Topic: Ratio and Proportion

Introduction:

• Ratio and Proportion Method.

• The comparison of two numbers or quantities by division is known as the ratio. Symbol ':' is used to denote ratio.

• For a ratio, the two quantities must be in the same unit. If they are not, they should be expressed in the same unit before the ratio is taken.

• A ratio may be treated as a fraction.

• Two ratios are equivalent, if the fractions corresponding to them are equivalent.

• Four quantities are said to be in proportion, if the ratio of the first and the second quantities is equal to the ratio of the third and the fourth quantities. The symbol '::' or '=' is used to equate the two ratios.

• The order of terms in a proportion is important. For example 3, 8, 24, 64 are in proportion but 3, 8, 64, 24 are not in proportion.

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

What is Ratio?

Ratio is a mathematical term used to compare two similar quantities expressed in the same units. The ratio of two terms 'x' and 'y' is denoted by x : y. In ratio x : y , we can say that x as the first term or antecedent and y, the second term or consequent.

In general, the ratio of a number x to a number y is defined as the quotient of the numbers x and y i.e. x/y.

Note that fractions and ratios are same; the only difference is that ratio is a unit less quantity while fraction is not.

The ratio of two quantities a and b in the same units, is the fraction a/b and we write it as a : b.In the ratio a : b, we call a as the first term or antecedent and b, the second term or consequent.

Eg. The ratio 5 : 9 represents 5/9 with antecedent = 5, consequent = 9.

Rule: The multiplication or division of each term of a ratio by the same non-zero number does not affect the ratio.

Eg. 4 : 5 = 8 : 10 = 12 : 15. Also, 4 : 6 = 2 : 3.

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Compound Ratio :

Ratios are compounded by multiplying together the fractions, which denote them; or by multiplying together the antecedents for a new antecedent, and the consequents for a new consequent. The compound of a : b and c : d is i.e. ac : bd.

Read More:

Duplicate Ratios:

Duplicate ratio of (a:b)(a:b) is $(a^2{:}b^2)(a^2{:}b^2)$

Sub-duplicate:

Sub-duplicate ratio of (a:b)(a:b) is $(a^{1/2}{:}b^{1/2})(a^{1/2}{:}b^{1/2})$

Triplicate Ratio:

Triplicate ratio of (a:b)(a:b) is $(a^3{:}b^3)(a^3{:}b^3)$

Sub-triplicate Ratio:

Sub-triplicate ratio of (a:b)(a:b) is $(a^{1/3}{:}b^{1/3})(a^{1/3}{:}b^{1/3})$
If a/b=c/d then, (a+b) / (a−b)=(c+d) /(c−d) [**Componendo and Dividendo**]

What is Proportion ?

The equality of two ratios is called proportion.
If a : b = c : d, we write a : b :: c : d and we say that a, b, c, d are in proportion.
Here a and d are called **extremes**, while b and c are called **mean terms**.
Product of means = Product of extremes.
Thus, a : b :: c : d (b x c) = (a x d).

When two ratios are equal, the four quantities composing them are said to be in proportion.
If a/b=c/d, then a, b, c, d are in proportions.
This is expressed by saying that 'a' is to 'b' is to 'c' is to 'd' and the proportion is written as
a : b :: c : d or a : b = c : d
(product of means = product of extremes)

If there is given three quantities like a, b, c of same kind then we can say it proportion of continued.
a : b = b : c the middle number b is called mean proportion. a and c are called extreme numbers.
So, b^2 = ac. (middle number)^2 = (First number x Last number).

Application: These properties have to be used with quick mental calculations; one has to see a ratio and quickly get to results with mental calculations.

- Fourth Proportional:

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If a : b = c : d, then d is called the fourth proportional to a, b, c.
- Third Proportional:
    a : b = c : d, then c is called the third proportion to a and b.
- Mean proportional between a and b is $\sqrt{ab}$.

Variations:

We say that x is directly proportional to y, if x = ky for some constant k and we write, $x \propto y$.
We say that x is inversely proportional to y, if xy = k for some constant k and
we write, $x \propto 1 / y$.