Quantitative Aptitude

Ratio and proportion

RATIO

When comparing any two numbers, sometimes, it is necessary to find out how many times one number is greater (or less) than the other. In other words, we often need to express one number as a fraction of the other.

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

<u>The Calculation of a ratio:</u>

Percentage and decimal values

The calculation of ratio is principally on the same lines as the calculation of a percentage value.

Hence, you should see it as:

The ratio 2/4 has a percentage value of 50% and it has a decimal value of 0.5.

Some Important properties of Ratios

1. It we multiply the numerator and the denominator of a ratio by the same number, the ratio remains unchanged.

   This is, $a/b = ma/mb$

2. If we divide the numerator and the denominator of a ratio by the same number, the ratio remains unchanged. Thus

   $a/b = (a/b)/b/d$

3. Denominator equation method:

   The magnitudes of two ratio can be compared by equating the denominators of the two ration and then checking for the value of the numerator.

   Thus, if we have to check for

   8/3 vs 11/4

We can compare $\frac{(8 \text{ x } 1.33)}{(3 \text{ x } 1.33)}$ vs 11/4

That is, 1 $\frac{(10.66)}{4}$ < 11/4

4. The ratio of two fractions can be expressed as a ratio of two integers. Thus the ratio:

$$a/b : c/d = \frac{(a/b)}{(c/d)} = \frac{(ad)}{(bc)}$$

5. If either or both the terms of a ratio are a surd quantity, then the ratio will never evolve into integral numbers unless the surd quantities are equal. Use this principal to spot options in questions having surds.
6. The multiplication of the ratios a/b and c/d yields:
   A/b x c/d = ac/bd

7. If a_1/b_1, a_2/b_2, a_3/b_3 .... a_n/b_n are unequal fractions Then the ratio:

   $(a_1 + a_2 + a_3 + \ldots\ldots + a_n)/(b_1 + b_2 + b_3 \ldots\ldots b_n)$
   lies between the lowest and the highest of these fractions.

8. Maintenance of equality when number are added in both the numerator and the denominator.
   This if best illustrated through an example:
   20/30 = (20 + 2)/(30/ + 3)

MATHEMATICAL USES OF RATIOS

Use 1

As a bridge between 3 or more quantities:
Suppose you have a ratio relationship given between the salaries of two individuals A and B. Further, if there is another ratio relationship between B and C. Then, by combining the two ratios, you can come up with a single consolidated ratio between A, B and C. This ratio will give you the relationship between A and C.

Use 2

Ratio as a Multiplier

This is the most common use of ratios:
If A:B is 3:1, then the value of B has to be Multiplied by 3 to the value of A.

CALCULATION METHODS related to RATIOS (A) Calculations method for Ratio comparisons:

There could be four broads cases when you might be required to do ratios comparisons:

The table below clearly illustrates these:

Percentage value comparison method:

Suppose you have to compare: 173/5624 with 181/241
In such a case just by estimating the 10% ranges for each ratio you can clearly see that –

the first ratio is > 80% while the second ratio is < 80%

Hence, the first ratio is obviously greater.

This method is extremely convenient if the two ratios have their values in difference 10% ranges. However, this problem will come will become slightly more difficult, if the two ratio fall in same 10% range.

Proportion

When two ratios are equal, the four quantities composing them are said to be proportional. Thus if a/b = c/d, them a, b, c are proportional. This is expressed by saying that a is to b as c is to d, and the proportion is written as

a : b : : c: d

or

a : b = c : d

The terms a and b are called the extremes while the terms b and c are called the means.