Concept of Percentage

What is a Percentage?

A fraction with denominator 100 is called percentage. To convert a fraction into percentage, multiply by 100 and put % sign.

Expressing one quantity as percentage of other:

Ex: What percent is number 5 of number 25?

Out of 25-> 5,

Out of 1-> 5/25,

Out of 100-> (5/25)*100= 20%.

Percentage Change:

General Formula: $Percent\ change = (\frac{Change\ in\ Quantity}{Original\ Quantity} * 100)$ %

$$Percentage\ increase = \frac{Increased\ value - original\ value}{Original\ value} * 100$$

$$Percentage\ decreased = \frac{Original\ value - Decreased\ value}{Original\ value} * 100$$

Percentage Change Advance:

1. If a value R is increased by x%, then decrease the increased resultant value $(R + \frac{Rx}{100})$ by $(\frac{x}{x+100} * 100)\%$ to get back the original value R.

2. If a value R is decreased by x%, then increase the decreased resultant value $(R - \frac{Rx}{100})$ by $(\frac{x}{100-x} * 100)\%$ to get back the original value R.

Ex: 1000 is increased by 20% then resultant value is 1200.

$\frac{20}{120} * 100 = 16.67\%$ (Rounded to nearest digit)

So, 1200 is reduced by 16.66% = $1200 * \frac{16.67}{100} = 200.04$

1200- 200.04= 1000 – the approximation due to the round off- If we use 16.66666666666667 we will get the exactly 200.

Percentage Increased/ Reduced BY and Percentage Increased/ Reduced TO:

If a quantity is reduced by x% then result will (100-x)% of orginal, and if a quantity is reduced to x%, then the new value is x% of original value.

By represent difference and to represents the final value.

Ex: if a rate of product is reduced by 30%, then the new rate will be 70% of original, and if the rate of the product is reduced to 30%, then new rate will be 30% of original.

Percentage in POPULATIONS:

If the original population of region is A, and annual growth is x%. Then population after R years is $A\left(1+\frac{x}{100}\right)^R$.

i. Increase in Population – $A[\left(1+\frac{x}{100}\right)^R - 1]$

If the original population of region is A, and decrease in population is x%. Then population after R years is $A\left(1-\frac{x}{100}\right)^R$.

i. Decrease in Population- $A[1-\left(1+\frac{x}{100}\right)^R]$.

If a value of a number is first increased by R% and then decreased by R%, the net change is always a decrease or loss in original value.

Hence, % Loss or decrease = $\left(\frac{R}{10}\right)^2$ %.

Other Important Notes:

a. If a value R is increased by x% to S, and S is again decreased to R by y%, Then x is always greater than y (Positive values only).

b. If a value R is decreased by x% to S, and S is again increased to R by y%, then x is always less than y.

c. If a value P is increased by x% then by y% and then by z%, the final value will be same even if we reverse the order of x,y,z. I.e., P is increased by z% first, then by y% and then by x%. (Same for the decrease)- Successive increase or decrease in value.

d. Similarly if value P is increased by X% then by Y% and then decreased by Z%. the final value will be same when P is decreased by Z% first, then increased by Y%, and then by X%.

e. If there is an increase of $\frac{x}{y}$ in any value A, then the increased value will be A $(1 + \frac{x}{y})$.

f. If there is a decrease of $\frac{x}{y}$ in any value A, then the increased value will be A $(1 - \frac{x}{y})$.