Mixture & Alligation Problems with Solutions

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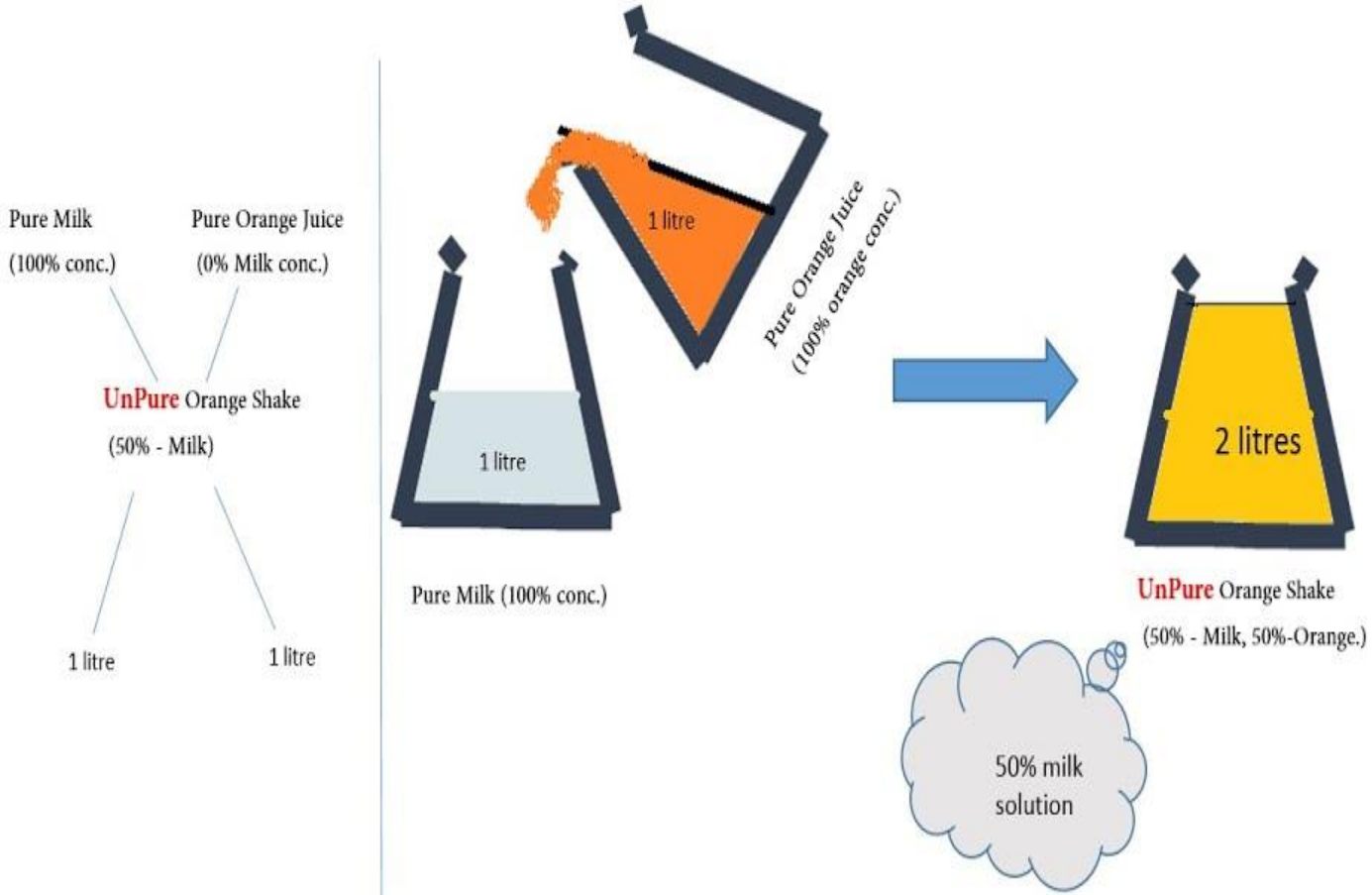
Mixtures and alligation



MIXTURE

REPLACEMENT	MILK	WATER
MILK: WATER=100:0	100	0
FIRST REPLACEMENT	- 10	+10
MILK : WATER= 9:1	90	10
SECOND REPLACEMENT	-9	-1+10
MILK:WATER= 81:19	81	19
THIRD REPLACEMENT	-8.1	-1.9+10
MILK:WATER= 729:271	72.9	27.1

VOLUME IS REMAIN CONSTANT

QUANTITY OF MILK LEFT AFTER n^{th} operation:-

$[(a - b)/a]^n$ X initial quantity

a = Initial quantity

b = Quantity taken out every time and replace by water.

n = Number of operation

GATE-2011

Q:- A container originally contains 10 liters of pure spirit. From container 1 liter of spirit is replaced with 1 liter of water. Subsequently, 1 liter of the mixture is again replaced with 1 liter of water and this process is repeated one more time. How much spirit is now in the container?

(a) 7.58 liters

(b) 7.84 liters

(c) 7 liters

(d) 7.29 liters

EXPLANATION

QUANTITY OF SPIRIT LEFT AFTER n^{th} operation:-

$[(a - b)/a]^n$ X initial quantity

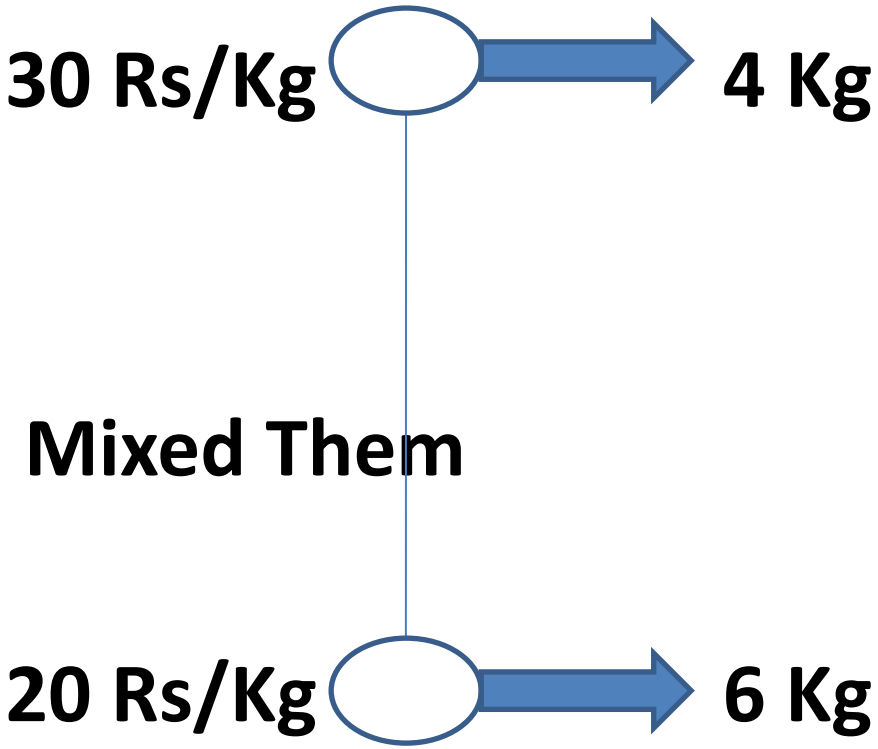
a = 10

b = 1

n = 3

$= [(10 - 1)/10]^3$ X 10 = 7.29 L (Ans.)

CONCEPT



What is the Mixture price?

EXPLANATION

Mixture Price = (30 X 4 + 20 X 6)/10 = 24 Rs/Kg

$$Q_L / Q_H = (P_H - MP) / (MP - P_L)$$

$$Q_{20} / Q_{30} = (30 - 24)/(24 - 20) = 6/4$$

QUESTION

Q:- One alloy contains copper and Zinc in the ratio 5:2 and the other contains in the ratio 3:4 respectively. How many kg of alloy 1 should be melted with alloy 2 in order to get 28 kg of new alloy. Having equal content of Cu and Zn.

EXPLANATION

	Cu : Zn	Cu	Zn
ALLOY-1	5:2	5/7	2/7
ALLOY-2	3:4	3/7	4/7
ALLOY-3	1:1	1/2	1/2

$Q_{alloy\text{-}2}/Q_{alloy\text{-}1} = (P1 - P3)/(P3 - P2) =$

$(5/7 - 1/2)/(1/2 - 3/7) = 3/1$

$3X + X = 4X = 28$

$X = 7kg$

Alloy-1 = 7 kg

Alloy -2 = 3X = 3 x 7 = 21 kg.

QUESTION

Q:- The ratio of water and milk in a 30 liters mixture is 7:3. Find the quantity of water to be added to the mixture in order to make this ratio 6:1.

EXPLANATION

W/M = 7/3

W = (7/10) X 30 = 21 Liters

M = 9 Liters

(21 + X)/ 9= 6/1

21 + X = 54

X = 33 Liters

QUESTION

Q:- In four vessels each of 20 liters capacity mixture of milk and water is filled. The ratio of milk and water are 2:1, 3:1, 3:2 and 1:1 in the four respective vessels. If all the four vessels are emptied into a single large vessel, find the proportion of milk and water in the mixture.

EXPLANATION

If the content of all the x glasses are emptied into a single large vessel, then proportion of milk and water in it is given by

(a1 / (a1+b1) + a2/ (a2+b2) +⋯+ ax /(ax+bx)) :

(b1/ (a1+b1) + b2 /(a2+b2)+⋯+ bx / (ax+bx))

Ans:-(2/3 + 3/4 + 3/5 + 1/2) : (1/3 + 1/4 + 2/5 + 1/2)= 151/60 : 89/60 = 151:89

QUESTION

Q:- Three vessels containing mixtures of milk and water are of capacities which are in the ratio 1:2:3. The ratios of milk and water in the three vessels are 4:1, 3:2 and 2:3 respectively. If one-fourth the contents of the first vessel, one-third of that of the second vessel and half of that of the third vessel are mixed; what is the ratio of milk and water in the new mixture?

EXPLANATION

Part of milk in the resultant solution

$1/4 \times 1/6 \times 4/5 + 1/3 \times 2/6 \times 3/5 + 1/2 \times 3/6 \times 2/5 = 1/5$

Part of water in the resultant solution

$=1/4 \times 1/6 \times 1/5 + 1/3 \times 2/6 \times 2/5 + 1/2 \times 3/6 \times 3/5 = 73/360$

Ratio of milk-to water $=1/5:73/360=72:73$

QUESTION

Q:- Sea water contains 5 % salt by weight. How many kg of fresh water must be added to 60 kg if sea water for the content of salt in solution to be made 3%.

EXPLANATION

Let x kg of fresh water is added to sea water

q salt / ((q salt + q water)) = (5% of 60) / (60+x)
= 3/100
(given 3% salt in solution)
3 / ((60+x)) = 3/100 = x=40kg

∴40 kg of fresh water must be added to sea water.

QUESTION

Q:- A mixture contains milk and water in the ratio 4 : 3 when 5 liters of water is added, then ratio becomes 1 : 1. Then find the amount of milk in the mixture

(a) 15 liters **(b) 20 liters**

(c) 25 liters **(d) 30 liters**

EXPLANATION

M/W = 4/3----------[i]

M/W+5 = 1/1---------[ii]

From [i] and [ii]

M = 20 L.

PARTNERSHIP

Q:- A and B enter into a partnership with capitals of ratio 5: 8, at the of 8 months A with draw from the business, if their profit are in the ratio 1 : 2. How long B invest his capital

(a) 8 months

(b) 10 months

(c) 9 months

(d) 6 months

EXPLANATION

$P \alpha C X T$

C = Capital , T = Time , P = Profit

$P_A \alpha C_A X T_A$----------[i]

$P_B \alpha C_B X T_B$ ----------[ii]

Taking ratio [i] and [ii]

$P_A/P_B = (C_A X T_A)/(C_B X T_B)$

$½ = (5 X 8)/ (8 X T_B)$

T_B = 10 Month.

Thank you