

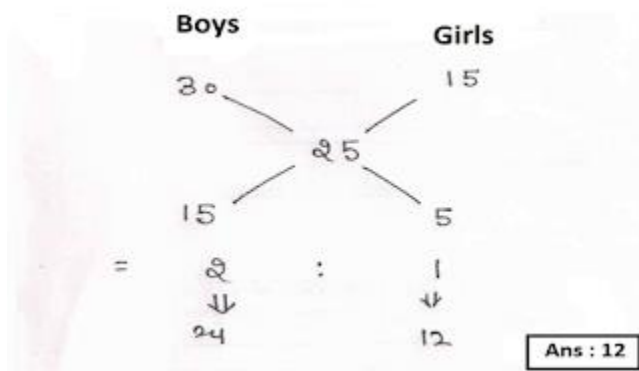
MIXTURE AND ALLIGATION

Students, the prerequisite for this chapter is that you must grasp the concept of percentage and ratio as provided by us in previous chapters. If you have not studied them, first study those chapters to get better understanding of this chapter. This chapter is not only useful in mixture questions but the same concept can also be applied in profit and loss, CI and SI, Average, Time and Distance etc.

Qus1. The average weight of boys and girls is 25. The average weight of only boys is 30 and that of only girls is 15. If the no of boys is 24, find the no. of girls.

- (A) 15
(B) 20
(C) 12
(D) 24

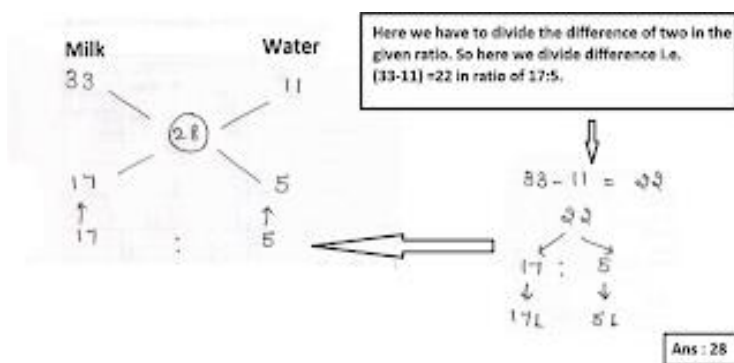
Sol:-



Qus.2. 17 liters of milk are mixed with 5 litre of water. If the price of water is 11per litre and that of milk is 33 per litre, find the average price.

- (A) 30
(B) 32
(C) 26
(D) 28

Sol:-

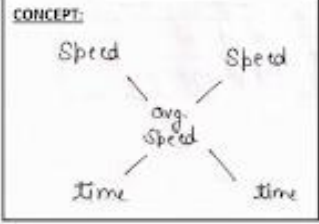


Qus.3 Khusbu travels at the speed of 25km/h for certain time. After this she travels at the speed of 40 km/h for 22 min. If the average speed of her journey is 31km/h find the time for which she travelled with the speed of 25km/h

- (A) 30min
 (B) 33 min
 (C) 24 min
 (D) 28 min

Sol:-

CONCEPT:



25 KM/H 40 KM/H

81

9 : 6

= 3 : 2

↓

22 KM/H

When we apply alligation on speed, we will get ratio of time in result

$2R = 22 \text{ Km}$
 $3R = 33 \text{ Min}$

Ans: 33min

Qus.4. Some amount of money was lent at 10% per annum and some at 20% per annum simple interest. Thus in 4 years, the total of interest earned from both the amount was rs 3400. If the total sum lent was 6000, find the amount lent at 20%.

- (A) 3500
 (B) 2500
 (C) 2800
 (D) 3000

Sol:-

10% (4 years) 20% (4 years)

2400 4800

3400

1400 1000

= 7 : 5

$7R + 5R = 12R = 6000$
 So $7R = 3500$
 $5R = 2500$

Ans: 2500

Qus5. A sum of 41 was divided among 34 boys and 16 girls. The amount that each boy received was 90p then find the amount received by each girl.

- (A) 65P
 (B) 60P
 (C) 62P
 (D) 64P

Sol:-

Avg. amount per person = $\frac{4100 \text{ P}}{50} = 82 \text{ P}$

So

Boys Girls

90 65

17 8

34 16

Ans: 65 paise

Qus.6 Dharmender purchased a horse and a cow for Rs 150000. Then after some time he sold both of them. He sold the horse at a profit of 25% and the cow at a profit of 20%. But in the whole transaction he earned a total of Rs 33000 as profit. Find the cost price of horse.

- (A) 90000
- (B) 50000
- (C) 60000
- (D) 45000

Sol:-

CONCEPT:

$\% \text{ Profit} = \frac{33000 \times 100}{150000} = 22\%$

So	Horse	Cow
	25%	20%
	22%	
	2	8
	↓	↓
	60000	90000

Since $5R = 150000 \Rightarrow$
So $R = 30000$

Ans: 60000

Qus.7 Vishal purchased 12 pencils and 4 pens at Rs240. He sold the pencils at its cost price and the pens at its cost price. If in the whole transaction he earned a profit of 2%, find the cost price of each pencil.

- (A) 18
- (B) 14
- (C) 12
- (D) 10

Sol:-

$\frac{11}{10} \rightarrow SP$ So Profit of 1 on 10 = 10% P
 $\frac{9}{10} \rightarrow SP$ So loss of 1 on 10 = 10% L

So

Pencils		Pens
+10%		-10%
+2%		
12		4
= 3	:	2
↓		↓
144		96

$5R = 240$
 $R = 48$

So C.P of 1 Pencil = $\frac{144}{12} = 12 \text{ Rs}$
 C.P. of 1 Pen = $\frac{96}{4} = 24 \text{ Rs}$

Ans:- Rs.12

Qus.8 35 liters of mixture of milk and water is sold Rs 60 per litre. The price of milk is 70 per litre and that of water is 20 per liter. Find the amount of milk in the mixture if the mixture is sold at a profit of 20%.

- (A) 21L
- (B) 35L
- (C) 14L
- (D) 26L

Sol:-

$5R = 35L$
 $3R = 21L$
 $2R = 14L$

20% Profit = $\frac{1}{5}$
 1 = profit
 5 = CP
 so $SP = 5 + 1 = 6$
 $6R = 60$
 Hence $5R = 50$

Since we are applying alligation on CP, we must take CP in middle. So we take 50.

Ans: 21 L

Qus9. Two mixture of water and wine contain water and wine in the ratio of 7:3 and 1:4. In what ratio should these two mixtures should be mixed so as to obtain 40 liters of mixture in which the ratio of water and wine 3:2.

- (A) 3:2
 (B) 5:2
 (C) 3:1
 (D) 4:1

Sol:-

Here we can take the ratio of either wine or water. The answer would be same in both cases. Here we have taken water.

Ans : 4:1

Qus10. 21kg of alloy contains copper and tin in the ratio of 4:3. Some amount of copper is extracted so that the ratio becomes 10:9. Find the amount of copper extracted.

- (A) 4kg
 (B) 7kg
 (C) 3kg
 (D) 2kg

Sol:-

Here we have not extracted zinc so zinc should be same. So to make zinc equal, we have multiplied by 3 and 1.

Here zinc is equal in both cases

$12R + 9R = 21R = 21 \text{ kg}$
 So $1R = 1 \text{ kg}$
 $12 - 10 = 2R = 2 \text{ kg}$.

So amount of cu extracted = 2kg

Qus 11. In a mixture, the ratio of milk and water is 4:1. 75 liters of water is added to the mixture so that the ratio of milk and water becomes 2:3. Find the initial amount of milk in the mixture.

- (A) 62L
- (B) 60L
- (C) 65L
- (D) 75L

Sol:-

M	W	
4	1	x 1
2	3	x 2

\Rightarrow

4	:	1	$\times 2$	$\Rightarrow 5R = 75$
4	:	6	$\times 1$	$\Rightarrow 1R = 15$

 $\Rightarrow 3 \times 4R + R = 5R = 5 \times 15 = 75L$
 \therefore MILK = $4R = 60L$

Here we have only added water. So ratio of milk should be same. So to make milk equal, we multiply by 1 and 2.

Qus12. There are three vessels of equal capacity. The ratio of milk and water in these 3 vessels is 7:3, 7:5 & 11:4. Then the content of all these vessels are poured into a large vessel. Find the amount of milk and water in the resultant mixture.

- (A) 121:95
- (B) 112:59
- (C) 121:59
- (D) 25:12

Sol:-

	M	W	
I	7	3	= 10 x 6
II	7	5	= 12 x 5
III	11	4	= 15 x 4

I	42	18
II	35	25
III	44	16
	121	59

The quantity of each vessel is same. So the total amount of milk and water in all 3 should be same. So to make it same we multiplied it by 6, 5 & 4.

Qus13. There are two vessels containing wine and water in the ratio of 3:2 and 4:3. Mixture from both the vessels is taken out in the ratio of 2:3 and poured in a third large vessel. Find the amount of wine in the large vessel if the total amount of mixture in the large vessel is 350litres

- (A) 175L
- (B) 204L
- (C) 200L
- (D) 196L

Sol:-

Wine	Water	
3	2	$\times 7$ $\times 3$
4	3	$\times 5$ $\times 3$

$42 : 28$
 $60 : 45$
 $102 : 73$

$175R = 350L$
 $1R = 2L$
 \therefore Wine = $102R = 204L$

Here first we multiply by 7 & 5 to make the quantity equal in both cases. Now quantity in both is equal to 35. Now we multiply them by 2 & 3 because they are taken in the ratio of 2:3

Ans: 204L

Qus.14. The ratio of oil and petrol in a container is 3:2. Then 10 litres of mixture is taken out and replaced by

petrol so that after it the ratio of oil and petrol becomes 2:3. Find the initial amount of oil in the mixture.

- (A) 9L
(B) 18L
(C) 20L
(D) 36L

Sol:-

1st method: Oil : Petrol. We multiply by 2 and 3 to make quantity of oil equal.

$$\begin{array}{l} 3 : 2 \\ -10L \\ \hline 3 : 2 \\ +10L \text{ Petrol} \\ \hline 2 : 3 \end{array} \quad \begin{array}{l} \times 2 \Rightarrow 6 : 4 \\ \times 3 \Rightarrow 6 : 9 \end{array} \quad \begin{array}{l} SR = 10 \\ R = 2 \\ \hline SR = 10 \\ R = 2 \end{array}$$

So $6 + 4 = 10R = 20L$
So initial quantity = $20 + 10 = 30L$.

So $\frac{30}{3} = 10$
oil = 10, 12 = Petrol
Remaining Replaced
40% 100%
40 20
= 2 : 1

1R = 10L
So total = $2 + 1 = 3R$
= 30L
So $30L \rightarrow 3 = 10L$
 $2 = 10L$

Ans: 18L

Qus.15 Two vessels contain a mixture of milk and water. In the first vessel the ratio of milk to water is 8:3 and in the second vessel the ratio is 5:1. A 70 litres of cask is filled from these vessels so as the ratio of milk and water in the new cask is 4:1. Find the amount of mixture that was taken out from the first vessel.

- (A) 14L
(B) 22L
(C) 20L
(D) 48L

Sol:-

Here we can take ratio of either milk or water

I	II		I	II
$\frac{8}{11}$	$\frac{5}{6}$	To make calculation easy we multiply each ratio by $11 \times 6 = 66$	$\frac{240}{11}$	$\frac{275}{6}$
$\frac{4}{5}$			$\frac{264}{11}$	$\frac{24}{6}$

So $11 + 24 = 35R = 70$
 $R = 2$
So $11R = 22L \rightarrow$ Amount of Mix. taken out from 1st.

Ans: 22L

Qus.16 In a container the ratio of wine and soda is 4:1. 10 liters of mixture is drawn from it and replaced by 20 liters of soda. The final ratio of wine and soda becomes 2:3. Find the initial amount of soda in the mixture.

- (A) 24L
(B) 20L
(C) 6L

(D) 10L

Sol:-

	Wine	:	Soda	
-10L	4	:	1	
	4	:	1	←
+20L Soda	2	:	3	←
	4	:	6	←

When we take out some mixture, the ratio of wine and soda in the remaining would be same as earlier

We multiplied by 2 because we have added only soda. Quantity of wine should be same in both

So Difference of 5R due to 20L
 $1R = 4L$
 So $4+1 = 5R = 20L$

Since 10L was taken out, So initial quantity = 20 + 10 = 30L

So initial quantity of wine and soda = 30L $\left\{ \begin{array}{l} 4 \rightarrow 24L \text{ wine} \\ 1 \rightarrow 6L \text{ Soda} \end{array} \right.$ Ans: 6L

Qus17. A bartender stole beer from a bottle that contained 50% of spirit and he replaced what he had stolen with beer having 20% spirit. The bottle then contained only 25% spirit. How much of the bottle did he steal.

- (A) 6/11
 (B) 5/11
 (C) 6/5
 (D) 5/6

Sol:-

Remaining	Replaced
50%	20%
5	25
= 1	= 5

Replaced = 5
 Total = Remaining + Replaced = 5 + 1 = 6
 So fraction of total bottle = $\frac{5}{6}$ Ans: 5/6

Qus.18 In a mixture of milk and water, the percentage of water is 26%. After replacing the mixture with 7 litres of pure milk, the percentage of milk in the mixture becomes 76%. Find the quantity of mixture.

- (A) 84L
 (B) 90L
 (C) 91L
 (D) 7L

Sol:-

Remaing	Replaced
74%	100%
24	2
12	1

Here we have replaced the solution with milk so we apply alligation on milk. Since in 2nd condition, mixture is replaced by pure milk, so we take the percentage as 100%.

$1R = 7L$
 So $12 = 84L$

Now
 Total = Remaining + Replaced
 = $12R + 1R$
 = $13R \rightarrow 91L$ Ans: 91L

Qus19. A vessel is full of 80 litres of milk. 8 litres of milk is taken out and replaced by water. Again 8 litres

of mixture is taken out and replaced by water, find the amount of milk in the final mixture so formed.

- (A) 6.48
 (B) 64.8
 (C) 68
 (D) 66.48

Sol:-

$$\text{Final Quantity} = \text{Initial Quantity} \left(1 - \frac{x}{C}\right)^n$$

C = Capacity of vessel
 x = Quantity taken out at one time
 n = No. of times process repeated.

So

$$\begin{aligned} \text{Final Quantity} &= 80 \left(1 - \frac{8}{80}\right)^2 \\ &= 80 \times \frac{9}{10} \times \frac{9}{10} \\ &= 64.8 \text{ L.} \end{aligned}$$

Ans : 64.8L

Qus.20 9 litres is drawn from a cask full of water and then filled with milk. 9 litres of mixture is again drawn and replaced with milk. The quantity of water left in the cask to that of the milk is 16:9. How much does the cask hold.

- (A) 45L
 (B) 40L
 (C) 144L
 (D) 81L

Sol:-

$$\text{Initial Quantity of Milk} = 16 + 9 = 25 R$$

$$\text{So in two process } 25 \rightarrow 16$$

$$\text{in one process } \sqrt{25} \rightarrow \sqrt{16}$$

$$\Rightarrow 5 \rightarrow 4$$

$$1R = 9L$$

$$5R = 45L$$

Ans : 45L

Qus.21 From a container full of milk, 15 litres of milk was taken out and replaced by water. He again repeated the process for 2 more times. Thus in 3 attempts the ratio of milk to water becomes 343:169. Find the volume of container.

- (A) 512L
 (B) 120L
 (C) 16L
 (D) 214L

Sol:-

$$\text{Initial Quantity of Milk} = 343 + 169 = 512$$

$$\text{Final Quantity of Milk} = 343$$

$$\text{So in 3 processes: } 512 \longrightarrow 343$$

$$\text{in 1 process: } \sqrt[3]{512} \longrightarrow \sqrt[3]{343}$$

$$= \frac{8}{1} \longrightarrow \frac{7}{1}$$

$$\text{So } \theta = 120L$$

Ans : 120L

Qus22. 2 vessels A & B of equal volume contain wine and soda in ratio of 3:2 and 2:1 respectively. 2 and 3 litres of solution is taken out from these vessels respectively and poured into a large vessel C. If this mixture occupied 40% of capacity of C, what proportion of volume of vessel C should be the volume of soda that shall be added so that the percentage of soda in vessel C becomes 50%.

- (A) 144/160
 (B) 14/144
 (C) 14/125
 (D) 12/127

Sol:-

Wine	Soda	
3	2	$\times 3 \times 2$
2	1	$\times 5 \times 3$
=		
18	12	
30	15	
=		
48	27	
16	9	

Capacity of vessel C $\times 40\% = 25$
 Capacity of vessel C = $\frac{125}{2}$
 To make 50% we need 7L of water
 So $\frac{7 \times 2}{125} = \frac{14}{125}$
 Ans: 14/125

Qus23. A solution contains beer and soda in the ratio of 3:5. 20% of that solution is taken out and replaced by beer. How many times the process should be repeated to make the ratio of beer and soda 17:8?

- (A) 2
 (B) 3
 (C) 4
 (D) Can not be determined

Sol:-

$$\text{Final Quantity} = \text{Initial quantity} \left(1 - \frac{x}{C}\right)^n$$

C = Capacity of vessel
 x = quantity taken out at one time
 n = No. of times process repeated.

$$\text{Initial quantity of water} = \frac{5}{8}$$

$$\text{Final quantity of water} = \frac{3}{25}$$

$$\text{Quantity taken out at one time} = 20\% = \frac{1}{5}$$

$$\text{So } \frac{3}{25} = \frac{5}{8} \left(1 - \frac{1}{5}\right)^n \Rightarrow \frac{64}{125} = \left(\frac{4}{5}\right)^n$$

$$n = 3$$

Ans : 3times

Qus. 24. In a kerosene bottle there is 32% oil. Some quantity of kerosene is taken out and of that quantity is replaced by kerosene that contains 18% oil so that the new mixture contains 28% oil. Find how much amount of kerosene is taken out.

- (A) 2/7
 (B) 3/4
 (C) 4/9
 (D) 6/11

Sol:-

Remaining	Replaced
32%	18%
10	4
= 5	= 2

Since only $\frac{1}{3}$ is replaced so
 actual withdrawn =
 $2 \times 3 = 6L$

So
 takenout = $\frac{6}{5+6} = \frac{6}{11}$ Ans: 6/11

Qus 25. An mixture contains milk and water in the ratio of 2:3 by volume. In 15 liters of such mixture, 10 litres of milk is added then find what volume of water has to be removed from the mixture so that the final mixture has milk & water in the ratio of 4 : 1.

- (A) 5.3L
 (B) 5L
 (C) 4.5L
 (D) 5.67L

Sol:-

15	
2	3
↓	↓
MILK 6L	9L + water

So A.T.Q :-

$$\frac{\text{Milk}}{\text{Water}} = \frac{6L + 10L}{9L - x} = \frac{4}{1}$$

Let amount of water taken = x litre

$$x = 5L.$$

Ans : 5L