

For More Visit - www.ssc-cgl2014.in

Reasoning and Quantitative Aptitude

Alligation or Mixture

Kindly click on advertisement on our website www.ssc-cgl2014.in while visiting to enable us to meet our expenses in maintaining our website. Thanks

ALLIGATION OR MIXTURE

ALLIGATION OR MIXTURE

IMPORTANT FACTS AND FORMULAE

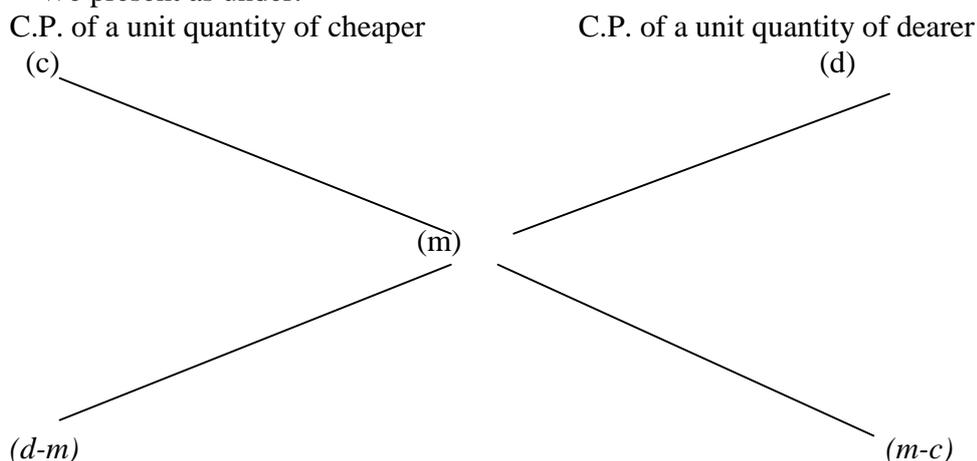
1. **Alligation:** It is the rule that enables us to find the ratio in which two or more ingredients at the given price must be mixed to produce a mixture of a desired price.

2. **Mean Price:** The cost price of a unit quantity of the mixture is called the mean price.

3. **Rule of Alligation:** If two ingredients are mixed, then

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

We present as under:



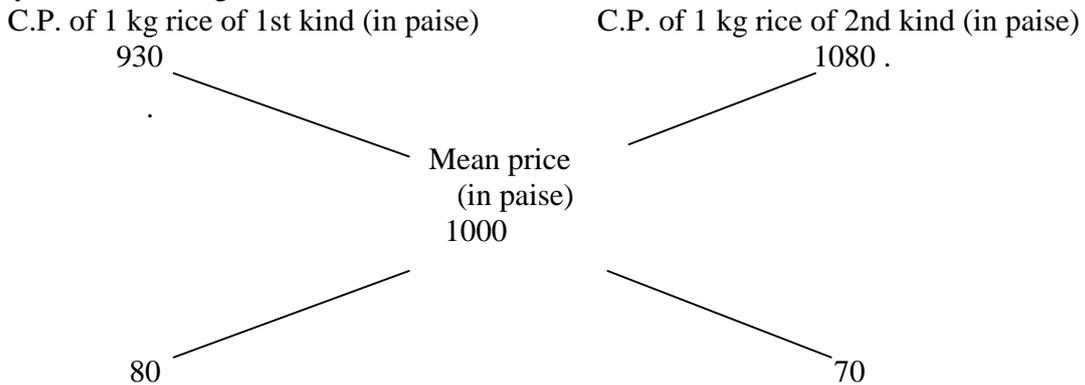
$$\therefore \text{(Cheaper quantity)} : \text{(Dearer quantity)} = (d - m) : (m - c).$$

4. 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 = $\left[x(1-y/x)^n \right]$ units.

SOLVED EXAMPLES

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

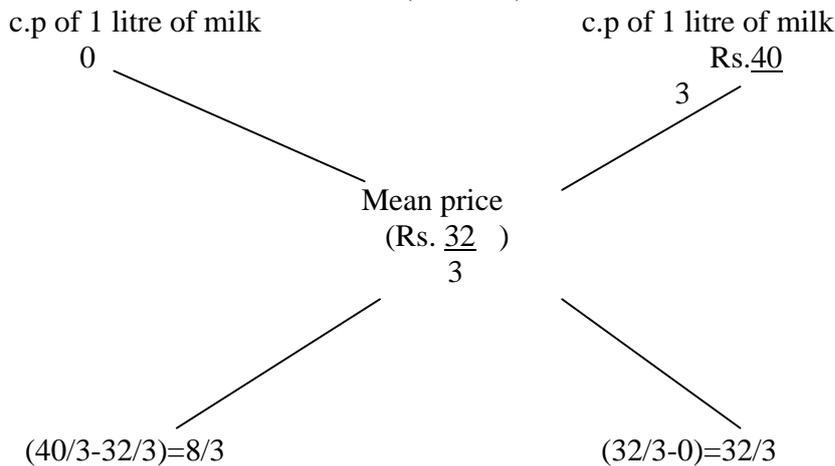
Sol. By the rule of alligation, we have:



∴ Required ratio = 80 : 70 = 8 : 7.

Ex. 2. How much water must be added to 60 litres of milk at 1 ½ litres for Rs. 20 So as to have a mixture worth Rs.10 2/3 a litre ?

Sol. C.P. of 1 litre of milk = Rs. (20 x 2/3) = Rs. 40/3



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

∴ Quantity of water to be added to 60 litres of milk = $[1/4 \times 60]$ litres = 15 litre

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

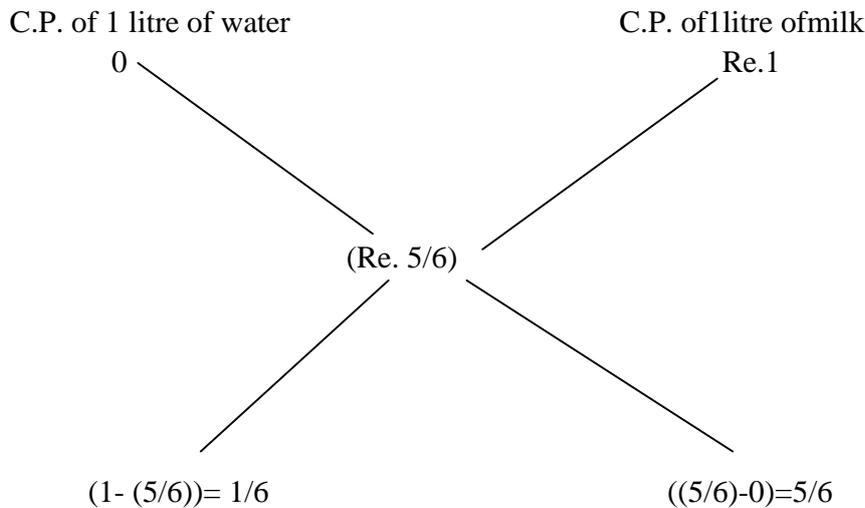
Sol. Let C.P. of milk be Re. 1 per litre.

Then, S.P. of 1 litre of mixture = Re. 1.

Gain obtained = 20%.

∴ C.P. of 1 litre of mixture = Rs. $[(100/120) * 1] = \text{Rs. } 5/6$

By the rule of alligation, we have:



∴ Ratio of water and milk = $1/6 : 5/6$

Ex. 4. How many kgs. of wheat costing Rs. 8 per kg must be mixed with 86 kg of rice costing Rs. 6.40 per kg so that 20% gain may be obtained by selling the mixture at Rs. 7.20 per kg ?

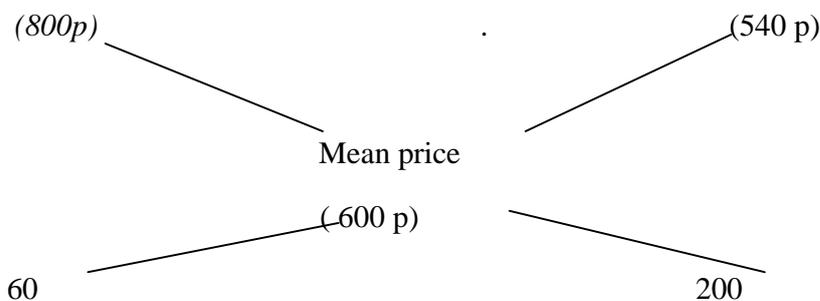
Sol. S.P. of 1 kg mixture = Rs. 7.20, Gain = 20%.

∴ C.P. of 1 kg mixture = Rs. $[(100/120) * 7.20] = \text{Rs. } 6$.

By the rule of alligation, we have:

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

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



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 $10x = 3 * 36$ 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 Re. 1 per litre

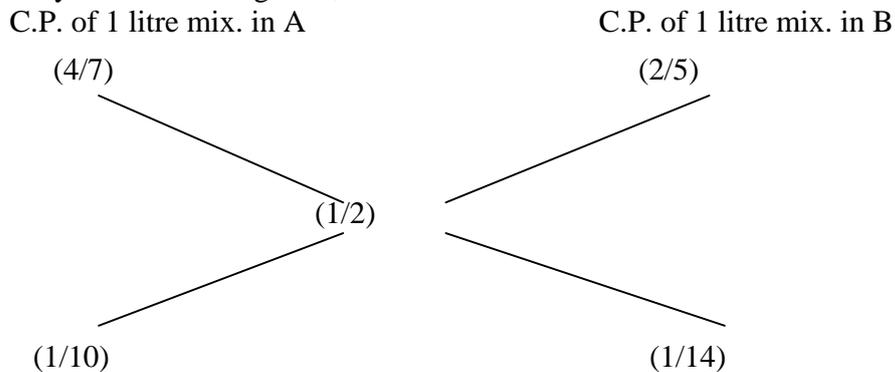
Milk in 1 litre mixture of A = $\frac{4}{7}$ litre; Milk in 1 litre mixture of B = $\frac{2}{5}$ litre;

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

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

Mean price = Re. $\frac{1}{2}$

By the rule of alligation, we have:

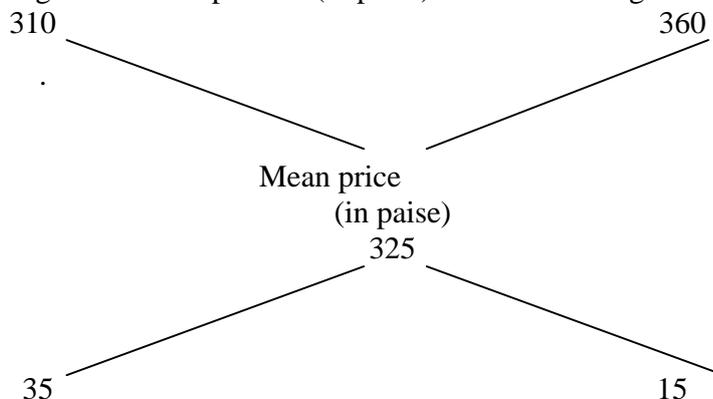


∴ Required ratio = $\frac{1}{10} : \frac{1}{14} = 7 : 5$

Ex. 6. In what proportion must rice at Rs. 3.10 per kg be mixed with rice at Rs. 3.60 per kg so that the mixture be worth Rs. 3.25 per kg ?

Sol. By the rule of alligation, we have:

C.P. of 1 kg rice of Cheaper rice (in paise) C.P. of 1 kg rice of dearer rice (in paise)



By the allegation rule:

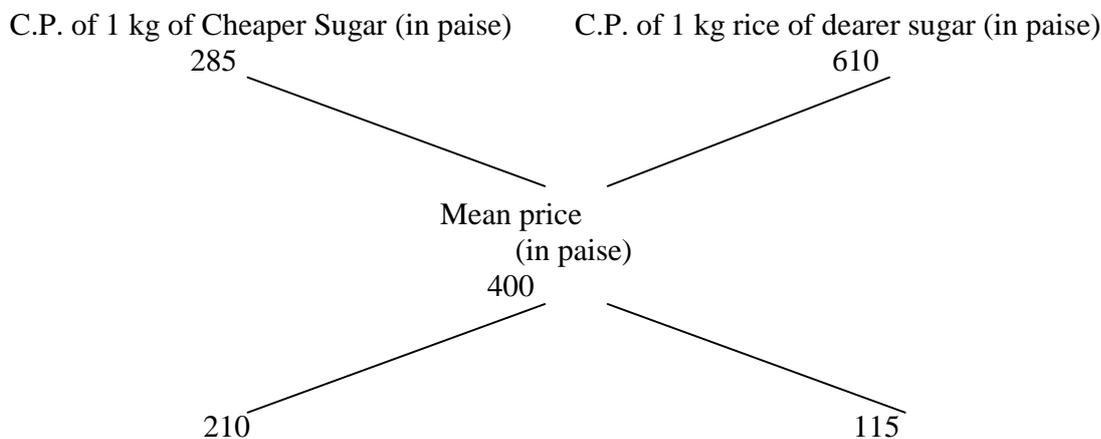
$$\frac{\text{(Quantity of cheaper rice)}}{\text{(Quantity of dearer rice)}} = \frac{35}{15} = \frac{7}{3}$$

∴ They must be mixed in the ratio 7:3.

Ex. 7. How many kilograms of sugar costing Rs.6.10 per kg. must be mixed with 126 kg. of sugar costing Rs. 2.85 per kg. so that 20% may be gained by selling the mixture at Rs. 4.80 per kg.?

Sol: S.p of 1Kg. of mixture = Rs. 4.80, Gain=20%.

$$\therefore \text{C.P of kg. of mixture} = \text{Rs. } [(100/120) * 4.80] = \text{Rs. } 4.$$



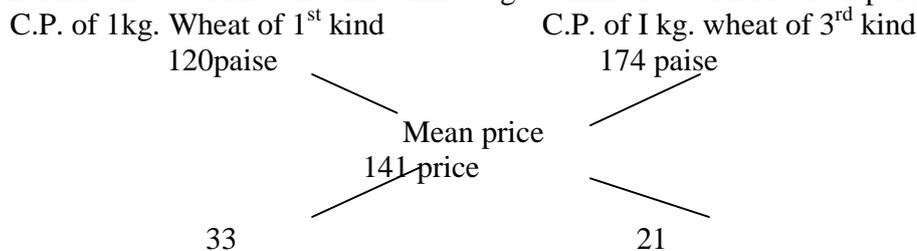
$$\therefore \frac{\text{(Quantity of cheaper sugar)}}{\text{(Quantity of dearer sugar)}} = \frac{210}{115} = \frac{42}{23}.$$

If cheaper sugar is 42 kg., dearer one=23 kg.

If cheaper sugar is 126 kg., dearer one=[(23/42)*126]kg.=69 kg.

Ex. 8. In what ratio must a person mix three kinds of wheat costing him Rs. 1.20, Rs. 1.44 and Rs. 1.74 per kg., so that the mixture may be worth Rs. 1.41 per kg?

Sol: step 1. Mix wheats of first and third kind to get a mixture worth Rs. 1.41 per kg.

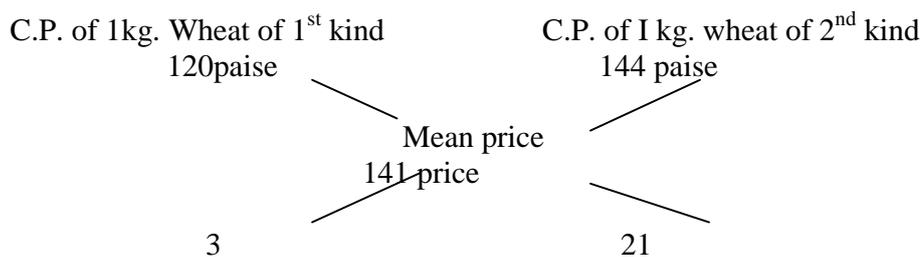


By allegation rule :

$$\frac{\text{(Quantity of 1}^{\text{st}} \text{ kind of wheat)}}{\text{(Quantity of 3}^{\text{rd}} \text{ kind of wheat)}} = \frac{33}{21} = \frac{11}{7}$$

i.e., they must be mixed in the ratio 11:7.

Step 2. Mix wheats of first and second kind to get a mixture worth Rs. 1.41 per kg.



By alligation rule :

$$\frac{\text{(Quantity of 1}^{\text{st}} \text{ kind of wheat)}}{\text{(Quantity of 3}^{\text{rd}} \text{ kind of wheat)}} = \frac{3}{21} = \frac{1}{7}$$

i.e., they must be mixed in the ratio 1:7.

Thus, $\frac{\text{(Quantity of 2}^{\text{nd}} \text{ kind of wheat)}}{\text{(Quantity of 1}^{\text{st}} \text{ kind of wheat)}}$

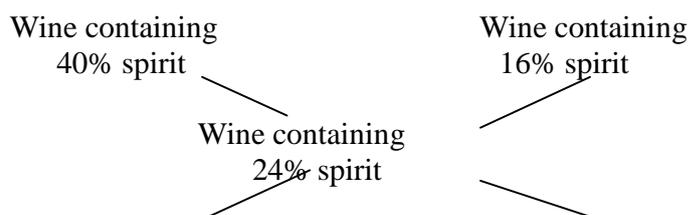
$$= \frac{\text{(Quantity of 2}^{\text{nd}} \text{ kind of wheat)}}{\text{(Quantity of 1}^{\text{st}} \text{ kind of wheat)}} \times \frac{\text{(Quantity of 1}^{\text{st}} \text{ kind of wheat)}}{\text{(Quantity of 3}^{\text{rd}} \text{ kind of wheat)}}$$

$$= [(7/1) * (11/7)] = 11/1.$$

∴ Quantities of wheat of (1st kind : 2nd kind : 3rd kind) = (1:7:7/11) = (11:77:7).

Ex. 9. A butler stole wine from a butt of sherry which contained 40% of spirit and he replaced what he had stolen by wine containing only 16% spirit. The butt was then of 24% strength only. How much of the butt did he steal?

Sol:



8

16

∴ By allegation rule:

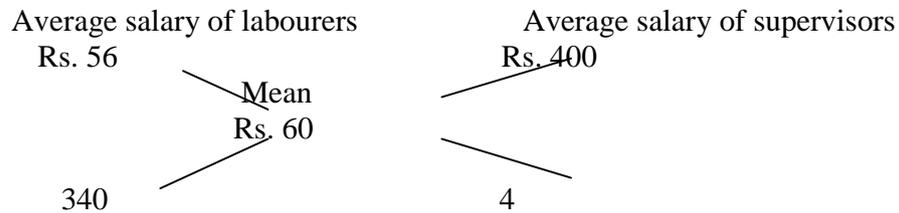
$$\frac{\text{(Wine with 40\% spirit)}}{\text{(Wine with 16\% spirit)}} = \frac{8}{16} = \frac{1}{2}$$

i.e., they must be mixed in the ratio (1:2).

Thus 1/3 of the butt of sherry was left and hence the butler drew out 2/3 of the butt.

Ex. 10. The average weekly salary per head of the entire staff of a factory consisting of supervisors and the labourers is Rs. 60. The average salary per head of the supervisors is Rs. 400 and that of the labourers is Rs. 56. Given that the number of supervisors is 12, find the number of labourers in the factory.

Sol:



∴ By allegation rule:

$$\frac{\text{(Number of labourers)}}{\text{(Number of supervisors)}} = \frac{340}{4} = \frac{85}{1}$$

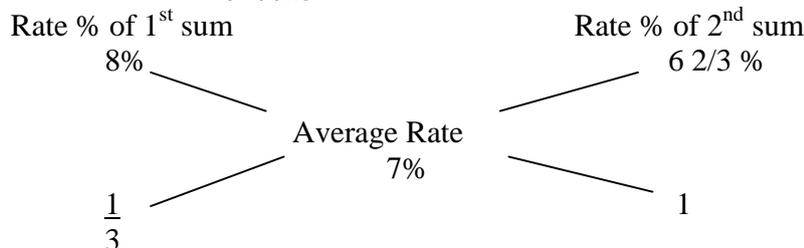
Thus the number of supervisors is 1, number of labourers = 85.

∴ if the number of supervisors is 12, number of labourers = 85*12 = 1020.

Ex. 11. A man possessing Rs. 8400 lent a part of it at 8% simple interest and the remaining at 6 2/3% simple interest. His total income after 1 1/2 years was Rs. 882. Find the sum lent at different rates.

Sol: Total interest on Rs. 8400 for 1 1/2 years is Rs. 882.

$$\therefore \text{Rate of interest} = \frac{100 \times 882 \times 2}{8400 \times 3} = 7\%$$



By allegation rule,

Money given at 8% S.I. = 1: 1 = 1:3

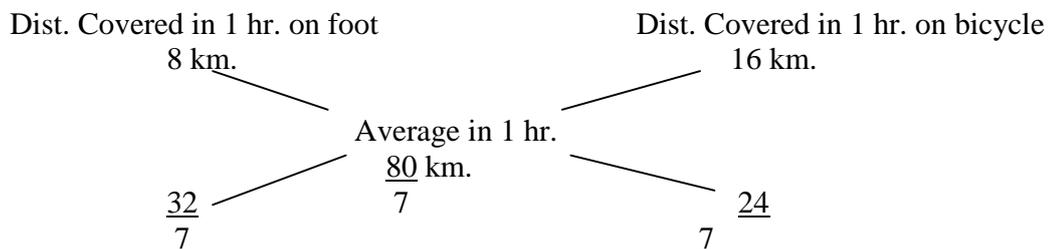
Money given at $6\frac{2}{3}\%$ S.I 3

\therefore Money lent at 8% = Rs. $[8400 \times (1/4)]$ = Rs. 2100.

Money lent at $6\frac{2}{3}\%$ = Rs. $[8400 \times (3/4)]$ = Rs. 6300.

Ex. 12. A man travelled a distance of 80 km. in 7 hours partly on foot at the rate of 8 km. per hour and partly on bicycle at 16 km. per hour. Find the distance travelled on foot.

Sol. Average distance travelled in one hour = $80/7$ km.



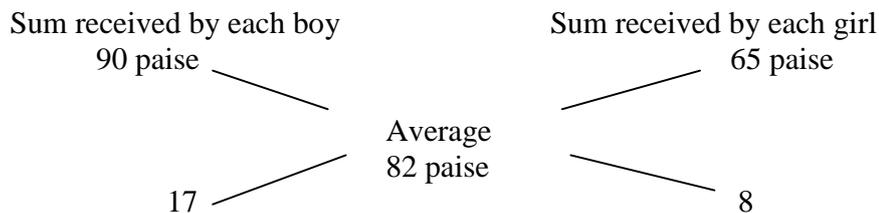
By alligation rule,

$$\frac{\text{Time taken on foot}}{\text{Time taken on bicycle}} = \frac{32}{24} = 4:3$$

Thus out of 7 hours in all, he took 4 hours to travel on foot.
Distance covered on foot in 4 hours = (4×8) km = 32 km.

Ex. 13. A sum of Rs. 41 was divided among 50 boys and girls. Each boy gets 90 paise and a girl 65 paise. Find the number of boys and girls.

Sol. Average money received by each = Rs. $\frac{41}{50}$ = 82 p.



By alligation rule,

Ratio of boys and girls = 17:8.

Ex. 14. A lump of two metals weighting 18 gms. Is worth Rs. 87 but if their weights be interchanged , it would be worth Rs. 78.60. if the price of one metal be Rs. 6.70 per gm., find the weight of the other metal in the mixture.

Sol. If one lump is mixed with the quantities of metals interchanged then the mixture of the two lumps would contain 18gm. Of first metal and 18gm. Of second metal and the price of the mixture would be Rs. (87+78.60) or 165.60.

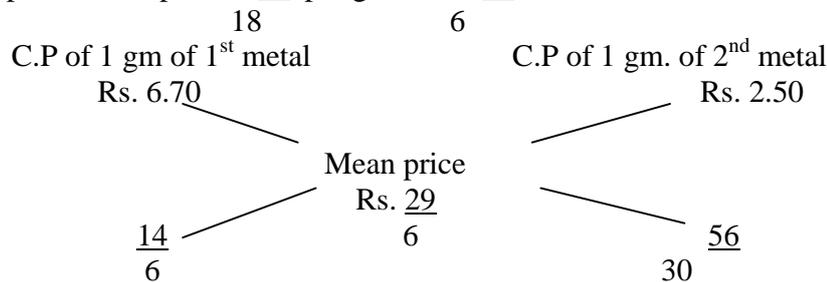
$$\therefore \text{cost of (18gm. Of 1}^{\text{st}} \text{ metal + 18 gm. Of 2}^{\text{nd}} \text{ metal)} = \text{Rs. } 165.60$$

$$\text{So, cost of (1 gm. of 1}^{\text{st}} \text{ metal + 1 gm. of 2}^{\text{nd}} \text{ metal)} = \text{Rs. } \frac{165.60}{18} = \text{Rs. } 9.20.$$

$$(\text{cost of 1 gm. of 1}^{\text{st}} \text{ metal}) + (\text{cost of 1 gm. of 2}^{\text{nd}} \text{ metal}) = \text{Rs. } 9.20.$$

$$\text{cost of 1 gm. of 2}^{\text{nd}} \text{ metal} = \text{Rs. } (\text{Rs. } 9.20 - 6.70) = \text{Rs. } 2.50.$$

$$\text{Now, mean price of lump} = \text{Rs. } \frac{87}{18} \text{ per gm.} = \text{Rs. } \frac{29}{6}$$



By alligation rule,

$$\frac{\text{Quantity of 1}^{\text{st}} \text{ metal}}{\text{Quantity of 2}^{\text{nd}} \text{ metal}} = \frac{14}{6} : \frac{56}{30} = 5:4$$

$$\text{In 9 gm. of mix., 2}^{\text{nd}} \text{ metal} = 4\text{gm.}$$

$$\text{In 18 gm. of mix., 2}^{\text{nd}} \text{ metal} = \frac{4}{9} \times 18 \text{ gm.} = 8 \text{ gm.}$$

Ex. 15. A container contains 80 kg. of milk. From this container , 8kg. of milk was taken out and replaced by water. This process was further repeated two times. How much milk is now contained by the container?

Remarks. Amount of liquid left after n operations , when the container originally contains x

$$\text{units of liquids, from which y units is taken out each time is } = \left[x(1-y/x)^n \right] \text{ units.}$$

$$\text{Sol. Amount of milk left} = 80[(1-(8/80)^3)] \text{ kg.} \\ = 58.34 \text{ kg.}$$

For More Visit - www.ssc-cgl2014.in

EXERCISE PROBLEMS:

1. 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. $\frac{1}{7}$

Answer: Option C

Explanation:

Suppose the vessel initially contains 8 liters of liquid.

Let x liters of this liquid be replaced with water.

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

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

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

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

$$\Rightarrow 10x = 16$$

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

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

2. 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 third variety per kg will be:

A.Rs. 169.50

B.Rs. 170

C.Rs. 175.50

D.Rs. 180

Answer: Option C

Explanation:

Since first and second varieties are mixed in equal proportions.

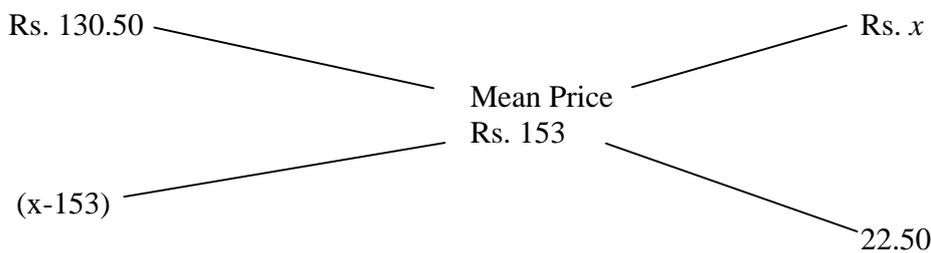
So, their average price = Rs. $\left(\frac{126 + 135}{2}\right)$ = Rs. 130.50

So, the mixture is formed 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 .

By the rule of alligation, we have:

Cost of 1 kg of 1st kind

Cost of 1 kg tea of 2nd kind



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

$$\Rightarrow x - 153 = 22.50$$

$$\Rightarrow x = 175.50$$

3. 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 |

Answer: Option C

Explanation:

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

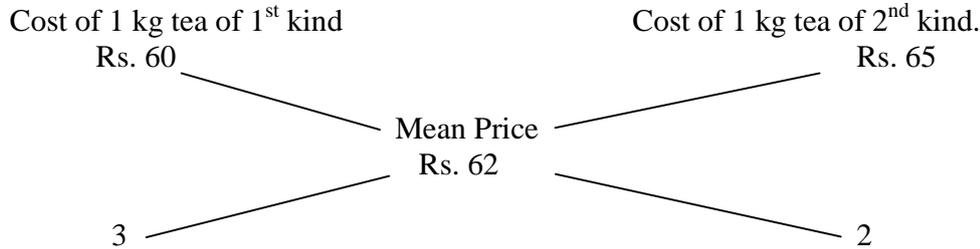
Quantity of A in mixture left = $\left(7x - \frac{7}{12} \times 9\right)$ liters = $\left(7x - \frac{21}{4}\right)$ liters.

Quantity of B in mixture left = $\left(5x - \frac{5}{12} \times 9\right)$ liters = $\left(5x - \frac{15}{4}\right)$ liters.

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

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

By the rule of alligation, we have:



∴ Required ratio = 3 : 2.

13. 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:

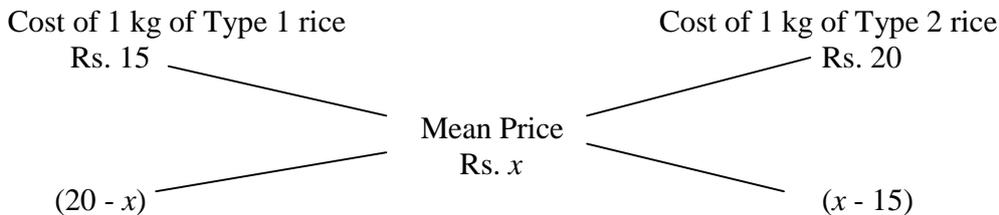
- | | |
|-----------|--------------|
| A. Rs. 18 | B. Rs. 18.50 |
| C. Rs. 19 | D. Rs. 19.50 |

Answer: Option A

Explanation:

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

By rule of alligation, we have:



∴ $\frac{(20 - x)}{(x - 15)} = \frac{2}{3}$

⇒ $60 - 3x = 2x - 30$

⇒ $5x = 90$

⇒ $x = 18$.

14. 8 liters 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 water is 16 : 81. How much wine did the cask hold originally?

- | | |
|--------------|--------------|
| A. 18 liters | B. 24 liters |
|--------------|--------------|

C.32 liters

D.42 liters

Answer: Option B

Explanation:

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

Then, quantity of wine left in cask after 4 operations = $[x(1 - 8/x)]$ litres.

$$\begin{aligned} \therefore \left(\frac{x(1 - (8/x))^4}{x} \right) &= \frac{16}{81} \\ \Rightarrow \left(1 - \frac{8}{x} \right)^4 &= \left(\frac{2}{3} \right)^4 \\ \Rightarrow \left(\frac{x-8}{x} \right) &= \frac{2}{3} \\ \Rightarrow 3x - 24 &= 2x \quad \Rightarrow x = 24. \end{aligned}$$

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

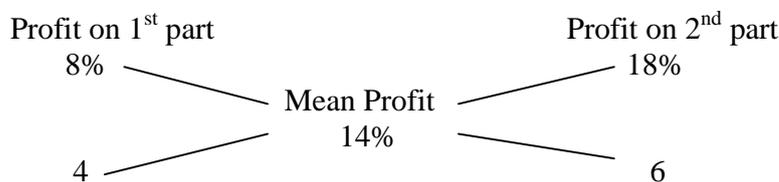
C.600 kg

D.640 kg

Answer: Option C

Explanation:

By the rule of alligation, we have:



Ration 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. 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?

A.7 liters

B.10 liters

C.5 liters

D.None of these

Answer: Option C

Explanation:

30 liters of the mixture has milk and water in the ratio 7: 3. i.e. the solution has 21 liters of milk and 9 litres of water. When you add more water, the amount of milk in the mixture remains constant at 21 liters. In the first case, before addition of further water, 21 liters of milk accounts for 70% by volume. After water is added, the new mixture contains 60% milk and 40% water.

Therefore, the 21 litres of milk accounts for 60% by volume.

Hence, 100% volume = $21/0.6 = 35$ liters.

We started with 30 liters and ended up with 35 liters. Therefore, 5 liters of water was added.

17. A 20 liter mixture of milk and water contains milk and water in the ratio 3: 2. 10 liters of the mixture is removed and replaced with pure milk and the operation is repeated once more. At the end of the two removal and replacement, what is the ratio of milk and water in the resultant mixture?

A. 17 : 3

B. 9 : 1

C. 3 : 17

D. 5 : 3

Answer: Option B

Explanation:

The 20 litre mixture contains milk and water in the ratio of 3 : 2. Therefore, there will be 12 litres of milk in the mixture and 8 litres of water in the mixture.

Step 1. When 10 litres of the mixture is removed, 6 litres of milk is removed and 4 litres of water is removed. Therefore, there will be 6 litres of milk and 4 litres of water left in the container. It is then replaced with pure milk of 10 litres. Now the container will have 16 litres of milk and 4 litres of water.

Step 2. When 10 litres of the new mixture is removed, 8 litres of milk and 2 litres of water is removed. The container will have 8 litres of milk and 2 litres of water in it. Now 10 litres of pure milk is added. Therefore, the container will have 18 litres of milk and 2 litres of water in it at the end of the second step.

Therefore, the ratio of milk and water is 18: 2 or 9: 1.

18. How many kgs of Basmati rice costing Rs.42/kg should a shopkeeper mix with 25 kgs of ordinary rice costing Rs.24 per kg so that he makes a profit of 25% on selling the mixture at Rs.40/kg?

A. 20 kgs

B. 12.5kgs

C. 3 : 16kgs

D. 200kgs

Answer: Option A

Explanation:

Let the amount of Basmati rice being mixed be x kgs. As the trader makes 25% profit by selling the mixture at Rs.40/kg, his cost per kg of the mixture = Rs.32/kg.

$$\text{i.e. } (x * 42) + (25 * 24) = 32 (x + 25)$$

$$\Rightarrow 42x + 600 = 32x + 800$$

$$\Rightarrow 10x = 200 \text{ or } x = 20 \text{ kgs.}$$

19. How many litres of a 12 litre mixture containing milk and water in the ratio of 2 : 3 be replaced with pure milk so that the resultant mixture contains milk and water in equal proportion?

A.4 liters

B.2 liters

C.1 liter

D.1.5 liters

Answer: Option B

Explanation:

The mixture contains 40% milk and 60% water in it. That is 4.8 litres of milk and 7.2 litres of water.

Now we are replacing the mixture with pure milk so that the amount of milk and water in the mixture is 50% and 50%. That is we will end up with 6 litres of milk and 6 litres of water.

Water gets reduced by 1.2 litres.

To remove 1.2 litres of water from the original mixture containing 60% water, we need to remove $1.2 / 0.6$ litres of the mixture = 2litres.

20. A zookeeper counted the heads of the animals in a zoo and found it to be 80. When he counted the legs of the animals he found it to be 260. If the zoo had either pigeons or horses, how many horses were there in the zoo?

A.40

B.30

C.50

D.60

Answer: Option C

Explanation:

Let the number of horses = x

Then the number of pigeons = $80 - x$.

Each pigeon has 2 legs and each horse has 4 legs.

Therefore, total number of legs = $4x + 2(80-x) = 260$

$$\Rightarrow 4x + 160 - 2x = 260$$

$$\Rightarrow 2x = 100$$

$$\Rightarrow x = 50.$$

21. From a cask of milk containing 30 litres, 6 litres are drawn out and the cask is filled up with water. If the same process is repeated a second, then a third time, what will be the number of litres of milk left in the cask?

A. 0.512 liters

B. 12 liters

C. 14.38 liters

D. 15.36 liters

Answer: Option D

Explanation:

The problem can be solved by traditional method but it is cumbersome process to do that. The problem is simple if its solution is simpler. Hence we will go for a simpler solution for this kind of problem.

There is a short cut method to find the Quantity of milk left after n^{th} operation.

It is given by $[(x - y)/x]^n$ of the whole quantity, where x is initial quantity of milk in the cask y is the quantity of milk withdrawn in each process and n is the number of process..

Hence from the above rule it can be say that

Quantity of milk left after the 3^{rd} operation = $[(30 - 6)/30]^3 * 30 = 15.36$ liters.

22. In what ratio must wheat at Rs.3.20 per kg be mixed with wheat at Rs.2.90 per kg so that the mixture be worth Rs.3.08 per kg

A. 5:7

B. 7:9

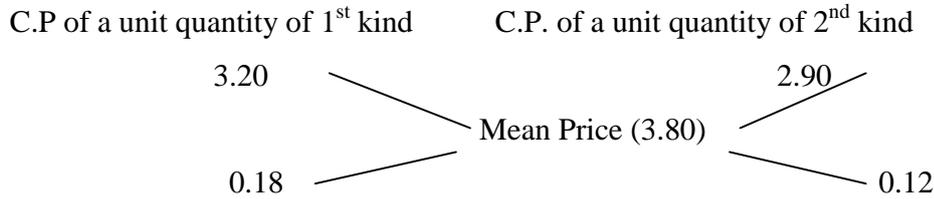
C. 3:2

D. 7:5

Answer: Option C

Explanation:

By the rule of alligation, we have:



∴ Required ratio = 0.18 : 0.12 = 3:2.

23. Two 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 milk and a water in the ratio 9:4?

- A.5:7
- C.3:2

- B.2:7
- D.7:5

Answer: Option B

Explanation:

Step (i) : Let C.P. of milk be Re.1

Given ratio of mixture in A = 8:5

∴ Milk in 1 liter mixture in A = 8/13 litre

∴ C.P of 1 liter mixture in A = Rs. 8/13

Ratio of Mixture in B = 5:2

∴ milk in 1 liter mixture in B – 5/7 litre

∴ C.P of 1 litre mixture in B = Rs. 5/7

Ratio of new mixture = 9:4

∴ Milk in 1 lit mixture = 9/13

C.P of 1 litre mixture = Rs/ 9/13 (Mean price)

Step (ii) : By the rule of allegation,

- i. C.P of 1 liter of mixture in A =8/13
- ii. C.P of 1 liter of mixture in B = 5/7
- iii. Mean price (p) = 9/13
- iv. d – m = 9/13 – 5-7 = 2/91
- v. m – c = 9/13 – 8/13 = 1/13

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

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

- | | |
|-------|-------|
| A.1:2 | B.2:7 |
| C.3:2 | D.7:5 |

Answer: Option A

Explanation:

By the rule of allegation,

- i. C.P of 1 liter of water = 0
- ii. C.P of 1 liter of milk = 12
- iii. Mean price (p) = 8
- iv. $d - m = 12 - 8 = 4$
- v. $m - c = 8 - 0 = 8$

$$\therefore \text{Ratio of water and milk} = 4 : 8 = 1 : 2$$

25. 729ml of mixture contains milk and water in the ratio 7:2 how much more water is to be added to get a new mixture containing milk and water in the ratio 7:3?

- | | |
|--------|--------|
| A.70ml | B.49ml |
| C.81ml | D.96ml |

Answer : Option C

Explanation:

Ratio of milk and water in 729 ml = 7:2

Step (i) Milk in 729 ml of mixture = $(7/9 \times 729)$ ml = 567 ml

\therefore water in 729 ml of mixture = $729 - 567 = 162$ ml

Step (ii) Let x be the quantity of water added to new mixture, with the ratio 7:3

\therefore Quantity of water in the new mixture = $(162 + x)$ ml

$$\text{Then } 7/3 = \frac{567}{162 + x}$$

$$\Rightarrow 7(162 + x) = 3 \times 567$$

$$\Rightarrow 1134 + 7x = 1701$$

$$\Rightarrow 7x = 1701 - 1134$$

$$\Rightarrow X = 567/7 = 81 \text{ ml}$$

\therefore Quantity of water added to new mixture = 81 ml.

26. A can contains 40kg of milk, from this container 4kg 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.29.16kg
C.32.49kg

- B.30kg
D.25.36kg

Answer: Option A

Explanation:

Quantity of milk in the can $x = 40 \text{ kg}$

Quantity of milk taken out $y = 4 \text{ kg}$

Number of times = 3

$$\begin{aligned} \therefore \text{Quantity of milk in the can} &= \left[x \left(1 - \frac{y}{x} \right)^n \right] \text{kg} \\ &= \left[40 \left(1 - \frac{4}{40} \right)^3 \right] \text{kg} = 40 (9/10)^3 \text{ kg} = 40 (729/1000) \end{aligned}$$

\therefore Quantity of milk in the can = 29.16 kg

27. Two vessels A and B contain spirit and water in the ratio 5:2 and 7:6 respectively. Find the ratio in which these mixture be mixed to obtain a new mixture containing spirit and water in the ratio 8:5?

- A.3:4
C.7:9

- B.5:7
D.4:3

Answer: Option C 7:9

Explanation:

Step (i) : Spirit in 1 litre mixture of A = $5/7$ litre

Spirit in 1 litre mixture of B = $7/13$ litre

Spirit in 1 litre mixture of final mixture = $8/13$ litre

Mean quantity = $8/13$ litre

Step (ii) By the rule of allegation,

- i. quantity of spirit in A (c) = $5/7$
 - ii. Quantity of spirit in B (d) = $7/13$
 - iii. Mean price (m) = $8/13$
 - iv. $d - m = 5/7 - 8/13 = 9/91$
 - v. $m - c = 8/13 - 7/13 = 1/13$
- ∴ Required ratio = $1/13 : 9/91 = 7 : 9$

28. Two vessels A and B contain milk and water mixed in the ratio 8:5 and 5:2 respectively. The ratio in which these 2 mixtures be mixed to get a new mixture containing $69 \frac{3}{13} \%$ milk is :

- | | |
|-------|-------|
| A.3:4 | B.2:7 |
| C.7:9 | D.4:3 |

Answer: Option B

Explanation:

Step (i) : Quantity of milk in 1 lr mixture of A = $8/13$ lr

Quantity of milk in 1 lr mixture of B = $5/7$ lr

Quantity of milk in 1 lr mixture of final mixture = $69 \frac{3}{13} \%$

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

Mean quantity = $9/13$ lr

Step (ii) By the rule of allegation,

- i. quantity of spirit in A (c) = $8/13$
 - ii. Quantity of spirit in B (d) = $5/7$
 - iii. Mean price (m) = $9/13$ lr
 - iv. $d - m = 5/7 - 9/13 = 2/91$
 - v. $m - c = 9/13 - 8/13 = 1/13$
- ∴ Required ratio = $2/91 : 1/13 = 2 : 7$

29. The cost of type I rice is Rs.15 p/kg and type II is Rs.20p/kg. Both are mixed in the ratio 2:3, price P/Kg of the mixed variety is :

A.Rs.20
C.Rs.15

B.Rs.30
D.Rs.18

Answer: Option D

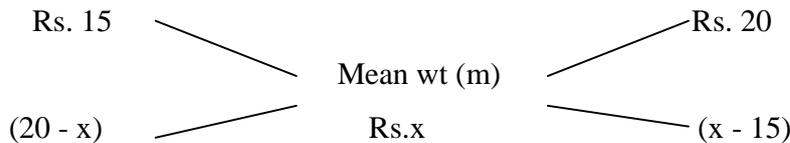
Explanation:

Step (i) : Let the price of mixed variety be x.Rs

Mean price = Rs.x

Cost of 1 kg of Type I

Cost of 1 kg of Type II



$$\therefore \text{ratio} = 20-x : x - 15$$

Step (ii) : Mixed variety is in the ratio = 2:3

$$\therefore \frac{20-x}{x-15} = \frac{2}{3}$$

$$60 - 3x = 2x - 30$$

$$X = 90 / 5 = 18$$

\therefore Ratios imply that the price of mixture = Rs. 18 per kg

30. 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?

A. 3 : 1
C. 4 : 3

B. 3 : 2
D. 5 : 3

Answer: Option A

Explanation:

By the rule of alligation:

Cost of 1 kg tea of 1st kind

Cost of 1 kg tea of 2nd kind

2. In what ratio must wheat at Rs.3.20 per kg be mixed with wheat at Rs.2.90 per kg so that the mixture be worth Rs.3.08 per kg
- A. 3:2
B. 5:4
C. 2:3
D. 4:5
3. How many kilograms of sugar costing Rs./9 per kg must be mixed with 27kg 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. 50 kg
B. 63kg
C. 72kg
D. 59kg
4. 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. 5:7
C. 7:5
D. 6:1
5. Two vessels A and B contain milk and water mixed in the ratio 8:5 and 5:2 res. The ratio in which these two mixtures be mixed to get a new mixture containing milk and a water in the ratio 9:4?
- A. 3:4
B. 5:9
C. 2:7
D. 3:2
6. In what ratio water be mixed with milk costing Rs.12 per liter to obtain a mixture worth of Rs.8 per litre?
- A. 2:4
B. 1:2
C. 5:7
D. 2:1
7. A sum of Rs.4000 is lent out in two parts, one at 8% simple interest and the other at 10% simple interest. In the annual interest is Rs.352, the sum lent at 8% is ?
- A. 1300
B. 1500
C. 2400
D. 3700
8. A merchant has 100kg 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. 120kg
B. 500kg
C. 300kg
D. 600kg
9. Two vessels A and B contain milk and water mixed in the ratio 4:3 and 2:3 in what ratio must these mixtures be mixed to form a new mixture containing half milk and half water?

- A. 5:6
C. 6:7
- B. 7:5
D. 7:8
10. 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.1/4
C.2/3
- B.1/3
D.2/4
11. 729ml of mixture contains milk and water in the ratio 7:2 how much more water is to be added to get a new mixture containing milk and water in the ratio 7:3?
A.70ml
C.81ml
- B.49ml
D.96ml
12. A sum of Rs.312 was divided among 100 boys and girls in such a way that the boy gets Rs.3.60 and each girl Rs.2.40 the number of girls is ?
A.30
C.20
- B.40
D.50
13. A man covered a distance of 2000km in 18 hours partly by bus at 72kmph and partly by train at 16kmph the distance covered by bus is ?
A.540ml
C.720ml
- B.960ml
D.840ml
14. A sum of rs.36.90 is made up of 180 coins which are either 10 paise coins or 25 p coins. The number of 10 p coins is ?
A.72
C.45
- B.54
D.67
15. A dishonest milk man professes to sell his milk at cost price but he mixed it with water and thereby gains 25%. The percentage of water in the mixture is ?
A.35%
C.20%
- B.25%
D.40%
16. A mixture of 20kg of spirit and water contains 10 water How much water must be added to this mixture to raise the percentage of water to 25%?
A.3kg
C.5kg
- B.4kg
D.6kg

17. A container contains 40kg of milk, from this container 4kg 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.43.12 kg
C.29.16kg
- B.43.22kg
D.12.45kg
18. 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 liquids A was contained by the can initially?
- A.20
C.22
- B.21
D.23
19. A mixture of milk and water measures 60 gallons. It contains 20% water. How many gallons of water should be added to it so that water may be 25%?
- A.6 gallons
C.8 gallons
- B.4 gallons
D.10 gallons
20. A mixture of spirit and water measure 80 gallons. It contains 20% water. How much water should be added to it so that water may be 25%?
- A.8 $\frac{1}{3}$ gallons
C.7 $\frac{1}{3}$ gallons
- B.6 $\frac{1}{3}$ gallons
D. 5 $\frac{1}{3}$ gallons
21. A man lent \$2000, part of this at 4% and the rest at 6% per annum simple interest. The whole annual interest amounted to \$92. How much did he lend at 6%?
- A.\$900
C.\$600
- B.\$800
D.\$1000
22. A man invested \$2500 into two parts such that if one part be put out at 5% S.I. and other at 6%, the yearly income may be \$140. How much did he invest at 5%?
- A.\$1250
C.\$1000
- B.\$1500
D.\$750
23. There are two vessels A and B in which the ratio of milk and water are as 5:2 and 8:7 respectively. Two gallons are drawn from vessel A and 3 gallons from vessel B, and are mixed in another empty vessel. What is the ratio of milk and water in it?
- A.106:69
C.89:86
- B.103:72
D.101:71
24. Two gallons of mixture in which there is $\frac{2}{5}$ of water and the rest spirit is mixed with five gallons of mixture in which there is $\frac{1}{3}$ of water and the rest spirit. What is the ratio of water and spirit in the new mixture?

- A.18:23
C.25:33
- B.12:17
D.37:68
25. One vessel contains a mixture of 5 parts pure wine and 3 parts soda, whereas the other vessel contains a mixture of 9 parts pure wine and 5 parts soda. Compare the strength of the wine.
- A.7:4
C.35:36
- B.7:8
D.14:5
26. One milk can contains a mixture of milk and water in the ratio 7:5 and the other contains the mixture of milk and water in which $\frac{2}{5}$ th is water. Compare their purity.
- A.36:35
C.10:7
- B.35:36
D.5:3
27. A woman sold 100 oranges at \$12.10, some at the rate of 3 for 35 cents and the rest at 7 for 85 cents. How many were sold at the first rate?
- A.45
C.15
- B.21
D.9
28. A merchant has 100 lbs of sugar, part of which he sells at 7% profit and the rest at 17% profit. He gains 10 % on the whole. Find how much is sold at 7% profit?
- A.70 lbs
C.30 lbs
- B.40lbs
D.50lbs