Quantitative Aptitude

Mixtures

When two or more ingredients are mixed together in a certain ratio, a mixture is formed.

Simple Mixture:

When two different ingredients are mixed in a certain ratio a Simple Mixture is formed.

Compound Mixture:

When two or more simple mixtures are mixed together, they form a Compound Mixture.

Mixing quantities of different cost:

Example:

How many kilograms of chocolate worth Rs. 1.20 a kilogram must be mixed with 10 kilograms of chocolate worth 90 paisa a kilogram to produce a mixture worth Rs. 1.00 a kilogram?

Solution:

Step 1: Set up a table for different types of chocolate.

	Original	Added	Result
Cost			
Amount			

Step 2: Fill in the table with information given in the question.

Let x = amount of chocolate added.

	Original	Added	Result
Cost	0.9	1.2	1
Amount	10	X	X + 10

Step 3: Multiply down each column.

	Original	Added	Result
Cost	0.9	1.2	1
Amount	10	X	X + 10
Multiply	0.9 × 10	1.2 × x	1 × (x + 10)

Step 4: original + added = result

0.9 × 10 + 1.2 × x = 1 × (x + 10)
9 + 1.2x = x + 10
Isolate variable x
1.2x – x = 10 – 9
0.2x = 1
x = 5

5 kilograms of the Rs. 1.20 per kilogram chocolate needs to be added.

Adding to the Solution:

Example:

Atul has 20 kilograms of a 20% of salt solution, how much salt should he add to make it a 25% solution?

Solution:

Step 1: Set up a table for salt.

	Original	Added	Result
Concentration			
Amount			

Step 2: Fill in the table with information given in the question.

The salt added is 100% salt, which is 1 in decimal. Change all the percent to decimals. Let x = amount of salt added. The result would be 20 + *x*.

	Original	Added	Result
Concentration	0.2	1	0.25
Amount	20	x	20+x

Step 3: Multiply down each column.

	Original	Added	Result
Concentration	0.2	1	0.25
Amount	20	x	20+x
Multiply	0.2×20	1×x	0.25(20+x)

Step 4: original + added = result

$0.2 \times 20 + 1 \times x = 0.25(20 + x)$

$4 + x = 5 + 0.25x$

Isolate variable x

$x - 0.25x = 5 - 4$

$0.75x = 1$

$x = \frac{1}{0.75!} + \frac{1}{3/4} = \frac{4}{3}$

He should add 3/4 kilogram of salt.

Removing from the Solution:

Example:

Atul has 20 kilograms of a 20% of salt solution. How much water should be evaporated to make it a 30% solution?

Solution:

Step 1: Set up a table for water. The water is removed from the original.

	Original	Removed	Result
Concentration			
Amount			

Step 2: Fill in the table with information given in the question.

The original concentration of water is 100% – 20% = 80%.

The resulted concentration of water is 100% – 30% = 70%.

The water evaporated is 100% water, which is 1 in decimal.

Change all the per cent to decimals.

Let x = amount of water evaporated. The result would be 20 – x.

	Original	Removed	Result
Concentration	0.8	1	0.7
Amount	20	x	20 - x

Step 3: Multiply down each column.

	Original	Removed	Result
Concentration	0.2	1	0.25
Amount	20	x	20+x
Multiply	0.2×20	1×x	0.25(20+x)

Step 4: Since the water is removed, we need to subtract

Original – removed = result
$0.8 \times 20 - 1 \times x = 0.70(20 - x)$
$16 - x = 14 - 0.7x$
Isolate variable x
$x - 0.7x = 16 - 14$
$0.3x = 2$
$X = 2/0.3 = 6.67$

He should evaporate 6.67 kilograms of water.

Replacing the Solution:
Problem:

A tank has a capacity of 10 gallons. When it is full, it contains 15% alcohol. How many gallons must be replaced by an 80% alcohol solution to give 10 gallons of 70% solution?

Solution:

Step 1: Set up a table for alcohol. The alcohol is replaced i.e. removed and added.

Original	Removed	Added	Result
Concetration			
Amount			

Step 2: Fill in the table with information given in the question.

Change all the per cent to decimals.

Let x = amount of alcohol solution replaced.

	Original	Removed	Added	Result
Concentration	0.15	0.15	0.8	0.7
Amount	10	x	x	10

Step 3: Multiply down each column.

	Original	Removed	Added	Result
Concentration	0.15	0.15	0.8	0.7
Amount	10	x	x	10
Multiply	0.15 × 10	0.15 × 10	0.8 × x	0.7 × 10

Step 4: Since the alcohol solution is replaced, we need to subtract and add.

Original – removed + added = result
$0.15 \times 10 - 0.15 \times x + 0.8 \times x = 0.7 \times 10$
$1.5 - 0.15x + 0.8x = 7$

Isolate variable x
$0.8x - 0.15x = 7 - 1.5$
$0.65x = 5.5$

$X = 5.5/0.65 = 8.46$

Hence 8.46 gallons of alcohol solution needs to be replaced.

Some Important Results:

Quantitative Aptitude

- When two or more ingredients (I_1, I_2, I_3…..I_n) are mixed such that the mixture contains x_1 quantity of ingredient I_1 of unit cost C_1, x_2 quantity of ingredient I_2 of unit cost C_2 and so on then the average Mean Cost Cm is defined as

$$Cm = \frac{C_1x_1 + C_2x_2 + \ldots\ldots C_nx_n}{x_1 + x_2 + \ldots\ldots x_n.}$$

- When two mixtures M_1 and M_2, each containing ingredients A and B in the ratio a:b and x:y respectively, are mixed, the proportion of the ingredients A and B i.e., Qa : Qb, in the compound mixture is given by:

$$\frac{Qa}{Qa} = \frac{M_1 \times \left(\frac{a}{a+b}\right) + M_2 \times \left(\frac{x}{x+y}\right)}{M_1 \times \left(\frac{b}{a+b}\right) + M_2 \times \left(\frac{y}{x+y}\right)}$$

- And, the quantity in which M_1 and M_2 is to be mixed when the quantity of A and B i.e. Qa and Qb in the compound mixture is known is given by:

$$\frac{Quantity\ of\ M_1}{Quantity\ of\ M_2} = \frac{\left(\frac{x}{x+y}\right) - \left(\frac{Qa}{Qa+Qa}\right)}{\left(\frac{Qa}{Qa+Qb}\right) - \left(\frac{a}{a+b}\right)}$$