

* Mind map * → "Ratio and proportion."

Ratio

$a:b \rightarrow$ Consequent (Second term)
 Antecedent (first term)

Features of Ratio

Fraction

$$\frac{a}{b} \Rightarrow \frac{N^o}{D^o}$$

Same Kind

eg. height of both 'a' and 'b'

Same Unit

eg. Kg both 'A' and 'B'

Order

$$\begin{matrix} a:b \\ b:a \end{matrix}$$

Type of Ratio

Compound Ratio

$$\begin{matrix} a:b = c:d \\ ac = bd \end{matrix}$$

Inverse Ratio

$$a:b = b:a$$

Duplicate Ratio

$$a:b = a^2:b^2$$

Triplicate Ratio

$$a:b = a^3:b^3$$

Continued Ratio

$$\begin{matrix} a:b; b:c \\ a:b:c \end{matrix}$$

Sub duplicate Ratio

$$a:b \Rightarrow \sqrt{a}:\sqrt{b}$$

Sub Triplicate Ratio

$$a:b = \sqrt[3]{a}:\sqrt[3]{b}$$

Continued Ratio

$a:b, b:c$ then $a:b:c$

11 21 22

$a:b, b:c$ and $c:d$ then $a:b:c:d$

111 211 221 222

Type of Questions

eg = 495

4% 7:11

180:815:495

45

Based on
Type of Ratio

Relation Given
Ratio find Out
(GBC)

Ratio Given
Add Or Sub.
New Ratio

Other

Same power
Direct apply

Different
power proper
method

Given

Not Given

given ratio
K-Sath K

Add Or
Sub.

Comparison

Convert into
decimal

Not of
Colns Convert
into %

Proportion

 $a:b = c:d$

$$\frac{a}{b} \times \frac{c}{d}$$

$$\Rightarrow ad = bc$$

product of extremes =
product of means

Continued proportion

$$a:b = b:c$$

$$\frac{a}{b} \times \frac{b}{c} \Rightarrow b^2 = ac$$

Mean

properties of proportion

~~Invertendo~~~~Invertendo~~

Invertendo

Dividendo

Addendo

Subtrahendo

Alternendo

Componendo

Componendo and Dividendo

Variation

Direct

$$\frac{a}{b} = \frac{c}{d} \text{ and } ad = bc$$

Inverse

$$ab = cd$$

Mind-Map = "Indices"

Indices

laws of Indices

$$\rightarrow a^m \cdot a^n = a^{m+n}$$

$$\rightarrow \frac{a^m}{a^n} = a^{m-n}$$

$$\rightarrow (a^m)^n = a^{mn} = a^{nm} = (a^n)^m$$

$$\rightarrow (ab)^n = a^n \cdot b^n$$

$$\rightarrow \left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$\rightarrow a^0 = 1$$

$$\rightarrow a^x = a^y \text{ then } x = y$$

$$\rightarrow x^a = y^a \text{ then } x = y$$

laws of surds

$$\sqrt[n]{a} = a^{\frac{1}{n}}$$

$$\sqrt[n]{ab} = \sqrt[n]{a} \sqrt[n]{b}$$

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

$$(\sqrt[n]{a})^n = a$$

$$a^{-m} = \frac{1}{a^m}$$

$$a^x = b^{\frac{1}{x}}$$

$$a = b^{\frac{1}{x}}$$

Some basic Results

$$(a+b)^2 \Rightarrow a^2 + b^2 + 2ab$$

$$(a-b)^2 \Rightarrow a^2 + b^2 - 2ab$$

$$(a+b)^3 = a^3 + b^3 + 3ab(a+b)$$

$$(a-b)^3 = a^3 - b^3 - 3ab(a-b)$$

$$a^2 - b^2 = (a+b)(a-b)$$

$$(a^3 + b^3) = (a+b)(a^2 + b^2 + ab)$$

$$(a^3 + b^3 + c^3 - 3abc) = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

$$a + b + c = 0 \text{ if } a^3 + b^3 + c^3 = 3abc$$

Types of questions

Numerical = prime factor

Combine One by One

Variable = Combine One

by One

Numerical + Variable

Power given first Simplify power

= Sign given base Same power Same

$\sqrt{\quad}$ Hatane Ke liye, Squaring

$\sqrt[3]{\quad}$ Hatane Ke liye, Cubic

more than two variable equal

Ratio Given

power $\rightarrow$ multiply

Base ki power

Ke reciprocal

$$x + = as$$

$$\div - \text{ it is}$$

$$-1 \ 0$$

Relation Not given

Max. Relation Highest

value

max. prime factor

Karke

Formula Base

$$a = \omega^{1/3} + \omega^{-1/3}$$

$$a^3 - 3a = \frac{\omega^2 + 1}{\omega^2}$$

Conclusion

$$\begin{matrix} \ominus \ominus \ominus \\ - - - \end{matrix} = 1$$

$$\begin{matrix} \ominus \ominus \ominus \\ - + - + - \end{matrix} = 0$$

Square Root

$$\text{eg. } \sqrt[6]{5 + 2\sqrt{6}}$$

$$\sqrt{3 + \sqrt{2}}$$

Q. No. $\Downarrow$

$$a = \omega^{1/3} - \omega^{-1/3}$$

$$a^3 + 3a = \frac{\omega^2 - 1}{\omega^2}$$

★ Mind Map ★ = "logarithm"

logarithm

laws of logarithm

$$\rightarrow \log_a mn = \log_a m + \log_a n$$

$$\rightarrow \log_a \frac{m}{n} = \log_a m - \log_a n$$

$$\rightarrow \log_a m^n = n \log_a m$$

$$\rightarrow \log_a a = 1$$

$$\rightarrow \log_a 1 = 0$$

$$\rightarrow \log_a b = \frac{\log b}{\log a} = \frac{\log_c b}{\log_c a}$$

$$\rightarrow \log_a b = b$$

$$\rightarrow a \log b = b \log a$$

$$\log_a b = x$$

$$a^x = b$$

Type of Questions

Single log

Convert into exponential form

more than One log
With + or - Sign

Convert into Single

$$\log -$$

$$\log_m + \log_n = \log mn$$

$$\log_m - \log_n = \log \frac{m}{n}$$

Type of Question

Single log but No benefit to Convert into exponential

Eg panel

$$\begin{array}{cc} X & + \\ \div & - \end{array}$$

more than One log
Without + or - Sign

= given

Left Side
Convert into exponential

≠ given

Right Side of
prime ~~power~~ factor
power Age

Same base type

Different base

$$\log_a b^m = \frac{m}{n} \log_a b$$

Divide me log

$$\frac{1}{\log_a b} = \log_b a$$

more than One
log with = Signmultiply = 1
Add or Sub = 0

Circular

$$\log_a b \log_b c$$

$$\log_c a = 1$$

★ Calci tricks

$$\log_{10} m$$

$$m \sqrt{19 \text{ time}} \\ - 1 \times 227695 \\ =$$

$$\log_{257} 21952$$

$$2 \times 75 \times = = = \text{ntime}$$

$$\text{Anti log}_{10} m$$

$$m \div 227695 \\ + 1 = (x =) 19 \\ \text{times}$$