# Mixtures and Alligations

## Tip 1

- The topic mixtures and alligations is basically an application of averages concept in CAT.
- The theory involved in this topic is very limited and students should be comfortable with the some basic formulas and concepts.
- This pdf covers all the important formulas and concepts related to mixtures and alligations.

# Tip 2

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

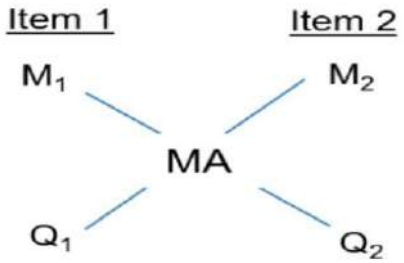
***Types of mixtures***

1. Simple mixture:  A simple mixture is formed by the mixture of two or more different substances.
   Example: Water and Wine mixture.

2. Compound mixture: A Compound mixture is formed by the mixture of two or more simple mixtures. (Example: one part of 'water and wine' mixture mixed with two parts of 'water and milk' mixture, etc.)

# Tip 3

- If $M_1$ and $M_2$ are the values and $Q_1$ and $Q_2$ are the quantities of item 1 and item 2 respectively, and $M_A$ is the weighted average of the two items, then




$$\frac{Q_1}{Q_2} = \frac{M_2 - M_A}{M_A - M_1}$$

- Weighted average $M_A$ can be calculated by: $$M_A = \frac{Q_1 M_1 + Q_2 M_2}{Q_1 + Q_2}$$

# Tip 4

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

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

# Tip 5

If two mixtures $M_1$ and $M_2$,having substances $S_1$ and $S_2$ in the ratio a:b and p:q respectively are mixed, then in the final mixture,

$$\frac{\text{Quantity of } S_1}{\text{Quantity of } S_2} = \frac{M_1\left[\frac{a}{a+b}\right]+M_2\left[\frac{p}{p+q}\right]}{M_1\left[\frac{b}{a+b}\right]+M_2\left[\frac{q}{p+q}\right]}$$

# Tip 6

If there is a container with ‘a’ liters of liquid A and if ‘b’ liters are withdrawn and equal amount is replaced by another liquid B and if the operation is repeated for ‘n’ times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
- $\frac{\text{Liquid A after nth operation}}{\text{Liquid B after nth operation}} = \frac{\left[\frac{a-b}{a}\right]^n}{1-\left[\frac{a-b}{a}\right]^n}$