

# 21

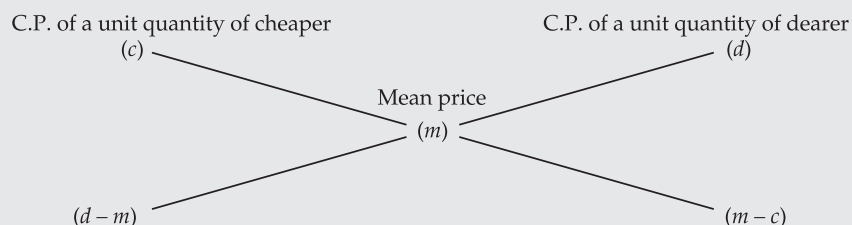
## Alligation or Mixture

### IMPORTANT FACTS AND FORMULAE

- I. 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 a desired price.
- II. Mean Price:** The cost price of a unit quantity of the mixture is called the mean price.
- III. Rule of Alligation:** If two ingredients are mixed, then

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

We present as under :



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

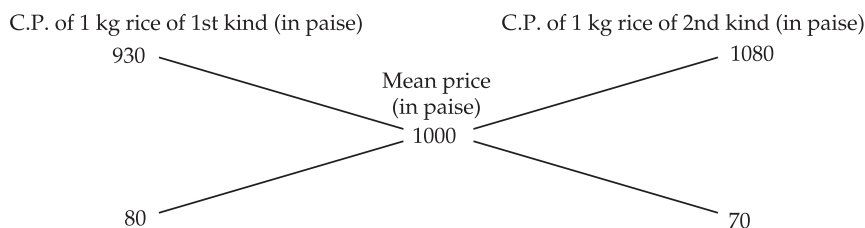
- IV.** Suppose a container contains  $x$  units of liquid from which  $y$  units are taken out and replaced by water.

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

### SOLVED EXAMPLES

**Ex. 1.** In what ratio must rice at ₹ 9.30 per kg be mixed with rice at ₹ 10.80 per kg so that the mixture be worth ₹ 10 per kg ?

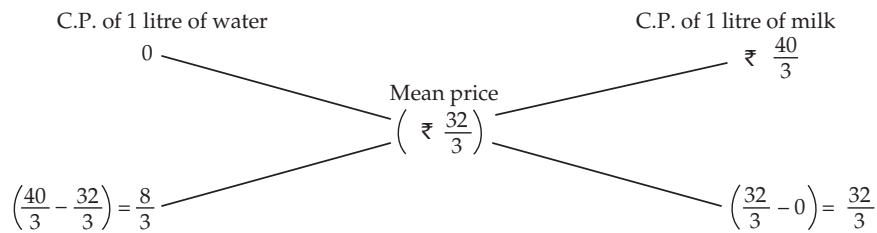
**Sol.** By the rule of alligation, we have :



$\therefore$  Required ratio =  $80 : 70 = 8 : 7$ .

**Ex. 2.** How much water must be added to 60 litres of milk at  $1\frac{1}{2}$  litres for ₹ 20 so as to have a mixture worth ₹  $10\frac{2}{3}$  a litre ?

**Sol.** C.P. of 1 litre of milk = ₹  $\left( 20 \times \frac{2}{3} \right) = ₹ \frac{40}{3}$ .



$$\text{Ratio of water and milk} = \frac{8}{3} : \frac{32}{3} = 8 : 32 = 1 : 4.$$

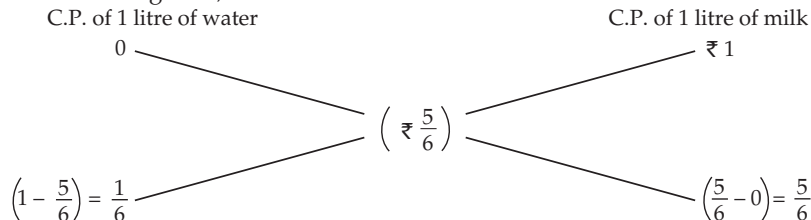
$$\therefore \text{Quantity of water to be added to 60 litres of milk} = \left(\frac{1}{4} \times 60\right) \text{ litres} = 15 \text{ litres.}$$

**Ex. 3.** In what ratio must water be mixed with milk to gain 20% by selling the mixture at cost price ?

**Sol.** Let C.P. of milk be ₹ 1 per litre. Then, S.P. of 1 litre of mixture = ₹ 1. Gain obtained = 20%.

$$\therefore \text{C.P. of 1 litre of mixture} = \text{₹} \left( \frac{100}{120} \times 1 \right) = \text{₹} \frac{5}{6}.$$

By the rule of alligation, we have :



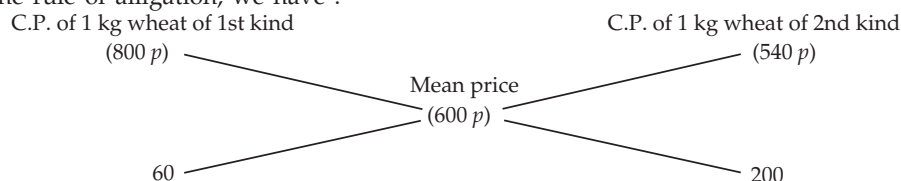
$$\therefore \text{Ratio of water and milk} = \frac{1}{6} : \frac{5}{6} = 1 : 5.$$

**Ex. 4.** How many kgs. of wheat costing ₹ 8 per kg must be mixed with 36 kg of rice costing ₹ 5.40 per kg so that 20% gain may be obtained by selling the mixture at ₹ 7.20 per kg ?

**Sol.** S.P. of 1 kg mixture = ₹ 7.20, Gain = 20%.

$$\therefore \text{C.P. of 1 kg mixture} = \text{₹} \left( \frac{100}{120} \times 7.20 \right) = \text{₹} 6.$$

By the rule of alligation, we have :



Wheat of 1st kind : Wheat of 2nd kind = 60 : 200 = 3 : 10.

Let  $x$  kg of wheat of 1st kind be mixed with 36 kg of wheat of 2nd kind.

Then,  $3 : 10 = x : 36$  or  $10x = 3 \times 36$  or  $x = 10.8$  kg.

**Ex. 5.** The milk and water in two vessels A and B are in the ratio 4 : 3 and 2 : 3 respectively. In what ratio, the liquids in both the vessels be mixed to obtain a new mixture in vessel C containing half milk and half water ?

**Sol.** Let the C.P. of milk be ₹ 1 per litre.

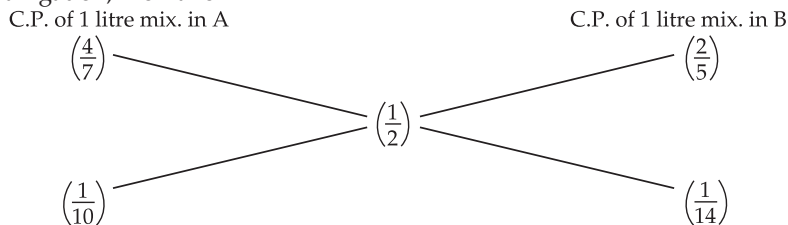
Milk in 1 litre mixture of A =  $\frac{4}{7}$  litre; Milk in 1 litre mixture of B =  $\frac{2}{5}$  litre;

Milk in 1 litre mixture of C =  $\frac{1}{2}$  litre.

$$\therefore \text{C.P. of 1 litre mixture in A} = \text{₹} \frac{4}{7}; \text{C.P. of 1 litre mixture in B} = \text{₹} \frac{2}{5}.$$

$$\text{Mean price} = ₹ \frac{1}{2}.$$

By the rule of alligation, we have :



$$\therefore \text{ Required ratio} = \frac{1}{10} : \frac{1}{14} = 7 : 5.$$

### EXERCISE

#### (OBJECTIVE TYPE QUESTIONS)

**Directions:** Mark (3) against the correct answer:

1. In what ratio must a grocer mix two varieties of pulses costing ₹ 15 and ₹ 20 per kg respectively so as to get a mixture worth ₹ 16.50 per kg ?  
(R.R.B., 2008)
 

(a) 3 : 7	(b) 5 : 7
(c) 7 : 3	(d) 7 : 5
2. Find the ratio in which rice at ₹ 7.20 a kg be mixed with rice at ₹ 5.70 a kg to produce a mixture worth ₹ 6.30 a kg.
 

(a) 1 : 3	(b) 2 : 3
(c) 3 : 4	(d) 4 : 5
3. In what ratio must tea at ₹ 62 per kg be mixed with tea at ₹ 72 per kg so that the mixture must be worth ₹ 64.50 per kg ?
 

(a) 3 : 1	(b) 3 : 2
(c) 4 : 3	(d) 5 : 3
4. In what ratio must water be mixed with milk costing ₹ 12 per litre to obtain a mixture worth of ₹ 8 per litre ?
 

(a) 1 : 2	(b) 2 : 1
(c) 2 : 3	(d) 3 : 2
5. The cost of Type 1 rice is ₹ 15 per kg and Type 2 rice is ₹ 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
 

(a) ₹ 18	(b) ₹ 18.50
(c) ₹ 19	(d) ₹ 19.50
6. In what ratio must a grocer mix two varieties of tea worth ₹ 60 a kg and ₹ 65 a kg so that by selling the mixture at ₹ 68.20 a kg he may gain 10%?
 

(a) 3 : 2	(b) 3 : 4
(c) 3 : 5	(d) 4 : 5
7. How many kilograms of sugar costing ₹ 9 per kg must be mixed with 27 kg of sugar costing ₹ 7 per kg so that there may be a gain of 10% by selling the mixture at ₹ 9.24 per kg ?
 

(a) 36 kg	(b) 42 kg
(c) 54 kg	(d) 63 kg
8. In what ratio must water be mixed with milk to gain  $16\frac{2}{3}\%$  on selling the mixture at cost price ?
 

(a) 1 : 6	(b) 6 : 1
(c) 2 : 3	(d) 4 : 3
9. 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) $6\frac{1}{4}\%$
(c) 20%	(d) 25%
10. Two vessels A and B contain spirit and water mixed in the ratio 5 : 2 and 7 : 6 respectively. Find the ratio in which these mixtures be mixed to obtain a new mixture in vessel C containing spirit and water in the ratio 8 : 5 ?
 

(a) 4 : 3	(b) 3 : 4
(c) 5 : 6	(d) 7 : 9
11. 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  $69\frac{3}{13}\%$  milk, is
 

(a) 2 : 7	(b) 3 : 5
(c) 5 : 2	(d) 5 : 7
12. 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 he mix from each of the containers so as to get 12 litres of milk such that the ratio of water to milk is 3 : 5 ?
 

(a) 4 litres, 8 litres	(b) 6 litres, 6 litres
(c) 5 litres, 7 litres	(d) 7 litres, 5 litres

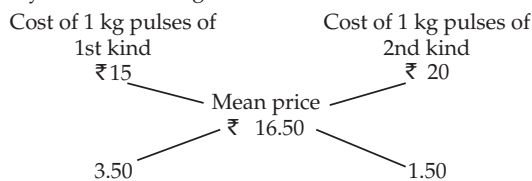
13. One quality of wheat at ₹ 9.30 per kg is mixed with another quality at a certain rate in the ratio 8 : 7. If the mixture so formed be worth ₹ 10 per kg, what is the rate per kg of the second quality of wheat ?  
 (a) ₹ 10.30 (b) ₹ 10.60  
 (c) ₹ 10.80 (d) ₹ 11
14. Tea worth ₹ 126 per kg and ₹ 135 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If the mixture is worth ₹ 153 per kg, the price of the third variety per kg will be :  
 (a) ₹ 169.50 (b) ₹ 170  
 (c) ₹ 175.50 (d) ₹ 180
15. 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  
 (a) 400 kg (b) 560 kg  
 (c) 600 kg (d) 640 kg
16. A jar full of whisky contains 40% alcohol. A part of this whisky is replaced by another containing 19% alcohol and now the percentage of alcohol was found to be 26%. The quantity of whisky replaced is :  
 (a)  $\frac{1}{3}$  (b)  $\frac{2}{3}$   
 (c)  $\frac{2}{5}$  (d)  $\frac{3}{5}$
17. 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
18. 8 litres are drawn from a cask full of wine and is then filled with water. This operation is performed three more times. The ratio of the quantity of wine now left in cask to that of the water is 16 : 65. How much wine did the cask hold originally ?  
 (a) 18 litres (b) 24 litres  
 (c) 32 litres (d) 42 litres
19. A can contains a mixture of two liquids A and B in the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially?  
 (a) 10 (b) 20  
 (c) 21 (d) 25
20. 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 replaced with water so that the mixture may be half water and half syrup ?  
 (a)  $\frac{1}{3}$  (b)  $\frac{1}{4}$   
 (c)  $\frac{1}{5}$  (d)  $\frac{1}{7}$
21. A milkman mixed some water with milk to gain 25% by selling the mixture at the cost price. The ratio of water and milk is respectively.  
 [SSC—CHSL (10+2) Exam, 2015]  
 (a) 5 : 4 (b) 4 : 5  
 (c) 1 : 5 (d) 1 : 4
22. 20 litres of a mixture contains milk and water in the ratio 3 : 1. Then the amount of milk to be added to the mixture so as to have milk and water in ratio 4 : 1 is  
 [SSC—CHSL (10+2) Exam, 2015]  
 (a) 7 litres (b) 4 litres  
 (c) 5 litres (d) 6 litres
23. A vessel contains a mixture of Grape, Pineapple and Banana juices in the respective ratio of 4 : 6 : 5. 15 litres of this mixture is taken out and 8 litres of grape juice and 2 litres of pineapple juice is added to the vessel. If the resultant quantity of grape juice is 10 litres less than the resultant quantity of pineapple juice. What was the initial quantity of mixture in the vessel? (in litres)  
 [IBPS—Bank PO/MT (Pre.) Exam, 2015]  
 (a) 120 (b) 150  
 (c) 105 (d) 135
24. The respective ratio of milk and water in the mixture is 4 : 3 respectively. If 6 Litres of water is added to this mixture, the respective ratio of milk and water becomes 8 : 7. What is the quantity of milk in the original mixture?  
 [IBPS—RRB Office Assistant (Online) Exam, 2015]  
 (a) 36 litres (b) 84 litres  
 (c) 48 litres (d) None of these
25. 35 kg of type A sandal powder, which costs ₹ 614 per kg, was mixed with a certain amount of type B sandal powder, which costs ₹ 695 per kg. then the mixture was sold at the rate of ₹ 767 per kg and 18% profit was earned. What was the amount (in kg) of type B sandal powder in the mixture?  
 [IBPS—Bank Spl. Officer (IT) Exam, 2015]  
 (a) 24 (b) 28  
 (c) 32 (d) 36
26. How many liters of water should be added to a 30 litre mixture of milk and water containing milk and water in the ratio of 7 : 3 such that the resultant mixture has 40% water in it?  
 [SSC—Junior Associates (Pre.) Exam, 2016]  
 (a) 5 (b) 2  
 (c) 3 (d) 8

## ANSWERS

- |         |         |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (c)  | 2. (b)  | 3. (a)  | 4. (a)  | 5. (a)  | 6. (a)  | 7. (d)  | 8. (a)  | 9. (c)  | 10. (d) |
| 11. (a) | 12. (b) | 13. (c) | 14. (c) | 15. (c) | 16. (b) | 17. (d) | 18. (b) | 19. (c) | 20. (c) |
| 21. (d) | 22. (c) | 23. (d) | 24. (d) | 25. (b) | 26. (a) |         |         |         |         |

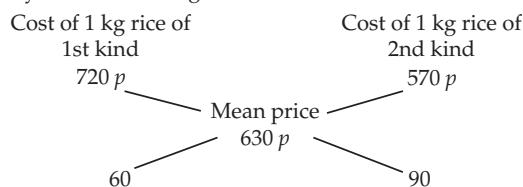
## SOLUTIONS

1. By the rule of alligation :



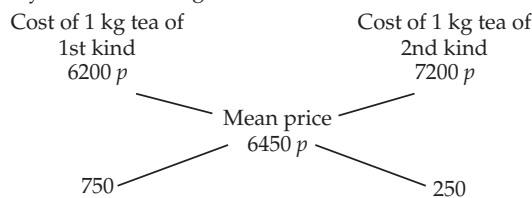
∴ Required rate = 3.50 : 1.50 = 35 : 15 = 7 : 3.

2. By the rule of alligation :



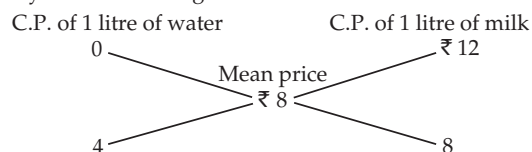
∴ Required ratio = 60 : 90 = 2 : 3.

3. By the rule of alligation :



∴ Required ratio = 750 : 250 = 3 : 1.

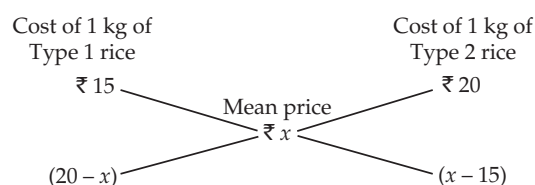
4. By the rule of alligation :



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

5. Let the price of the mixed variety be ₹ x per kg.

By the rule of alligation, we have :



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

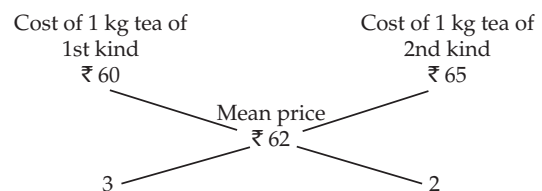
$$\Rightarrow 5x = 90 \Rightarrow x = 18.$$

So, price of the mixture is ₹ 18 per kg.

6. S.P. of 1 kg of the mixture = ₹ 68.20, Gain = 10 %.

$$\text{C.P. of 1 kg of the mixture} = ₹ \left( \frac{100}{110} \times 68.20 \right) = ₹ 62.$$

By the rule of alligation, we have :

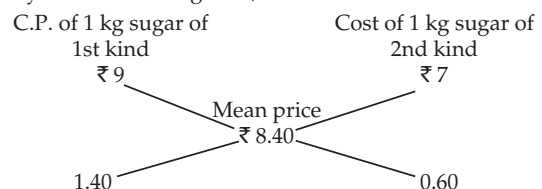


∴ Required ratio = 3 : 2.

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

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

By the rule of alligation, we have :



∴ Ratio of quantities of 1st and 2nd kind = 14 : 6 = 7 : 3.

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

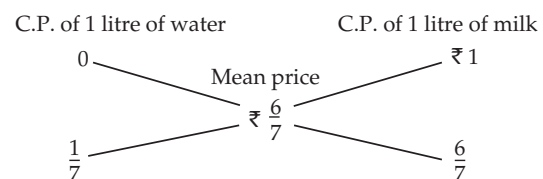
$$\text{Then, } 7 : 3 = x : 27 \text{ or } x = \left( \frac{7 \times 27}{3} \right) = 63 \text{ kg.}$$

8. Let C.P. of 1 litre milk be ₹ 1.

$$\text{S.P. of 1 litre of mixture} = ₹ 1, \text{ Gain} = \frac{50}{3} \%$$

$$\therefore \text{C.P. of 1 litre of mixture} = \left( 100 \times \frac{3}{350} \times 1 \right) = ₹ \frac{6}{7}.$$

By the rule of alligation, we have :

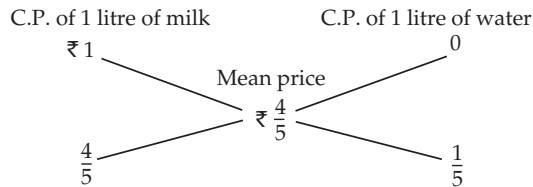


$$\therefore \text{Ratio of water and milk} = \frac{1}{7} : \frac{6}{7} = 1 : 6.$$

9. Let C.P. of 1 litre milk be ₹ 1.

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

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



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

Hence, percentage of water in the mixture

$$= \left( \frac{1}{5} \times 100 \right) \% = 20\%.$$

10. Let the C.P. of spirit be ₹ 1 per litre.

Spirit in 1 litre mix. of A =  $\frac{5}{7}$  litre;

C.P. of 1 litre mix. in A = ₹  $\frac{5}{7}$ .

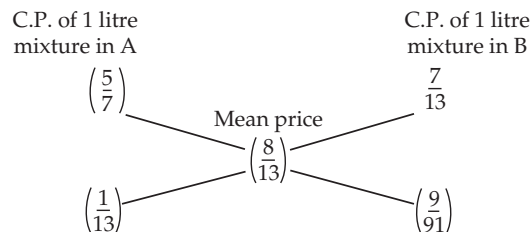
Spirit in 1 litre mix. of B =  $\frac{7}{13}$  litre;

C.P. of 1 litre mix. in B = ₹  $\frac{7}{13}$ .

Spirit in 1 litre mix. of C =  $\frac{8}{13}$  litre;

Mean price = ₹  $\frac{8}{13}$ .

By the rule of alligation, we have:



$$\therefore \text{Required ratio} = \frac{1}{13} : \frac{9}{91} = 7 : 9.$$

11. Let cost of 1 litre milk be ₹ 1.

Milk in 1 litre mix. in A =  $\frac{8}{13}$  litre,

C.P. of 1 litre mix. in A = ₹  $\frac{8}{13}$ .

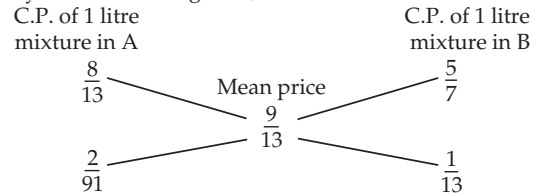
Milk in 1 litre mix. in B =  $\frac{5}{7}$  litre,

C.P. of 1 litre mix. in B = ₹  $\frac{5}{7}$ .

Milk in 1 litre of final mix. =  $\left( \frac{900}{13} \times \frac{1}{100} \times 1 \right) = \frac{9}{13}$  litre;

Mean price = ₹  $\frac{9}{13}$ .

By the rule of alligation, we have :



$$\therefore \text{Required ratio} = \frac{2}{91} : \frac{1}{13} = 2 : 7.$$

12. Let cost of 1 litre milk be ₹ 1.

Milk in 1 litre mix. in 1st can =  $\frac{3}{4}$  litre,

C.P. of 1 litre mix. in 1st can = ₹  $\frac{3}{4}$ .

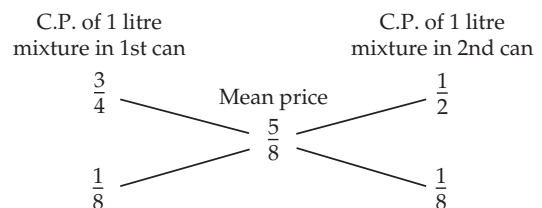
Milk in 1 litre mix. in 2nd can =  $\frac{1}{2}$  litre,

C.P. of 1 litre mix. in 2nd can = ₹  $\frac{1}{2}$ .

Milk in 1 litre of final mix. =  $\frac{5}{8}$  litre,

Mean price = ₹  $\frac{5}{8}$ .

By the rule of alligation, we have :



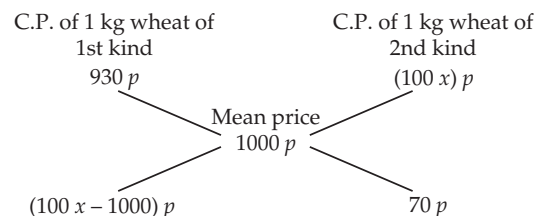
$$\therefore \text{Ratio of two mixtures} = \frac{1}{8} : \frac{1}{8} = 1 : 1.$$

So, quantity of mixture taken from each can

$$= \left( \frac{1}{2} \times 12 \right) = 6 \text{ litres.}$$

13. Let the rate of the second quality be ₹  $x$  per kg.

By the rule of alligation, we have :



$$\therefore \frac{100x - 1000}{70} = \frac{8}{7} \Rightarrow 700x - 7000 = 560 \Rightarrow 700x = 7560$$

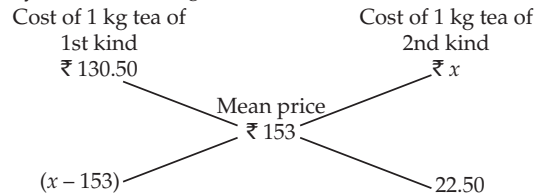
$$\Rightarrow x = ₹ 10.80.$$

14. Since first and second varieties are mixed in equal proportions, so their average price

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

So, the mixture is formed by mixing two varieties, one at ₹ 130.50 per kg and the other at say, ₹  $x$  per kg in the ratio 2 : 2, i.e., 1 : 1. We have to find  $x$ .

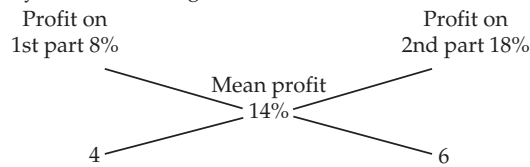
By the rule of alligation, we have :



$$\therefore \frac{x - 153}{22.50} = 1 \Rightarrow x - 153 = 22.50 \Rightarrow x = 175.50.$$

Hence, price of the third variety = ₹ 175.50 per kg.

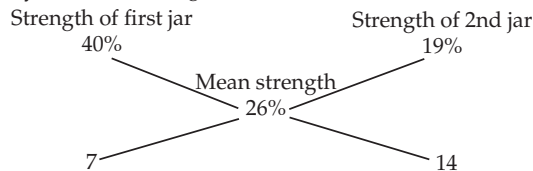
15. By the rule of alligation, we have :



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

$$\therefore \text{Quantity of 2nd kind} = \left( \frac{3}{5} \times 1000 \right) \text{ kg} = 600 \text{ kg}.$$

16. By the rule of alligation, we have :



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

$$\therefore \text{Required quantity replaced} = \frac{2}{3}.$$

17. Amount of milk left after 3 operations

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

$$= \left( 40 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} \right) = 29.16 \text{ litres}.$$

18. Let the quantity of the wine in the cask originally be  $x$  litres.

Then, the quantity of the wine left in cask after 4 operations

$$= \left[ x \left( 1 - \frac{8}{x} \right)^4 \right] \text{ litres}.$$

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

$$\Rightarrow 3x - 24 = 2x \Rightarrow x = 24.$$

19. Suppose the can initially contains  $7x$  and  $5x$  litres of mixtures A and B respectively.

Quantity of A in mixture left

$$= \left( 7x - \frac{7}{12} \times 9 \right) \text{ litres} = \left( 7x - \frac{21}{4} \right) \text{ litres}.$$

Quantity of B in mixture left

$$= \left( 5x - \frac{5}{12} \times 9 \right) \text{ litres} = \left( 5x - \frac{15}{4} \right) \text{ litres}.$$

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

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

$$\Rightarrow 112x = 336 \Rightarrow x = 3.$$

So, the can contained 21 litres of A.

20. Suppose the vessel initially contains 8 litres of liquid. Let  $x$  litres of this liquid be replaced with water.

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

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

$$\therefore \left( 3 - \frac{3x}{8} + x \right) = \left( 5 - \frac{5x}{8} \right)$$

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

$$\Rightarrow 10x = 16 \Rightarrow x = \frac{8}{5}.$$

$$\text{So, part of the mixture replaced} = \left( \frac{8}{5} \times \frac{1}{8} \right) = \frac{1}{5}.$$

21. C.P. of 1 litres of milk = ₹ 100

$\therefore$  Mixture sold for ₹ 125

$$= \frac{125}{100} = \frac{5}{4} \text{ liters}$$

$$\therefore \text{Quantity of mixture} = \frac{5}{4} \text{ liters}$$

$$\therefore \text{Quantity of milk} = 1 \text{ liters}$$

$$\therefore \text{Quantity of water} = \frac{5}{4} - 1 = \frac{1}{4} \text{ liters}$$

$$\therefore \text{Required ratio} = \frac{1}{4} : 1$$

$$= 1 : 4$$

22. In 20 litres of mixture.

$$\text{Quantity of Milk} \Rightarrow \frac{3}{4} \times 20 = 15 \text{ liters}$$

$$\text{Quantity of Water} \Rightarrow \frac{1}{4} \times 20 = 5 \text{ liters}$$

Let the quantity of milk added be  $x$  liters.

According to the question,

$$\frac{15 + x}{5} = \frac{4}{1}$$

$$\Rightarrow 15 + x = 4 \times 5$$

$$\Rightarrow x = 20 - 15 = 5 \text{ liters}$$

23. Let quantity of grape, pineapple and banana juice in the mixture be  $4x$ ,  $6x$  and  $5x$  respectively

Total initial quantity of juice in the vessel

$$= 4x + 6x + 5x = 15x \text{ liters}$$

In 15 liters of juice,  
 Grape's juice = 4 liters  
 Pineapple's juice = 6 liters  
 Banana's juice = 5 liters  
 Resultant quantity of grape juice is 10 liters less than the resultant quantity of pineapple juice.

$$\Rightarrow (6x - 6 + 2) - (4x - 4 + 8) = 10$$

$$\Rightarrow 6x - 4 - 4x - 4 = 10$$

$$\Rightarrow 2x - 8 = 10$$

$$\Rightarrow 2x = 10 + 8 = 18$$

$$\Rightarrow x = 9$$

$$\therefore \text{Initial quantity of mixture} = 15x \\ = 15 \times 9 = 135 \text{ liters}$$

24. Let the quantity of milk and water in initial mixture be  $4x$  and  $3x$  liters.

Quantity of water =  $3x$  liters

On adding 6 liters of water, we get

$$\frac{4x}{3x+6} = \frac{8}{7}$$

$$\Rightarrow 28x = 24x + 48$$

$$\Rightarrow 28x - 24x = 48$$

$$\Rightarrow 4x = 48$$

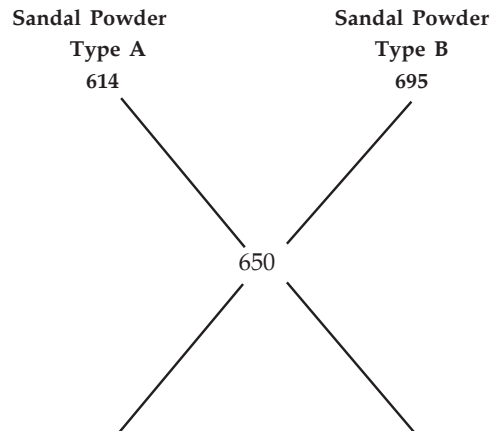
$$\Rightarrow x = \frac{48}{4} = 12$$

$$\therefore \text{Required quantity of milk} \\ = 4x = 4 \times 12 = 48 \text{ liters.}$$

25. Cost price of mixture

$$= \frac{\text{Sale price}}{(100 + \text{gain}\%)} \times 100 = \frac{767}{118} \times 100 = ₹ 650$$

By using allegation method:



$$695 - 650 = 45$$

$$650 - 614 = 36$$

$$\text{Ratio} = 5 : 4$$

$$\therefore \text{Quantity of A type of sandal is } 35 \text{ kg}$$

$$\therefore 5x = 35 \text{ kg}$$

$$\therefore x = 7 \text{ kg}$$

$$\text{Thus B type sandal} = 7 \times 4 = 28 \text{ kg}$$

26. Total quantity of mixture = 30 litres

$$\text{Quantity Milk in the mixture} = \frac{7}{7+3} \times 30 \text{ litre} = 21 \text{ litres}$$

$$\text{and quantity water in the mixture} = \frac{3}{7+3} \times 30 \text{ litre} = 9 \text{ litres}$$

Let water to be mixed ' $a$ ' litre

$$\text{Then } (30 + a) \times \frac{40}{100} = 9 + a$$

$$\text{or } 120 + 4a = 90 + 10a$$

$$\text{or } 120 - 90 = 10a - 4a$$

$$30 = 6a$$

$$\Rightarrow a = 5$$

Hence, 5 litres water mixed in the mixture.