

Mixtures and Alligations Formulae

Mixture:

A mixture is created when two or more substances are mixed in a certain ratio.

Types of mixtures:

- Simple mixture:-
A simple mixture is formed by the mixture of two or more different substances.
Ex. Milk and Water mixture
- Compound mixture:-
Compound mixture is formed by the mixture of two or more simple mixtures.

Weighted average:

If M1 and M2 are the values, Q1 and Q2 are the quantities of item 1 and item 2 respectively and MA is the weighted average of the two items, then

$$\frac{Q1}{Q2} = \frac{M2 - MA}{MA - M1}$$

Weighted average MA can be calculated by,

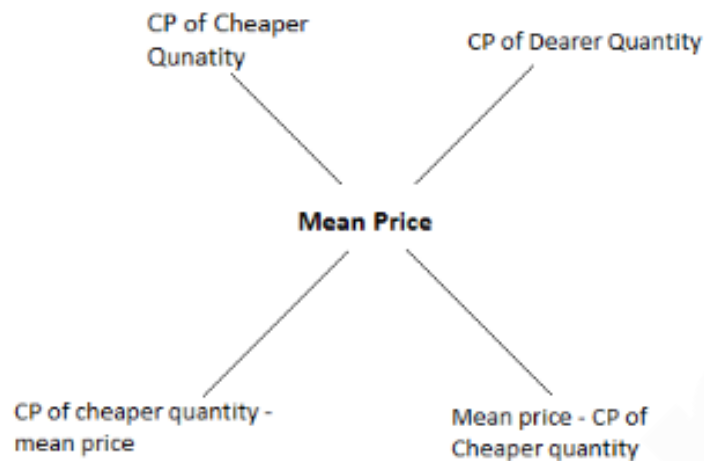
$$MA = \frac{Q1M1 + Q2M2}{Q1 + Q2}$$

Alligation:

The rule which enables us to find the ratio in which two or more elements are mixed together is called alligation.

The alligation rule can be applied when cheaper substance is mixed with expensive substance

$$\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} = \frac{\text{Price of dearer} - \text{Mean price}}{\text{Mean price} - \text{Price of cheaper}}$$



- If two mixtures M1 and M2 ,having substances S1 and S2 in the ratio a : b and p : q respectively are mixed, then in the final mixture,

$$\frac{\text{Quantity of S1}}{\text{Quantity of S2}} = \frac{M1 \left(\frac{a}{a+b}\right) + M2 \left(\frac{p}{p+q}\right)}{M1 \left(\frac{b}{a+b}\right) + M2 \left(\frac{q}{p+q}\right)}$$

- If there is a container with 'a' liters of liquid A and if 'b' liters are withdrawn and equal amount is replaced by another liquid B and if the operation is repeated for 'n' times
After nth operation,

Liquid A in the container = $\left(\frac{a}{b-a}\right)^n \times$ Initial quantity of A in the Container

$$\frac{\text{Liquid A after nth operation}}{\text{Liquid B after nth operation}} = \frac{\left(\frac{a}{b-a}\right)^n}{1 - \left(\frac{a}{b-a}\right)^n}$$




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