Ratio and Proportion - Important Formulas

1. **Ratio:**

The ratio of two quantities *a* and *b* in the same units, is the fraction $\frac{a}{b}$ 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 $\frac{5}{9}$ 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.

2. **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*).

3. **Fourth Proportional:**

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:

Mean proportional between *a* and *b* is $\sqrt{ab}$.

4. **Comparison of Ratios:**

We say that (*a* : *b*) > (*c* : *d*) ⇔ $\frac{a}{b} > \frac{c}{d}$.

5. **Compounded Ratio:**

6. The compounded ratio of the ratios: $(a : b)$, $(c : d)$, $(e : f)$ is $(ace : bdf)$.

7. **Duplicate Ratios:**

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

Sub-duplicate ratio of $(a : b)$ is $(a : b)$.

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

Sub-triplicate ratio of $(a : b)$ is $(a^{1/3} : b^{1/3})$.

If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a + b}{a - b} = \frac{c + d}{c - d}$. [componendo and dividendo]

8. **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, $x \propto \frac{1}{y}$.