



PERCENTILE CLASSES

Mixture & Alligation

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Mixture

Mixture

Simple Mixture: When two different ingredients are mixed together, it is known as a simple mixture.

Compound Mixture: When two or more simple mixtures are mixed together to form another mixture, it is known as a compound mixture.

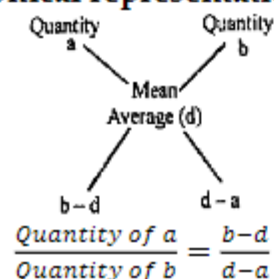
Alligation: Alligation is nothing but a faster technique of solving problems based on the weighted average situation as applied to the case of two groups being mixed together.

The word 'Alligation' literally means 'linking'.

✓ **Alligation rule:** It states that when different quantities of the same or different ingredients of different costs are mixed together to produce a mixture of a mean cost, the ratio of their quantities is inversely proportional to the difference in their cost from the mean cost.

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

Graphical representation of Alligation Rule:



Applications of Alligation Rule:

- (i) To find the mean value of a mixture when the prices of two or more ingredients, which are mixed together and the proportion in which they are mixed are given.
- (ii) To find the proportion in which the ingredients at given prices must be mixed to produce a mixture at a given price.

➤ **Alligation Rule for Compound Mixture:** Remember that in compound mixture, same mixtures i.e., mixtures of same ingredients are mixed together in different proportion to make a new mixture.

Let Mixture 1 has ingredients A and B in ratio $a : b$

And Mixture 2 has ingredients A and B in ratio $x : y$.

Now, M unit of mixture 1 and N unit of mixture 2 are mixed to form compound mixture. Then, in the resultant mixture, the ratio of A and B is:

$$(i) \frac{\text{Quantity of ingredient A}}{\text{Quantity of ingredient B}} = \frac{q_A}{q_B} = \frac{M\left(\frac{a}{a+b}\right) + N\left(\frac{x}{x+y}\right)}{M\left(\frac{b}{a+b}\right) + N\left(\frac{y}{x+y}\right)}$$

And,

$$\text{Quantity of A in resultant mixture} = \frac{q_A}{q_A + q_B} \times (M + N)$$

- (ii) When q_A and q_B are known and M and N have to be found out

$$\frac{\text{Quantity of mixture 1}}{\text{Quantity of mixture 2}} = \frac{Q_1}{Q_2} = \frac{\left(\frac{x}{x+y}\right) - \left(\frac{q_A}{q_A + q_B}\right)}{\left(\frac{q_A}{q_A + q_B}\right) - \left(\frac{a}{a+b}\right)}$$

And,

Quantity of mixture 1

$$= \frac{Q_1}{Q_1 + Q_2} \times \text{Quantity of resultant mixture}$$

Quantity of mixture 2

$$= \frac{Q_2}{Q_1 + Q_2} \times \text{Quantity of resultant mixture}$$

Removal and Replacement

- (i) Let a vessel contains Q unit of mixture of ingredients A and B. From this, R unit of mixture is taken out and replaced by an equal amount of ingredient B only.

If this process is repeated n times, then after n operations $\frac{\text{Quantity of A left}}{\text{Quantity of A originally present}} = \left(1 - \frac{R}{Q}\right)^n$ and quantity of B left = Q - Quantity of A left

- (ii) Let a vessel contains Q unit of ingredient A only. From this R unit of ingredient A is taken out and replaced by an equal amount of ingredient B.

If this process is repeated n times, then after n operations,

$$\text{Quantity of A left} = Q \left(1 - \frac{R}{Q}\right)^n$$

$$\text{Quantity of B} = 1 - \text{Quantity of A left}.$$

Exercise - or

1. How much Pepsi at Rs. 6 a litre is added to 15 litre of 'dew' at Rs. 10 a litre so that the price of the mixture be Rs. 9 a litre?
(a) 5 (b) 8 (c) 10 (d) none of these
2. In my pocket there are Rs. 25 consisting of only the denominations of 20 paise and 50 paise. Thus there are total 80 coins in my pocket. The no. of coins of the denomination of 50 paise is:
(a) 30 (b) 70 (c) 50 (d) 25
3. In my office the average age of all the female employees is 21 years and that of male employees is 32 years, where the average age of all the male and female employees is 28 years. The total no. of employees in my office could be:
(a) 35 (b) 78 (c) 231 (d) 90
4. A car agency has 108 cars. He sold some cars at 9% profit and rest at 36% profit. Thus he gains 17 % on the sale of all his cars the no. of cars sold at 36 profit is:
(a) 25 (b) 32 (c) 35 (d) 75
5. The shopkeeper mixed 40 kg refined oil with vegetable oil worth Rs. 60 kg. thus he gains Rs 10 aster selling the mixture of the two oils. The price of the first oil is:
(a) 20 (b) 25 (c) 45 (d) Can't be determined
6. If 5kg of salt costing Rs.5/kg and 3kg of salt costing Rs.4/kg are mixed, find the average cost of the mixture per kilogram.
(a) Rs.4.5 (b) Rs.4.625 (c) Rs.4.75 (d) Rs.4.125
7. A mixture of 125 gallons of wine and water contains 20% water. How much water must be added to the mixture in order to increase the percentage of water to 25% of the new mixture?
(a) 10 gals (b) 8.5 gals (c) 8 gals (d) 8.33 gals
8. A cistern contains 50 litres of water. 5 litres of water is taken out of it and replaced by wine. The process is repeated again. Find the proportion of wine and water in the resulting mixture.
(a) 1:4 (b) 41:50 (c) 19:81 (d) 81:19
9. A vessel is full of refined oil. $\frac{1}{4}$ of the refined oil is taken out and the vessel is filled with mustard oil. If the process is repeated 4 times and 10 litres of refined oil is finally left in the vessel, what is the capacity of the vessel?
(a) 33 litres (b) $\frac{2460}{81}$ litre (c) $\frac{2560}{81}$ litre (d) 30 litres
10. In what ratio should two qualities of coffee powder having the rates of Rs.47 per kg and Rs.32 per kg be mixed in order to get a mixture that would have a rate of Rs.37 per kg?
(a) 1:2 (b) 2:1 (c) 1:3 (d) 3:1
11. A sum of Rs.36.90 is made up of 90 coins that are either 20 paise coins or 50 paise coins. Find out how many 20 paise coins are there in the total amount.
(a) 47 (b) 43 (c) 27 (d) 63
12. A man buys milk at Rs.8.5 per litre and dilutes it with water. He sells the mixture at the same rate and thus gains 11.11% find the quantity of water mixed by him in every litre of milk.
(a) .111 litres (b) 0.909 litre (c) 0.1 litre (d) 0.125 litre
13. The price of a pen and a pencil is Rs.35. The pen was sold at a 20% profit and the pencil at a 10% less. If in the transaction a man gains Rs.4, how much is cost price of the pen?

- (a) Rs.10 (b) Rs.25 (c) Rs.20 (d) None of these
14. In the Singapore zoo, there are deers and there are ducks if the heads are counted, there are 180, while the legs are 448. What will be the number of deers in the zoo?
(a) 136 (b) 68 (c) 44 (d) 22
15. A bartender stole champagne from a bottle that contained 50% of spirit and he replaced what he had stolen with champagne having 20% spirit. The bottle then contained only 25% spirit. How much of the bottle did he steal?
(a) 80% (b) 83.33% (c) 85.71% (d) 88.88%
16. From a 3 : 5 solution of milk and water, 20% is taken out and replaced by milk. How many times should this process be done to make the ratio milk to water as 17:8?
(a) Once (b) Twice (c) Thrice (d) Four times
17. A and B are two alloys of gold and copper prepared by mixing the respective metals in the proportions of 7:2 and 7:11, respectively. If the alloys are mixed to form a third alloy C, which has an equal proportion of gold and copper. What is the ratio of alloys A and B in the mixture?
(a) 2:5 (b) 5:2 (c) 11:2 (d) 1:2
18. A shrewd milkman mixes water and milk in the ratio of 2:3 what part of this mixture should be removed and replaced with water so that the solution contains water and milk in the ratio 1 : 1 ?
(a) $\frac{1}{6}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$
19. A milkman sells his mixture of milk and water at the cost price of milk itself and thus he gains a profit of 20% what is the ratio of milk and water in the mixture.
(a) 4:1 (b) 5:1 (c) 1:4 (d) None of these

Exercise - 02

- In the 75 litres of mixture of milk and water, the ratio of milk and water is 4:1 the quantity of water required to make the ratio of milk and water 3:1 is:
(a) 1 Litres (b) 3 litres (c) 4 litres (d) 5 litres
- In what proportion water be mixed with spirit to gain 12.5% by selling it at cost price?
(a) 3 : 5 (b) 1 : 8 (c) 2 : 7 (d) 1 : 9
- A butler stole wine from a butt of sherry containing 50% of spirit then he replenished it by different wine containing 20 % spirit. Thus there was only 30% strength spirit in the new mixture. How much of the original wine did he steal?
(a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) $\frac{1}{2}$ (d) $\frac{1}{4}$
- Baniya sells two types of tea viz. Desi Chai and Videshi chai. He sells Desi Chai at Rs.18 per kg and incurs a loss of 10th whereas on selling the Videshi Chai at Rs.30 kg. he gains 20% in what proportion should the Desi Chai and videshi chai be mixed such that he can gain a profit of 25% by selling the mixture at Rs.27.5 per kg ?
(a) 3 : 2 (b) 2 : 3 (c) 2 : 5 (d) 3 : 5
- 450 litres of a mixture of milk and water contains the milk and water in the ratio 9 : 1 . how much water should be added to get a new mixture containing milk and water in the ratio 3 :1?
(a) 54 (b) 90 (c) 45 (d) 63
- The ratio of petrol and kerosene in the container is 3 : 2 when 10 litres of the mixture is taken out and is replaced by the kerosene, the ratio becomes 2 : 3 the total quantity of the mixture in the container is:
(a) 25 (b) 30 (c) 45 (d) cannot be determined
- How many kilograms of sugar worth Rs.3.60 per kg should be mixed with 8kg of sugar worth Rs.4.20 per kg such that by selling the mixture at Rs.4.40 per kg there may be again of 10%
(a) 6kg (b) 3kg (c) 2kg (d) 4kg
- The average salary per head of all employees of a company is Rs.600. The average salary of 120 officers is Rs.4000. I the average salary per head of the rest of the employees is Rs.560, find the total number of workers in the company.
(a) 10200 (b) 10320 (c) 10500 (d) 10680
- A container has a capacity of 20 gallons and is full of sprit . 4 gallons of spirit is drawn out the container is gain filled with water. This processes repeated 5 times. Find out how much spirit is left in the resulting mixture finally?
(a) $6\frac{257}{525}$ gallons (b) $6\frac{346}{625}$ gallons (c) 6.5 gallons (d) 6.25 gallons
- In what ratio should water be mixed with soda costing Rs.12 litre so as to make a profit of 25% be selling the diluted liquid at Rs.13.75 per litre?
(a) 10:1 (b) 11:1 (c) 1:11 (d) 12:1
- A vessel is full of a mixture of kerosene and petrol in which there is 18% kerosene. Eight litres are drawn off and then the vessel is filled with petrol. If the kerosene is now 15%, how much does the vessel hold?
(a) 40 litres (b) 32 litres (c) 36 litres (d) 48 litres
- What will be the ratio of petrol and kerosene in the final solution formed by mixing petrol and kerosene that are present in three vessels of equal capacity in the ratios 4: 1, 5:2 and 6 :1 respectively?
(a) 166: 22 (b) 83:22 (c) 83 : 44 (d) None of these
- A 20 percent gain is made by selling the mixture of two types of ghee at Rs.480 per kg. if the type costing 610 per kg was mixed with 126 kg of the other, how many kilograms of the former was mixed?

- (a) 138 kg (b) 34.5kg (c) 69 kg (d) cannot be determined
14. A succession of numbers is said to be in the Arithmetic Progression (AP) if the difference between any given term and the previous term is constant throughout. In a AP $n_1, n_2, n_3, \dots, n_{46}$, the sum of odd numbered terms $n_1, n_3, n_5, \dots, n_{45}$ is 1272. What is the sum of all the 46 terms of this AP?
(a) 2491 (c) 2400
(b) 2500 (d) Cannot be determined
15. Four gallons are drawn from a case full of wine. It is then filled with water. Four gallons of mixture are again drawn and the cask is re filled with water. The ratio of the quantity of wine now left in the cask to that of the mixture in it is 36:49. How much does the cask hold?
(a) 30 gallons (b) 25 gallons (c) 35 gallons (d) 28 gallons
16. There is a vessel holding 40 L of milk. Four litres of milk is initially taken out from the vessel and 4 L of water is then poured in. After this, 5 L of mixture is replaced with 5 L of water. And finally 6 L of the mixture is replaced with 6L of water. How much milk (in litres) is there in the vessel?
(a) 26.775 (b) 29.16 (c) 24.72 (d) 27.42
17. From a vessel containing pure milk, 9 L is taken out. It is replaced with an equal quantity of water. This operation repeated twice. The ratio of milk and water now in the vessel is 16 : 9. What was the volume of milk in the vessel initially?
(a) 54 L (b) 36 L (c) 42 L (d) 45 L
18. A vessel contains a mixture of two liquids A and B in the ratio of 7:5. When 9 L of the mixture is taken out and the vessel is filled with B, the ratio of A and B is now 7:9. How many litres of liquid A was there in the vessel initially?
(a) 24 L (b) 21 L (c) 18 L (d) 27 L
19. A milkman dilutes 36 L of pure milk with water. The percentage of milk in the solution is now 75%. How many litres of water did he add?
(a) 6 L (b) 8 L (c) 12 L (d) 16 L
20. Doodhimal, the local milkman was notorious for the quality of milk that he used to sell. Initially he had 60L of milk in his can. He removed one-third of it and replaced that with water. He then removed one-third of the mixture and again added water to it. How many times should this process be repeated if Doodhimal wants the concentration of milk to be just below 20%?
(a) 3 (b) 4 (c) 5 (d) 7

Exercise - 03

TITA/Short Answers

1. A trader sells total 315 TV sets. He sells black and white TV sets at a loss of 6% and colour TV sets at a profit of 15% thus he gains 9% on the whole. The no. of B/W TV sets, which he has sold, is

2. The diluted wine contains only 8 litres of wine and the rest is water. A new mixture whose concentration is 30% is to be formed by replacing wine. How many litres of mixture shall be replaced with pure wine. If there was initially 32 litres of water in the mixture?

3. From a container, 6 litres milk was drawn out and was replaced by water. Again 6 litres of mixture was drawn out and was replaced by the water. Thus the quantity of milk and water in the container after these two operations is 9 : 16. The quantity of mixture is:

4. A dishonest milkman purchased milk at Rs.10 per litre and mixed 5 litre of water in it. By selling the mixture at the rate of Rs.10 per litre he earns a profit of 25% the quantity of the amount of the mixture that he had was:

5. There are two kinds of alloys of tin and copper. The first alloy contains tin and copper such that 93.33% of it is tin. In the second alloy there is 86.66% tin. What weight of the first alloy should be mixed with some weight of the second alloy so as to make a 50 kg mass containing 90 % of tin?

6. There are two solutions of sulphuric acid (acid + water) with concentration of 50% and 80 %, respectively. They are mixed in a certain ratio to get a 62% sulphuric acid solution. This solution is mixed with 6 L of water to get back 50% solution. How much of the 80% solution has been used in the entire process?

7. An industrial solvent of 90% strength is prepared and stored in a 150 L capacity container. The container is filled to 80% of its capacity. It is required to decrease the concentration of the solvent in the container to less than 60%. For doing this, either pure water can be added to it and/or solution can be removed. But removal can only be done if there is no a given time, only 10 L of the solution can be added or removed. How many times should water be added to the solution?

8. A vessel contains a mixture of two liquids A and B in the ratio of 4:1. When 10 L of the mixture is replaced with liquid B, the ratio becomes 2:3. How many litres of liquid A was present in the jar initially?

9. Sharat invests a total of Rs.10,000 in two parts, some money @ 6% per annum and rest of the money @ 8% per annum of SI. After two years, he got a total of Rs.1440 as interest. What is the amount put at 6% per annum interest?

Mixture Answers Key & Solutions

Solutions

Exercise - or

1. Ans. (a)

Solution: let x litre Pepsi is required.

$$\begin{array}{ccc}
 6 & & 10 \\
 & \searrow & \nearrow \\
 & 9 & \\
 & \nearrow & \searrow \\
 x & & 15
 \end{array}$$

$$(10 - 9) = 1 \quad 3 = (9 - 6)$$

$$\text{Therefore } \frac{x}{15} = \frac{1}{3}$$

$$X = 5 \text{ litre}$$

Alternatively : go through options.

2. Ans. (a)

Solution: go through options:

$$30 \times 50 + 50 \times 20 = 2500 \text{ paise}$$

Alternatively: Since the average price of a coin

$$= \frac{2500}{80} = 31.25 \text{ paise}$$

$$\begin{array}{ccc}
 20 & & 50 \\
 & \searrow & \nearrow \\
 & 31.25 & \\
 & \nearrow & \searrow \\
 18.75 & & 11.25
 \end{array}$$

So the ratio of no. of 20 paise coins to the no. of 50 paise coins

$$= 18.75 : 11.25$$

$$= 75 : 45 = 5 : 3$$

Therefore, the no. of coins of the denominations of so paise is 30.

3. Ans. (c)

Solution: since the ratio of no. of female and male employees is 4:7 so the total no. of employees must be the multiples of 11. Hence the possible answer is 231.

$$\begin{array}{ccc}
 21 & & 32 \\
 & \searrow & \nearrow \\
 & 28 & \\
 & \nearrow & \searrow \\
 4 & & 7
 \end{array}$$

4. Ans. (b)

Solution: Since the ratio of cars sold at profit of 9% to the 36% is 19 : 8 hence the no. of cars sold at 36 % profit is 32.

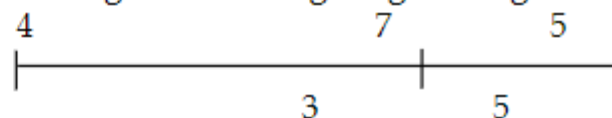
$$\begin{array}{ccc}
 9 & & 36 \\
 & \searrow & \nearrow \\
 & 17 & \\
 & \nearrow & \searrow \\
 19 & & 8
 \end{array}$$

5. Ans. (d)

Solution: Since there is insufficient data.

6. Ans. (b)

Solution: solving the following allegation figure



The answer would be 4.625/kg

7. Ans. (d)

Solution: in 125 gallons we have 25 gallons water and 100 gallons wine. To increase the percentage of water to 25% we need to reduce the percentage of wine to 75% this means that 100 gallons of wine = 75% of the new mixture thus the total mixture = 133.33 gallons. Thus we need to mix 133.33 - 125 = 8.33 gallons of water in order to make the water equivalent to 25% of the mixture.

8. Ans. (c)

Solution: amount of water left = $50 \times \frac{9}{10} \times \frac{9}{10} = 40.5$ litres. Hence wine = 9.5 litres. Ratio of wine and water = 19:81 option (c) is the correct.

9. Ans. (c)

Solution: Let the quantity of refined oil initially be Q. then we have $Q \times \frac{1}{4} \times \frac{3}{4} \times \frac{1}{4} \times \frac{3}{4} = 10 \rightarrow Q = 2560/81$ litre

10. Ans. (a)

Solution: The ratio would be 1 : 2 as seen from the figure.



11. Ans. (c)

Solution: the average value of a coin is 41 paise and there are only 20 paise and 50 paise coins in the sum. Hence the ratio of the number of 20 paise coins to 50 paise coins would be $9:21 = 3:7$ since there are a total of 90 coins the number of 20 paise coins would be $3 \times 90/10 = 27$ coins.

12. Ans. (a)

Solution: the requisite 11.11 % profit can be got by mixing 0.111 litres of water in 1 litre of milk. In such a case the total milk quantity would be 1.111 litres and the price would be for 1 litre only. The profit would be $0.111/1 = 11.11\%$

13. Ans. (b)

Solution: Solve using options as that would be the best way to tackle this questions. Option (b) fits the situation perfectly as if we take the price of the pen as Rs. 25, the cost of the pencil would be Rs. 10. The profit in selling the pen would be Rs. 10 the profit in selling the pen would be Rs.5 while the loss in selling the pencil would be Rs.1 the total profit would be Rs.4 as stipulated by the problem.

14. Ans. (c)

Solution: If all the animals were ducks we would have 180 heads and 360 legs if we reduce the number of ducks by 1 to 179 and increase the number of deers by 1 to 1 we would get an incremental 2 lets.

Since, the number of legs we need to increment is 88 ($448-360 = 88$), we need to have 44 deers and 136 ducks.

15. Ans. (b)

Solution: 20% spirit is mixed with 50% spirit to get 25% spirit. The ratio of mixing would be 5:1 this means be stole $\frac{5}{6}$ th of the bottle or 83.33% of the bottle.

16. Ans. (c)

Solution: Let the value of milk = $3x$ L and volume of water = $5x$ L

When 20 % of mixture is taken out

Volume of milk left = $\left(3x - \frac{1}{5} \times 3x\right) = \frac{12x}{5} = 2.4x$ L

Volume of water left = $\left(5x - \frac{1}{5} \times 5x\right) = 4x$ L

And $1.6 \times L$ of milk is added , new ratio = 1:1 by proceeding similarly, we get option (c) as answer.

17. Ans. (a)

Solution: x = amount of alloy B

y = amount of alloy A

In the alloy

Take the quantity of gold in both the alloy under consideration and then take allegation.

$$\frac{x}{y} = \frac{\frac{7}{1} - \frac{9}{2}}{\frac{9}{2} - \frac{7}{1}} = \frac{\frac{14-9}{2}}{\frac{9-7}{2}} = \frac{\frac{5}{2}}{\frac{2}{2}} = 5:2$$

Hence, required ratio = 2.5

18. Ans. (a)

Solution: Let x part of mixture is removed.

$$\text{Then } \frac{2 - \frac{2}{5}x + x}{3 - \frac{3}{5}x} = 1$$

$$X = \frac{5}{6}$$

19. Ans. (a)

Solution: Method I Let CP o milk be Rs.100

Then CP o mixture = Rs.

$$\left(100 - \frac{1}{6} \times 100\right) = \text{Rs. } \frac{250}{3}$$

Using allegation, we get

$$\frac{\text{Milk}}{\text{Water}} = \frac{\frac{250}{3} - 0}{100 - \frac{40}{3}} = \frac{5}{1}$$

Method 2 in these questions, answer can be calculated as follows.

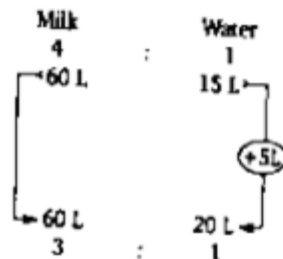
Ratio of milk and water = 100 % profit % = 100%:20% = 5:1

Exercise - 02

1. Ans. (d)

Solution: Total quantity of mixture = 75 litre

Therefore



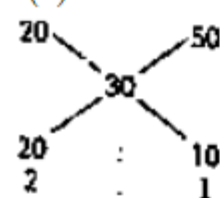
2. Ans. (b)

Solution: profit = 12.5% = $\frac{1}{8}$

Hence the ratio of water to spirit is 1 : 8

Since profit % = $\frac{\text{profit}}{\text{cost}} \times 100$

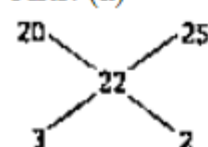
3. Ans. (b)



Solution:

Since the ratio of 20 % wine to 50 % wine is 2 : 1, it means there is $\frac{2}{3}$ wine which is replaced with wine in which the concentration of spirit is 20%

4. Ans. (a)



Solution: The S.P. of Desi Chai = Rs.18

The S.P. of Videshi Chai = Rs.30

The C.P. of Desi Chai = Rs.20

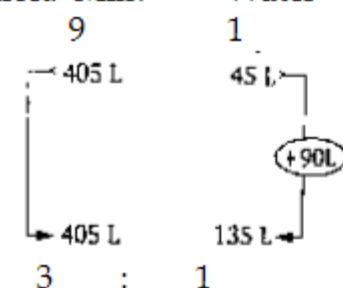
The C.P. of Videshi Chai = Rs.25

The S.P. of Mixture Chai = Rs.27.5

The C.P. of mixture = Rs.22

5. Ans. (b)

Solution: Milk



6. Ans. (b)

Solution: petrol : Kerosene

3 : 2 (initially)

2 : 3 (after replacement)

$$\frac{\text{Remaining (or left) quantity}}{\text{initial quantity}} = \left(1 - \frac{\text{replaced quantity}}{\text{total quantity}}\right)$$

$$\text{(for petrol)} \frac{2}{3} = \left(1 - \frac{10}{K}\right)$$

$$\frac{1}{3} = \frac{10}{K}$$

$$K = 30 \text{ litre}$$

Therefore, the total quantity of the mixture in the container is 30 litres

7. Ans. (d)

Solution: Since by selling at Rs. 4.40 we want a profit of 10% it means that the average cost required is Rs.4 per kg. Mixing sugar worth Rs. 3.6 kg and Rs.4 .2 kg to get Rs. 4 kg means a mixture ratio of 1:2 thus, to 8 kg of the second variety we need to add 4 kg of the first variety to get the required cost price.

8. Ans. (b)

Solution: average salary

of rest of employees	overall average salary
Average salary of Rs. 560 officers Rs 4000	Rs. 600

Number of rest of employees

From the figure it is clear that the ratio of the number of officers to the number of other employees would be 540:3400 workers since there are 120 officers, there would be $3400 \times 3 = 10200$ workers in the company. Thus the total number of employees would be $10200 + 120 = 10320$.

9. Ans. (b)

Solution: The amount of spirit left = $20 \times \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} = 4096/625 = 6 \frac{346}{625}$.

10. Ans. (c)

Solution: in order to sell at a 25% profit by selling at 13.75 the cost price should be $13.75/1.25 = 11$. Also since water is freely available, we can say that the ratio of water and soda must be 1:11

11. Ans. (d)

Solution: The following visualization would help:

Petrol	final mixture
original mixture	
0 % Kerosene	15% Kerosene 18%
Kerosene	

8 Litres ratio of mixing
 ??
 $= 3:15$
 $= 1.5$

From the figure we can see that the original mixture would be 40 litres and the petrol being mixed is 8 litres. Thus the vessel capacity is 48 litre.

12. Ans. (b)

Solution: In order to solve this we need to assume a value for the amounts in the vessels, if we assume 35 litres as the quantities, in the three vessels we will get: 28 litre + 25 litre + 30 litre = 83 litre of petrol and 22 litres of kerosene in 105 litres of the mixture. The required ratio is 83:22.

13. Ans. (d)

Solution: We cannot determine the answer to this question as we do not know the price per kg of the other type of ghee, hence, we cannot find the ratio of mixing which would be required in order to move further in this question.

14. Ans. (d)

Solution: Given $n_1 + n_3 + \dots + n_{45} = 1273$
 From above, we cannot find the value of d.

15. Ans. (d)

Solution: Let the initial volume be 85x.

$$36x = 49x \left(1 - \frac{4}{49x}\right)^2$$

$$\left(\frac{6}{7}\right)^2 = \left(1 - \frac{4}{49x}\right)^2$$

$$1 - \frac{4}{49x} = \frac{6}{7}$$

$$x = 4/7$$

$$\text{Required volume} = 49 \times 4/7 = 28 \text{ g}$$

16. Ans. (a)

Solution: After first operation, milk left =

$$40 \left(1 - \frac{4}{40}\right) = 40 \left(1 - \frac{1}{10}\right) = 40 \cdot \frac{9}{10} = 36\text{L}$$

$$\text{After second operation, milk left} = 36 \left[1 - \left(\frac{5}{40}\right)\right] = 31.5$$

$$\text{After third operation milk left} = \left(36.5 - 6 \times \frac{31.5}{40}\right) = (26.775 \text{ L})$$

17. Ans. (d)

Solution: Let 25x be the volume of pure milk present in vessel.

Apply the formula,

$$\text{Amount left} = \text{Initial amount} \left(1 - \frac{\text{amount take out}}{\text{initial amount}}\right)^n$$

n = Number of times operation carried out

$$16x = 25x \left(1 - \frac{9}{25x}\right)^2$$

$$X = \frac{9.5}{25} = \frac{9}{5}$$

$$\text{Hence volume of milk present initially} = 25 \cdot \frac{9}{5} = 45 \text{ L}$$

18. Ans. (b)

Solution: Let 7x and 5x volume of liquid A and B are present in vessel then,

$$\frac{7x - \frac{7}{12} \cdot 9}{5 - \frac{5}{12} \cdot 9} = \frac{7}{9}$$

$$X = 3$$

$$\text{Hence, } 7:3 = 21 \text{ L of liquid A was present}$$

19. Ans. (c)

Solution: Let x = volume of water he added

$$\frac{36}{36+x} = \frac{3}{4}$$

$$144 = 108 + 3x$$

$$3x + 36$$

$$X = 12$$

20. Ans. (b)

Solution: After first replacement concentration of milk

$$= \frac{40}{60} \times 100 = 66.66\%$$

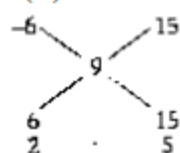
After second replacement concentration of milk

$$= \frac{80/3}{60} \times 100 = 44.44\%$$

A sequence is found: 66.66% 44.44% and 22.22% thus this process is done for 4 times.

Exercise - 03
TITA/Short Answers

1. Ans. (d)



Solution: thus the ratio of B/W TV sets to the no. of colour TV sets

Therefore no. of B/W TV sets = 90

2. Ans. (b)

Solution:

Wine	Water
8 L	32 L
1	4
20 %	80 % (Original ratio)
30 %	70 % (required ratio)

In this case, the percentage of water being reduced when the mixture is being replaced with wine.

So the ratio of left quantity to the initial quantity is 7 : 8

$$\text{Therefore } \frac{7}{8} = \left[1 - \frac{k}{40}\right] \Rightarrow \frac{7}{8} = \left[\frac{40-k}{40}\right]$$

$$K = 5 \text{ litre}$$

3. Ans. (a)

$$\text{Solution: } \frac{9}{25} = \left(1 - \frac{6}{K}\right)^2$$

$$\frac{3}{5} = \left(1 - \frac{6}{K}\right)$$

$$K = 15 \text{ litre}$$

4. Ans. (c)

Solution: the cost price of the mixture would have been Rs. 8 per litre for him to get a profit of 25% by selling at Rs. 10 per litre. The ratio of mixing would have been 1:4 water is to milk as can be seen in the figure.

Water	Mixture	Milk
Rs. 0 per litre	Rs. 8 per litre	Rs. 10 per liter

Ratio of mixing = 2:8 or 1:4

Since we are putting in 5 litres of water, the amount of milk must be 20 litres. The amount of mixture then would become 25 litre.

5. Ans. (d)

Solution: In order to mix two tin alloys containing 86.66% tin and 93.33% tin to get 90% tin the ratio of mixing should be 1:1 thus, each variety should be 25 kgs each.

6. Ans. (c)

Solution: Let x L of 50% solution and y L of 80% solutions are used.

$$\frac{x}{y} = \frac{80-62}{62-50} = \frac{18}{12} = \frac{x}{y} = \frac{3}{2}$$

Solution get mixed in the ratio 3:2

Now, suppose the value of acid is Z litres $\Rightarrow \frac{0.62Z}{yz+6} = \frac{1}{2}$

$$\Rightarrow 1.24 Z = Z + 6 \Rightarrow 0.24 Z = 6$$

$$\text{Hence required rate} = \frac{2}{5} \times 25 = 10 \text{ litres}$$

7. Ans. (d)

Solution: Value of solvent in container = $\left(\frac{4}{5} \times 150\right) \text{ L} = 120 \text{ L}$

Concentration of solvent = $\left(\frac{9}{10} \times 120\right) \text{ L} = 108 \text{ L}$

When first time water is added, the concentration of solvent

$$= \frac{108}{130} \times 100 = 83\%$$

When second time water is added, the concentration of solvent.

$$= \frac{108}{140} \times 100 = 77\%$$

When third time the water is added, the concentration of solvent

$$= \frac{108}{140} \times 100 = 72\%$$

Now 10 L solution should be removed solvent present in container = $(108 - 7.2) \text{ L} = 100.8 \text{ L}$

Again 10 L water is added and 10 L solvent is removed to get the required solution, water is added 6 times.

8. Ans. (c)

Solution: Suppose x litre was the initial volume of mixture then, volume of liquid A $\frac{4}{5}x$, and volume of liquid B = $\frac{x}{5}$

$$\text{Now, } \frac{\frac{4}{5}x - \frac{4}{5} \cdot 10}{\frac{1}{5}x - \frac{1}{5} \cdot 10 + 10} = \frac{2}{3}$$

$$\frac{\frac{4}{5}x - 8}{\frac{1}{5}x - 2 + 10} = \frac{2}{3} = \frac{\frac{4}{5}x - 8}{\frac{1}{5}x + 8} = \frac{2}{3}$$

$$12x - 120 = 2x + 80$$

$$10x = 200$$

$$x = 20$$

$$\text{Volume of liquid} = \frac{4}{5} \cdot 20 = 161$$

9. Ans. (a)

Solution: Net interest earned by him = $\frac{1}{2} \times \frac{1440}{1000} \times 100 = 7.2\%$

Let Rs.x is invested at 6% P.A. and rest invested at 8% P.A.

$$\frac{x}{y} = \frac{8-7.2}{7.2-6} = \frac{.8}{1.2} = \frac{2}{3}$$

$$\text{Required amount} = \frac{2}{5} \times 10,000 = \text{Rs.400}$$