

• Alligation or Mixture - General Questions

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 be half water and half syrup?

A.  $\frac{1}{3}$

B.  $\frac{1}{4}$

C.  $\frac{1}{5}$

D.  $\frac{1}{7}$

**Answer:** Option C

**Explanation:**

Suppose the vessel initially contains 8 litres of liquid.

Let  $x$  litres of this liquid be replaced with water.

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

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

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

$$\Rightarrow 5x + 24 = 40 - 5x$$

$$\Rightarrow 10x = 16$$

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

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

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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 the mixture is worth Rs. 153 per kg, the price of the third variety per kg will be:

A. Rs. 169.50

B. Rs. 170

C. Rs. 175.50

D. Rs. 180

**Answer:** Option C

**Explanation:**

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 varieties, one at Rs. 130.50 per 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 1 <sup>st</sup> kind	Cost of 1 kg tea of 2 <sup>nd</sup> kind	
Rs. 130.50	Mean Price	Rs. $x$
$(x - 153)$	Rs. 153	22.50

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

$$\Rightarrow x - 153 = 22.50$$

$$\Rightarrow x = 175.50$$

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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?

[A.](#) 10

[B.](#) 20

[C.](#) 21

[D.](#) 25

**Answer:** Option C

**Explanation:**

Suppose the can initially contains  $7x$  and  $5x$  of mixtures A and B respectively.

$$\text{Quantity of A in mixture left} = \left(7x - \frac{7}{12} \times 9\right) \text{ litres} = \left(7x - \frac{21}{4}\right) \text{ litres.}$$

$$\text{Quantity of B in mixture left} = \left(5x - \frac{5}{12} \times 9\right) \text{ litres} = \left(5x - \frac{15}{4}\right) \text{ litres.}$$

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

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

$$\Rightarrow 252x - 189 = 140x + 147$$

$$\Rightarrow 112x = 336$$

$$\Rightarrow x = 3.$$

So, the can contained 21 litres of A.

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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 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?

[A.](#) 4 litres, 8 litres

[B.](#) 6 litres, 6 litres

[C.](#) 5 litres, 7 litres

[D.](#) 7 litres, 5 litres

**Answer:** Option B

**Explanation:**

Let the cost of 1 litre milk be Re. 1

Milk in 1 litre mix. in 1<sup>st</sup> can =  $\frac{3}{4}$  litre, C.P. of 1 litre mix. in 1<sup>st</sup> can Re.  $\frac{3}{4}$

Milk in 1 litre mix. in 2<sup>nd</sup> can =  $\frac{1}{2}$  litre, C.P. of 1 litre mix. in 2<sup>nd</sup> can Re.  $\frac{1}{2}$

Milk in 1 litre of final mix. =  $\frac{5}{8}$  litre, Mean price = Re.  $\frac{5}{8}$

By the rule of alligation, we have:

C.P. of 1 litre mixture in 1<sup>st</sup> can    C.P. of 1 litre mixture in 2<sup>nd</sup> can

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

∴ 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.

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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?

[A.](#) 3 : 7

[B.](#) 5 : 7

[C.](#) 7 : 3

[D.](#) 7 : 5

**Answer:** Option C

**Explanation:**

By the rule of alligation:

Cost of 1 kg pulses of 1 <sup>st</sup> kind	Cost of 1 kg pulses of 2 <sup>nd</sup> kind	
Rs. 15	Mean Price	Rs. 20
3.50	Rs. 16.50	1.50

∴ 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:

A. 4%

B.  $\frac{1}{64}\%$

C. 20%

D. 25%

**Answer:** Option C

**Explanation:**

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

Then, S.P. of 1 litre of mixture = Re. 1, Gain = 25%.

$$\text{C.P. of 1 litre mixture} = \text{Re. } \left( \frac{100}{125} \times 1 \right) = \frac{4}{5}$$

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. $\frac{4}{5}$	$\frac{1}{5}$

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

$$\text{Hence, percentage of water in the mixture} = \left( \frac{1}{5} \times 100 \right) \% = 20\%.$$

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

A. 36 kg

B. 42 kg

C. 54 kg

**D.** 63 kg

**Answer:** Option D

**Explanation:**

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

$$\therefore \text{C.P. of 1 kg of mixture} = \text{Rs.} \left( \frac{100}{110} \times 9.24 \right) = \text{Rs.} 8.40$$

By the rule of alligation, we have:

C.P. of 1 kg sugar of 1 <sup>st</sup> kind	Cost of 1 kg sugar of 2 <sup>nd</sup> kind	
Rs. 9	Mean Price	Rs. 7
1.40	Rs. 8.40	0.60

$\therefore$  Ratio of quantities of 1<sup>st</sup> and 2<sup>nd</sup> kind = 14 : 6 = 7 : 3.

Let x kg of sugar of 1<sup>st</sup> be mixed with 27 kg of 2<sup>nd</sup> kind.

Then, 7 : 3 = x : 27

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

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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?

**A.** 26.34 litres

**B.** 27.36 litres

**C.** 28 litres

**D.** 29.16 litres

**Answer:** Option D

**Explanation:**

$$\begin{aligned} \text{Amount of milk left after 3 operations} &= \left[ 40 \left( 1 - \frac{4}{40} \right)^3 \right] \text{ litres} \\ &= \left( 40 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} \right) = 29.16 \text{ litres.} \end{aligned}$$

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

**A.**  $\frac{1}{3}$

**B.** 2

3

C.  $\frac{2}{5}$

D.  $\frac{3}{5}$

**Answer:** Option B

**Explanation:**

By the rule of alligation, we have:

Strength of first jar	Strength of 2 <sup>nd</sup> jar	
40%	Mean	19%
	Strength	
7	26%	14

So, ratio of 1<sup>st</sup> and 2<sup>nd</sup> quantities = 7 : 14 = 1 : 2

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

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

A. 1 : 6

B. 6 : 1

C. 2 : 3

D. 4 : 3

**Answer:** Option A

**Explanation:**

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

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

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

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. $\frac{6}{7}$	$\frac{6}{7}$

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

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

[A.](#) 1 : 3

[B.](#) 2 : 3

[C.](#) 3 : 4

[D.](#) 4 : 5

**Answer:** Option B

**Explanation:**

By the rule of alligation:

Cost of 1 kg of 1 <sup>st</sup> kind	Cost of 1 kg of 2 <sup>nd</sup> kind	
720 p	Mean Price	570 p
60	630 p	90

∴ Required ratio = 60 : 90 = 2 : 3.

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12. In what ratio must a grocer mix two varieties of tea worth 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

**Answer:** Option A

**Explanation:**

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

C.P. of 1 kg of the mixture = Rs.  $\left( \frac{100}{110} \times 68.20 \right)$  = Rs. 62.

By the rule of alligation, we have:

Cost of 1 kg tea of 1 <sup>st</sup> kind	Cost of 1 kg tea of 2 <sup>nd</sup> kind	
Rs. 60	Mean Price	Rs. 65
3	Rs. 62	2

∴ Required ratio = 3 : 2.

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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:

**A.** Rs. 18

**B.** Rs. 18.50

**C.** Rs. 19

**D.** Rs. 19.50

**Answer:** Option A

**Explanation:**

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	Rs. 20
$(20 - x)$	$(x - 15)$
$\therefore \frac{(20 - x)}{(x - 15)} = \frac{2}{3}$	
$\Rightarrow 60 - 3x = 2x - 30$	
$\Rightarrow 5x = 90$	
$\Rightarrow x = 18.$	

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14. 8 litres are drawn from a cask full of wine and is then filled with water. This operation is performed three more times. The ratio of the quantity of wine now left in cask to that of water is 16 : 65. How much wine did the cask hold originally?

**A.** 18 litres

**B.** 24 litres

**C.** 32 litres

**D.** 42 litres

**Answer:** Option B

**Explanation:**

Let the quantity of the wine in the cask originally be  $x$  litres.

Then, quantity of wine left in cask after 4 operations =  $\left[ x \left( 1 - \frac{8}{x} \right)^4 \right]$  litres.

$$\begin{aligned}\therefore \left( \frac{x(1 - (8/x))^4}{x} \right) &= \frac{16}{81} \\ \Rightarrow \left( 1 - \frac{8}{x} \right)^4 &= \left( \frac{2}{3} \right)^4 \\ \Rightarrow \left( \frac{x - 8}{x} \right) &= \frac{2}{3} \\ \Rightarrow 3x - 24 &= 2x \\ \Rightarrow x &= 24.\end{aligned}$$

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

A. 400 kg

B. 560 kg

C. 600 kg

D. 640 kg

**Answer:** Option C

**Explanation:**

By the rule of alligation, we have:

Profit on 1 <sup>st</sup> part	Profit on 2 <sup>nd</sup> part	
8%	18%	
	Mean Profit	
	14%	
4	6	

Ration of 1<sup>st</sup> and 2<sup>nd</sup> parts = 4 : 6 = 2 : 3

∴ Quantity of 2<sup>nd</sup> kind =  $\left(\frac{3}{5} \times 1000\right)_{\text{kg}} = 600 \text{ kg.}$