



PEA502A – Lecture #11

CHAIN RULE & ALLIGATION-MIXTURE

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CHAIN RULE



Direct Proportion

Two quantities are said to be directly proportional, if on the increase (or decrease) of the one, the other increases (or decreases) to the same extent.

Eg. Cost is directly proportional to the number of articles.

(More Articles, More Cost)



Indirect Proportion

Two quantities are said to be indirectly proportional, if on the increase of the one, the other decreases to the same extent and vice-versa.

Eg. The time taken by a car is covering a certain distance is inversely proportional to the speed of the car.

More speed, Less time taken

Note: In solving problems by chain rule, we compare every item with the term to be found out.



Question Q11.1

If 15 toys cost Rs234, what

- A. Rs.540
- B. Rs.546
- C. Rs.548
- D. Rs.556



quick yak:
Direct
Proportion



Answer: Option B

Explanation:

Let the required cost be Rs x . Then

More toys, More Cost (Direct Proportion)

$$15 : 35 :: 234 : x$$

$$(15x) = (35 \times 234)$$

$$X = 546$$



Question Q11.2

If 36 men can do a piece of work in 12 hours, how many hours will 15 men do it?



- A. 60 hours
- B. 50 hours
- C. 66 hours
- D. 70 hours



Answer: Option A

Explanation:

Let the required number of hours be Rs x . Then

Less men, More hours (Indirect Proportion)

$$15 : 36 :: 25 : x$$

$$(15x) = (36 \times 25)$$

$$X = 60$$



Question P11.1

If the wages of 6 men for 15 days be Rs2100, then find the wages of 9 men for 12 days.

- A. Rs 2520
- B. Rs 2560
- C. Rs 2620
- D. Rs 2650



Answer: Option A

Explanation:

Let the required wages be Rs x. Then

More men, More wages (Direct Proportion)

Less days, Less wages (Direct Proportion)

Men 6 : 9

Days 15 : 12 :: 2100 : x

$$6 \times 15 \times x = 9 \times 12 \times 2100$$

$$X = 2520$$



ALLIGATION OR MIXTURE



Alligation

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.

Mean Price

The cost of a unit quantity of the mixture is called the mean price.

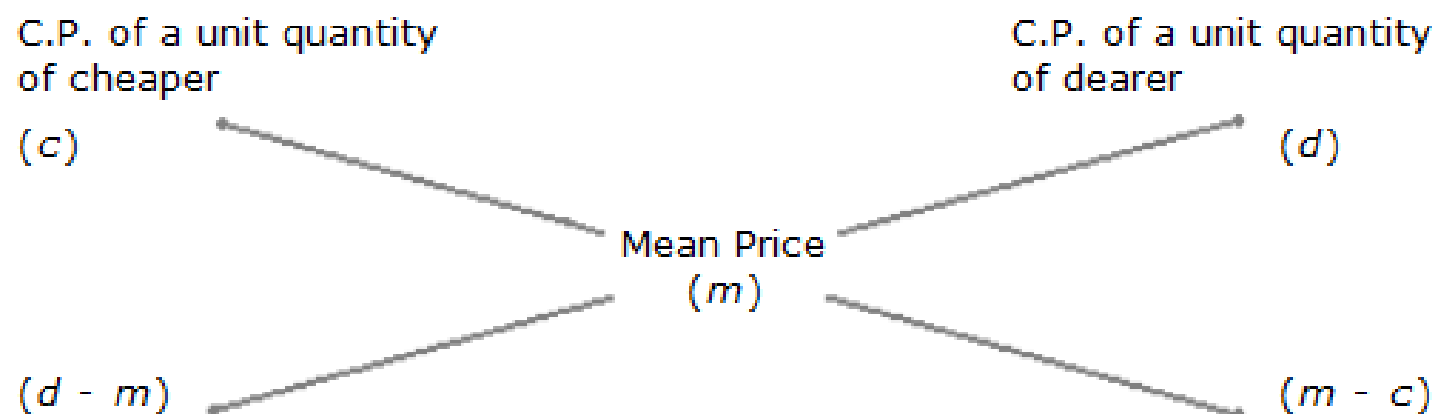


Rule of Alligation:

If two ingredients are mixed, then

$$\left(\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} \right) = \left(\frac{\text{C.P. of dearer} - \text{Mean Price}}{\text{Mean price} - \text{C.P. of cheaper}} \right)$$

We present as under:



$$\therefore (\text{Cheaper quantity}) : (\text{Dearer quantity}) = (d - m) : (m - c).$$

Suppose a container contains x of liquid from which y units are taken out and replaced by water.

$$\text{After } n \text{ operations, the quantity of pure liquid} = \left[x \left(1 - \frac{y}{x} \right)^n \right] \text{ units.}$$



Question Q11.3

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

Answer : Option B

By the rule of alligation:



∴ Required ratio = 60 : 90 = 2 : 3.



Question Q11.4

How many kilogram of sugar costing Rs. 9 per kg must be mixed with 27 kg of sugar costing Rs. 7 per kg so that there may be a gain of 10% by selling the mixture at Rs. 9.24 per kg?

- A. 36 kg
- B. 42 kg
- C. 54 kg
- D. 63 kg

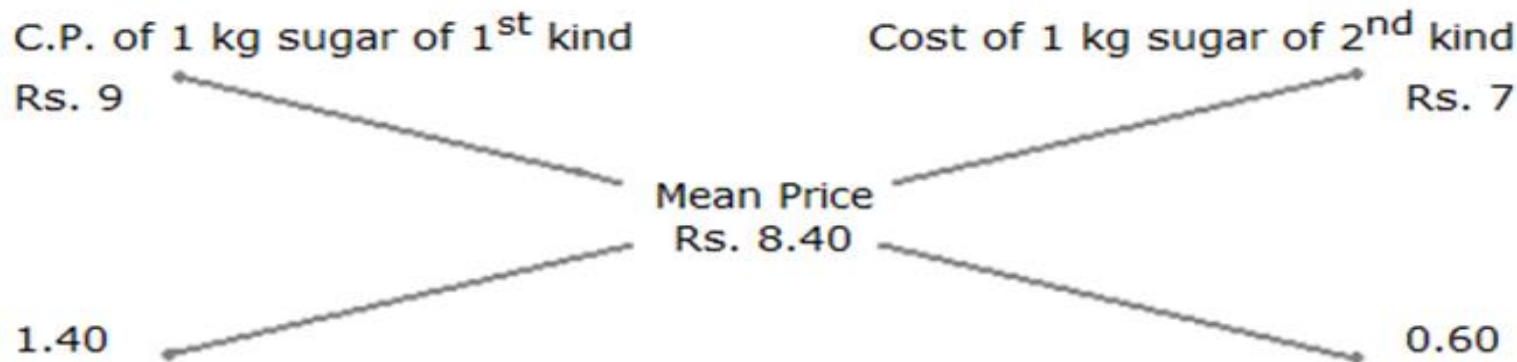


Answer : Option D

S.P. of 1 kg of mixture = Rs. 9.24, Gain 10%.

$$\therefore \text{C.P. of 1 kg of mixture} = \text{Rs.} \left(\frac{100}{110} \times 9.24 \right) = \text{Rs.} 8.40$$

By the rule of alligation, we have:



$$\therefore \text{Ratio of quantities of 1st and 2nd kind} = 14 : 6 = 7 : 3.$$

Let x kg of sugar of 1st be mixed with 27 kg of 2nd kind.

$$\text{Then, } 7 : 3 = x : 27$$

$$\Rightarrow x = \left(\frac{7 \times 27}{3} \right) = 63 \text{ kg.}$$



Question 11.5

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. 4%
- B. 6%
- C. 20%
- D. 25%



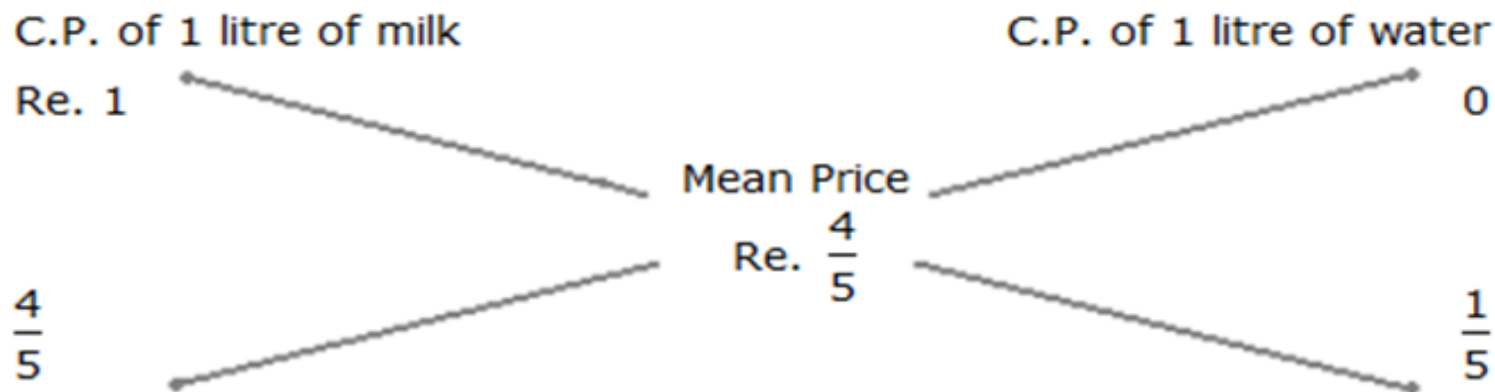
Answer : Option C

Let C.P. of 1 litre milk be Re. 1

Then, S.P. of 1 litre of mixture = Re. 1, Gain = 25%.

$$\text{C.P. of 1 litre mixture} = \text{Re. } \left(\frac{100}{125} \times 1 \right) = \frac{4}{5}$$

By the rule of alligation, we have:



$$\therefore \text{Ratio of milk to water} = \frac{4}{5} : \frac{1}{5} = 4 : 1.$$

$$\text{Hence, percentage of water in the mixture} = \left(\frac{1}{5} \times 100 \right) \% = 20\%.$$



Question P11.2

A container contains 40 litres of milk. From this container 4 litres of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?

- A. 26.34 litres
- B. 27.36 litres
- C. 28 litres
- D. 29.16 litres



Answer : Option D

Amount of milk left after 3 operations =

$$\left[40 \left(1 - \frac{4}{40} \right)^3 \right] \text{ liters}$$

$$= \left(40 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} \right)$$

$$= 29.16 \text{ liters}$$



Next Class: Time & Work