ALLIGATION AND MIXTURES

Introduction

Weighted Average

It is observed that the average can be calculated only if the weights of all the factors are same. Hence, the weighted average is a more generalized form of average. This can be further understood with the following illustration.

|	Class A	Class B
No. of students	10	10
Average age	12 yrs	16 yrs

Now, if we combine both these classes, then the average age of all the students $=\frac{12+16}{2}=\frac{28}{2}=14$ years. This is one standard **example** of average.

Let us see another example:

	Class A	Class B
No. of students	10	14
Average age	12 yrs	14 yrs

Now, if we combine these two classes, then the average can not be calculated by the above mentioned method, since the weights attached to different averages are different.

Finding Expression for Weighted Average
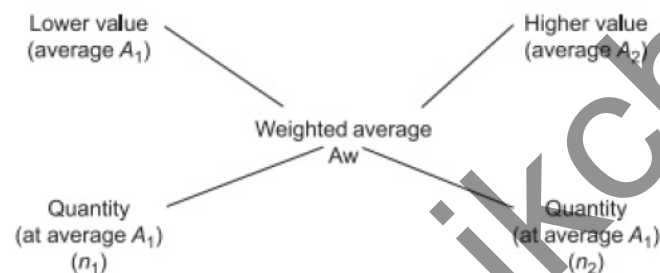
And we write this as: $\frac{n_1}{n_2}=\frac{A_2-A_w}{A_w-A_1}$

i.e.,

$$\frac{\text{Quantity (Lower priced)}}{\text{Quantity (Higher priced)}}=\frac{\text{Higher price}-\text{Average price}}{\text{Average price}-\text{Lower price}}$$

It is quite obvious that the ratio of the number of persons /items in different groups is proportionate to the deviations of their average from the average of all the people combined. This average of all the members combined is known as weighted average and is denoted by A_w. This process of mixing the two groups is also referred as alligation.

Elements of Weighted Average

As we can see from the above derivation, there are five quantities:

i. Number of members in 1st group (n_1)
ii. Number of members in 2nd group (n_1)
iii. Average of 1st group (A_1)
iv. Average of 2nd group (A_2)
v. Weighted average (A_w)

Normally, in the case of weighted average, we get questions in which one of these five elements is missing, and with the help of the remaining four quantities, the value of that missing quantity is found. Different possibility (situations) are given below **(Y represents – data given, N represents – data not given):**

Sitution	N_1	N_2	A_1	A_2	A_w
First	Y	Y	Y	Y	N
Second	Y	Y	Y	N	Y
Third	Y	Y	N	Y	Y
Fourth	Y	N	Y	Y	Y
Fifith	N	Y	Y	Y	Y
Sixth	N	N	Y	Y	Y

First Situation

Example 7 10 kg of rice priced at Rs.12 per kg is mixed with 6 kg of rice priced at Rs.16 per kg. What is the average price of the whole mixture?

Solution Lower priced value = Rs.12 per kg and its quantity = 10 kg

Higher priced value = Rs.16 per kg and its quantity = 6 kg
Using alligation,

$\frac{10}{6}=\frac{16-A_w}{A_w-12}$, or, A_w = Rs.13.5/kg

However, in my opinion, in this situation, it is better to use the normal method rather than using the weighted average method of finding A_w.

Normal method – Total value = 12 × 10 + 16 × 6 = 216
Hence, average price = 216/16 = Rs.13.5/kg

Second/Third Situation

Example 8 Two varieties of rice are mixed in the ratio 2:3. The price of the mixture is Rs.12 per kg and the price of the variety having lower weight is Rs.10 per kg. Find the price of the other variety.

Solution
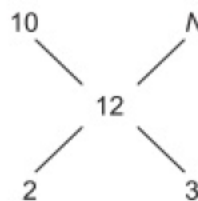
$[N – 12]$ $[12 – 10]$%
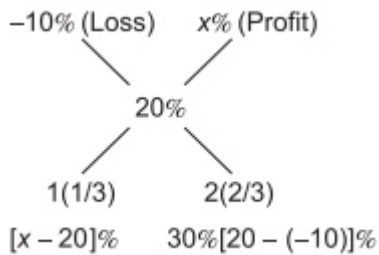
Now, $\frac{2}{3}=\frac{(N-12)}{(12-10)}=\frac{N-12}{2}$

Hence, N = Rs.13.33 per kg

Fourth/Fifth Situation

Example 9 Some articles are purchased for Rs.450. 1/3rd of the articles are sold at a loss of 10%. At what percentage profit should the remaining articles be sold to obtain a net profit of 20% on the whole transaction?

Solution

Now, $= [20 - (-10)]/[x - 20] = 2/1$

Hence, x = 35%

It is seen that the quantities are in the ratio of 1:2, so the deviation from mean percentage profit in the loss percentage and profit percentage will also be same.
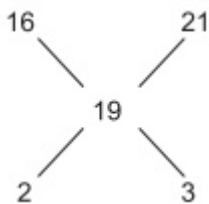
Two corresponds to 30%, and 1 will correspond to 15%.

Hence, x = 35%

Sixth Situation

Example 10 Two different qualities of sugar are mixed in some ratio. The price of one quality of sugar is Rs.16/kg and that of another quality is Rs.21/kg. In what ratio have the sugar of two qualities been mixed if the price of the mixture is Rs.19/kg?

Solution

Hence, the ratio of quantity of sugar of different qualities = 2:3

MIXTURES

When two or more than two pure substances/mixtures are mixed in a certain ratio, they create a mixture. Here, we shall confine ourselves to mostly homogenous mixtures in view of the questions commonly asked in CAT.

Mixing without Replacement

In this particular type of mixing, two or more than two substances are mixed without any part of any mixture being replaced.

Example 11 In a mixture of 420 L, the ratio of milk and water is 6:1. Now, 120 L of the water is added to the mixture. What is the ratio of milk and water in the final mixture?

Solution Volume of milk = 360 L and volume of water = 60 L.

When 120 L of water is added, volume of water = 180 L

Hence, the ratio of milk water = 2:1

Example 12 A milkman mixes 20 L of water with 80 L of milk. After selling one-fourth of this mixture, he adds water to replenish the quantity that he had sold. What is the current proportion of water to milk?

**Solution** Ratio of milk and water = 20:80

When one-fourth of this mixture is sold, total volume of mixture will be reduced by 25%, so 25% of milk and water both will reduce. So, volume of milk and water after selling out one-fourth of mixture = 60 L and 15 L, respeffectively.

Addition of 25 L, of water will finally give us the following: volume of milk = 60 L and volume of water = 40 L. Hence, the ratio of water and milk is 40:60 = 2:3.

Example 13 How many litres of fresh water should be mixed with 30 L of 50% milk solution so that resultant solution is a 10% milk solution?

Solution

Method 1 Using Alligation
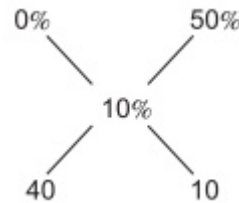
So, the ratio of fresh water added: milk solution = 4:1

Hence, 120 L of fresh water should be added.

Method 2 Principle of constant volume of one component

Since we add fresh water, the volume of milk will be constant.

Now, volume of milk = 15 L = 10% of the new mixture.

So, 100% of the new mixture = 150 L

So, volume of fresh water added = 150 − 30 = 120 L.

Method 3 Principle of inverse proportion

We know that concentration is inversely proportional to the volume of solute added.

So, in this case 30 × 50% = 10% × (30 + x), where x is the volume of water added.

So, x = 120 L

Method 4 Using equation

In the final mixture, $\frac{\text{Milk}}{\text{Total}} = 10\% = \frac{15}{30+X}$

So, x = 120 L

Mixing with replacement

In this particular type of mixing, two or more than two substances are mixed by replacing some part of a mixture. In these types of questions, total volume may or may not be the same and information regarding the same can be obtained from the question.

If V is the initial volume of milk (or any liquid), and x litres of milk is always replaced by water, then quantity of milk left after n such operations

$= V \left(1 - \frac{x}{V}\right)^n$

This formula is very similar to the standard formula we have seen in the case of **compound interest** $\left[P \left(1 + \frac{R}{100}\right)\right]$.

The only difference between the two formulae is that while the interest is being added every year (or for the given time-period), volume of milk gets reduced after every operation.

Using the values of the above example, quantity of milk left after three operations

$= 40 \times \frac{36}{40} \times \frac{36}{40} \times \frac{36}{40} = 19.16$ L

The same problem can be solved with straight-line approach of percentage also Since 10% of existing volume is taken out every time, the percentage of milk in the final mixture after the third operation = 72.9%

$100\% \xrightarrow{10\%\downarrow} 90\% \xrightarrow{10\%\downarrow} 81\% \xrightarrow{10\%\downarrow} 72.9\%$

Since 100% = 40, so 72.9% = 29.16 L

Case II When the quantity withdrawn and the quantity replaced are of the same volume, but the total volume before replacement does not remain the same.

Initially, there are 40 L of milk, and 4 L of milk is taken out and 4 L of water is poured in

So, there will be 36 L of milk and 4 L of water.

Now, 5 L of mixture is taken out and 5 L of water is poured in.

The quantity of milk and water being withdrawn here will be in the ratio of 36:4. So, the quantity of milk withdrawn = $\frac{36}{40} \times 5$

Milk left = $40 \times \frac{36}{40} \times \frac{35}{40}$

Again, if now 6 L of mixture is taken out and 6 L of water is poured in,

Milk left = $40 \times \frac{36}{40} \times \frac{35}{40} \times \frac{34}{40}$

Case III When the quantity withdrawn and the quantity replaced are not of the same volume.

Initially, there are 40 L of milk, and 4 L of milk is taken out and 5 L of water is poured in.

Obviously, there will be 36 L of milk and 5 L of water.

Now, 5 L of mixture is taken out and 6 L of water is poured in then the quantity of milk and water being withdrawn will be in the ratio of 36:5. So, the quantity of milk withdrawn = $\frac{36}{41} \times 5$

Milk left = $40 \times \frac{36}{40} \times \frac{36}{41}$

Again 6 L of mixture is taken out and 7 L of water is poured in.

Therefore, the volume of milk in the final mixture = $40 \times \frac{36}{40} \times \frac{36}{41} \times \frac{36}{42}$

Example 14 Two vessels A and B of equal capacities contain mixtures of milk and water in the ratio 4:1 and 3:1, respeffectively. 25% of the mixture from A is taken out and added to B. After mixing it thoroughly, an equal amount is taken out from B and added back to A. The ratio of milk to water in vessel A after the second operation is:
(a) 79:21 (b) 83:17
(c) 77:23 (d) 81:19

Solution Assume there is 20 L of the mixture in both the vessels.

In vessel A, milk = 16 L and water = 4 L

25% from A to B = milk in B = 15 + 4 = 19 L
= water in B = 5 + 1 = 6 L
ratio = 19:6 Equal amount from vessel B to vessel A

= milk in A = $12 + \frac{19}{5} = \frac{79}{5}$
= water in A = $3 + \frac{6}{5} = \frac{21}{5}$
Hence, the ratio is 79:21

1. In an alloy there is 12% of copper. To get 69 kg of copper. How much alloy will be required?
   (a) 424 kg (b) 575 kg
   (c) 828 kg (d) 1736 kg

2. A mixture contains spirit and water in the ratio 3:2. If it contains 3 litres more spirit than water. the quantity of spirit in the mixture is
   (a) 10 litres   (b) 12 litres
   (c) 8 litres (d) 9 litres

3. 3. 40 litres of a mixture of milk and 8, water contains 10% of water, the water to be added, to make the water content 20% in the new mixture is :
   (a) 6 litres (b) 6.5 litres
   (c) 5.5 litres   (d) 5 litres

4. A mixture of 30 litres contains milk and water in the ratio of 7:3. How much water should be added to it so that the ratio of milk and water and becomes 3:7?
   (a)40 l   (b)100 l
   (c)128 l   (d)68 l

5. How much pure alcohol to be added to 400 ml of a solution containing 15% alcohol to change the concentration of alcohol in the mixture to 32%,
   (a) 60 ml   (b) 100ml
   (c) 128 ml (d) 68 ml

6. In what ratio must a grocer mix tea at Rs.60 a kg, and Rs.65 a kg, so that by selling the mixture at Rs. 68.20 a kg, he may gain 10%
   (a) 3:2   (b) 3 :4
   (c)3:5   (d)4:5

7. A barrel contains a mixture of wine and water in the ratio 3:1 . How much fraction of the mixture must be drawn off and substituted by water so that the ratio of wine and water in the resultant mixture in the barrel becomes 1 : 1 ?
   (a) ¼   (b)1 / 3
   (c) 2/3   (d)3/3

8. In 50 gm alloy of gold and silver. The gold is 80%by weight. How much gold should mixed to this alloy so than the weight of gold would become 95%
   (a) 200 gm (b)150 gm
   (c) 50gm   (d)100gm

9. There are 81 litres pure milk in a container. One-third of milk is replaced by water in the container. Again one-third of mixture is extracted and equal amount of water is added. What is the ratio of milk to water in the new mixture?
   (a) 1: 2   (b)1:1
   (c) 2: 1   (d)4:5

10. In 80 litres mixture of milk and water the ratio of amount of milk to that of amount of water is 7: 3.In order to make this ratio 2:1 how many litres of water should be added?
    (a)5   (b)6
    (c) 8   (d)4

11. Vessels A and B contain mixtures of milk and water in the ratio 4:5 and 5:1 respectively. In what ratio should quantities of mixture be taken from A and B to from a mixture in which milk to water is the ratio 5: 4?
(a) 2:5   (b)4: 3
(c)5 : 2   (d) 2: 3

12. The milk and water in a mixture are in the ratio 7:5. When 15 litres of water are added to it. The ratio of milk and water in the new mixture becomes 7:8.The total quantity of water in the new mixture is
(a)35 litres (b)35 litres
(c)40 litres   (d)45 litres

13. 200 litres of a mixture contains 15%water and the rest is milk. The amount of milk that must be added so that the resulting mixture contains 87.5% milk is
(a) 30 litres   (b) 35 Litres
(c) 40 litres   (d) 45 litres

14. A person has a chemical of Rs. 25 per liters. In what ratio should water be mixed with chemical the mixture at Rs. 20 litres he may get profit of 25%
(a) 14:9   (b) 16:9
(c) 9:14   (d) 9:16

15. 7kg of tea costing Rs.280 per kg is mixed with 9 kg of tea costing Rs. 240 per kg. The average price per kg of the mixed tea is:
(a) Rs 255.80   (b) Rs. 257.50
(c) Rs 267.20   (d) Rs. 267.50

16. In what ratio must a mixture of 30% alcohol strength be mixed with that of 50% alcohol strength so as to get a mixture of 45% alcohol strength
(a) 1:2   (b) 1:3
(c) 2:1   (d) 3:1

17. In a 729 litres mixture of milk and water, the ratio of milk to water is 7:2, To get a new mixture containing milk and water in the ratio 7:3, the amount of water to be added is
(a) 81 litres   (b) 71 litres
(c) 56 litres   (d) 50litres

18. In a 40 litres mixture of milk and water the ratio of milk to water is 7:1. In order to make the ratio of milk and water 3:1, the quantity of water (in litres) that should be added to the mixture will be
(a) 20/3   (b)13/2
(c)99   (d)27/4

19. In an alloy, zinc and copper are in the ratio 1:2. In the second alloy, the same elements are in the ratio 2:3 . If these two alloys be mixed to form a new alloy in which two elements are the ratio 5:8, the ratio of these two alloys in the new alloys is:

(a) 3 : 10   (b)3 :7
(c)10 : 7   (d)1 : 3

20. A jar contained a mixture of two liquids A and B in the ratio 4:1. When 10 litres of the mixture was taken out and10litres of liquid B was poured into the jar. This ratio became 2:3. The quantity of liquid A contained in the jar initially was
(a) 4 litres   (b) 8 litres
(c) 16 litres   (d) 40 litres

21. In a mixture of 75 litres, the Ratio of milk to water is 2:1. The amount of water to be further added to the mixture so as to make the ratio of the milk to water 1:2 will be
(a) 45 litres   (b) 60 litres
(c) 75 litres   (d) 40 litres

22. A and B are two alloys of gold and copper prepared by mixing metals in the ratio 5:3 and 5:11 respectively. Equal quantities of these alloys are melted to form a third alloy C, The ratio of gold and copper in the alloy C is
(a) 25:13   (b) 33: 15
(c) 15:17   (d) 17:1

23. Two types of alloys posses silver in the ratio of 7: 22 and 21:37. In what ratio should alloys be mixed so as to have in which gold and silver would exists ratio 25 : 62
(a)13:8   (b)8:13
(c) 13: 12   (d)6 : 9

24. An alloy contains Zinc, copper, tin in the ratio 2:3:1 and other contains copper, tin and lead in the ratio 5:4:3. If equal weights of both alloys are melted together to form a third alloy, then the weight of lead per kg in the new alloy will be.
(a) ½ kg   (b) 1/8 kg
(c) 3/14 kg   (d)7/9 kg

25. The ratio in which tea costing Rs.192 per kg is to be mixed with tea costing Rs.150 per kg so that the mixed tea, when sold for Rs.194.40 per kg. gives a profit of 20% is:
(a) 2:5   (b) 23:5
(c) 5:3   (d) 5:2

26. The ratio of the quantities of sugar, in which sugar costing Rs.20 per kg. and Rs. 15 per kg, should be mixed so that here will be neither loss nor gain on selling the mixed sugar at the rate of Rs. 16 per kg is:
(a) 2:1   (b) 2:1
(c) 4:1   (d) 1:4

27. A mixture of 40 litres of milk and water contains 10% of water. How much water must be added to make the water 20% in the new mixture?

(a) 10 litres   (b) 7 litres
(c) 5 litres   (d) 3 litres

28. A mixture contains wine and water in the ratio 3:2 and another mixture contains them in the ratio 4:5. How many litres of the latter must be mixed with 3 litres of the former so that the resultant mixture may contain equal quantities of wine and water ?

(a) 5/3 litre (b) 27 litres
(c) 9/2 litres   (d) 15/4 litres

29. A mixture of 80 litres of wine and water contains 60 percent wine how much water must be added to make it 50 percent wine in the new mixture?

(a) 16 litres (c) 1.6 litres   (b) 18 litres   (d) 20 litres

30. In a mixture of 60 litres . The ratio of milk and water is 2: 1 . How much more water must be added to make its ratio 1:2?

(a) 40 litres   (b) 52 litres
(c) 54 litres   (d) 60 litres

31. In what ratio Darjeeling Tea costing Rs.320 per kg be mixed with Assam Tea costing Rs.250 per kg so that there is a gain of 20% by selling the mixture at Rs.324 per kg?
(a) 1:2   (b) 2:3
(c) 3:2   (d) 2:5

32. The ratio of milk and water in mixtures of four containers are 5:3, 2:1, 3:2 and 7:4 respectively. In which container is the quantity of milk, relative to water, minimum?
(a) First   (b) Second
(c) Third   (d) Fourth

33. The ratio of the volumes of water and glycerine in 240cc of mixture is 1:3. The quantity of water (in cc) that should be added to the mixture so the volumes of water and glycerine become 2:3 is 34.
(a) 55   (b) 60
(c) 62.5   (d) 64

34. The ratio of the quantities of add and water in a mixture is 1: 3, it 5 litres of acid is further added to the mixture, the new ratio becomes 1:2. The quantity of new mixture in litres is
(a) 32   (b) 40
(c) 42   (d) 45

35. In a mixture of 25 litres, the ratio of acid to water is 4:1. Another 3 litres of water is added to the mixture. The ratio of acid to water in the new mixture is:
(a) 5:2   (b) 2: 5
(c) 3:5   (d) 5:3

36. Two equal vessels are filled with the mixtures of water and milk in the mixtures of water and milk in the ratio of 3:4 and 5:3 respectively. If the mixtures

are poured into a third vessel, the ratio of water and milk in the third vessel will be:
(a) 15:12   (b) 53:59
(c) 20:9   (d) 59:53

37. Two vessels A and B contain acid and water in the ratio 4:3 and 5:3 respectively. Then the ratio in which these mixtures to be mixed to obtain a new mixture in vessel C containing acid and water in the ratio 3:2 is
(a) 5:8   (b) 7:8
(c) 7:5   (d) 4 : 7

38. Two containers have acid and water mixed respectively, in the ratio 3:1 and 5:3. To get new mixture with ratio of acid to water as 2:1, the two types have to be mixed in the ratio?
(a) 1:1   (b) 2:1
(c) 2:3   (d) 3:2

39. Acid and water are mixed in a vessel A in the ratio of 5:2 and in the vessel B in the ratio 8:5. In what proportion should quantities be taken out from the two vessels so as to form a mixture in which the acid and water will be in the ratio of 9:4?
(a) 7:2   (b) 2:7
(c) 7:4   (d) 2:3

40. The acid and water in two vessels A and B are in the ratio 4:3 and 2:3. In what ratio should the liquids in both the vessels be nixed to obtain a new mixture in vessel C containing half acid and half water?
(a) 7:5   (b) 5:7
(c) 7:3   (d) 5:3

41. The ratio of spirit and water in two mixtures of 20 liters and 36 litres is 3:7 and 7:5 respectively. Both the mixtures are mixed together. Now the ratio of the spirit and water in the new mixture is:
(a) 25:29   (b) 0
(c) 27:29   (d) 27:31

42. Two vessel A And B contain acid and water mixed in the ratio 2:3 and 4:3. In what ratio must these mixtures be mixed to form a new containing half acid and half water?
(a) 5:7   (b) 1:2
(c) 2:1   (d) 7:5

43. Alcohol and water in two vessels A and B are in the ratio 5:3 and 5:4 respectively. In what ratio, the liquids in both the vessels be mixed to obtain a new mixture in vessel C in the ratio 7:5?
(a) 2: 3   (b) 3:2
(c) 3:5   (d) 2:5

44. A vessel is filled with liquid 3 parts of which are water and 5 parts are 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)1/3   (b)¼
(c)1/5   (d)1/7

45. Two vessels A and B contain milk and water mixed in the ratio 4:3 and 2:3. The ratio in which these mixtures be mixed to form a new mixture containing half milk and half water is :

(a) 7:5
(c) 5:6   (b) 6:5   (d) 4:3

46. A container contains 60 kg of milk. From this container 6kg of milk was taken out and replaced by water. This process was repeated further two times. The amount of milk left in the container is:
(a) 34.24 kg   (b) 39.64 kg
(c) 43.74 kg   (d) 47.9 kg

47. 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 900/13% milk is
(a) 3:5   (b) 5:2
(c) 5:7   (d) 2:7

48. A and B area two alloys of gold and copper the ratio of gold is respectively. If equal quantities of these two use melted to from anew alloy C, then ratio of gold and copper in C is:
(a) 6: 5   (b) 9:4
(c) 12:7   (d) 7:5

49. A can contains a mixture of two liquids A and B in the ratio 7:5. When 9 litres of mixture are drained 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) 35

50. Two vessels contain milk and Water in the ratio 3:2 and 7:3, Find the ratio in which the contents of the two vessels to be mixed to get a new mixture in which the ratio of milk and water is 2: 1?
(a) 2:1   (b) 1 : 2
(c) 4:1   (d)1 : 4

51. A shopkeeper bought 15 kg of Rice at the Rs 29 per kg and 25 kg at Rs. 20 per kg. He sold the mixture of both types of rice at the rate of Rs.27 per kg. His profit in this transaction?

(a) Rs. 1.25   (b) Rs. 150
(c) Rs. 140 (d) Rs.145

52. The proportion of acid and water in three samples is 2:1, 3:2, and 5:3. A mixture containing equal quantities of all three samples is made. The ratio of Water and acid in the mixture is:

(a) 120 : 133   (b) 227 : 133
(c) 227 : 120   (d) 133 : 227

53. Two alloys are both made up of Copper and tin. The ratio of copper and tin in the first alloy is 1:3 and in the second alloy is 2:5, In what ratio should the two alloys be to obtain a new alloy in which the ratio of tin and copper be 8:3?
(a) 3:5   (b)4 : 7
(c) 3:8   (d) 5 : 11

54. A mixture contains alcohol and Water in the ratio 4:3. If 5 litres water is added to the mixture, the ratio becomes 4:5. The quantity of alcohol in the given mixture is:
(a) 3 litres (b) 4 litres
(c) 15 litres   (d) 10 litres

55. 15 litres of a mixture contains alcohol and water in the Ratio 1:4. If 3 litres of water is mixed in it, the percentage of alcohol in the new mixture will be
(a) 15   (b) 161.8
(c) 17   (d) 18

56. Three vessels whose capacities 5ȵrt: in the ratio of 3:2:1 are completely filled with milk mixed with water. The ratio of milk and water in the mixture of vessels are 5:2, 4:1 and 4:1 respectively. Taking 1/3 of first, 1/2 of second and 117 of third mixtures, a new mixture kept in a new vessel is prepared. The percentage of water in the new Mixture is
(a) 32   (b) 28
(c) 30   (d) 24

57. The ratio in which two sugar solutions of the concentrations 15% and 40% are to be mixed to get a solution of concentration 30% is:
(a) 2:3   (b) 3:2
(c) 8:9   (d) 9:8

58. Nikita bought 30 kg of wheat at the rate of Rs. 9.50 per kg and 40 kg of wheat at the rate of Rs. 8.50 per kg and mixed then. She sold the mixture at the rate of Rs. 8.90 per kg. Her total profit or loss in the transaction was:

(a) Rs. 2 loss   (b) Rs. 2 profit
(c) Rs. 7 loss   (d) Rs. 7 profit

59. How many kg. of salt at 42 Paise per kg must a man mix with 25 kg of salt at 24 Paise per kg, so that he may, on selling the mixture at 40 Paise per kg. gain 25% on the outlay?

(a) 20   (b) 30
(c) 40   (d) 50

60. A mixture of a certain quantity of milk with 16 litres of water is worth 90 Paise per litre. If pure milk be worth Rs. 1.80 per litre. How much milk is the in the mixture?

(a)40 liters (b)16 liters
(c)60 liters   (d)80 liters

61. A gold smith has two qualities of gold one of 12 carats and another 16 carats purity. In what proportion would he mix both make an ornament of 15 carats purity?
    (a) 1:3   (b) 2:3
    (c) 3:2   (d) 3:1

62. 300 kg of sugar solution has 40% sugar in it. How much sugar should be added to lake it 50% in the solution?
    (a) 40 kg   (b) 50 kg
    (c) 60 kg   (d) 80 kg

63. 729 ml of a 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) 60 ml   (b) 71 ml
    (c) 52 ml   (d) 81 ml

64. Three vessels whose capacities age 3 : 2 : 1 are completely filled with milk mixed with water, the ratio of milk and water in the mixture of vessels are 5 : 2, 4 : 1 and respectively. Taking 1/3 of first 1/2 of second and turns a new mixtures kept in new vessel is prepared, third mixture is:
    (a) 32
    (c) 30   (b) 28   (d) 24

65. 60 kg of an alloy A is mixed with 100 kg of alloy B. If alloy A has lead and tin in the ratio 3:2 and alloy B has tin and copper in the ratio 1:4, the amount of tin in the new alloy is
    (a) 44 kg   (b) 53 kg
    (c) 80 kg   (d) 24 kg

66. Two blends of a commodity costing Rs. 35 and Rs. 40 per kg respectively are mixed in the ratio 2 : 3 by weight, If one-fifth of the mixture is sold at Rs 46 per kg and the remaining at the rate at 55 per kg, the profit percent is:
    (a) 50   (b) 20   (c) 40   (d) 30

67. There glasses of equal volume contain acid mixed with water, The ratio of acid and water are 2 : 3, 3 : 4 and 4 : 5 respectively, Contents of these glasses are poured in a large vessel. The ratio of acid and water in the large vessel is:
    (a) 417 : 564   (b) 401 : 544
    (c) 407:560   (d) 411 : 540

68. Two types of tea costing & 180/kg and Rs. 2801 kg. In what ratio should these be mixed so that obtained mixture sold at Rs. 320 kg to earn a profit of 20% is:
    (a) 3 : 13   (b) 4: 13
    (c) 1 : 13   (d) 2 : 13

69. In 2 kg mixture of copper and aluminum, 30% is copper. How much aluminum powder should be added to the mixture so that the quantity of copper becomes 20%?
    (a) 900 gms   (b) 800 gms
    (c) 1000 gms   (d) 1200 gms

70. The liquids X and Y are mixed in ratio of 3:2 and the mixture is sold at Rs.11 per liter at a profit of 10% . If the liquid X costs Rs. 2 more per liter than Y, the cost of X per liter is (In Rs.)
    (a) 9.50   (b)10.80
    (c)11.75   (d)11

71. A vessel contains 60 liter of milk, 12 litres of milk taken out from it and replaced by water. Then again from mixture. 12 litres area again taken out and replaced by water. The ratio of milk and water in the resultant mixture.
    (a)16 : 9   (b)15 : 10
    (c)16 : 10   (d)9 : 5

72. Two vessels contain mixture of petrol and kerosene in the ratio 4:3 and 3:5 respectively. The ratio of the volumes of the quantities from the two vessel to be mixed together so that the new mixture may contain same volume of petrol and kerosene is:
    (a)7 : 4   (b)9 : 6
    (c)3 : 2   (d)7 : 8

73. A can is full of a mixture of two liquids A and B in the ratio of 7 : 5.When 9 liters of mixture are drawn off from the can and replaced by the same quantity of liquid B, the ratio of A and B in the can becomes 7 : 9. The capacity of the can is.
    (a) 21 liters   (b)20 litres
    (c)10 litres (d) 36 liters

74. Three containers whose volumes area in the ratio of 2 : 3 : 4 are full of mixture of spirit and water. In the 1st container the ratio of spirit and water is 4 : 1 in container the ratio is 11 : 4 and in the 3rd container ratio is 7:3. All the three mixtures are mixed in a big container. The ratio of spirit and water in the resultant mixture is:
    (a) 4 : 9   (b)9 : 5
    (c) 11 : 4   (d)5 : 10

1. (b) According to the question,
    Alloy contains 12% of copper
    $= \frac{12}{100} = \frac{3}{25}$ (3→ Copper, 25 → Mixture)
    3 kg of copper in 25 kg mixture
    1 kg of copper
    $= \frac{25}{3}$ kg mixture
    69 kg of copper
    $= \frac{25}{9} \times 69 = 25 \times 23 = 575\ kg$
    Alloy = 575 kg

2. (d) Let the amount of water be x liter

According to the question,

$$\frac{x+3}{x} = \frac{3}{2}$$

$$x = 6$$

Thus, Quantity of spirit in the mixture

$$x + 3 = 6 + 3 = 9 \text{ liters}$$

Alternate:

Spirit : Water

$$\downarrow \quad : \quad \downarrow$$

$$3 \quad : \quad 2$$

1 unit more

1 unit = 3 liters

3 units = 9 liters

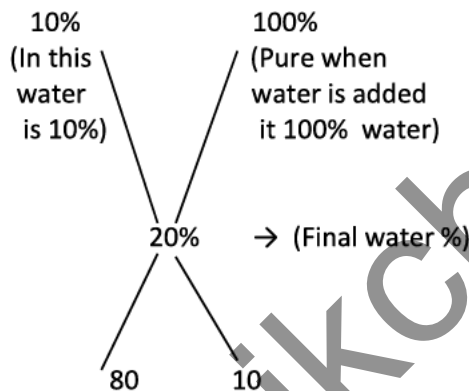**3.** (d) Water content in 40 liters of mixture

$= 40 \times 10/100 = 4$ liters

Thus, Milk in the mixture $= 40 - 4 = 36$ liters

Let x litters of water is mixed

$$\frac{4+x}{40+x} = \frac{20}{100} = \frac{1}{5}$$

$$x = 5 \text{ liters}$$

Alternate:

```
        10%                    100%
     (In this                (Pure when
      water                   water is added
      is 10%)                 it 100% water)

              20%    → (Final water %)

        80            10
```

(This mixture is   8   :   1 (This is the quantity of

of 40 liters multiply $\times 5$ $\times 5$ water added in ratio)

by 5 to make it 40

     40   5 Liters

Note: You can also solve this problem by ratio method.

Alternative: Change the percentage into the ratio

Initial Mixture   :   Final mixture

10% water   20% water

$$\frac{10}{100} = \frac{1}{10} \qquad \frac{20}{100} = \frac{1}{5}$$

(1 →Water, 10 Mixture)   (1 → Water, 5→ Mixture)

Thus, $\frac{Water}{milk} = \frac{1}{10-1} = \frac{1}{9}$

$$\frac{Water}{milk} = \frac{1}{5-1} = \frac{1}{4}$$

Now,

Water   :   Milk

Initial Ratio $1_{\times 4}$: $9_{\times 4}$

Final Ratio $1_{\times 9}$: $4_{\times 9}$

∴ Remember water is added not milk, so make milk equal

           Water   :   Milk

Initial Ratio   4   :   36

     5 units add

Final Ratio   9   :   36

→ 4 + 36 = 40

Thus, 40 units = 40 liters

1 unit = 1 liter

5 units = 5 liters

4. (a)   Milk   :   Water

Initial ratio $7_{\times 3}$: $3_{\times 3}$

Final Ratio $3_{\times 7}$: $7_{\times 7}$

Thus, Remainder water is added, so make milk equal

21   :   9   = 21 + 9 = 30

             40

21   :   49   = 21 + 49 = 70
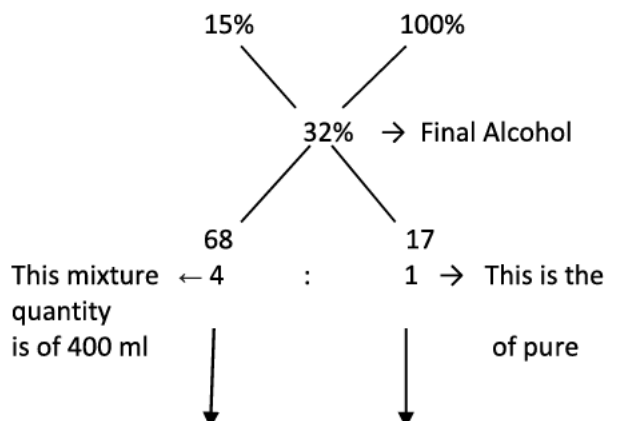
30 units = 30 liters

1 units = 1 liters

40 units = 40 liters

5. (b) According to the question

Pure alcohol = 100%

By Allegation,

```
        15%            100%

              32%    → Final Alcohol

        68            17
```

This mixture ← 4   :   1 → This is the quantity

is of 400 ml   of pure

Alcohol in ration
multiply by 100
make it 400

$$400 \quad : \quad [100]$$

Alternate:

	A	W	Total
	3	17	20
Units added	8	17	25

20 units → 400 ml

1 unit → 400/20

5 units → $\frac{400}{20} \times 5 = 100$

Thus, Alcohol added to the mixture = 100 ml

6. (a) According to the question,

S.P. of 1 kg mixture = Rs. 68.2

Profit = 10% = $\frac{10}{100}$
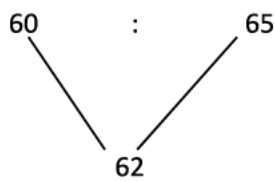
$\frac{1}{10}$ (1 → Profit, 10 → C.P.)

S.P. = 10 + 1 = 11 units

Thus, 11 units = 68.2

1 unit = $\frac{68.2}{11}$ = 6.2

10 units = 62

Thus, Cost price of 1 kg mixture
Rs. 62

$$60 \quad : \quad 65$$
$$62$$

(65 - 62)= 3 : (62 - 60) = 2

Required ratio = 3 : 2

7. (b) According to the question,

	Wine	:	Water	Total
Initial Ratio	3	:	1	4
Final Ratio	1	:	1	2 × 2

$$\begin{array}{ccc} 3 & : & 1 \\ 1 & & 1 \\ 2 & : & 2 \end{array}$$
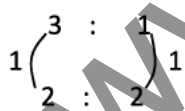
1 unit taken out and added

Hence Required part of quantity = $\frac{1}{3}$

Alternative :

Let the quantity of liquid drawn out
=x

$$\frac{3 - \frac{3}{4}x}{1 - \frac{1}{4}x + x} = \frac{1}{1}$$

12 − 3x = 4 − x + 4x

8 = 6x

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

Hence required part of quantity = $\frac{4/3}{4} = \frac{1}{3}$

Alternative :

Let the quantity of liquid drawn out = x

$$\frac{3 - \frac{3}{4}x}{1 - \frac{1}{4}x + x} = \frac{1}{1}$$

12 − 3x = 4 − x + 4x

8 = 6x

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

Hence Required part of quantity = $\frac{4/3}{4} = \frac{1}{3}$

8. (b) By allegation rule

$$\begin{array}{ccc} 80\% & & 100\% \\ & 95\% & \end{array}$$

(In the initial
mixture gold
is 80%)

(When pure gold is added
it is 100%)

$$(100 - 95) = 5 \quad : \quad (95 - 80)$$
$$= 15$$

$$5 \quad : \quad 15$$

(This is the quantity
of gold added in ratio)

$$1 \qquad\qquad 3$$

× 50   × 50

50 gm   **[150 gm]**

9. (d) According to the question,

$\frac{1}{3} \times Milk = \frac{1}{3} \times 81 = 27$

Final Quantity of milk = Initial Quantity $\left(1 - \frac{x}{c}\right)^n$

x = Quantity taken out at a time

c = Capacity of vessel

n = no. of process

$= 81 \left(1 - \frac{27}{81}\right)^2 = 81 \left(1 - \frac{1}{3}\right)^2$

$= 81 \times \frac{2}{3} \times \frac{2}{3} = 36$

Thus, Quantity of water = 81 − 36 = 45

Ratio of milk and water in final mixture

$$= \frac{36}{45} = \frac{4}{5}$$
$$= 4 : 5$$

10. (d) According to the question,

	Milk	:	Water
Initial Ratio	7 $_{\times 2}$	:	3 $_{\times 2}$
Final Ratio	2 $_{\times 7}$	:	1 $_{\times 7}$

∴ Remainder water is added not milk so make milk equal

14 : 6 = 20 unit

14 : 7 }1

20 units = 80 liters

1 unit = 4 liters

Water added = 4 liters
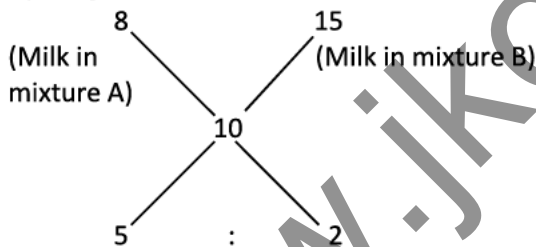
11. (c) According to the question

	Milk	:	Water	Total
(Take LCM)				
Mixture A	4 × 2	:	5 × 2	= 9 2

3

18

Mixture B   5 × 3 : 1 × 3 = 6

2

Final Mixture   5 × 2 : 4 × 2 = 9

Again

	Milk	:	Water
Mixture A	8	:	10
Mixture B	15	:	3
Final mixture	10	:	8

By allegation rule (milk)

8   15

(Milk in   (Milk in mixture B)

mixture A)

10

5   :   2

= 5 : 2

12. (b) According to the question,

Milk   :   Water

7   :   5

} 3 unit

7   :   8

∴ Remember water is added and not milk, so make milk equal but here milk is already equal

3 units = 15 liters

1 unit = 5 liters

8 units = 40 liters

Total quantity of water in the new mixture.

= 40 liters

13. (c) According to the question,

Initial mixture contains 15% water

Therefore milk content in the mixture

= (100 - 15)% = 85%

By Allegation rule:

85%   100%

(Milk in

Mixture   Pure milk)

87.5%

12.5   2.5

5   1

40%   40%
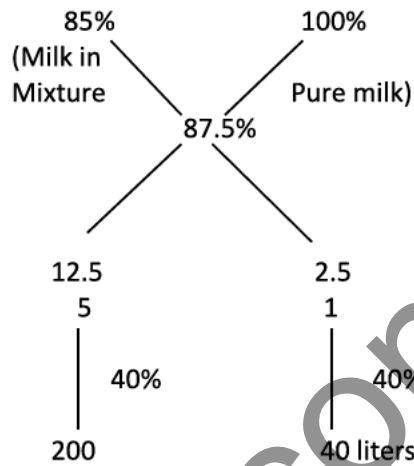
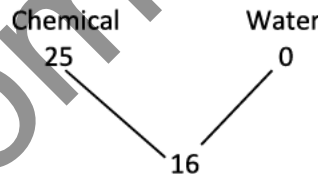200   40 liters

Amount of milk added = 40 liters

14. (d) Let the price of the water be Rs. 0

According to the question

S.P. of the mixture = 20 Rs.

C.P of the mixture = 20 × 100/125 = Rs. 16

Now using Allegation method

Chemical   Water

25   0

16

(16 - 0) = 16   (25 - 16) = 9

Ratio of water to chemical

= 9 : 16

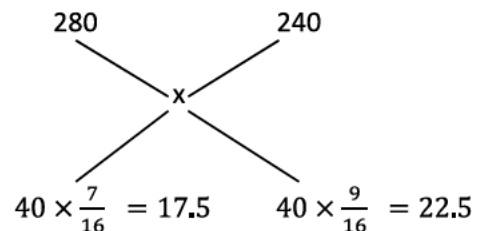**15.** (b) According to the question,

Average price of mixed tea

$$= \frac{280 \times 7 + 240 \times 9}{16}$$

$$= \frac{1960 + 2160}{16} = \frac{4120}{16}$$

Rs. 257.60

Alternate:

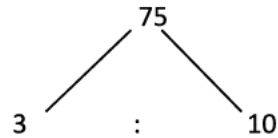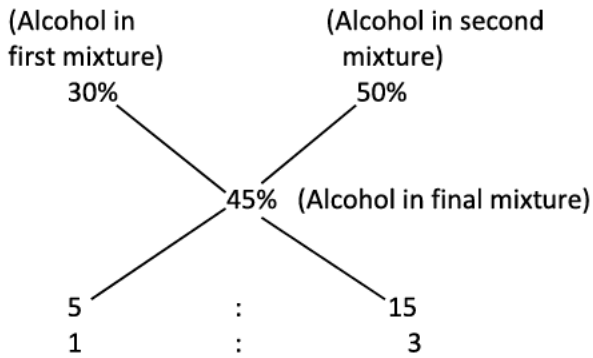Take Difference = 40 divide it in ratio 7 : 9

280   240

x

$$40 \times \frac{7}{16} = 17.5 \quad 40 \times \frac{9}{16} = 22.5$$

Thus, 280 - x = 22.5

x = 280 - 22.5 = Rs. 257.50

16. (b) According to the question

By allegation:

(Alcohol in   (Alcohol in second
first mixture)   mixture)
   30%   50%

45% (Alcohol in final mixture)

      5   :   15
      1   :   3

                    75

      3   :   10

17. (a) According to the question

Milk : Water

   7 : 2 ⎞ = 9
         ⎟ 1 unit
   7 : 3 ⎠

Thus, Remember, water is added not milk, so make milk equal. Here milk is already equal.

9 units 729

1 unit = 81 units

The amount of water added = 81 liters

18. (a) According to the question,

	Milk	:	Water
Initial Ratio	7 ×3	:	1 ×3
Final Ratio	7 ×3	:	1 ×7

Thus, Remember, water is added, not milk, so make milk equal

Initial Ratio 21 : 3 ⎞ = 24
                       ⎟ 4 units
Final Ratio   21 : 7 ⎠

24 units = 40 liters

1 Unit = $\frac{40}{24}$ liters

4 units = $\frac{40}{24} \times 4$

= $\frac{40}{6}$ = $\frac{24}{3}$ = $6\frac{2}{3}$ *liters*

19. (a) According to the question

In first alloy 1 × 65 : 2 × 39 = 3   65

Second Alloy 2 × 39 : 3 × 39 = 5   36
195   —————

New alloy   5 × 15 : 8 × 15 = 13   15
First alloy   65 : 130
Second alloy   78 : 117
New alloy   75 : 120
Apply allegation

      65   78

20. (c) According to the question
10 liters of mixture taken out
Ratio will also be 4 : 1

      4 : 1   4 : 1
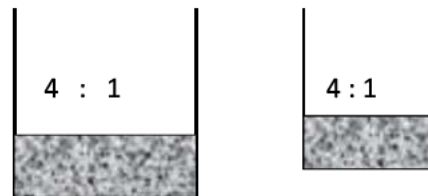
Thus, Liquid B is poured, there is no change in A make A equal.

A : B
4 : 3
2 ×2 : 3 ×2
4 : 1 ⎞ = 5 unit
4 : 6 ⎠ 5 unit
(10 liters of liquid)
Thus, 5 unit = 10 liters
 1 unit = 2 liters
5 units = 10 liters
But j10 liters were initially taken out
Thus, Initial mixture = 10 + 10 = 20 liters

Quantity A $= \frac{4}{5} \times 20 = 16$ $liters$

Alternate: Let the initial quantity of liquid A and B

= 4x and x

According to question

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

12x - 24 = 2x + 16

10x = 40

x = 4

→ Initial quantity = 4x

= 4 × 4 = 16 liters

21. (c) According to the question,

Milk : Water

  2 : 1

  1 $_{×2}$: 2 $_{×2}$

Remember water is added not milk.

Make milk equal

  2 : 1 ⎤ = Total 3 units

           ⎥ 3 units

  2 : 4 ⎦

3 units = 75 liters

1 unit = 25 liters

3 units (added) = 3 × 25 = 75 liters

22. (c) According to the question

Alloy A → 5 $_{×2}$: 3 $_{×2}$ = 8 $_{×2}$ ⎤ Equal quantity

                                ⎥ is

Alloy B → 5 : 11 = 16 ⎦ Mixed

Alloy A → 10 : 6 = 16

Alloy B → 5 : 11 = 16

         15 : 17

23. (a) According to the question

    By Alligation

Gold   Silver

$\frac{1}{29}$ $\frac{21}{58}$

         $= \frac{25}{87}$

$\frac{13}{174}$ $\frac{4}{87}$

[13] : **[8]**

24. (b) According to the question

Gold : Copper : Tin   Total

2 × 2 : 3 × 2 : 1 × 2 = 6 × 2   (Make

                               Quantity

  4 : 6 : 2 = 12 Equal)

Copper : Tin : Lead   Total

  5 : 4 : 3   12

Weight of lead $= \frac{3}{12 + 12} = \frac{3}{24} = \frac{1}{8}$ kg.

25. (a) According to the question,

S.P. of mixed tea

  = Rs. 194.40

Profit = 20% $= \frac{1}{5}$ (1 → Profit, 5 → C.P.)

S.P. = 6 units

6 units $= \frac{194.40}{6} = 32.4$

5 units - 5 × 32.4 = Rs. 162

By Alligation

  192   150

          162

(162 - 150)   (192 - 162)

  = 12   = 30

  12   :   30

  2   :   5

26. (d) According to the question

When there is no profit no loss, here

C.P = S.P

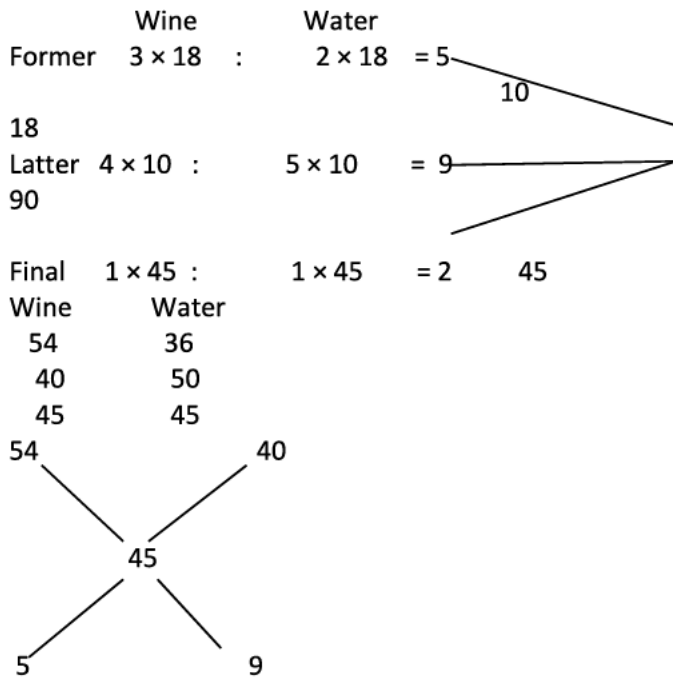Thus, Cost price of mixed sugar = Rs. 16/kg

Apply Alligation

  20   15

       16

(16 - 15) : (20 - 16)

  = 1   = 4

→ Ratio = 1 : 4

27. (c) By Alligation

Initial Mixture   Water

  10%   100%

      20%

  80   :   10

  8   :   1

  ↓ × 5   ↓ × 5

40   **[5 liters]**

28. (b) According to the question

	Wine		Water	
Former	3×18	:	2×18	= 5

                                    10

18

Latter 4×10 : 5×10 = 9

90

Final 1×45 : 1×45 = 2   45

Wine	Water
54	36
40	50
45	45

54   40

         45

5   9

Ratio of former and latter = 5 : 9

5 units → 3

1 Unit → $\frac{3}{5}$

9 units → $\frac{3 \times 9}{5}$ = $\frac{27}{5}$ = $5\frac{2}{5}$

29. According to the question

Water initial mixture pure water

40%   100%

       50%   (Water in final Mixture)
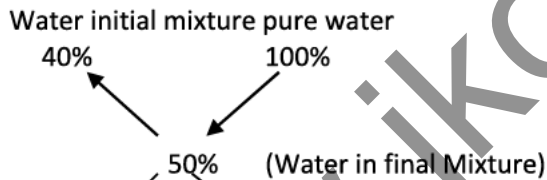
50%   :   10%

5   :   1

  × 16   × 16

80   16

(Liters)   (Liters)

30. (d) According to the question,

Mixture = 60 liters
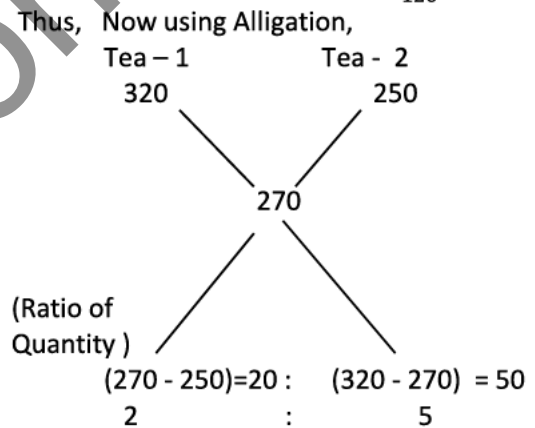
Ratio of $\frac{Milk}{Water}$ = $\frac{2}{1}$ > 3 units

3 units → 60 liters

1 units → 20 liters

Thus, $\frac{Milk}{Water}$ = $\frac{40 \ liters}{20 \ liters}$

Milk	Water
40 liters	20 liters

      × 40   +

                  [x]

---

1   2

                  × 40

             80 Liters

Thus,   20 + x = 80

x = 60   liters

Water added = 60 liters

31. (d) According to the question

SP of a mixture of Tea = Rs. 324

CP of a mixture of Tea = $324 \times \frac{100}{120}$ = $Rs.$ 270

Thus,   Now using Alligation,

Tea − 1   Tea - 2

320   250

        270

(Ratio of Quantity)

(270 - 250)=20 :   (320 - 270) = 50

2   :   5

32. (c) According to the question,

Container:-

I		II		III		IV	
M	W	M	W	M	W	M	W
5	: 3	2	: 1	3	: 2	7	: 4

Container (I): -

$\frac{Milk}{Water}$ = $\frac{5}{3}$ = 1.67

Container (ii): -

$\frac{Milk}{Water}$ = $\frac{2}{1}$ = 2

Container (iii) : -

$\frac{Milk}{water}$ = $\frac{3}{2}$ = 1.5

Container (iv): -

$\frac{Milk}{Water}$ = $\frac{7}{4}$ = 1.75

Thus, The quantity of milk relative to water minimum in container III.

33. (b) According to the question,

Mixture = 240 cc

Ratio of $\dfrac{Water}{Glycerine} = \dfrac{1}{3}$ ⟩ 4 units

4 units → 240

1 unit → 60

Thus, $\dfrac{Water}{Glycerine} = \dfrac{1 \times 60}{3 \times 60} = \dfrac{60}{180}$

Water   Glycerine

  60   180

  +

 [x] _____ ⟩ × 60

  2   3

↓ × 60

120

Thus, 60 + x = 120

x = 60 cc

Quantity of water added = 60

34. (d) According to the question,

	Acid	Water
Initial solution	$1_{\times 2} = 2$	$3_{\times 2} = 6$
Final Solution	$1_{\times 3} = 3$	$2_{\times 3} = 6$

1 unit increase   Same

Final Solution = 3 + 6 = 9 units

As we know that only acid is added so water is same initially and finally.

We know 5 liters acid is added so.

1 unit → 5 liters

9 liters → 5 × 9 = 45 liters

Thus, Final mixtures = 45 liters

∴ Final mixtures = 45 liters

35. (a) According to the question,

Mixture = 25 liters

Ratio of $\dfrac{Acid}{Water} = \dfrac{4}{1}$ ⟩ 5 units

∴ 5 units → 25 liters

1 unit → 5 liters

∴ $\dfrac{Acid}{Water} = \dfrac{4 \times 5}{1 \times 5} = \dfrac{20}{5}$

	Acid	Water
Initial	20 :	5
	+	
		3
Final Ratio	20 :	8
	[5 :	**2]**

36. (d) According to the question,

	Water	Milk	Total
Vessel – 1	$3_{\times 6} = 24$	$4_{\times 8}$	$7_{\times 8}$
Vessel- 2	$5_{\times 7} = 35$	$3_{\times 7}$	$8_{\times 7}$
Final Ratio:	59 :	53	

Note: - If two different solution are mixed then ensure that the quantity of both solution are same.

37. (b) According to the question,

	Acid	Water
Vessel A	4 :	3
Vessel	5 :	3

Now using alligation,

A   B

$\dfrac{4}{7}$ $\dfrac{5}{8}$

$\dfrac{3}{5}$

$\left(\dfrac{5}{8} - \dfrac{3}{5}\right) = \dfrac{1}{40}$ $\dfrac{1}{35} = \left(\dfrac{3}{5} - \dfrac{4}{7}\right)$

35   :   40

Final Ratio : **[7   :   8]**

38. (a)

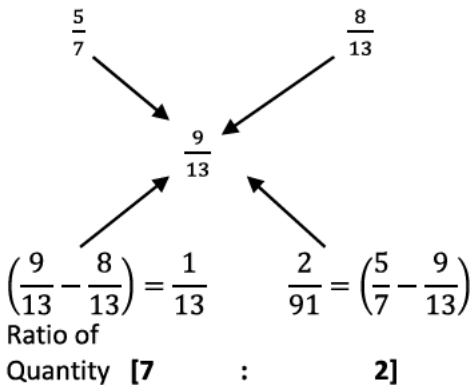|	Acid	Water
Vessel A	3 :	1
Vessel B	5 :	3

Use Alligation

A   :   B

$\dfrac{3}{4}$ $\dfrac{5}{8}$

$\dfrac{2}{3}$

$\left(\dfrac{2}{3} - \dfrac{5}{8}\right) = \dfrac{1}{24}$ $\dfrac{1}{12} = \left(\dfrac{3}{4} - \dfrac{2}{3}\right)$

12   24

Ratio of 1   :   2

39. (a) According to the question,

	Acid	Water
Vessel-A	5 :	2
Vessel-B	8 :	5

Now using Alligation,

A   B

$$\frac{5}{7} \qquad \frac{8}{13}$$

$$\frac{9}{13}$$

$$\left(\frac{9}{13} - \frac{8}{13}\right) = \frac{1}{13} \qquad \frac{2}{91} = \left(\frac{5}{7} - \frac{9}{13}\right)$$

Ratio of
Quantity **[7   :   2]**

40. (a) According to the question,

	Acid	:	Water
Vessel-A	4	:	3
Vessel-B	2	:	3

Now using Alligation,

A   B
$$\frac{4}{7} \qquad \qquad \frac{2}{5}$$

$$\frac{1}{2}$$

$$\left(\frac{1}{2} - \frac{2}{5}\right) = \frac{*}{10} \qquad \frac{1}{14} = \left(\frac{4}{7} - \frac{1}{2}\right)$$

Ratio of
Quantity **[7   :   5]**
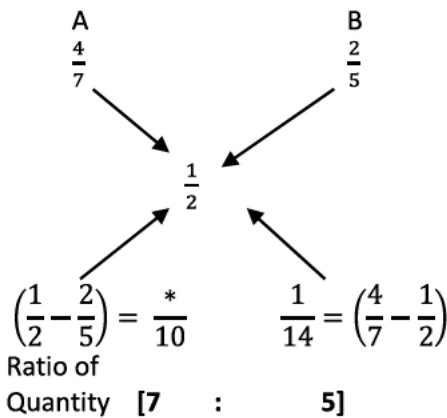
41. (c) According to the question,
Mixture – 1   = 20 liters
Mixture- 2   = 36 liters
In mixture –1   Ratio of
$$\frac{Spirit}{Water} = \frac{3}{7} \Big> 10 \; units$$
In Mixture -2   ratio of
$$\frac{Spirit}{Water} = \frac{7}{5} \Big> 12 \; units$$
10 units → 20 liters
1 unit → 2 liters
12 units → 36
1 unit → 3 liters
∴ In Mixture - 1 $\frac{Spirit}{Water} = \frac{3\times2}{7\times2} = \frac{6}{14}$
Thus, In Mixture - 2 $\frac{Spirit}{Water} = = \frac{7\times3}{5\times3} = \frac{21}{15}$
Ratio of spirit and water
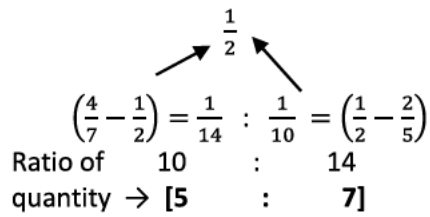$$\frac{6+21}{14+\ 15} - \frac{27}{29} = 27 : 29$$

42. (a)

	Acid	:	Water
Vessel A	2	:	3
Vessel B	4	:	3

Now, using alligation,

A   B
$$\frac{2}{5} \qquad \qquad \frac{4}{7}$$

$$\frac{1}{2}$$

$$\left(\frac{4}{7} - \frac{1}{2}\right) = \frac{1}{14} \ : \ \frac{1}{10} = \left(\frac{1}{2} - \frac{2}{5}\right)$$
Ratio of   10   :   14
quantity → **[5   :   7]**

43. (a) According to the question,

	Acid	:	Water
Vessel A	5	:	3
Vessel B	5	:	4

Now, using alligation,

A   B
$$\frac{5}{8} \qquad \qquad \frac{5}{9}$$

$$\frac{7}{12}$$

$$\left(\frac{7}{12} - \frac{5}{9}\right) = \frac{1}{36} \ : \ \frac{1}{24} = \left(\frac{5}{8} - \frac{7}{12}\right)$$
Ratio of   24   :   36
quantity → **[2   :   3]**
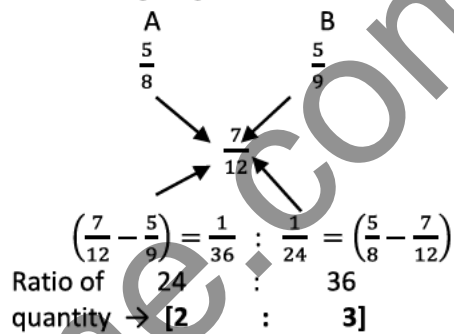
44. (c) According to the question

	Water		Syrup	Total
Initial	3	+	5	= 8
Final	1 ×5 = 5	+	1 ×5 = 5	= 10

+2   Same

Water added in final $= \frac{2}{10} = \frac{1}{5}$

45. According to the question,

	Milk	:	Water
Vessel A	4	:	3
Vessel B	2	:	3

Now using Alligation,

A   B
$$\frac{4}{7} \qquad \qquad \frac{2}{5}$$

$$\frac{1}{2}$$

$$\left(\frac{1}{2} - \frac{2}{5}\right) = \frac{1}{10} \qquad \frac{1}{14} = \left(\frac{4}{7} - \frac{1}{2}\right)$$
                    14   :   10
Final
Ratio **[7   :   5]**
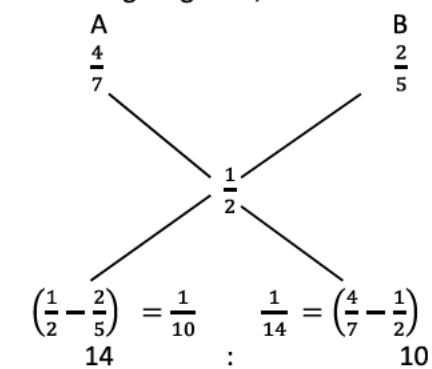
46. (c) According to the question,
Initial quantity   = 60 kg
As we know that,

Final quantity   = Initial Quantity $\left(1 - \frac{Volume\ taken\ out}{Initial\ quatity}\right)$

Where 'n' number of times volume taken out
Final quantity

$$= 60\left(1 - \frac{6}{60}\right)^3 = 60 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10}$$
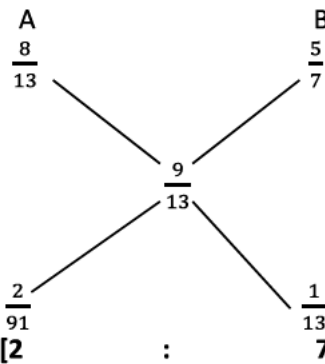
Final quantity of milk

= 43.74 kg.

47. (d) According to the question,

	Milk	:	Water
Vessel A	8	:	5
Vessel B	5	:	2

New mixture containing $69\frac{3}{13}\%$

Milk i.e. $= \frac{900}{13 \times 100} = \frac{9}{13} milk$
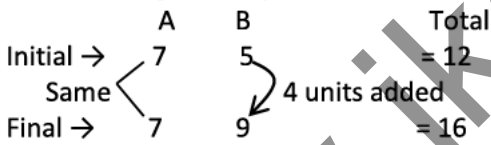
Thus, Now using Alligation,

A
$\frac{8}{13}$

B
$\frac{5}{7}$

$\frac{9}{13}$

$\frac{2}{91}$

$\frac{1}{13}$

[2 : 7] → **Final Ratio**

48. (d) According to the question,

	Gold	Copper	Total
A →	$7_{\times 2} = 14$	$2_{\times 2} = 4$	$9_{\times 2} = 18$

Same

B → 7 : 11   18

[7 : 5]

49. (c) According to the question,

	A	B	Total
Initial →	7	5	= 12
Final →	7	9	= 16

Same, 4 units added

4 units → 9 liters

1 unit → $\frac{9}{4}$ liters
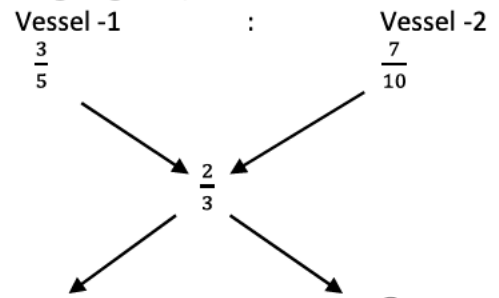
12 units → $\frac{9}{4} \times 12 = 27$ liters

Initially solution was

= 24 + 9 = 36 liters

Quantity of liquid 'A' initially

$= \frac{7}{12} \times 36 = 21$ liters

50. (b) According to the question,

	Milk	:	Water
Vessel A	3	:	2
Vessel B	7	:	3

Now using alligation,

Vessel -1 : Vessel -2
$\frac{3}{5}$ $\frac{7}{10}$

$\frac{2}{3}$

$\left(\frac{7}{10} - \frac{2}{3}\right) = \frac{1}{30}$ $\frac{1}{15} = \left(\frac{2}{3} - \frac{3}{5}\right)$

Ratio of
Quantity **[1 : 2]**

51. (d) According to the question,
CP of the mixture
= 15 × 29 + 25 × 20 = Rs. 935
SP of the mixture
= 27 × 40 = Rs. 1080
Profit = SP − CP
= 1080 − 935 = Rs. 145

52. (d) According to the question,

	Acid		Water	Total
Sample - 1	$2_{\times 40} = 80$:	$1_{\times 40} = 40$	$3_{\times 40}$
Sample - 2	$3_{\times 24} = 72$:	$2_{\times 24} = 48$	$5_{\times 24}$
	- 120			
Sample- 3	$5_{\times 15} = 75$:	$3_{\times 15} = 45$	$8_{\times 15}$

Ratio of
Quantity **[227 : 133]**
Required ratio = **133 : 227**

53. (b) According to the question,

	Copper		Tin
First ally →	1	:	3
Second Ally →	2	:	5
Mix Alloy =	3	:	8

Now using Alligation,

Alloy − 1   Alloy - 2
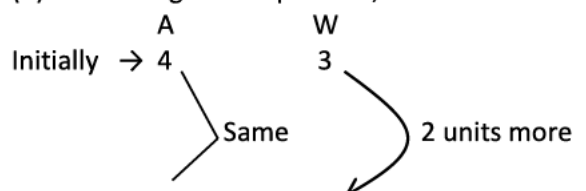$\frac{1}{4}$ $\frac{2}{7}$

$\frac{3}{11}$
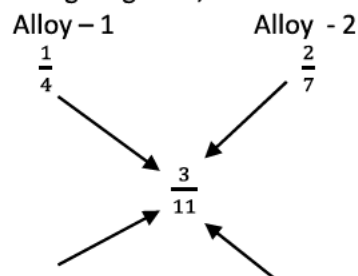
$\left(\frac{2}{7} - \frac{3}{11}\right) = \frac{1}{77}$ $\frac{1}{44} = \left(\frac{3}{11} - \frac{1}{4}\right)$

Ratio of
Quantity **[4 : 7]**

54. (d) According to the question,

	A	W
Initially →	4	3

Same   2 units more

Finally →   4   5

2 units → 5 liters

1 unit → $\frac{5}{2}$ liters

4 units → $\frac{5}{2} \times 4 = 10\ liters$

∴ Quantity of Alcohol
= 10 liters

55. (b) According to the question,

Mixtures = 15 liters

Ratio of $\frac{Alcohol}{Water} = \frac{1}{4}$ ⟩ 5 units

            Alcohol   Water

Initially   3   12

                           +

                           3

Final → 3   15

∴ Percentage of alcohol in new mixture

$= \frac{3}{18} \times 100 = 16\frac{2}{3}\%$

56. (d) Capacities of Vessels = 3 : 2 : 1

	Milk	:	Water		Total
Mixture					
V-1 →	(5	:	2	=	7)×5
V-2 →	(4	:	1	=	5)×7
V-3 →	(4	:	1	=	5)×7

Equate the Mixture

	Milk	:	Water		
V-1 →	(25	:	10	=	35
V-2 →	(28	:	7	=	35
V-3 →	(28	:	7	=	35
Capacities	M	:	W		= Total Mixture
V-1 →	(75	:	30	=	105
V-2 →	(56	:	14	=	70
V-3 →	(28	:	7	=	35

Water taken out

→ $\frac{1}{3}$ of water in (V - 1) + $\frac{1}{2}$ of water in (V - 2) + $\frac{1}{7}$ water in (V - 3)

→ $\frac{1}{3} \times 30 + \frac{1}{2} \times 14 + \frac{1}{7} \times 7$

→ 10 + 7 + 1 = 18

Similarly mixture will be

$\frac{1}{3} \times 105 + \frac{1}{2} \times 70 + \frac{1}{7} \times 35 = 75$

% of water $= \frac{18}{75} \times 100 \rightarrow 24\%$

57. (a) According to the question By using Alligation method

    15%   40%

           30%
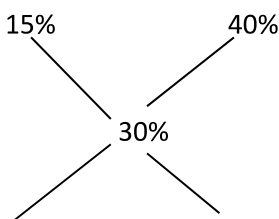
(40 - 30) = 10   (30 - 15) = 15

Ratio 2 : 3

58. (a) According to the question

CP of the mixture

= 30 × 9.5 + 40 × 8.5

= 285 + 340 = Rs. 625

S.P. of the mixture = 8.90 × 70

= Rs. 623
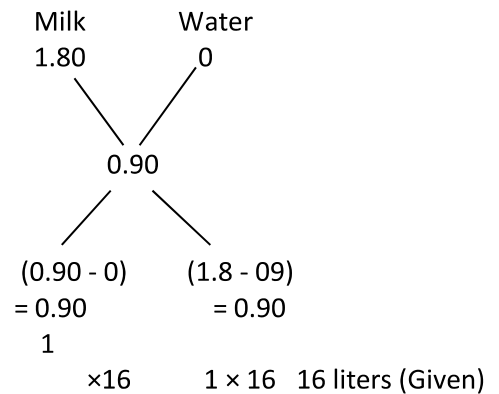
Loss = C.P − S.P.

Loss = 625 623 = Rs. 2

59. (a) According to the question,

S.P. of the mixture = 40P per kg.

C.P. of the mixture $= 40 \times \frac{100}{125} = 32$ P per kg

Now using Alligation.

    42   24

        32

(32 - 24) = 8   (42 − 32) = 10

Ratio of Quantity 4 : 5
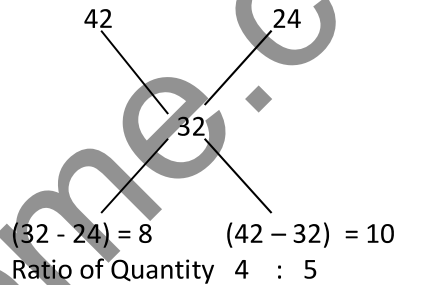
5 units → 25 kg

1 unit → 5 kg

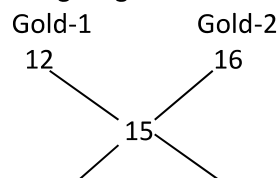4 units → 5 × 4 = 20 kg

∴ Salt at 42 P per kg was = 20 kg

60. (b) Let the Price of Water = Rs. 0

According to the solution,

CP of Pure Milk = Rs. 1.80

C.P of the Mixture = Rs. 0.90

Now using Alligation method.

    Milk   Water

    1.80   0

        0.90

(0.90 - 0)   (1.8 - 09)

= 0.90   = 0.90

  1

     ×16   1 × 16 16 liters (Given)

Ratio of quantity **[16 liters]**

61. (a) According to the questions

By using Alligation method.

  Gold-1   Gold-2

   12   16

      15

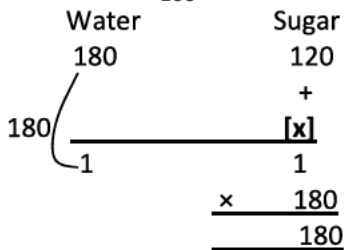$(16 - 15) = 1$ $(15 - 12) = 3$

          1   :   3   Ratio of Quantity

62. (c) According to the questions

Sugar Solution = 300 kg.
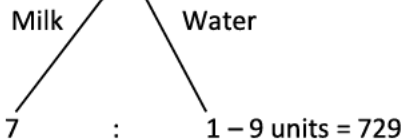
40% Sugar = $\frac{40}{100} \times 300$ = $120\ kg$

Water	Sugar
180	120
	+

180 [_____ [x]

   1   1

          ×   180

                180

Let the sugar added = x kg.

∴ 120 + x = 180 kg.

x = 60 kg.

63. (d)   729

          Milk ╱ ╲ Water

   7   :   1 – 9 units = 729

   567   162   1 unit = 81

	M	:	W
Initial →	7	:	2 ⌉
After adding			⌉ 1 unit
Water	7	:	3 ⌋

Always milk will be same

i.e. 1 unit of water will be added = 1

unit → 81 mili liter

64. (d)   M   :   W   =

1st	(5	:	2	=	7) × 5 × 3
2nd.	(4	:	1	=	5) × 7 × 2
3rd.	(4	:	1	=	5) × 7 × 1

or, $(75 : 30) \times \frac{1}{3}$ $(56 : 14) \times \frac{1}{2}$ $(28 : 7) \times \frac{1}{7}$

          25   :   10

          25   :   7

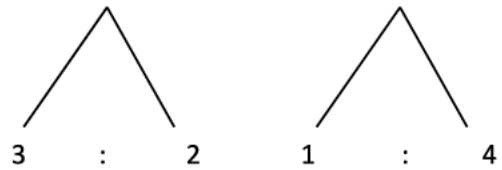   4   :   1

          57   :   18   = 75

% of water in mixture

= $\frac{18}{75} \times 100$ = 24%

65. (a)   Alloy A   Alloy B

          60 kg   100kg

/\   /\

3   :   2   1   :   4

36 kg	24 kg	20 kg	80 kg
(Lead)	(Tin)	(Tin)	(Copper)

Total

Tin 24 + 20   = 44 kg

66. (c) Let first blend is 2 kg and second blend is 3 kg.

Total cost price = (35 × 2) + (40 × 3) = 70 + 120 →

Rs. 190

Total selling price = (1 × 46) + (4 × 55) = 266

$\left[\frac{1}{5} of\ 5\ kg = 1\right]$

Profit percent = $\frac{Total\ Profit}{Total\ C.P.} \times 100$

$= \frac{266-190}{190}$ = 40%

67. (b)   Acid   : Water   Mixture

Glass 1 $\left[2 : 3 = 5\right] \times 63$

Glass2 $\left[3 : 4 = 7\right] \times 45$

Glass 3 $\left[4 : 5 = 9\right] \times 35$

Glass 1	126	:	189	= 315
Glass 2	135	:	180	= 315
Glass 3	140	:	175	= 315

          +   +

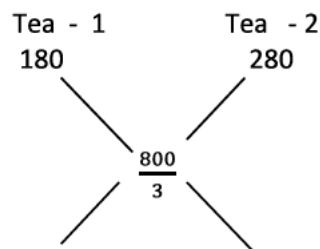   [401]   [544]

68. (d) According to the question,

SP of the mixture = Rs. 320

Gain = 20%

Thus, C.P. of the mixture = $320 \times \frac{100}{120}$

= Rs. $\frac{800}{3}$

Now, Using alligation method.

Tea - 1   Tea - 2

180   280

╲   ╱

$\frac{800}{3}$

╱   ╲

$280 - \frac{800}{3} = \frac{40}{3}$ $\frac{800}{3} - 180 = \frac{260}{3}$

Ratio of →   40   :   260

Quantity   2   :   13

69. (c) According to the question,

Mixture of copper and aluminium = 2000 gm

30% is copper means $= \frac{30}{100} \times 2000$

= 600 gm copper

$\frac{600}{1400 + x} = \frac{20\%}{80\%}$

1400 + x = 2400

x = 1000 gms

Alternate: -

Copper   :   Aluminium

30   :   70

20   :   80

Copper   :   Aluminium

3   :   7

→ 10 units = 2000 gms

→ 1 unit = 200 gm

1 : 4 → ×3

We have to equal Copper amount because only Aluminium is added.

Copper   :   Aluminium

3   :   7

3   :   12   + 5 units

1 unit = 200 gm

5 unit = 200 × 5 = 1000 gm

70. (b) x : y

Quantity 3 : 2 → 5 units

According to question

S.P. of 1 unit = Rs. 11

SP of 5 unit = Rs. 55

C.P of 1 unit is = 10

Then CP of 5 units = Rs. 50

Let Y's Cost = Z Rs.

X's cost = z + 2 Rs.

C.P. = Quantity × Cost

50 = 3 (z + 2) + 2z

50 = 3z + 6 + 2z

z = 8.80 Rs.

Cost of X = 8.80 + 2 → 10.80 Rs.

71. (a) Total milk = 60 liters

Drawn off = 12 liters

$\frac{Final\ Quantity}{Initial\ Quantity} = \left(1 - \frac{x}{c}\right)^t$

x = Replaced Quantity

C = Capacity

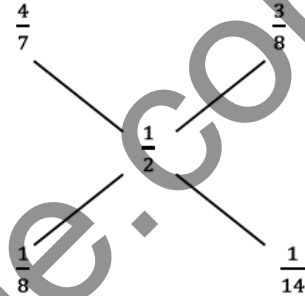T = Number of process

$\frac{Final\ Quantity}{Initial\ Quantity} = \left(1 - \frac{12}{60}\right)^2$

$= \left(\frac{4}{5}\right)^2 = \frac{16}{25}$

Ratio of milk and water in the resultant mixture = 16 : 9

72. (a)

1st. Vessel   2nd Vessel

$\frac{4}{7}$ $\frac{3}{8}$

$\frac{1}{2}$

$\frac{1}{8}$ $\frac{1}{14}$

Petrol : Kerosene $= \frac{1}{8} : \frac{1}{14}$

= 14 : 8 = 7 : 4

73. (d) According to the question.

A   B

Initial   7   +   5 = 12

                  4 units

Final   7   +   9 = 16

Solution

4 units → 9

1 unit → $\frac{9}{4}$

16 units → $\frac{9}{4} \times 16 = 36$

The capacity of the can = 36 liters

74. (c)

	Sprit		Milk	Total	Capacity Ratio
I	4	+	1	= 5	2
II	11	+	4	= 15	3
III	7	+	3	= 10	4

	Sprit	Milk	Total
I	$4_{\times 12}$=48	$1_{\times 12}$=12	$5_{\times 6 \times 2}$
II	$11_{\times 6}$=66	$4_{\times 6}$=24	$15_{\times 2 \times 3}$
III	$7_{\times 12}$=84	$3_{\times 12}$=36	$10_{\times 3 \times 4}$

Total Ratio = 198 : 72

               11 : 4

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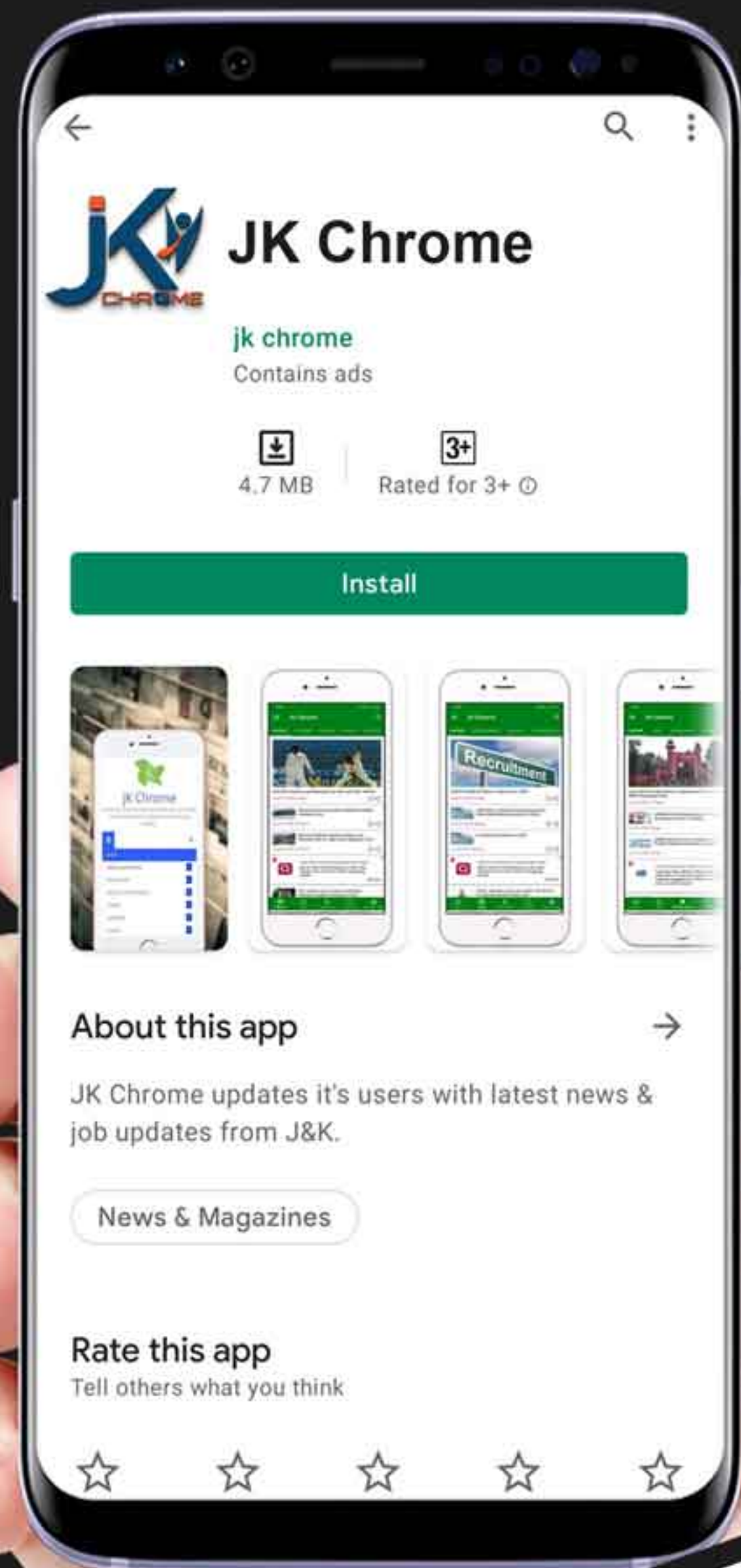Employment News
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