Alligation or mixture

1). Two vessels A and B contain milk and water mixed in the ratio 8:5 and 5:2 respectively. The ratio in which these two mixtures be mixed to get a new mixture containing 69 3/13 % milk is.

Soln:

Let cost of 1 litter milk be Rs: 1

Milk in 1 litter mix in A = 8/13 litter

CP of 1 liter mix in A = Re 8/13

Milk in 1 liter mix, in B = 5/7 liter

CP of 1 liter mix in B = Re 5/7

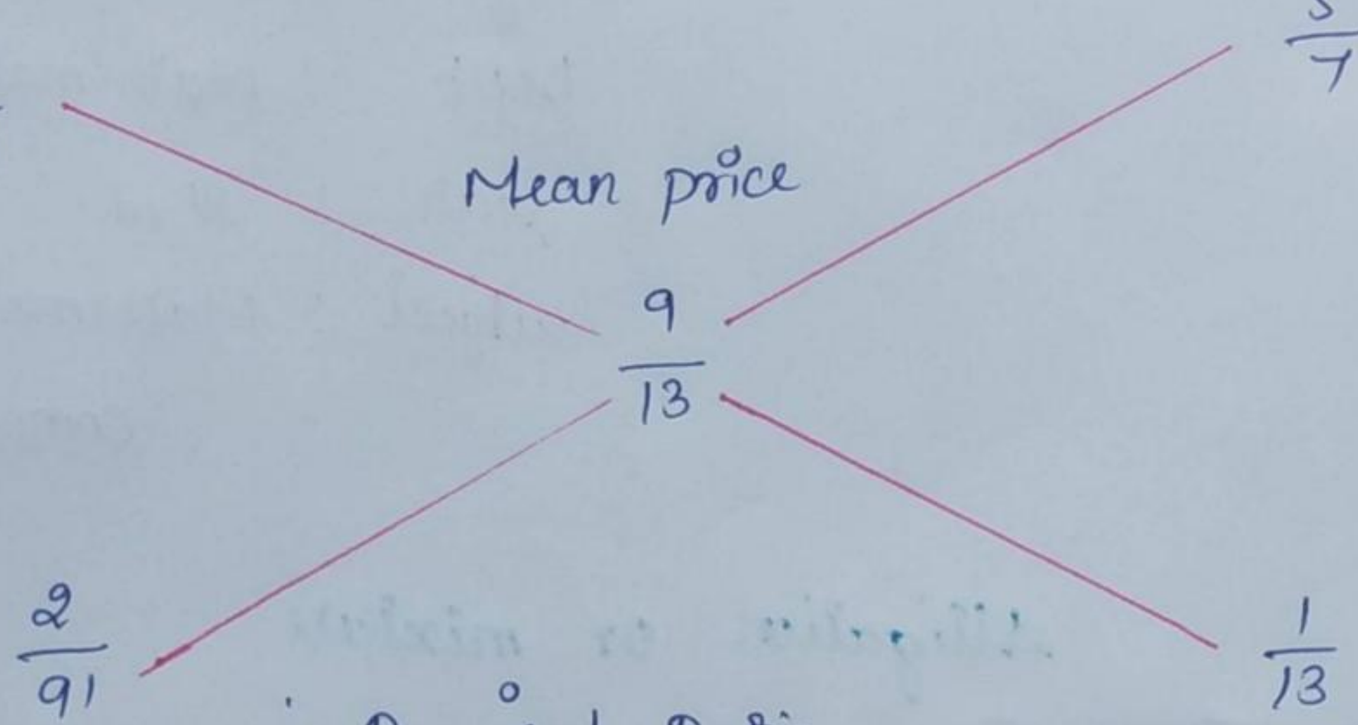
Milk in 1 liter of final mix

$= \left(\frac{900}{13} \times \frac{1}{100} \times 1\right) = \frac{9}{13}$

Mean price = $\frac{9}{13}$

By the rule of alligation, we have C.P of 1 liter mixture in A

C.P of 1 liter mixture in B.



∴ Required Ratio = $\frac{2}{91} : \frac{1}{13} = 2:7$ //

2). A Milk vendor has 2 cans of Milk. The first contains 25% water and the rest milk. The second contains 50% water. How much milk should be mix from each of the containers so as to get 12 liters of milk such that the ratio of water to milk as 3:5?

Soln: Let cost of 1 liter milk be Re. 1

Milk in 1 liter mix in Ist can = 3/4 liter

C.P of 1 liter mix in Ist can = Re 3/4.

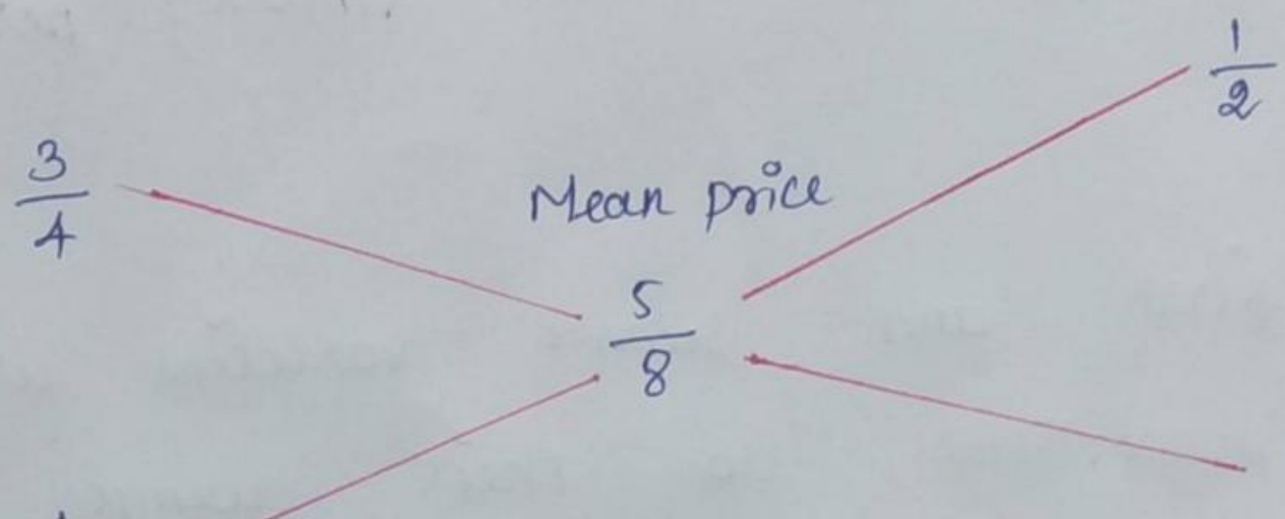
Milk in 1 liter mix in 2nd can = 1/2 liter

C.P of 1 liter mix in 2nd can = Re 1/2

Milk in 1 liter of final mix = 5/8 liter.

Mean price $= Re\ \frac{5}{8}$.

By the rule of alligation, C.P of 1 liter mixture we have : C.P 1 liter mixture in 2nd can.
in 1st can



Ratio of two mixtures $= \frac{1}{8} : \frac{1}{8} = 1 : 1$

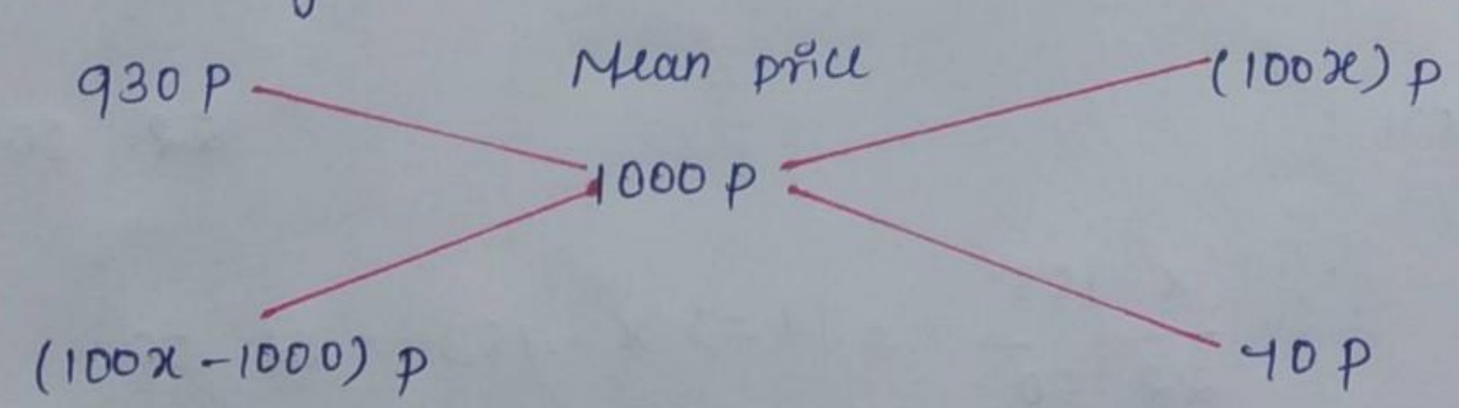
So quantity of mixtures taken from each can $\} = (\frac{1}{2} \times 12) = 6$ lt.

3). One quality of wheat at Rs: 9.30 per kg is mixed with another quality at certain rate in the ratio 8:7. If the mixture so formed be worth Rs. 10 per kg, what is the rate per kg of the second quality of wheat ?

Soln:

Let the rate of the Second quality be Rs. x per kg

C.P of 1 kg wheat 1st kind C.P of 1 kg wheat of 2nd kind.



$\therefore \frac{100x - 1000}{70} = 8/7 \Rightarrow 700x - 7000 = 560$

$700x = 7560 \Rightarrow x = Rs.\ 10.80.$

A). Tea worth Rs. 126 per kg and Rs. 135 per kg are mixed with a third variety in the ratio 1 : 1 : 2 if the mixture is worth Rs. 153 per kg the price of the theird variety per kg will be

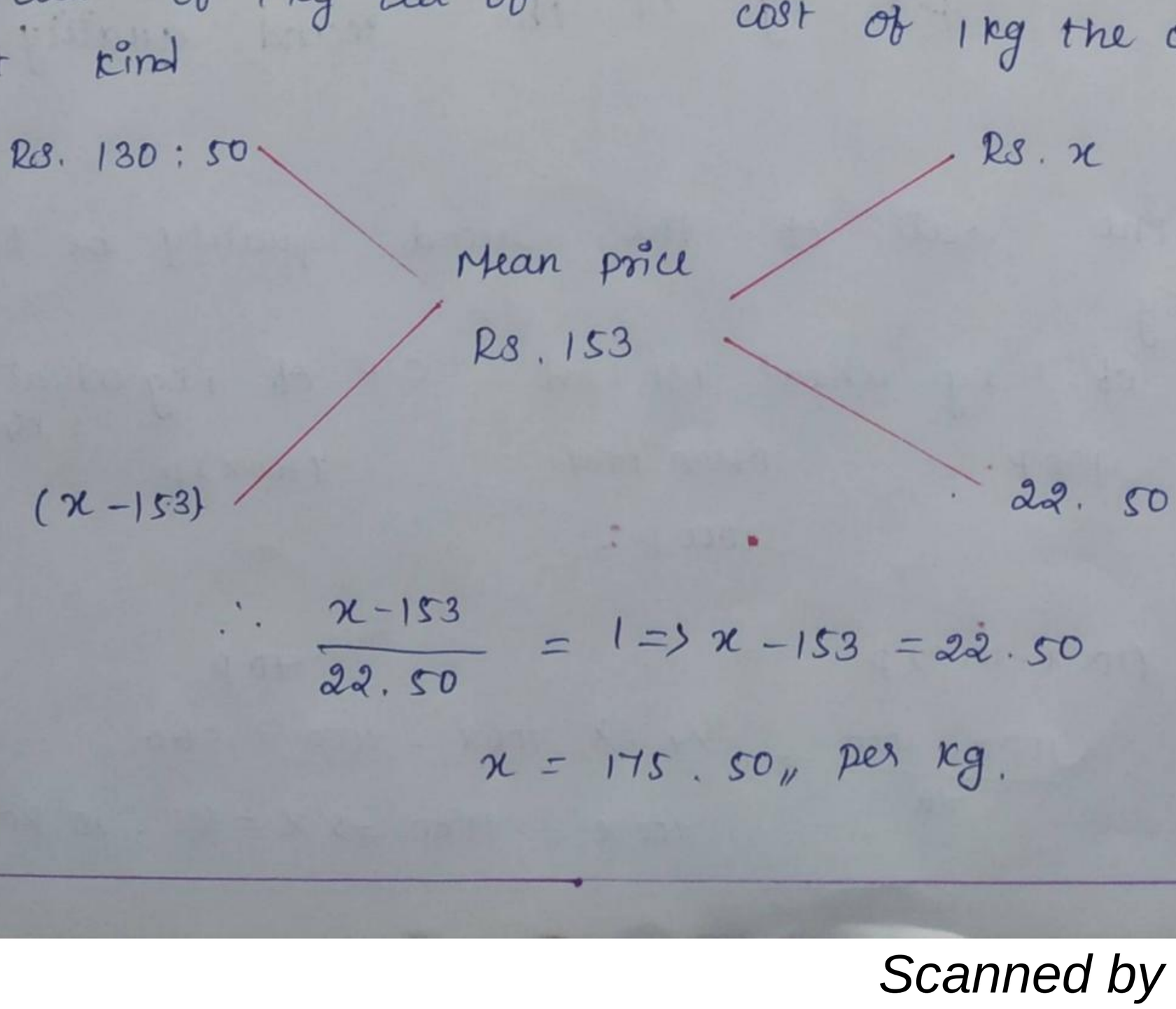
Soln:

Since first and second varieties are mixed in equal proportions, so theis avenge price.

$$= Rs\left(\frac{126+135}{2}\right) = Rs: 130.50.$$

So, the mixtures is formal by mixing two varieties one at Rs: 130.50 per kg and the other at say.

Rs. x per kg in the ratio 2:2, i.e 1:1 we have to find x.



$$\therefore \frac{x-153}{22.50} = 1 \Rightarrow x - 153 = 22.50$$

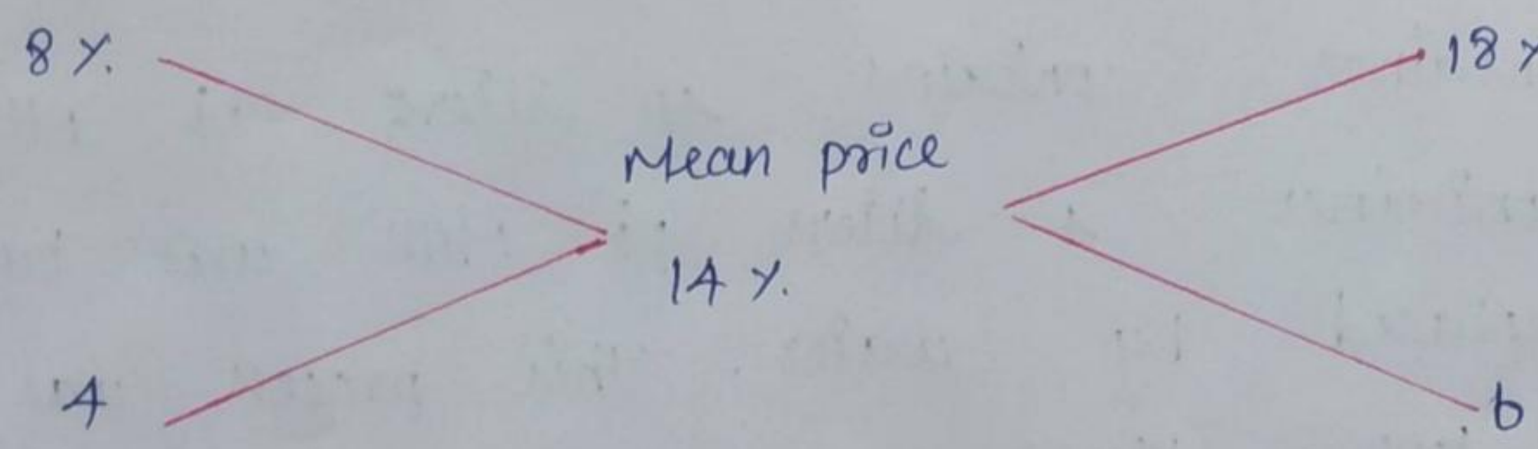
$$x = 175.50 \text{ per kg.}$$

5). A merchant has 1000 kg of sugar, part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. The quantity sold at 18% profit is.

Soln:

By the rule of alligation

we have: profit on 1st part — profit on 2nd part



Ratio of 1st and 2nd parts = 4 : 6 = 2 : 3

$\therefore$ Quantity of 2nd kind = $(\frac{3}{5} \times 1000)$ kg

= 600 kg.

b) A jar full of whisky containing 40% alcohal. A part of this whisky is replaced by another containing 19% alcohol and now the percentage of alcohol was found to be 26% quantity of whisky replaced is.

Soln:

By the rule of alligation

we have: Strength of 1st jar — Strength of 2nd jar

40 %. 19 %.

Mean Strength

26 %.

7 14 %.

So, ratio of 1st and 2nd quantities $= 7 : 14 = 1 : 2$

$\therefore$ required quantity replaced $= \frac{2}{3}$ "

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

Soln:

Amount of milk left after 3 operaters

$= \left[40\left(1-\frac{4}{10}\right)^3\right]$ liters

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

$= 29.16$ liters.

8). 8 liters are drawn from a cast full of wine and is then filled with water. This operation is performed there more times. The ratio of the quantity of wine now left in cast to that of the water 16 : 65. How much wine did the cask hold originally.

Sol:

Let the quantity of the time in the cask originally be x liters.

Then quantity of time left, in cast after 4 operations $= \left[x\left(1 - \frac{8}{x}\right) \right]$ liters.

$$\therefore \quad x\left(1-\frac{8}{x}\right)^4 = \frac{16}{81} \Rightarrow \left(1-\frac{8}{x}\right)^4 = \left(\frac{2}{3}\right)^2$$

$$\Rightarrow \frac{x-8}{x} = 2/3$$

$$3x - 24 = 2x$$

$$x = 24$$

9). A can contains a mixture of two liquids A and B in the ratio 7 : 5 when 9 liters of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9 How many liters of liquid A was contained by the can initially?

Soln:

Suppose the can initailly contains $4x$ and $5x$ liters of mixtures A and B respectively.

Quantity of A in mixture left $= \left(4x - \frac{7}{12} \times 9\right)$ liters

Quantity of B in mixture left $= \left(5x - \frac{5}{12} \times 9\right)$ liters

$= \left(5x - \frac{15}{4}\right)$ liters

$$\therefore \frac{\left(4x - \frac{21}{4}\right)}{\left(5x - \frac{15}{4}\right) + 9} = \frac{7}{9} \Rightarrow \frac{28x - 21}{20x + 21} = 7/9$$

$$252x - 189 = 140x + 147$$

$$\Rightarrow 112x = 336$$

$$\boxed{x = 3}$$

So the can contained 21 liters of A

10). A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and repleaced with water so that the mixture many be half water and half syrup.

Soln:

Suppose the vessel initailly contains 8 liters of liquid.

Let x liters of this liquid be replaced with water.

$$\text{Quantity of water in new mixture} \Big\} = \left(3 - \frac{3x}{8} + x\right) \text{liters}$$

$$\text{Quantity of syrup in new mixture} \Big\} = \left(5 - \frac{5x}{8}\right)$$

$$\Rightarrow 5x + 24 = 40 - 5x$$

$$\Rightarrow 10x = 16$$

$$x = \frac{16}{10} \quad \begin{matrix} 8 \\ 5 \end{matrix}$$

$$x = \frac{8}{5}$$

So part of the mixture replaced.

$$= \left(\frac{8}{5} \times \frac{1}{8}\right)$$

$$= 1/5 .$$

Allegation OR Mixture

11. In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 per kg

Ans

By the rule of allegation:

Cost of 1 kg pulses of 1st kind — Rs. 15

Cost of 1 kg pulses of 2nd kind — Rs. 20

Mean price — Rs. 16.50

3.50

1.50

$\therefore$ Required ratio = 3.50 : 1.50 = 35 : 15 = 7 : 3

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

Ans

By the rule of allegation:

Cost of 1 kg rice of 1st kind — 720 p

Cost of 1 kg rice of 2nd kind — 570 p

Mean price — 630 p

60

90

∴ Required ratio = 60 : 90 = 2 : 3

13. In what ratio must tea at Rs. 62 per kg be mixed with tea at Rs. 72 per kg so that the mixture must be worth Rs. 64.50 per kg?

Sol:

By the rule of alligation

Cost of 1 kg tea of 1st kind | Cost of 1kg tea of 2nd kind

6200 p | 7200 p

Mean price

6450 p

750 | 250

∴ Required ratio = 750 : 250 = 3 : 1

14. In what ratio must water be mixed with milk costing Rs. 12 per litre to obtain a mixture worth of Rs. 8 per litre?

Sol:

By the rule of alligation:

C.P of 1 litre of water | C.P of 1 litre of milk

0 | Rs. 12

Mean price

Rs. 8

4 | 8

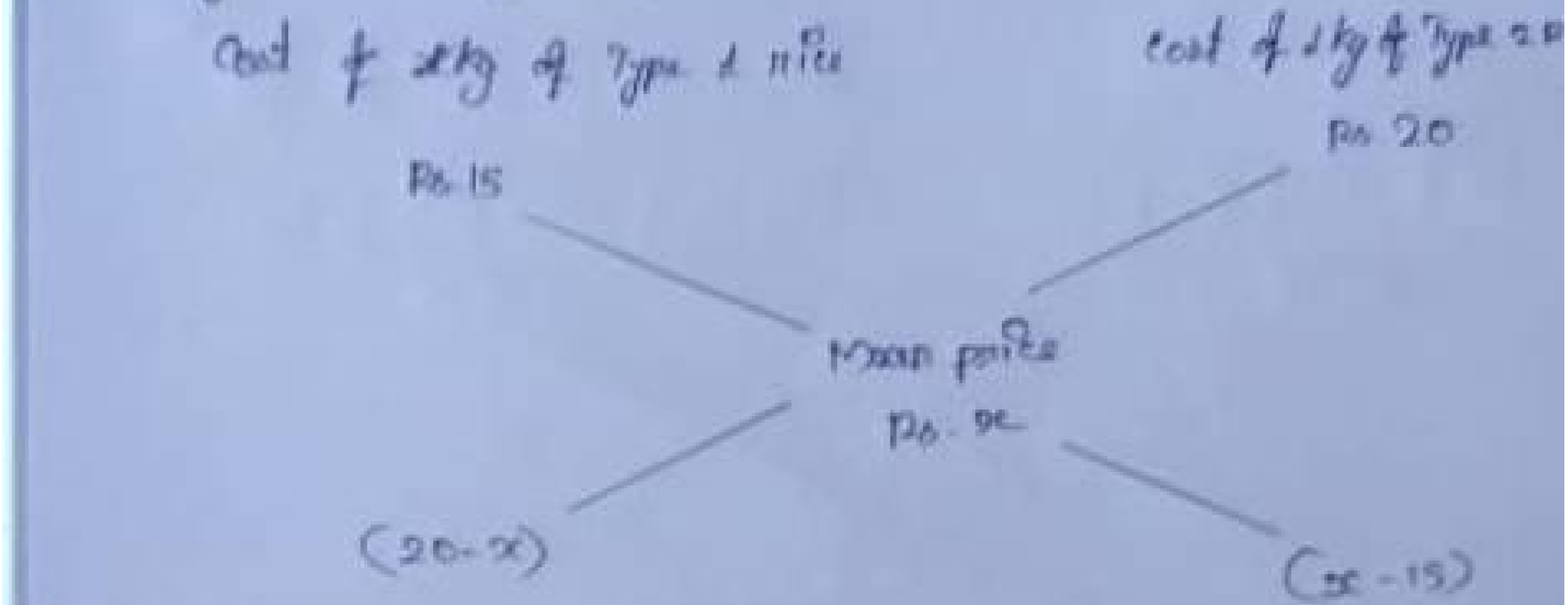
∴ Ratio of water to milk = 4 : 8 = 1 : 2.

16. The cost of Type 1 rice is Rs. 15 per kg and Type 2 rice is Rs. 20 per kg. If both Type 1 and Type 2 are mixed in the ratio of 2:3, then the price per kg of the mixed variety of rice is

Sol.

Let the price of the mixed variety be Rs. x per kg

By the rule of allligation, we have:



$\therefore \frac{(20-x)}{(x-15)} = \frac{2}{3} \Rightarrow 60-3x = 2x-30 \Rightarrow 5x = 90 \Rightarrow x = 18.$

So, Price of the mixture is Rs 18 per kg.