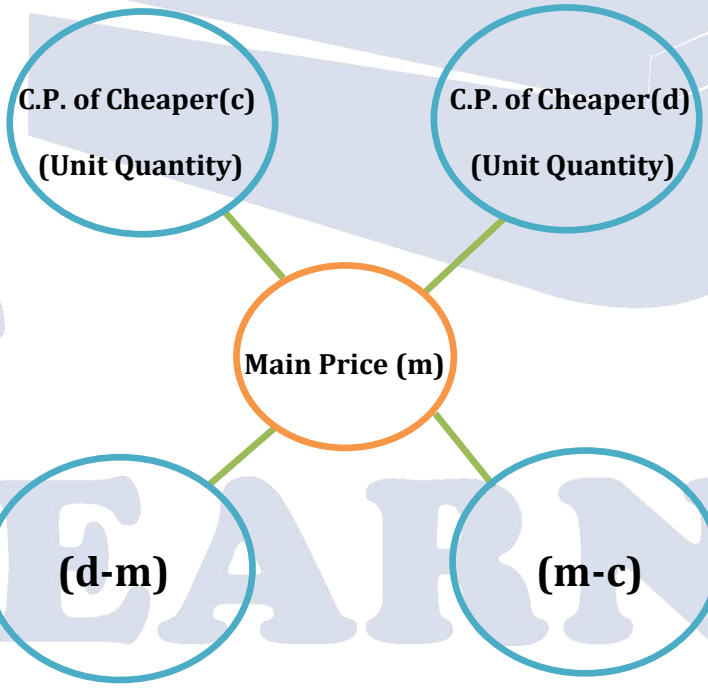
Allegation and Mixtures

Points to remember:

1. **Allegation**: It refers to a rule that helps to find the ratio in which two or more ingredients at a given price are mixed to produce a mixture of specified price.
2. **Mean Price**: It is the cost price of a unit quantity of a mixture which is prepared by mixing two or more ingredients.
3. **Allegation rule**: It says that if two ingredients at a given price are mixed to produce a mixture at the given price, the ratio of quantity of cheaper ingredient and quantity of dearer ingredient is given by;

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



Cheaper quantity: Dearer quantity: (d-m) :(m-c)

Some quicker methods:

1) A container contains x units of a liquid from which y units are taken out and replaced by water. Again from this mixture y units are taken out and replaced by water. If this process is repeated n times;

$$\frac{\text{liquid left in the container after n operation}}{\text{Original quantity of the liquid in the vessel}} = \frac{x-y}{x}$$

Or,

Quantity of pure liquid after n operation = $x * \left(1-\frac{y}{x}\right)^n$

2) If n containers of equal capacity are filled with the mixture of liquids X and Y in the ratio x1: y1, x2: y2,.... xn: yn, respectively and the content of all the containers is mixed in a single container;

$$\frac{\text{Quantity of liquid A}}{\text{Quantity of liquid B}} = \frac{\frac{x1}{x1+y1} + \frac{x2}{x2+y2} + \cdots \frac{xn}{xn+yn}}{\frac{y1}{x1+y1} + \frac{y2}{x2+y2} + \cdots \frac{yn}{xn+yn}}$$

3) If n containers of different sizes (z1, z2,... zn) are filled with a mixture of liquids X and Y in the ratio x1: y1, x2: y2,...xn: yn, respectively and the content of all the containers is mixed in a single container;

$$\frac{\text{Quantity of liquid A}}{\text{Quantity of liquid B}} = \frac{\frac{x1z1}{x1+y1} + \frac{x2z2}{x2+y2} + \cdots \frac{xnzn}{xn+yn}}{\frac{y1z1}{x1+y1} + \frac{y2z2}{x2+y2} + \cdots \frac{ynzn}{xn+yn}}$$