reciprocal ratio)

$a = b \Rightarrow$ denotes Ratio of equality.

For the ratio $a:b \Rightarrow a^2:b^2$ is called "duplicate ratio"

For the ratio $a : b \Rightarrow \sqrt{a} : \sqrt{b}$ is called "sub-duplicate ratio"

For the ratio $a:b \Rightarrow a^3:b^3$ is called Triplicate ratio

For the ratio $a : b \Rightarrow \sqrt[3]{a} : \sqrt[3]{b}$ "sub-triplicate ratio"

Compounded ratio: Ratio's are compounded by multiplying the fraction which denote

Ex: a:b and c:d are two ratios

Its compounded ratio

$$\frac{a \times c}{b \times d} \Rightarrow ac : bd$$

Compound Ratio:

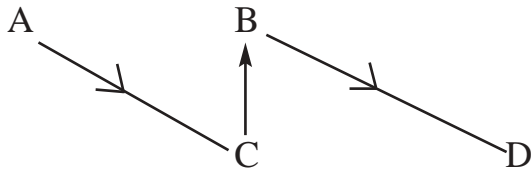
Theorem II:

The ratio of first and second quantity = A: B

The ratio of second and third quantity = C: D

The ratio of first, second & third quantity

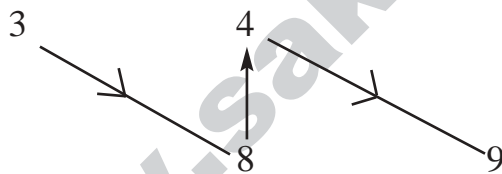
I Qty : II Qty : III Qty



$$I : II : III = (A \times B) : (B \times C) : (B \times D)$$

Ex: If A:B = 3 : 4 and B : C = 8 : 9 find A:B:C

A : B : C



$$A:B:C = 24 : 32 : 36 = 6 : 8 : 9$$

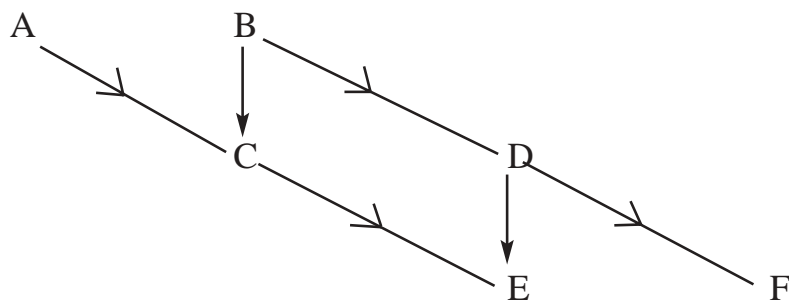
Theorem II:

The ratio of first and second quantity = A:B

The ratio of second and third quantity = C:D

The ratio of third and fourth quantity = E:F

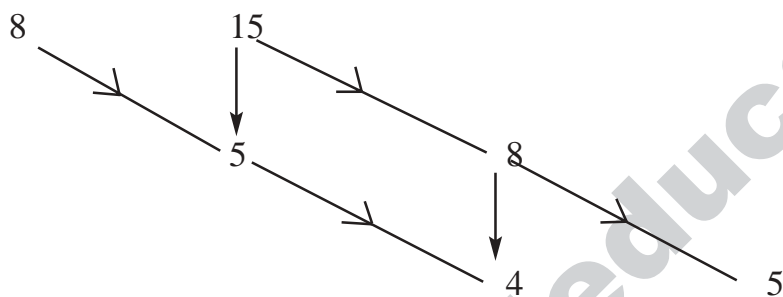
I Qty : II Qty : III Qty : IV Qty



$$I:II:III:IV = (ACE) : (BCE) : (BDE) : (BDF)$$

Ex: If $A:B = r : 15$, $B:C = 5:8$ and $C:D = 4:5$ then $A:B:C:D$?

A : B : C : D



$$\begin{aligned} A:B:C:D &= (8 \times 5 \times 4) : (15 \times 5 \times 4) : (15 \times 8 \times 4) : (15 \times 8 \times 5) \\ &= 160 : 300 : 480 : 600 \\ &= 8 : 15 : 24 : 30 \end{aligned}$$

Theorem III

"If two numbers are in the ratio of $a:b$ and their sum is " x " then these numbers will be"

$$\text{First number} = \frac{ax}{a+b}$$

$$\text{Second number} = \frac{bx}{a+b}$$

Theorem IV

If three numbers are in the ratio of $a:b:c$ and the sum of these numbers is ' x ' these numbers will be..

$$\left(\frac{ax}{a+b+c} \right) : \left(\frac{bx}{a+b+c} \right) : \left(\frac{cx}{a+b+c} \right) \text{ respectively}$$

Examples:

1) $a:b = 2:3$, $b:c = 4:5$ then $a:b:c = ?$

$$\begin{array}{cc} \begin{array}{ccc} a & b & \\ & | & \\ & b & c \end{array} & \begin{array}{ccc} 2 & 3 & \\ & | & \\ & 4 & 5 \end{array} \\ \hline ab:bb:bc & \hline 8 : 12 : 15 \end{array}$$

Ans: $a:b:c = 8:12:15$

2) $x:y = 3:5$, $y:z = 2:3$ then $x:y:z = ?$

sol: $\begin{array}{ccc} 3 & 5 & \\ & | & \\ & 2 & 3 \end{array}$

$6 : 10 : 15$

Ans: $6 : 10 : 15$

3) $a = \frac{2}{3}b$, $b = \frac{4}{5}c$, $a:b:c = ?$

sol: $a = \frac{2}{3}b, b \Rightarrow \frac{a}{b} = \frac{2}{3} \Rightarrow a:b = 2:3$

$b = \frac{4}{5}c \Rightarrow \frac{b}{c} = \frac{4}{5} \Rightarrow b:c = 4:5$

$$\begin{array}{ccc} 2 & 3 & \\ & | & \\ & 4 & 5 \end{array}$$

$8 : 12 : 15$

Ans: $a:b:c = 8:12:15$

4) $a = 2b$, $b = 3c$, then $a:b:c = ?$

$a = 2b \Rightarrow \frac{a}{b} = \frac{2}{1} \Rightarrow a:b = 2:1$

sol: $b = 3c \Rightarrow \frac{b}{c} = \frac{3}{1} \Rightarrow b:c = 3:1$

$$\begin{array}{ccc} 2 & 1 & \\ & | & \\ & 3 & 1 \end{array}$$

$6 : 3 : 1$

Ans. $a:b:c = 6 : 3 : 1$

5) If $2a = 3b$, $4b = 5c$, then $a:b:c$:

sol: $2a = 3b \Rightarrow \frac{a}{b} = \frac{3}{2} \Rightarrow a : b := 3 : 2$

$4b = 5c \Rightarrow \frac{b}{c} = \frac{5}{4} \Rightarrow b : c = 5 : 4$

$$\begin{array}{l} 3 : 2 \\ \quad \diagdown \quad \diagup \\ \quad \quad 5 : 4 \end{array}$$

$15 : 10 : 8$

Ans. $15 : 10 : 8$

6) $x = 3y = 5z$ then $x : y : z = ?$

sol: $x = 3y \Rightarrow \frac{x}{y} = \frac{3}{1} \Rightarrow x : y = 3 : 1$

$3y = 5z \Rightarrow \frac{y}{z} = \frac{5}{3} \Rightarrow y : z = 5 : 3$

$$\begin{array}{l} 3 : 1 \\ \quad \diagdown \quad \diagup \\ \quad \quad 5 : 3 \end{array}$$

$15 : 5 : 3$

Ans. $x : y : z = 15 : 5 : 3$

7) $\frac{a}{5} : \frac{b}{6} : \frac{c}{7}$ then $a : b : c =$

sol: $5 : 6 : 7$ (answer is same as denominators)