CHAPTER 3

Partnership, Mixtures and Alligations

3.1 Mixtures

Definition

Mixtures are generally of two types. When two different ingredients are mixed together, it is known as simple mixture, e.g. a mixture of water and milk; water and pure spirit.

When two or more simple mixtures (made of same ingredients of same or different proportions) are mixed together to form another mixture, it is known as a compound mixture.

3.2 Alligation Rule

Alligation literally means "linking". The alligation rule states that,

'What different quantities of same or different ingredients, of different cost (value) are mixed together to produce a mixture of a mean cost (value), the ratio of their quatities are inversely proportional to the differences in their cost from the mean cost (value)'

$$\frac{\text{Quantity of smaller cost ingredient}}{\text{Quantity of larger cost ingredient}} = \frac{\text{Larger cost} - \text{Mean cost}}{\text{Mean cost} - \text{Smaller cost}}$$

Let C_1 = cost price of 1st ingredient

C_2 = cost price of 2st ingredient

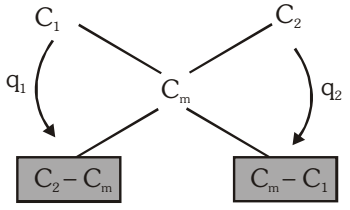
Now, these two ingredient are mixed to produce a mixture such that

C_m = cost price of the mixture (mean price)

then, the ratio of the quantity of two ingredients to produce this mixture is given by:

$$\frac{\text{quantity of } 1^{st} \text{ ingredient}}{\text{quantity of } 2^{nd} \text{ ingredient}} = \frac{C_2 - C_m}{C_m - C_1}$$

Diagram Representation



$$\frac{q_1}{q_1} = \frac{C_2 - C_m}{C_m - C_1}$$

3.3

To Find the Quantity of Ingredients in the Mixture of Given Amount

From formula, we have obtained the ratio of ingredients i.e. $\left(\frac{q_1}{q_2}\right)$.

Now, if the amount of the mixture = Q, then,

quantity of 1st ingredient in the mixture = $\frac{q_1}{q_1 + q_2} \times Q$

and quantity of 2st ingredient in the mixture = $\frac{q_2}{q_1 + q_2} \times Q$

This formula is known as Ratio–Quantity Rule.

NUMERICAL CHALLENGE 3.1

1. In what propotion must a grocer mix teas sold @ Rs 1.02/kg and Rs 1.44/kg so as to make a mixture worth Rs 1.26/kg?

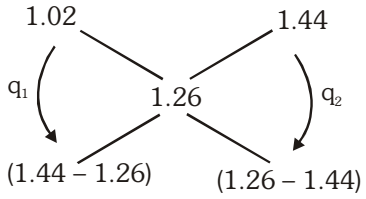
Solution

As per Alligation Rule,

$$\frac{\text{quantity of cheaper tea}}{\text{quantity of dearer tea}} = \frac{q_1}{q_2} = \frac{(1.44 - 1.26)}{(1.26 - 1.02)}$$

$$= \frac{.18}{.24}$$

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



$\therefore$ proportion of two kinds of tea to be mixed (to get a mixture worth Rs 1.26/kg) is 3 : 4.

2. How much salt (in kg) worth 42 P per kg must mix with 25 kg of salt worth 24 P per kg so that he may, on selling the mixture at 40 P per kg, gain 25% on the outlay?

Solution

Here, selling price of the mixture has been given, but alligation rule is applied on the cost price of mixture as well as on cost price of ingredients.

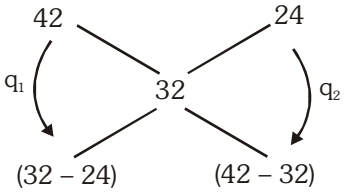
Cost price of the mixture = $\frac{40}{125} \times 100 = 32$ P per kg.

By applying rule of Alligation now,

$$\frac{\text{quantity of dearer salt}}{\text{quantity of cheaper salt}} = \frac{q_1}{q_2}$$

$$= \frac{32 - 24}{42 - 32}$$

$$= \frac{8}{10} = \frac{4}{5}$$



The proportion of 4: 5 indicates that every 5 kg of cheaper salt (24 P) is to be mixed with 4 kg of dearer salt (42 P) to produce the mean mixture (32 P).

$\Rightarrow$ 25 kg of cheaper salt (given) is to be mixed with 20 kg of dearer salt (42 P).

Hence the required amount of dearer salt (42 P) is 20 kg.

3.4

Alligation Rule for a Mixture of Three Ingredients

When three ingredients with cost prices C_1, C_2 and C_3 respectively are mixed to form a mixture of mean price (or cost price) C_m, then

	Memory tips
q_1 = proportion of 1st ingredient = $(C_2 - C_m)\ (C_3 - C_m)$	(here, cost of q_1 absent)
q_2 = proportion of 2nd ingredient = $(C_m - C_1)\ (C_3 - C_m)$	(here, cost of q_2 absent)
q_3 = proportion of 3rd ingredient = $(C_2 - C_m)\ (C_m - C_1)$	(here, cost of q_3 absent)

$$q_1 : q_2 : q_3 = (C_2 - C_m) \times (C_3 - C_m) : (C_m - C_1) \times (C_3 - C_m) : (C_2 - C_m) \times (C_m - C_1)$$

Similarly, after finding out the proportion, for the different ingredients, the required quantities can be found out as :

$$q_1 = \text{quantity of 1st ingredient} = \frac{q_1}{(q_1 + q_2 + q_3)} \times \text{amount of mixture}$$

$$q_2 = \text{quantity of 2nd ingredient} = \frac{q_2}{(q_1 + q_2 + q_3)} \times \text{amount of mixture}$$

$$q_3 = \text{quantity of 3rd ingredient} = \frac{q_3}{(q_1 + q_2 + q_3)} \times \text{amount of mixture}$$

NUMERICAL CHALLENGE 3.2

In what proportion may three kinds of cashewnuts worth Rs 327, Rs 329 and Rs 332 per kg be mixed to produce a mixture worth Rs 330/kg?

Solution

Here, C_1 = Rs 327
C_2 = Rs 329
C_m = Rs 330
C_3 = Rs 332

Using the formula, we have

$$q_1 : q_2 : q_3 = (C_2 - C_m)\ (C_3 - C_m) : (C_m - C_1)\ (C_3 - C_m) : (C_2 - C_m)\ (C_m - C_1)$$
$$= 1 \times 2 : 3 \times 2 : 1 \times 3$$
$$= 2 : 6 : 3$$

This ratio of three kinds of cashewnuts can also be found out by following shor-cut method.

3.5 Mean Value (Or Cost Price) of the mixture

Case I

When two ingredients A and B are mixed

q_1 and q_2 → Quantities of A and B respectively
C_1 and C_2 → Cost price of A and B respectively

Mean value (cost price) is given by

$$C_m^* = \frac{C_1 \times q_1 + C_2 \times q_2}{q_1 + q_2}$$

*** It is similar to finding the average of two ingredients with different cost price and quantities.**

Note : (i) q_1 and q_2 may also be in ratio form (in proportion) in the above formula.
(ii) Above formula can also be derived from the Alligation Rule

Case II

When more than two ingredients are mixed

$$C_m = \frac{(C_1 \times q_1 + C_2 \times q_2 + \ldots + C_n \times q_n)}{(q_1 + q_2 + \ldots + q_n)}$$

NUMERICAL CHALLENGE 3.3

A man mixes 6 kgs of tea worth Rs 6 per kg and 4 kgs of tea worth Rs 7 per kg and the mixture is sold at 10% profit. Find the selling price per kg of the mixture.

Solution

$$\text{Mean value (cost price) of the mixture} = \frac{6\times 6+4\times 7}{6+4}$$

$$= \text{Rs } 6.4 \text{ per kg.}$$

$$\text{Sale price per kg of the mixture} = 1.1 \times 6.4$$

$$= \text{Rs } 7.04 \text{ per kg.}$$

3.6 Six golden rules to solve problems on mixture

Assumptions

(a) In Ratio form: There is one given mixture of P kg (say) having two ingredients A and B in the ratio a : b.

OR

(b) In Percentage form: There is one given mixture of P kg (say) containing two ingredients A and B. Ingredient A is m% of the mixture.

Rule 1

Quantity of each ingredient is to be found out by using the Ratio-Quantity Rule

e.g. Quantity of A = $\frac{a}{a+b}\times P$, as per the assumption in (a)

Quantity of B = $\frac{b}{a+b}\times P$

Rule 2

This rule is applicable when the quantity of any ingredient is expressed as percentage of the mixture

[as per the assumptions (b)]

e.g. quantity of A = m% of P, as per assumption (b) and quantity of B = (100 – m)% of P.

Rule 3

If x kg (say) of any ingredient is added to the mixture, then in the final, that particular ingredient increases by x kg and the amount of mixture also increases by x kg, but the quantity of other ingredient remains unchanged.

e.g. (a) In Ratio form : Let x kg of ingredient A be added to the mixture, then

$$\text{new ratio of A and B} = \frac{\text{Quantity of A}}{\text{Quantity of B}} = \frac{\left(P\times\frac{a}{a+b}\right)+x}{P\times\frac{b}{a+b}}$$

[Refer Rule-1]

(a) In Percentage form : Let x kg of ingredient A be added to the mixture,

$$\text{then new \% of A in the mixture} = \frac{\text{New quantity of A}}{\text{Amount of mixture}}\times 100\%$$

$$\Rightarrow \text{\% of A in the mixture} = \frac{m\%\text{ of } P + x}{P+x}\times 100\%$$

[See Assumption (b)]

Similarly,

$$\text{new \% of B in the mixture} = \frac{\text{Quantity of B}}{\text{Amount of mixture}}\times 100\%$$

$$\text{new \% of B in the mixture} = \frac{(100-m)\%\text{ of } P}{P+x}\times 100\%$$

NUMERICAL CHALLENGE 3.4

In ratio form

1. The ratio of milk and water in a mixture of 35 litres is 4 : 1. How much water must be add to the mixture so that the ratio of milk and water be 3 : 2 ?

Solution

In this problem, we are concerned with ratio of milk and water,

i.e. $\frac{\text{Quantity of milk}}{\text{Quantity of water}}$

It is given that $\frac{\text{Quantity of milk}}{\text{Quantity of water}} = \frac{4}{1}$

Now, say, x litres of water is added to 35 litres of mixture to obtain the say ratio as 3 : 2

$$\Rightarrow \frac{\text{Quantity of milk}}{\text{Quantity of water}} = \frac{\frac{4}{1+4}\times 35}{\left(\frac{1}{1+4}\times 35\right)+x} = \frac{3}{2}$$

$$\Rightarrow \frac{28}{7+x} = \frac{3}{2}$$

$$\Rightarrow x = 11\frac{2}{3} \text{ litres}$$

Hence, $11\frac{2}{3}$ litres of water must be added to the mixture.

2. The ratio of milk and water–milk mixture is 2 : 3. How much water should be added to 60 litres of the mixture to make the ratio of milk and mixture as 1 : 3 ?

Solution

In this problem, we are concerned with the ratio of milk and mixture.

i.e. $\frac{\text{Quantity of milk}}{\text{Quantity of mixture}} = \frac{2}{3}$ (given)

Now, say, x litres of water is added to 60 litres of mixture to obtain new ratio as 1 : 3. The quantity of mixture becomes (60 + x)

$$\Rightarrow \frac{\text{Quantity of milk}}{\text{Quantity of mixture}} = \frac{\frac{2}{3+2}\times 60}{60+x} = \frac{1}{3}$$

$$\Rightarrow x = 60 \text{ litres}$$

Therefore, 60 litres of water should be added.

In percentage form

3. In 70 litres of a mixture of milk and water, the quantity of water is 10%. How much water should be added so that new mixture may contain 25%.

Solution

Quantity of water = 10% of mixture = 10% of 70 litres

Let the quantity of to be added = x litres

$$\therefore \text{ new percentage of water in the mixture} = \frac{(10\% \text{ of } 70)+x}{(70+x)} \times 100\% = 25\%$$

New percentage of water = 25% (given)

$$\Rightarrow \frac{(10\% \text{ of } 70)+x}{70+x}\times 100 = 25$$

$$\Rightarrow \frac{7+x}{70+x} = \frac{1}{4}$$

$$\Rightarrow x = 14 \text{ litres}$$

Hence the quantity of water to be added = 14 litres.

4. Ram adds 1 litre of water to 5 litres of a 20% solution, of alcohol in water. What is the final strength of alcohol?

Solution

The problem asks to find the final strength of alcohol i.e. % alcohol in solution. Here one litre of water is only added.

Hence, we are concerned with the $\frac{\text{alcohol}}{\text{solution}}$

$$\therefore \quad \text{Required final strength of acohol} = \frac{\text{quantity of alcohol}}{\text{quantity of solution}} \times 100\%$$

$$= \frac{20\% \text{ of } 5}{5+1} \times 100\%$$

1 litre of water added increases the solution by 1 litre

$$= \frac{1}{6} \times 100\%$$

$$= 16\frac{2}{3}\%$$

Rule 4

Rule two mixture with same ingredients are mixed, then the quantity of each ingredient in each mixture in found separately and these added to find the quantity in the final mixture.

e.g. One mixture of P kg contains A and B in the ratio a : b

Another mixture of Q kg contains A and B in the ratio x : y

Now, these two mixtures are mixed to form a new mixture.

In the new mixture (final mixture),

$$\frac{\textbf{quantity of A}}{\textbf{quantity of B}} = \frac{\textbf{quantity of A in first mixture + in second mixture}}{\textbf{quantity of B in first mixture + in second mixture}}$$

$$= \frac{\left(\frac{a}{a+b}\right)P + \left(\frac{x}{x+y}\right)Q}{\left(\frac{b}{a+b}\right)P + \left(\frac{y}{x+y}\right)Q} \qquad \textbf{(Using Rule-1)}$$

Similarly, in percentage form,

if ingredient A is m% in the P kg of first mixture

and ingredient A is n% in the Q kg of second mixture,

then, in the final mixture, containing these two mixture,

$$\textbf{the new \% of A} = \frac{\textbf{(quantity of A in first mixture + in second mixture)}}{\textbf{amount of mixture}} \times 100\%$$

$$= \frac{\textbf{(m\% of P + n\% of Q)}}{\textbf{(P + Q)}} \times 100\% \qquad \textbf{(Using Rule-2)}$$

NUMERICAL CHALLENGE 3.5

In two alloys, the ratio of copper and zinc are 3 : 4 and 5 : 8. If 14 kg of first alloy and 26 kg of second alloy are mixed, then find the ratio of copper and zinc in the new allow.

Solution

	Alloy 1	Alloy 2	New Alloy
Copper —	$\frac{3}{7} \times 14$	$\frac{5}{13} \times 26$	$\frac{3}{7} \times 14 + \frac{5}{13} \times 26$
Zinc —	$\frac{4}{7} \times 14$	$\frac{8}{13} \times 26$	$\frac{4}{7} \times 14 + \frac{8}{13} \times 26$

The required ratio of copper and zinc in the new alloy

$$= \frac{\text{Quantity of copper}}{\text{Quantity of Zinc}} = \frac{\frac{3}{7}\times 14 + \frac{5}{13}\times 26}{\frac{4}{7}\times 14 + \frac{8}{13}\times 26} = \frac{6+10}{8+16} = \frac{2}{3}$$

Rule 5*

When two mixtures are mixed, then the ratio of the quantities of each mixture in the final (new) mixture can be found by applying Alligation Rule to the parts of same ingredient in the two mixtures and also in the final mixture.

NUMERICAL CHALLENGE 3.6

Two vessels contain spirit and water mixed respectively in the ratios 3 : 1 and 5 : 3. Find the ratio in which these are to be mixed to get a new mixture in which the ratio of spirit to water is 2 : 1.

Solution

Let us consider the parts of spirit in both the given mixtures and also in the new mixture.

The parts of spirit in the first mixture = $\frac{3}{3+1} = \frac{3}{4}$

The parts of spirit in the second mixture = $\frac{5}{5+3} = \frac{5}{8}$

The parts of spirit in the new mixture = $\frac{2}{2+1} = \frac{2}{3}$

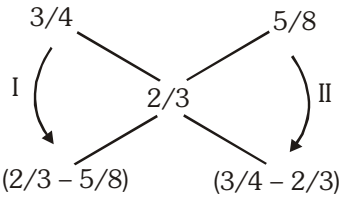
***Note :** The difference in the application of Rule-4 and Rule-5. As the **Rule-4** is used to find the quantity of **each ingredient** in the final mixture, but the **Rule-5** is to find the quantity of **each mixture** in the final mixture.

By applying Alligation Rule,

$$\frac{\text{Quantity of Mixture I in the new mixture}}{\text{Quantity of Mixture II in the new mixture}}$$

$$= \frac{\frac{2}{3} - \frac{5}{8}}{\frac{3}{4} - \frac{2}{3}}$$

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



Rule required ratio of two mixture is 1 : 2

Rule 6

Two mixtures of the same ingredients are mixed.

If x kg (say) of any ingredient A is added to the above mixture, then the value of x can be found out by the folloowing equation:

x + quantity of A in Mix I + quantity of A in Mix II = quantity of A in new mixture.

NUMERICAL CHALLENGE 3.7

In two mixture, spirit and water are related in the ratios of 3 : 5 and 7 : 4, 24 gallons of mixture I, 44 gallons of mixture II and 25 gallons of spirit are mixed together. What is the final ratio of spirit and water ?

Solution

Here, 25 gallons of spirit is added to the mixture.

$\therefore$ quantity of spirit in both the mixtures and in the final mixture is to be considered.

Let the ratio of spirit and water in the final mixture be m : n.

New, as per question

quantity of spirit in Mix I + spirit in Mix II + pure spirit = quantity of spirit in final mixture (By Rule-6)

$$\Rightarrow \quad \left(\frac{3}{3+5}\times 24\right)+\left(\frac{7}{7+4}\times 44\right)+25=\frac{m}{m+n} \qquad (24+44+25)$$

$$\Rightarrow \quad \frac{9+28+25}{24+44+25}=\frac{m}{m+n}$$

$$\Rightarrow \quad \frac{m}{m+n}=\frac{2}{3}$$

$$\Rightarrow \quad \frac{m}{n}=\frac{2}{1}$$

Therefore, the final ratio of spirit and water is 2 : 1

3.7 Removal and replacement by equal amount

Case I

Removal of an amount from a mixture

Let the mixture contain A and B

Amount of mixture = M

Now, 'x' unit of mixture is taken out and replaced by an equal amount of any ingredient, say B.

So, amount of mixture taken out = x

This process (of taking out and replacing) is repeated 'n' times

$$\frac{\textbf{amount of A * left out}}{\textbf{amount of A originally present}}=\left[1-\frac{x}{M}\right]^n$$

(at the start of operation)

Amount of B left out = M – amount of A left out.

***because replacement is done by equal amount of B, so, the formula finds 'amount of A left out' first.**

NUMERICAL CHALLENGE 3.8

A seven litre vessel contain a mixture of milk and water, milk being 49% of total volume. A few litres of the mixture is taken out and replaced by equal amount of water. This process is repeated twice and now the milk is 9% only. How many litres of mixture is taken out each time?

Solution

Let the amount of mixture taken out each time = x litres.

Number of operations = 2 [Here, mixture is replaced by water]

Using the formula,

$$\frac{\text{amount of milk left}}{\text{amount of milk originally}} = \left(1-\frac{x}{M}\right)^2$$

$$\Rightarrow \frac{9\%V}{49\%V} = \left(1-\frac{x}{7}\right)^2$$

$$\Rightarrow \frac{9}{49} = \left(1-\frac{x}{7}\right)^2$$

$$\Rightarrow 1-\frac{x}{7} = \frac{3}{7}$$

$\Rightarrow x = 4$

Therefore, 4 litres of mixture are taken out each time.

Case II

Removal of an amount from an ingredient

Unlike case I, here, initially there is one ingradient only and a certain amount of it is taken out at the first instance and replaced by an equal amount of another ingredient. Then again, same amount of mixture is taken out in the second operation and replaced by the same ingredient.

Let the vessel contain only ingredient A.

Amount of A initially present = a, say

In first operation, amount of A taken out = x and replaced by another ingredient, say B

In second operation, amount of mixture taken out = x and replaced by B

↓

(after first operation, amount of A removed is replaced by equal amount of second ingredient B, so, before second operation, A gets mixed with the second ingredient, B. Hence, in second operation, we cannot take only A, but we take out a mixture of A and B).

If this operation of taking out and replacing with equal amount of B* is repeated 'n' times,then

$$\frac{\textbf{Amount of A * remaining}}{\textbf{Amount of A initially present}} = \left[1-\frac{x}{a}\right]^n$$

$$\textbf{Amount of A remaining} = a\left[1-\frac{x}{a}\right]^n$$

and,

$$\frac{\textbf{Amount of A remaining}}{\textbf{Amount of B remaining}} = \frac{\left[1-\frac{x}{a}\right]^n}{1-\left[1-\frac{x}{a}\right]^n}$$

Because replacement is done by equal amount of B, so, the formula finds 'amount of A remaining' first

NUMERICAL CHALLENGE 3.9

Nine litres are drawn from a flask full of juice and it is then filled with water. Nine litres of the mixture are withdraw and the flask is again filled with water. The ratio of quantity of juice now remaining at the flask to that of the water in it is 16 : 9. How does the flask hold?

Solution

Let the capacity of flask = litres (which is equal to amount of juice initially present).

Using the formula,

$$\frac{\text{Amount of A remaining}}{\text{Amount of B remaining}} = \frac{\left(1-\frac{x}{a}\right)^n}{1-\left(1-\frac{x}{a}\right)^n}$$

The process is repeated twice, i.e. n = 2

Amount withdrawn each time = x = 9

$$\Rightarrow \quad \frac{16}{9} = \frac{\left(1-\frac{9}{a}\right)^2}{1-\left(1-\frac{9}{a}\right)^2}$$

$$\Rightarrow \quad \frac{16}{9} - \frac{16}{9}\left(1-\frac{9}{a}\right)^2 = \left(1-\frac{9}{a}\right)^2$$

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

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

$$\Rightarrow \quad a = 45$$

Therefore, the capacity of flask = 45 litres.

3.8 Partnership

When more than one person invests in the same business jointly, the "profit or loss is shared in the ratio of the investments of the partners." The persons who invest money are called Partners.

Investment and Share

(i) If there is profit in the business run by A and B then,

$$\frac{\text{Amount of investment of A} \times \text{No. of months invested by A}}{\text{Amount of B's investment} \times \text{No. of months invested by B}} = \frac{\text{Profit of A}}{\text{Profit of B}}$$

$$\Rightarrow \quad \frac{\text{A's Monthly Equivalent of Investment (MEI)}}{\text{B's Monthly Equivalent of Investment (MEI)}} = \frac{\text{Profit of A}}{\text{Profit of B}}$$

(ii) If more than two persons invest money in a business then, MEI of A : MEI of B : MEI of C = Profit for A : Profit for B : Profit for C

(iii) If there is loss in business,
MEI of A : MEI of B : MEI of C = Loss of A : loss of B : loss of C.

(iv) If the number of months invested or period of investment is the same for each partner, then, A's investment : B's investment : C's investment = A's profit : B's profit : C's profit

NUMERICAL CHALLENGE 3.10

1. A and B together invested Rs 12,000 in a business. At the end of the year, out of a total profit of Rs 1,800, A's share was Rs 750. What was the investment of A ?

Solution

Since profits are shared in the ratio of their investments

$$\frac{\text{A's Investment}}{\text{B's Investment}} = \frac{\text{profit share of A}}{\text{profit share of B}}$$ (Money invested by A and B for the same period)

$$= \frac{750}{1800-750} = \frac{750}{1050} = \frac{5}{7}$$

$\therefore$ Investment of A = $\frac{5}{5+7} \times 12000$ = Rs 5,000.

2. A started a business with a capital of Rs 10,000 and 4 months later, B joined him with a capital of Rs 5,000. What is the share of A in the total profit of Rs 2,000 at the end of the year ?

Solution

$$\frac{\text{Profit of A}}{\text{Profit of B}} = \frac{\text{MEI of A}}{\text{MEI of B}} = \frac{\text{Amount} \times \text{No. of months}}{\text{Amount} \times \text{No. of months}}$$

$$= \frac{10,000 \times 12}{5000 \times 8} = \frac{3}{1}$$

$\therefore$ Profit share of A = $\frac{3}{3+1} \times 2000$ = Rs 1,500

3. In a business, A, B, and C invested Rs 380, Rs 400 and Rs 420 respectively. Divide a net profit of Rs. 180 among the partners.

Solution

A's profit : B's profit : C's profit = A's investment : B's investment : C's investment

= 380 : 400 : 420 = 19 : 20 : 21

Profit share of A = $\frac{19}{60} \times 180$ = Rs 57

Profit share of B = $\frac{20}{60} \times 180$ = Rs 60

Profit share of C = $\frac{21}{60} \times 180$ = Rs 63

Partnership, Mixtures And Alligation SOLVED EXAMPLES

1. A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and replaced with water so that the mixture may by half water and half syrup

(1) $\frac{1}{3}$ (2) $\frac{1}{3}$ (3) $\frac{1}{3}$ (4) $\frac{1}{3}$

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

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

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

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

$\Rightarrow$ 5x + 24 = 40 – 5x

$\Rightarrow$ 10x = 16

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

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

2. Tea worth Rs. 126 per kg and Rs. 135 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If mixture is worth Rs. 153 per kg, the price of the third variety per kg will be:

(1) Rs. 169.50 (2) Rs. 170

(3) Rs. 175.50 (4) Rs. 180

Sol. Since first and second varieties are mixed in equal proportions.So, their average price = Rs. $\left(\frac{126+135}{2}\right)$ = Rs. 130.50

So, the mixture is formed by mixing two varienties, one at Rs. 130.50 kg and the other at say, Rs. x per kg in the ratio 2 : 2, i.e., 1 : 1. We have to find x. By the rule of alligation, we have:

Cost of 1 kg of 1st kind	Cost of 1 kg tea of 2nd kind
Rs. 130.50	Mean Price Rs. x
(x – 153)	Rs. 153 22.50

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

$\Rightarrow$ x – 153 = 22.50

$\Rightarrow$ x = 175.50

3. A can contains a mixture of two liquids A and B is the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially ?

(1) 10 (2) 20

(3) 21 (4) 25

Sol. Suppose the can intially contains 7x and 5x of mixtures A and B respectively.

Quantity of A in mixture left = $\left(7x-\frac{7\times9}{12}\right)$ litres

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

Quantity of B in mixture left = $\left(7x-\frac{5\times9}{12}\right)$ litres

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

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

$\Rightarrow \quad \frac{28x-21}{20x+21} = \frac{7}{9}$

$\Rightarrow$ 252x – 189 = 140x +147

$\Rightarrow$ 112x = 336

$\Rightarrow$ x = 3.

So, the can contained 21 litres of A.

4. A milk vendor has 2 cans of milk. The first contains 25% water and the rest milk. The second contains 50% water. How much milk such should he mix from each of the containers so as to get 12 litres of milk such that the ratio of water to milk is 3 : 5?

(1) 4 litres, 8 litres

(2) 6 litres, 6 litres

(3) 5 litres, 7 litres

(4) 7 litres, 5 litres

Sol. Let the cost of 1 litre milk be Re. 1

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

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

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

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

By the rule of alligation, we have:

C.P. of 1 litre mixture in 1st can : C.P. of 1 litre mixture in 2nd can

$\frac{3}{4}$	Mean Price	$\frac{1}{2}$
$\frac{1}{8}$	$\frac{5}{8}$	$\frac{1}{8}$

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

So, quantity of mixture taken from each can = $\left(\frac{1}{2} \times 12\right)$ = 6 litres.

5. In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg ?

(1) 3 : 7 (2) 5 : 7

(3) 7 : 3 (4) 5 : 5

Sol. By the rule of alligation :

Cost of 1 kg pulses of 1st kind : Cost of 1 kg of 2nd kind

Rs. 15	Mean Price	Rs. 20
3.50	Rs. 16.50	1.50

$\therefore$ Required rate = 3.50 : 1.50 = 7 : 3.

6. A dishonest milkman professes to sell his milk at cost price but he mixes it with water and thereby gains 25%. The percentage of water in the mixture is :

(1) 4% (2) $6\frac{1}{4}$ %

(3) 20% (4) 25%

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

Then, S.P. of 1 litre of mixture = Re. 1, Gain = 25%. C.P. of 1 litre mixture = Re. $\left(\frac{100}{125} \times 1\right) = \frac{4}{5}$

By the rule of alligation, we have: C.P. of 1 litre of milk : C.P. of 1 litre of water

Re. 1	Mean Price	0
$\frac{4}{5}$	Re. $\frac{4}{5}$	$\frac{1}{5}$

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

Hence the percentage of water in mixture

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

7. How many kilogram of sugar costing Rs. 9 per kg must be mixed with 27 kg of sugar costing Rs. 7 per kg that there may be a gain of 10% by selling the mixture at Rs. 9.24 per kg ?

(1) 36 kg (2) 42 kg

(3) 54 kg (4) 63 kg

Sol. S.P. of 1 kg of mixture = Rs. 9.24, Gain 10%.

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

= 8.40

By the rule of alligation, we have:

C.P. of 1 kg sugar of 1st kind : Cost of 1 kg sugar of 2nd kind

Rs. 9	Mean Price	Rs. 7
1.40	Rs. 8.40	0.60

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

$\therefore$ Ratio of quantities of 1st and 2nd kind

= 14 : 6 = 7 : 3

then, 7 : 3 = x : 27

$\Rightarrow$ x = $\left(\frac{7 \times 27}{3}\right)$ = 63 kg.

8. A container contains 40 litres of milk. From this container 4 litres of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?

(1) 26.34 litres (2) 27.36 litres

(3) 28 litres (4) 29.16 litres

Sol. Amount of milk left after 3 operations

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

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

9. A jar full of liquid contains 40% alcohol. A part of this liquid is replaced by another containing 19% alcohol and now the percentage of alcohol was found to be 26%. The quantity of liquid replaced is :

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $\frac{2}{5}$ (4) $\frac{3}{5}$

Sol. By the rule of alligation, we have :

Strength of 1st jar : Strength of 2nd jar

40 %	Mean strength	19 %
7	26 %	14

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

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

10. In what ratio must water be mixed with milk to gain $16\frac{2}{3}$ % on sellingt the mixture at cost price?

(1) 1 : 6 (2) 6 : 1 (3) 2 : 3 (4) 4 : 3

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

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

$\therefore$ C.P. of 1 litre of mixture = $\left(100\times\frac{3}{350}\times1\right)=\frac{6}{7}$

By the rule of alligation, we have:

C.P. of 1 litre of water : C.P. of 1 litre of milk

0	Mean Price	Re. 1
$\frac{1}{7}$	Re. $\frac{6}{7}$	$\frac{6}{7}$

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

11. Find the ratio in which rice at Rs. 7.20 per kg be mixed with rice at Rs. 5.70 per kg to produce a mixture worth Rs. 6.30 per kg.

(1) 1 : 3 (2) 2 : 3 (3) 3 : 4 (4) 4 : 5

Sol. By the rule of alligation:

Cost of 1 kg of 1st kind : Cost of 1 kg of 2nd kind

720g	Mean Price	570 p
60	630 p	90

$\therefore$ Required ratio = 60 : 90 = 2 : 3.

12. In what ratio must a grocer mix two varieties of tea worth Rs. 60 per kg and Rs. 65 per kg so that by selling the mixture at Rs. 68.20 per kg he may gain 10%?

(1) 3 : 20 (2) 3 : 4 (3) 3 : 5 (4) 4 : 5

Sol. S.P of 1 kg of the mixture = Rs. 68.20, Gain = 10%.

C.P. of 1 kg of the mixture = Rs. $\left(\frac{100}{110}\times68.20\right)$ = Rs. 62. By the rule of alligation, we have:

Cost of 1 kg tea of 1st kind. : Cost of 1 kg tea of 2nd kind.

Rs 60	Mean Price	Rs. 65
3	Rs. 62	2

$\therefore$ Required ratio = 3 : 2.

13. The cost of Type 1 rice is Rs. 15 per kg and Type 2 rice is Rs. 20 per kg. If both Type 1 and Type 2 are mixed in the ratio of 2 : 3, then the price per kg of the mixed variety of rice is:

(1) Rs. 18 (2) Rs. 18.50

(3) Rs. 19 (4) Rs. 19.50

Sol. Let the price of the mixed variety be Rs. x per kg. By rule of alligation, we have:

Cost of 1 kg of Type 1 rice : Cost of 1 kg of Type 2 rice

Rs 15	Mean Price	Rs. 20
(20 – x)	Rs. x	(x – 15)

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

$\Rightarrow \quad 60 - 3x = 2x - 30$

$\Rightarrow \quad 5x = 90$

$\Rightarrow \quad x = 18.$

14. A merchant has 1000 kg of sugar, part of which he sells at 8% profit and the rest at18% profit. He gains 14% on the whole. The quantity sold at 18% profit is:

(1) 400 kg (2) 560 kg

(3) 600 kg (4) 640 kg

Sol. By the rule of alligation, we have :

Profit on 1st part : Profit on 2nd part

8 %	Mean Price	18 %
4	14%	6

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

\ Quantity of 2nd kind = $\left(\frac{3}{5}\times1000\right)$ kg = 600 kg.

15. A, B and C enter into a partnership . 'A' contributes Rs 320 for 4 months, 'B' contributes Rs 510 for 3 months, and 'C' contributes Rs 270 for 5 months. If the total profit is Rs 208, find the profit share of the partners.

Sol. A's profit : B's profit : C's profit = MEI of A : MEI of B : MEI of C

$= 320 \times 4 : 510 \times 3 : 270 \times 5$

$= 1280 : 1530 : 1350$

$= 128 : 153 : 135$

$\therefore$ Profit of A $= \frac{128}{(128+153+135)} \times 208 = \frac{128}{416} \times 208 =$ Rs 64

Profit of A $= \frac{153}{416} \times 208 =$ Rs 76.50

Profit of A $= \frac{135}{416} \times 208 =$ Rs 67.50

16. A,B and C enter into partnership with a total of Rs 8,200. A's capital is Rs 1,000 more than B's and Rs 2,000 less than C's. What is B's share of the year's profit of Rs 2,460?

Sol. Given A = B + 1,000 = C – 2,000

$\Rightarrow$ C = B + 3,000

$\therefore$ A + B + C = (B + 1,000) + B + (B + 3,000) = Rs 8,200 (given)

$\therefore$ 3B + 4,000 = 8,200

B = Rs 1,400

$\therefore$ Share of profit of B $= \frac{1,400}{8,200} \times 2,460$

= Rs 420

17. Three hikers A, B and C start on a trip with Rs 5 each and agree to share the expenses equally. If at the end of the trip, A has Rs 20 left with him, B Rs 30 and C Rs 40, how must they settle their accounts ?

Sol. They start with total of Rs $(50 \times 3) =$ Rs 150 and they return after the trip with $(20 + 30 + 40) =$ Rs 90 So, to settle their accounts, each person must have Rs $\frac{90}{3} =$ Rs 30 with them. Hence C must pay Rs 10 to A.

18. Rs 1,290 is divided between A, B and C so that A's share is $1\frac{1}{2}$ times B's and B's share is $1\frac{3}{4}$ times, C. What is C's share?

Sol. A : B = $1\frac{1}{2} : 1 = 3 :$

$= A \quad B \quad C$

B : C = $1\frac{3}{4} : 1 \qquad = 7 : 4$

$\therefore$ A : B : C = $3 \times 7 : 2 \times 7 : 2 \times 7 : 2 \times 4$

$= 21 : 14 : 8$

$\therefore$ share of C $= \frac{8}{21+14+8} \times 1290$

= Rs 240.

19. A and B invest Rs 3,000 and Rs 4,000 in a business. A receives Rs 10 per month out of the profit as a remuneration for ranning the business and the rest of profit is divided in proportion to the investments. If in a year 'A' totally receives Rs 390, what does B receives ?

Sol. Total profit – Remuneration = Balance profit.

This balance profit is divided in proportion to their investments.

$$\frac{\text{Balance profit of A}}{\text{Balance profit of B}} = \frac{\text{Investment of A}}{\text{Investment of B}}$$

$$\Rightarrow \frac{390 - 10 \times 12}{\text{Balance profit of B}} = \frac{3000}{4000} = \frac{3}{4}$$

(Since remuneration of A is Rs 10 per month)

$\Rightarrow$ Balance profit of B $= 4 \times \frac{270}{3} =$ Rs 360.

Since B does not get any remuneration, hence B receives Rs 360 at the end of the year.

20. What amount of money is divided between A, B and C if B and C together get Rs 100 and A gets twice as much as B while C with A gets Rs 150?

Sol. Given, B + C = 100

and A + C = 150

$\therefore$ A = 2B, $\therefore$ 2B + C = 150

$\Rightarrow$ B + (B + C) = 150

(Since B + C = 100)

$\therefore$ B = 150 – 100 = 50

$\therefore$ A + B + C = (A + C) + B = 150 + 50

= Rs 200.

21. A and B entered into partnership with capitals in the ratio of 4 : 5. After 3 months, A withdrew $\frac{1}{4}$ of his capital and B with drew $\frac{1}{5}$ of his capital. The gain at the end of 10 months was Rs 760. Find their shares of profit.

Sol. Ratio of capitals of A and B are 4 : 5

Let, the capitals of A and B be Rs 4x and 5x respectively. Hence, monthly equivalent of investment (MEI) of A,

$= [3 \times 4x] + \left[7 \times 4x \times \frac{3}{4}\right] = 33x$

(Since A invested $\frac{3}{4} \times 4x$ for 7 months)

Similarly, monthly equivalent of investment of B,

$= [3 \times 5x] + \left[7 \times 5x \times \frac{4}{5}\right] = 43x$

(Since B invested $\frac{4}{5} \times 5x$ for 7 months)

$\therefore \quad \frac{\text{Profit share of A}}{\text{Profit share of B}} = \frac{\text{MEI of A}}{\text{MEI of B}} = \frac{33x}{43x}$

$\therefore$ Profit of A $= \frac{33}{(33+43)} \times 760 = \text{Rs } 330$

Profit of B $= \frac{43}{(33+43)} \times 760 = \text{Rs } 430$

22. Three student A, B and C hired a computer for a month. 'A' runs 27 floppy discs for 19 days, B runs 21 for 17 days and C runs 24 for 23 days. If at the end of the month, the rent amounts to Rs 23,700, how much ought to be paid by each?

Sol. Floppy-days = No. of floppies × days run

Here,

A's floppy-days : B' floppy-days : C's floppy-days = A's payment for rent : B's payment for rent : C's payment for rent.

$27 \times 19 : 21 \times 17 : 24 \times 23$ = A's rent : B' rent : C's rent.

$(171) : (119) : (184)$

$\therefore$ Payment for rent by

A $= \frac{171}{(171+119+84)} \times 23{,}700 = \text{Rs } 8{,}550$

Payment for rent by B $= \frac{119}{474} \times 23{,}700$

= Rs 5,950

Payment for rent by C $= \frac{184}{474} \times 23{,}700$

= Rs 9,200

23. The share of A in a partnership is Rs 1,000 more than that of B, but capital of A is invested for 8 months while capital of B for 12 months. If the share of A of the yearly profits is the same as that of B, then what is the capital of A?

Sol. $\frac{\text{MEI of A}}{\text{MEI of B}} = \frac{\text{Profit of A}}{\text{Profit of B}}$

$\Rightarrow \quad \frac{\text{Capital of A} \times 8}{(\text{Capital of A} - 1000 \times 12)} = \frac{1}{1}$

$\therefore$ Capital of A = Rs. 3,000

24. A, B and C invest Rs 4,000, 5000 and 6000 respectively in a business and A gets 25% of profit for managing the business, the rest of profit is divided by A, B and C in proportion to their investment. If in a year, A gets Rs 200 less than B and C together, what was the total profit prove for that year?

Sol. After giving 25% of the total profit amount to A for managing the business, the rest 75% of total profit is divided amoung A, B and C in proportion to their investments.

In 75% of total profit, A's share : B's share : C share = 4,000 : 5,000 : 6,000 = 4 : 5 : 6

$\therefore$ 75% of total profit = 4x + 5x + 6x

$\therefore \quad$ Total profit $= \frac{15x}{75\%} = 20x$

$\therefore$ Share of A = 4x + 25% of 20x = 9x

Share of B = 5x

Share of C = 6x

Given, (5x + 6x) – 9x = 200 $\Rightarrow$ x =100

$\therefore$ Total profit = 20x = 20 × 100 = Rs 2,000.

25. Two partners invested Rs 1,250 and Rs 850 respectively in a business. Both the partner distribute 60% of the profit equally and distribute the rest 40% as the interest on their capitals. If one partners received Rs 30 more than the other, find the total profit.

Sol. Since 60% of the profit is distributed equally so, one partner recives Rs 30 more than the other only due to distribution of rest 40% of the basis of their invested capitals.

$\therefore \quad \frac{\text{A's 40\% profit}}{\text{B's 40\% profit}} = \frac{1250}{850} = \frac{25}{17}$

$\Rightarrow \quad \frac{\text{A's 40\% profit} + \text{B's 40\% profit}}{\text{A's 40\% profit} - \text{B's 40\% profit}} = \frac{25+17}{25-17}$

$\Rightarrow \quad \frac{\text{40\% of profit}}{30} = \frac{42}{8}$

$\Rightarrow$ Profit $= \frac{42}{8} \times 30 \times \frac{100}{40} = \text{Rs } 393.75$

$\therefore$ Total profit is Rs 393.75.

26. In a partnership, A invests $\frac{1}{6}$ of the capital for $\frac{1}{6}$ of the time, B invests $\frac{1}{3}$ of the capital for $\frac{1}{3}$ of the time and C, the rest of the capital for whole time. Find A's share of the total profit of Rs 2,300.

Sol. Capital of C = $1 - \frac{1}{6} - \frac{1}{3} = \frac{1}{2}$

Let the total time be 12 months

$\therefore$ A's profit : B's profit : C's profit = MEI of A : MEI of B : MEI of C

$= \frac{1}{6} \times \left(\frac{1}{6} \times 12\right) : \frac{1}{3} \times \left(\frac{1}{3} \times 12\right) : \frac{1}{2} \times 12$

$= \frac{1}{3} : \frac{4}{3} : 6$

$= 1 : 4 : 18$

$\therefore$ Share of A = $\frac{1}{1+4+18} \times 2300$ = Rs. 100.

1. A, Band C started a business by investing Rs. 1,20,000, Rs. 1,35,000 and Rs. 1,50,000 respectively. Find the share of each, out of an annual profit of Rs. 56,700.
(1) Rs. 16800, 18900, 21000
(2) Rs. 18900, 21000, 16900
(3) Rs. 21000, 18900, 16000
(4) None of these

2. Alfred started a business investing Rs. 45,000. After 3 months, Peter joined him with a capital of Rs. 60,000. After another 6 months, Ronald joined them with a capital of Rs. 90,000. At the end of the year, they made a profit of Rs. 16,500. Find the share of each.
(1) 6600, 6600, 3300
(2) Rs. 3300, 6600, 6000
(3) Rs. 6000, 3300, 6600
(4) None of these

3. A, B and C start a business each investing Rs. 20,000. After 5 months A withdrew Rs. 5000, B withdrew Rs. 4000 and C invests Rs. 6000 more. At the end of the year, a total profit of Rs. 69,900 was recorded. Find the share of each.
(1) Rs. 20500, 28200, 21200
(2) Rs. 20500, 21200, 28200
(3) Rs. 21200, 20500, 28000
(4) Rs 28500, 20000, 28200

4. A, B and C enter into partnership. A invests 3 times as much as B invests and B invests two-third of what C invests. At the end of the year, the profit earned is Rs. 6600. What is the share of B ?
(1) Rs. 1000 (2) Rs. 2000
(3) Rs. 1200 (4) Rs 1400

5. Four milkmen rented a pasture. A grazed 24 cows for 3 months; B 10 cows for 5 months; C 35 cows for 4 months and D 21 cows for 3 months. If A's share of rent is Rs. 720, find the total rent of the field.
(1) Rs. 3150 (2) Rs. 3250
(3) Rs. 3100 (4) Rs 3200

6. A invested Rs. 76,000 in a business. After few months, B joined him with Rs. 57,000. At the end of the year, the total profit was divided between them in the ratio 2 : 1. After how many months did B join ?
(1) 4 month (2) 6 month
(3) 8 month (4) 3 month

7. A, B and C enter into a partnership by investing in the ratio of 3: 2: 4. After one year, B invests another Rs. 2,70,000 and C, at the end of 2 years, also invests 2,70,000. At the end of three years, profits are shared in the ratio of 3 : 4 : 5. Find the initial investment of each.
(1) Rs. 270000, 360000, 18000
(2) Rs. 360000, 180000, 270000
(3) Rs. 260000, 350000, 180000
(4) Rs. 270000, 180000, 360000

8. P and Q started a business investing Rs. 85,000 and Rs. 15,000 respectively. In what ratio the profit earned after 2 years be divided between P and Q respectively?
(1) 3 : 4 (2) 3 : 5
(3) 15 : 23 (4) None of these

9. Anand and Deepak started a business investing Rs. 22,500 and Rs. 35,000 respectively. Out of a total profit of Rs. 13,800, Deepak's share is :
(1) Rs. 5400 (2) Rs. 7200
(3) Rs. 8400 (4) Rs. 9600

10. A, B, C enter into a partnership investing Rs. 35,000, Rs. 45,000 and Rs. 55,000 respectively. The respective shares of A, B, C in an annual profit of Rs. 40,500 are:
(1) Rs. 10,500, Rs. 13,500, Rs. 16,500
(2) Rs. 11,500, Rs. 13,000, Rs. 16,000
(3) Rs. 11,000, Rs. 14,000, Rs. 15,500
(4) Rs. 11,500, Rs. 12,500, Rs. 16,500

11. Reena and Shaloo are partners in a business. Reena invests Rs. 35,000 for 8 months and Shaloo invests Rs. 42,000 for 10 months. Out of a profit of Rs. 31,570, Reena's share is :
(1) Rs. 9471 (2) Rs. 12,628
(3) Rs. 18,040 (4) Rs. 18,942

12. Kamal started a business investing Rs. 9000. After five months, Sameer joined with a capital of Rs. 8000. If at the end of the year, they earn a profit of Rs. 6970, then what will be the share of Sameer in the profit?
(1) Rs. 1883.78 (2) Rs. 2380
(3) Rs. 3690 (4) Rs. 3864

13. Simran started a software business by investing Rs. 50,000. After six months, Nanda, joined her with a capital of Rs. 80,000. After 3 years, they earned a profit of Rs. 24,500. What was Simran's share in the profit ?
(1) Rs. 9423 (2) Rs. 10,250
(3) Rs. 12,500 (4) None of these

14. A and B started a business in partnership investing Rs. 20,000 and Rs. 15000, respectively. After six months, C joined them with Rs. 20,000. What will be B's share in the total profit of Rs. 25,000 earned at the end of 2 years from the starting of business?

(1) Rs. 7500 (2) Rs. 9000

(3) Rs. 9500 (4) Rs. 10,000

15. Aman started a business investing Rs. 70,000. Rakhi joined him after six months with an amount of Rs. 1,05,000 and Sagar joined them with Rs. 1.4 lakhs after another six months. The amount of profit earned should be distributed in what ratio among Aman, Rakhi and Sagar respectively, 3 years after Aman started the business?

(1) 7 : 6 : 10

(2) 12 : 15 : 16

(3) 42 : 45 : 56

(4) Cannot be determined

16. Arun, Kamal and Vinay invested Rs. 8000, Rs. 4000 and Rs. 8000 respectively in a business. Arun left after six months. If after eight months, there was a gain Rs. 4005, then what will be the share of Kamal?

(1) Rs. 890 (2) Rs. 1335

(3) Rs. 1602 (4) Rs. 1780

17. A, B and C enter into a partnership. They invest Rs. 40,000, Rs. 80,000 Rs. 1,20,000 respectively. At the end of the first year, B withdraws Rs. 40,000 while at the end of the second year, C withdraws Rs. 80,000. In what ratio will the profit be shared at the end of 3 years?

(1) 2 : 3 : 5 (2) 3 : 4 : 7

(3) 4 : 5 : 9 (4) None of these

18. A,B,C invested Rs. 1260, Rs. 840, Rs. 2100 respectively in a partnership business share of profit of C in a total profit of Rs. 2420 is

(1) 726 (2) 484

(3) 1210 (4) 1110

19. In a business A invested Rs. 2000 for 6 month, B invested Rs. 4000 for 3 months, C invested Rs. 3000 for 4 months. They divides a profit of Rs. 3300 in the ratio of their investment, then share of A is

(1) 3600 (2) 800

(3) 1000 (4) 1100

20. A and B invest in a business in the ratio 3 : 2. If 5% of the total profit goes to charity and A's share is Rs. 855, the total profit is :

(1) Rs. 1425 (2) Rs. 1500

(3) Rs. 1537.50 (4) Rs. 1576

21. Avinash invested an amount of Rs. 25,000 and started a business. Jitendra joined him after one year with an amount of Rs. 30,000. After two years from starting the business they earned the profit of Rs. 46,000. What will be Jitendra share in the profit ?

(1) Rs. 14,000 (2) Rs. 12,000

(3) Rs. 7,66,67 (4) None of these

22. Mr. Nilesh Agarwal opened a workshop investing Rs. 40,000. He invested additional amount of Rs. 10,000 every year. After two years his brother Suresh joined him with an amount of Rs. 85000. Therefore Suresh did not invest any additional amount. On completion of four years from the opening of workshop they earned an amount of Rs. 1,95,000. What will be Nilesh's share in the earning ?

(1) Rs. 85,000 (2) Rs. 1,10,000

(3) Rs. 1, 35,000 (4) Rs. 95,000

23. A invests Rs. 3000 for one year in a business. How much B should invest in order that the profit after 1 year may be divided into ratio of 2 : 3 ?

(1) Rs. 2000 (2) Rs. 1800

(3) Rs. 3600 (4) Rs. 4500

24. Three friends A, B and C started a business by investing amount in the ratio of 5 : 7 : 6 respectively. After a period of six months C withdrew half of the amount invested by him. If the amount invested by A is Rs. 40, 000 and the total profit earned at the end of one year is Rs. 33,000, what C's share is profit ?

(1) Rs. 9,000 (2) Rs. 12,000

(3) Rs. 11,000 (4) Rs. 10,000

25. Mr. Shivkumar started a business investing Rs. 25,000 in 1996. In 1997 he invested an additional amount of Rs. 10,000 and Mr. Rakesh joined him with an amount of Rs. 35,000. In 1998 Mr. Shivkumar invested another additional amount of Rs. 10,000 and Mr. Rakesh joined him with an amount of Rs. 35,000. What will be Rakesh's share in the profit of Rs. 1,50,000 earned at the end of three years from the start of business in 1996 ?

(1) Rs. 70,000 (2) Rs. 60,000

(3) Rs. 45,000 (4) None of these

26. A and B started business with Rs. 3000 and Rs. 4000 respectively. After 8 months A withdraws Rs. 1000 and B advances Rs. 1000 more. At the end of the year, their profits amounted to Rs. 630. Then the share of A is :

(1) Rs. 180 (2) Rs. 360

(3) Rs. 200 (4) Rs. 240

27. Prabodh bought 30 kg of rice at the rate of Rs. 8.50 per kg and 20 kg of rice at the rate of Rs. 9.00 per kg. He mixed the two. At what price (approx.) per kg should he sell the mixture in order to get 20% profit ?

(1) Rs. 9.50 (2) Rs. 8.50
(3) Rs. 10.50 (4) Rs. 12.00

28. Prabhu purchased 30 kg. of rice at the rate of Rs. 17.50 per kg. and another 30 kg. rice at a certain rate. He mixed the two and sold the entire quantity at the rate of Rs. 18.60 per kg. and made 20 percent overall profit. At what price per kg. did he purchase the lot of another 30 kg. rice ?

(1) Rs. 14.50 (2) Rs. 12.50
(3) Rs. 15.50 (4) Rs. 13.50

29. A and B started a business jointly. A's investment was thrice the investment of B and the period of his investment is twice that of B. If B received Rs. 4000 as profit, then their total profit is :

(1) Rs. 16000 (2) Rs. 24000
(3) Rs. 20000 (4) Rs. 28000

30. A and B are partners in a business. A contributes $\frac{1}{4}$ of the capital for 15 months and B received $\frac{2}{3}$ of the profit. Find for how long B's money was used ?

(1) 1 year (2) 9 months
(3) 6 months (4) 10 months

31. A, B and C are partners of a company. During a particular year A received one third of the profit, B received one-fourth of the profit and C received the remaining Rs. 5,000. How much did A receive ?

(1) Rs. 5,000 (2) Rs. 4,000
(3) Rs. 3,000 (4) Rs. 1,000

32. Nikita bought 30 kg of wheat at the rate of Rs. 4.75 per kg, 40 kg of wheat at the rate of Rs. 4.25 per kg and mixed them. She sold the mixture at the rate of Rs. 4.45 per kg. Her total profit or loss in the transaction was

(1) Rs. 1 loss (2) Rs. 1 profit
(3) Rs. 3.50 loss (4) Rs. 3.50 profit

33. A began a business with Rs. 4500 and was joined after wards by B with Rs. 5400. When did B join if the profits at the end of the year were divided in the ratio 2 : 1 ?

(1) after 4 months (2) after 5 months
(3) after 6 months (4) after 7 months

34. 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 :

(1) 10 litres (2) 12 litres
(3) 8 litres (4) 9 litres

35. A container contains 240 litres of wine, 80 litres is taken out of the container everyday and an equal quantity of water is put into it. Find the quantity of the wine that remains in the container at the end of the fourth day.

(1) 39.2 litres (2) 32 litres
(3) 42.5 litres (4) 47.40 litres

36. A vessel contains 50 litres milk. The milkman delivers 10 litres to the first house and adds an equal quantity of water. He does exactly the same at the second and third house. What is the ratio of milk and water when he has finished delivering at the third house ?

(1) 64 : 61 (2) 27 : 37
(3) 16 : 19 (4) 19 : 27

37. Several litres of acid were drawn off from a 54 litres vessel full of acid and an equal amount of water is added. Again the same volume of the mixture was drawn off and replaced by water. As a result, the vessel contained 24 litres of pure acid. How much acid was drawn off initially?

(1) 12 litres (2) 16 litres
(3) 18 litres (4) 24 litres

38. A mixture of a certain quantity of milk with 16 litres of water is worth 90 paise per litre. If pure milk be worth 108 paise per litre, how much milk in there is the mixture ?

(1) 60 litres (2) 20 litres
(3) 80 litres (4) 90 litres

39. A mixture of a certain quantity of milk with 32 litres of water is worth Rs. 1.50 per litre. If pure milk be worth Rs. 4.50 per litre, how much milk is there in the mixture ?

(1) 18 litres (2) 14 litres
(3) 16 litres (4) 20 litres

40. The amount of wheat @ 610 per quintal which should be added to 126 quintals of wheat costing Rs. 285 per quintal so that 20% may be gained by selling the mixture at Rs. 480 per quintal will be :

(1) 38 quintals (2) 49 quintals
(3) 69 quintals (4) 50 quintals

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	1	1	2	3	2	1	4	4	3	1	2	2	4	1	2	1	2	3	4	
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	4	2	4	1	4	4	3	4	4	4	2	1	4	4	4	1	3	3	3	