Direct and Inverse proportions

INTRODUCTION - DIRECT AND INVERSE PROPORTIONS

Variations in one quantity bring variation in the other quantity.

For example:

If the number of eggs purchased increases, the total cost also increases.



Introduction of Direct Proportion

Direct proportion involves situations where two values vary, but the ratio between the values remains constant.

Example: Suppose the price of one piece of soap is 20 Rs. If a person wants to buy one dozen pieces of soap then how much he have to pay & what will be the price of two dozen of soaps?



Solution:

	We have For 1 dozen	1soap = 20 Rs.
i.e.,		12 soaps = 12 x 20 Rs.
	For 2 dozen	= 240 Rs.
i.e.,		24 soaps = 24 x 20 Rs.
		= 480 Rs.

This shows that as number of piece increase, price also increase. Hence price & piece are in **direct proportion**.

'x' & 'y' are two variables & they are in direct proportion, then division of x & y will be constant.

i.e., $\frac{\mathbf{x}}{\mathbf{y}} = \mathbf{c}$

Here, c is a constant known as proportionality constant

If there is any situation in which on increasing one variable the other one also increase then we generally use the following rule.

Variable 1		Variable 2
а		b
С		d
	$\frac{\mathbf{a}}{\mathbf{b}} = \frac{\mathbf{c}}{\mathbf{d}}$	
	ad = bc	

Or,

Example: A machine in a soft drink factory fills 840 bottles in six hours. How many bottles will it fill in five hours?

Solution:

Bottles fills in 6 hrs = 840 Bottles fills in 1 hr = $\frac{840}{6}$ = 140



Hours (y)	1	5
No. of bottles (x)	140	Х

$$C = \frac{x}{y}$$

Let, number of bottles be 'x' & hours be 'y'

 $C = \frac{number of bottles}{hours}$ $C = \frac{140}{1}$ C = 140

Now, X is the number of bottles which fills in 5hrs.

Using relation,

x = 140 x 5

x = 720

x = cy

Thus, 720 bottles will fill in 5hrs.

Example: If the weight of 12 envelops is 40grams, how many envelops weigh 5 kilograms?

Solution:

Let the Number of envelops weigh 5 kilograms = x

Number of envelops	12	Х
Weight of envelop	40	5000
(in grams)		

Number of envelop and weight are in directly proportion,

$$\frac{12}{40} = \frac{x}{5000}$$
$$\frac{12 \times 5000}{40} = x$$
$$X = 1500$$

X - 1

Required number of envelops = 1500



Two quantities x and y are in direct proportion if they increase together in such a manner that the ratio of their corresponding values remain constant.

$$xy = k$$

x And y are vary directly. y_1 and y_2 are the values of 'y 'corresponding to the values of x_1 , x_2 of 'x' respectively. Then

 $x_1y_2 = x_2y_1$ $\frac{x1}{y1} = \frac{x2}{y2}$

Or,

Introduction of Inverse Proportion

If increased in one quantity causes decrease in another quantity, then we say that both quantities are inversely related.

If two quantities x & y are in inverse proportion then their product will be constant.

i.e xy = c

Where, c is the proportionality constant.

If there is any situation in which on increasing one variable the other one decrease then we generally use the following rule.

Variable 1		Variable 2
а		С
b		d
	ac = bd	

Or,

Example: Imran brought 40 toys each cost Rs.14. How many toys Imran can buy at Rs.8 each from the same amount?

 $\frac{\mathbf{a}}{\mathbf{d}} = \frac{\mathbf{b}}{\mathbf{c}}$

Solution:

We have

Number of toys	Cost
40	14
Х	8



By the principle of inverse proportion,

 $40 \times 14 = 8x$ 560 = 8xx = 70 toys

Imran can buy 70 toys at Rs. 8 each.

Example: 8 pipes are required to fill a tank in 2hr 30 minutes. How long will it take if only 4 pipes of the same pipes of the same type are used?

Solution:

Desired time to fill the tank is x minutes.

Number of pipes	8	4
Time (in minutes)	90	x

Lesser the number of pipes more will be the time required by it to fill the tank.

 $90 \times 8 = x \times 4$ $[\therefore x1y1 = x2 y2]$ $\frac{(90 \times 8)}{4} = x$ x = 180

Hence, Time taken by 4 pipes is 3 hrs.

Two quantities x and y are in inverse proportion if an increase in x causes a proportional decrease in y.

The product of their corresponding values remains constant.

$$xy = k$$

Then *x* and *y* are said to vary inversely.

y1, y2 are the values of y corresponding to the values to the values x1, x2 of x respectively then

$$x1y1 = x2y2$$

 $\frac{x1}{x2} = \frac{y2}{y1}$

Or

