Mixture and Alligation

Mixture: Mixing of two or more than two type of quantities gives us a mixture.

Example:

Quantities of these elements can be expressed as percentage or ratio.(20% of sugar in water)

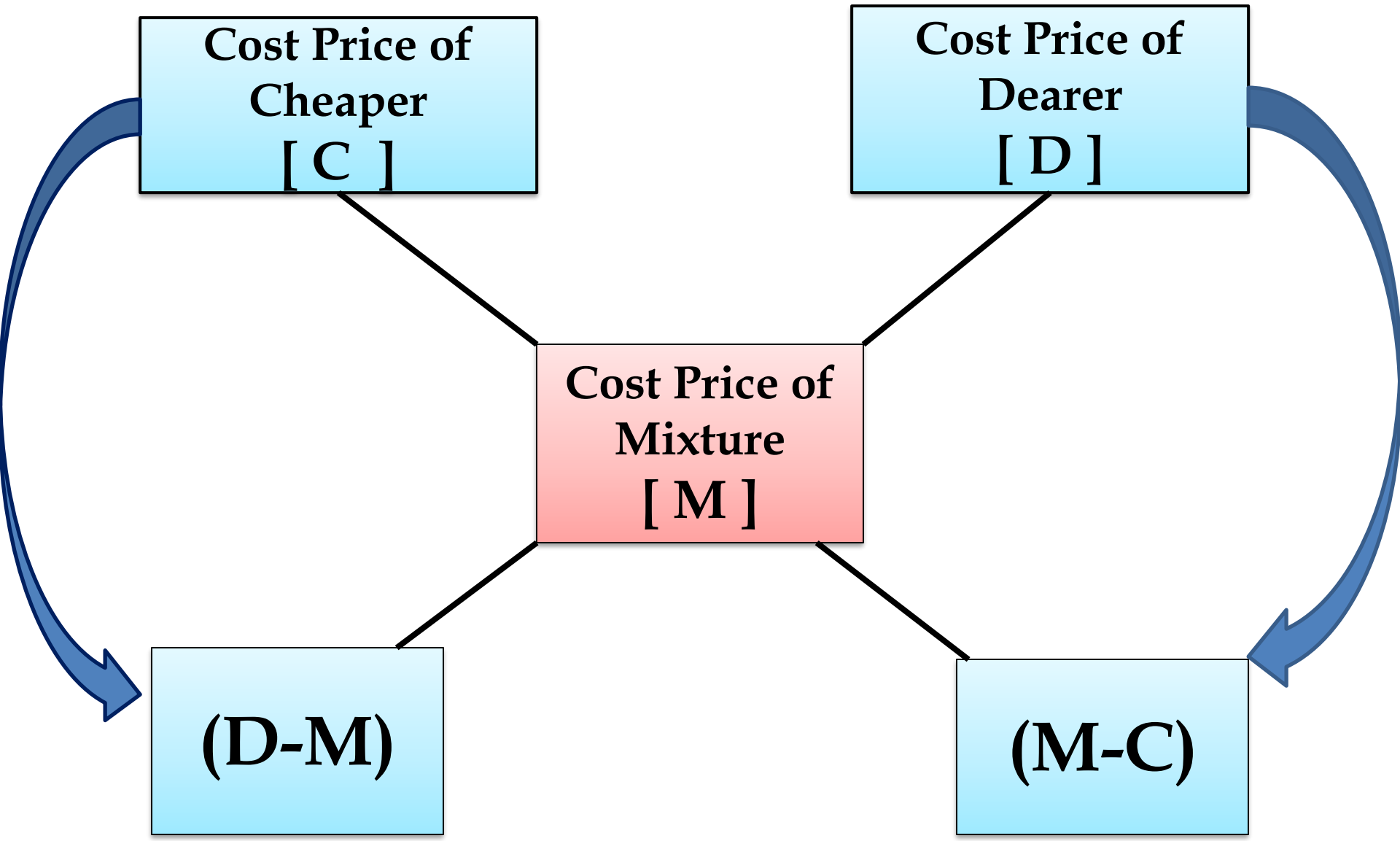
Fraction (A solution of sugar and water such that sugar : water = 1:4)

Alligation : Alligation is a rule which is used to solve the problems related to mixture and its ingredient.

It is the rule that enables us to find the ratio in which two or more ingredients at the given price must be mixed to produce a mixture of desired price.

Alligation Rule : When two elements are mixed to make a mixture and one of the elements is cheaper and other one is costlier then,

$$\frac{\text{Quantity of Cheaper}}{\text{Quantity of Costlier}} = \frac{\text{CP of Costlier} - \text{Mean Price}}{\text{Mean Price} - \text{CP of Cheaper}}$$


Cost Price of Cheaper [C]
Cost Price of Dearer [D]
Cost Price of Mixture [M]
(D-M)
(M-C)

$$\frac{\text{Quantity of Cheaper}}{\text{Quantity of dearer}} = \frac{(D-M)}{(M-C)}$$

Note: (1) Mean value lies between cheaper Value and dearer value.

(2) All the three values in alligation rule should be same type having same unit. For e.g. Cost price.

1. In what ratio must a grocer should mix two varieties of pulses costing Rs.15 /Kg and Rs.20/Kg respectively so as to get a mixture worth Rs.16.50/Kg?

[A] 7 : 3

[B] 4 : 5

[C] 6 : 4

[D] None of the above

2. Find the ratio in which rice at Rs.7.20 a Kg be mixed with rice at Rs. 5.70 a Kg to produce a mixture worth Rs. 6.30 a Kg?

[A] 1 : 3

[B] 2 : 3

[C] 3 : 4

[D] 4 : 5

3. In what ratio must a grocer mix two varieties of tea worth Rs. 60 a kg and Rs. 65 a kg so that by selling the mixture at Rs. 68.20 a kg he may gain 10%?

[A] 3 : 2

[B] 3 : 5

[C] 3 : 6

[D] None of the above

4. How many kg of tea worth Rs. 25/kg must be blended with 30 kg of tea worth Rs. 30/kg so that by selling the blended variety at Rs. 30/kg there should be a gain of 10%?

[A] 36 Kg

[B] 40 Kg

[C] 32 Kg

[D] None of the above

5. A dishonest milkman professes to sell his milk at cost price but he mixes it with water and thereby gains 25%. The percentage of water in the mixture is:

[A] 20%

[B] 10 %

[C] 11 %

[D] None of the above

6. In what ratio must water be added to spirit to gain 10% by selling it at the cost price?

[A] 1 : 11

[B] 1 : 5

[C] 1 : 10

[D] 1 : 9

7. Sea water contains 5% salt by weight. How many kilograms of fresh water must be added to 40kg of sea water for the salt content of the solution to be 2%?

[A] 50

[B] 60

[C] 65

[D] 70

8. A mixture of 45 L of spirit and water contains 20% of water in it. How much water must be added to it to make the water 25% in the new mixture?

[A] 3 L

[B] 4 L

[C] 5 L

[D] 6 L

9. In a zoo, there are rabbits and pigeons. If head are counted, there are 200 and legs are 580. How many rabbits are there ?

[A] 110

[B] 90

[C] 80

[D] 120

10. A man has 90 pens. He sells some of these at profit of 15 % and rest at 9% profit. On the whole transaction he gets a profit of 11%.How many pens did he sell at 9% profit.

[A] 60

[B] 50

[C] 40

[D] 70

11. A trader has 25 kg of rice. A part of which he sold at 4% profit and rest at 9% profit. His overall gain is 7%. What is the quantity he sold at 9% profit?

[A] 9 Kg

[B] 10 Kg

[C] 12 Kg

[D] 15 Kg

12. A man buys two cows for Rs. 1350 and sells one for loss of 6% and the other for gain of 7.5% and on the whole he neither gains nor loses. What does each cow cost?

[A] Rs. 850, Rs.500

[B] Rs. 650, Rs. 700

[C] Rs. 750, Rs. 600

[D] Rs. 550, Rs. 800

13. There are 50 students in a class, Rs. 320 are distributed among them so that each boy get 10 Rs. and each girl get 5 Rs. Find no. of girls.?

[A] 36

[B] 18

[C] 14

[D] 7

14. A merchant borrowed Rs.3500 from two money lenders. For one loan he paid 14% p.a. and for other 18% p.a. Total interest paid for one year was Rs.525. How much did he borrow at 18% p.a.

[A] Rs.875

[B] Rs.625

[C] Rs.750

[D] Rs.1000

15. A man travels 80 km in 7 hrs. Some part on foot with 8kmph and rest on cycle with 16kmph. Find the distance covered by cycle.

[A] 16 Km

[B] 32 Km

[C] 24 Km

[D] 48 Km

16. In what ratio must a person mix three kinds of tea costing Rs.60/kg, Rs.75/kg and Rs.100 /kg so that the resultant mixture when sold at Rs.96/kg yields a profit of 20%?

[A] 1 : 2 : 4

[B] 3 : 7 : 6

[C] 1 : 4 : 2

[D] None of these

17. Find out the ratio of new mixture so that it will cost Rs 1.40 per kg from the given three kinds of rice costing Rs 1.20, Rs 1.45 and Rs 1.74.

[A] 39 : 20 : 20

[B] 30 : 20 : 30

[C] 30 : 29 : 29

[D] None of these

Mixture Questions

18. In 28L mixture of milk and water the ratio of milk and water is 5:2. How much quantity of water is to be added so that the milk and water becomes 2:5

[A] 60 L

[B] 42 L

[C] 40 L

[D] 36 L

19. A mixture consist Milk and water in 5:1. On adding 5 L water, the ratio becomes 5:2. Find quantity of milk in original mixture.

[A] 5 L

[B] 10 L

[C] 15 L

[D] 25 L

20. Mixture consist Milk and water in 4:3. On adding 2 L of water, ratio becomes 8:7. find total quantity of final mixture.

[A] 15 L

[B] 30 L

[C] 45 L

[D] 60 L

21. Two bucket contains same amount of mixture of Milk and water in 9:5 and 4:3 resp. If these buckets are further mixed, find the ratio of milk and water in final mixture.

[A] 11 : 17

[B] 17 : 11

[C] 9 : 8

[D] 8 : 9

22. Two bucket contains same amount of mixture of Milk and water in 9:5 and 4:3 resp. If these buckets are further mixed in 1:2, find the ratio of milk and water in final mixture.

[A] 17 : 25

[B] 25 : 17

[C] 9 : 16

[D] 8 : 18

23. Three equal glasses are filled with mixture of Milk and water in 3 : 1, 5 : 3 and 9 : 7 resp. If these glasses are further mixed, find the ratio of milk and water in final mixture.

[A] 11:17

[B] 17:11

[C] 31 : 17

[D] 17 : 31

24. Mixture consist 80% Acid and rest water. A part of this mixture is replaced with same amount of water and new ratio becomes 4:3. find part of mixture which is replaced.

[A] 1/5

[B] 2/5

[C] 1/7

[D] 2/7

25. A tank is filled with mixture consist 3 part water & 5 part alcohol. A part of this mixture is drawn off and replaced with same amount of water. New mixture contains half water and half alcohol. find part of mixture which is replaced.

[A] 1/5

[B] 2/5

[C] 1/7

[D] 2/7

26. A bucket contains two liquids A and B in 5:3. If 16 L of mixture is drawn off and replaced with same amount of liquid B, the ratio becomes 3:5. How much Liter bucket holds?

[A] 40 L

[B] 24 L

[C] 26 L

[D] 80 L

27. Two vessels A and B contain M and W in 4:3 and 2:3 resp. In what ratio the liquids may be mix to obtain a new mixture containing half milk and half water ?

[A] 7 : 5

[B] 5 : 7

[C] 1 : 4

[D] 1 : 2

28. Two vessels A and B contain M and W in 8:5 and 5:2 resp. In what ratio the liquids may be mix to obtain a new mixture containing 69and(3/13) % milk ?

[A] 2 : 7

[B] 7 : 2

[C] 5 : 6

[D] 6 : 5

Removal and Replacement

If a vessel contains "x" liters of liquid A and if "y" liters be withdrawn and replaced by liquid B, then if "y" liters of the mixture be withdrawn and replaced by liquid B, and the operation is repeated 'n' times in all, then :

$$\frac{\text{Quantity of liquid A after } n^{th} \text{ operation}}{\text{Initial quantity of liquid of A}} = \left[\frac{x-y}{x}\right]^n = \left[1-\frac{y}{x}\right]^n$$

$$\mathbf{F.C = I.C(1-y/x)^n}$$

FC= Final concentration

IC= Initial concentration

y = no. of liters replaced

x = Total concentration

n = total number of iterations

29. A container contains 40 L milk. 4 L was taken out and replaced with water. This process is repeated further 2 times. Now how much milk is there in the mixture?

[A] 28 L

[B] 29.16 L

[C] 27.16 L

[D] 30 L

30. A vessel contains 125 liters of wine. 25 liters of wine was taken out of the vessel and replaced by water. Then, 25 liters of mixture was withdrawn and again replaced by water. The operation was repeated for third time. How much wine is now left in the vessel?

[A] 49 L

[B] 64 L

[C] 72 L

[D] 56 L

31. 8 L was taken out from a cask full of wine and replaced with water. This operation is performed 3 more times. The ratio of quantity of wine left in the cask to that of water is 16:65. how much wine did the cask hold initially?

[A] 12 L

[B] 18 L

[C] 24 L

[D] 30 L

32. A jar full of whisky contains 40% alcohol. A part of this is replaced with another containing 19% alcohol. Now there is 26% alcohol. Find the quantity of whisky which is replaced.

[A] 1/2

[B] 1/3

[C] 1/5

[D] 2/3