

## RATIO PROPORTION AND VARIATION

### RATIO :-

The ratio  $a : b$  represents a fraction  $a/b$ .  $a$  is called antecedent and  $b$  is called consequent. Ratio is the relation between two numbers which is expressed by a fraction,

The equality of two different ratios is called proportion.

If  $a : b = c : d$  then  $a, b, c, d$  are in proportion. This is represented by  $a : b :: c : d$ .

In  $a : b = c : d$ , then we have  $a * d = b * c$ .

If  $a/b = c/d$  then  $(a + b) / (a - b) = (d + c) / (d - c)$ . The ratio of two quantities  $a$  and  $b$  in the same units, is the fraction  $a/b$  and we write it as  $a : b$ . Ratio of two quantities is always an abstract number (without any units)

In the ratio  $a : b$ , we call  $a$  as the first term or antecedent and  $b$ , the second term or consequent.

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,  $4 : 6 = 2 : 3$ .

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,  $a : b :: c : d = (b * c) = (a * d)$ .

VARIATION: 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,  $x \propto 1/y$

.Ratio: If  $A$  is thrice as good a workman as  $B$ , then: Ratio of work done by  $A$  and  $B = 3 : 1$ . Ratio of times taken by  $A$  and  $B$  to finish a work =  $1 : 3$  general formula can be extended if more than 2 people (or machines are working together)  $1/TA + 1/TB + 1/TC + \dots = 1/T_{\text{together}}$  Where  $TA, TB$  and  $TC$  are the times taken by  $A, B$  and  $C$  respectively to complete the task alone and  $T_{\text{together}}$  is the time taken by them to complete the task when they are all working together. Example If Alex can build a house in 2 days and his apprentice Bob can build a house in 3 days, then how long will it take Alex and Bob to build a house when they are working together? Putting the information from the question into the formula gives us Invert both sides of the equation Time working together =  $6/5 = 1 \frac{1}{5}$  days So Alex and Bob will take  $1 \frac{1}{5}$  days to build a house when they are working together.

Tips:

- 1) Direct proportion: If  $x$  is directly proportional to  $y$ :  $x_1/y_1 = x_2/y_2$
- 2) Indirect proportion: If  $x$  is inversely proportional to  $y$ :  $x_1 y_1 = x_2 y_2$