AVERAGES

- KOUSTAV

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CONCEPT

$$Average = \frac{Sum\ of\ the\ Terms}{No.\ of\ Terms}$$

1. 2 dragons and 8 unicorns are bought at an average of Rs.140. If the average price of a unicorn is Rs.60. What is the average price of a dragon?

A) Rs.480 B) Rs.920 C) Rs.460 D) Rs.980

$$\frac{2D + 8 \times 60}{10} = 140$$

$$2D = 1400 - 480$$

$$= 920$$

$$D = 460$$

2. A family consists of two grandparents, two parents and three grandchildren. The average age of the grandparents is 67 years, that of the parents is 35 years and that of the grandchildren is 6 years. What is the average age of the family?

A) $28^{4}/_{9}$ B) $31^{5}/_{7}$ C) $32^{1}/_{6}$ D) $31^{2}/_{3}$

$$\frac{67\times2 + 35\times2 + 6\times3}{7} = 31\frac{5}{7}$$

3. The average weight of 15 students in a group is 26kg. When the teacher's weight is included it becomes 30kg. What is the weight of the teacher?

A) 78 B) 86 C) 62 D) 90

$$\frac{15 \times 26 + T}{16} = 30$$

$T = 16 \times 30 - 15 \times 26$

$= 90$

New P = Old Avg ± Diff × No of Ppl

$T = 26 + 4 \times 16$

$= 26 + 64$

$= 90$

What if New avg = 25 kg

$T = 26 - 1 \times 16 = 10$

4. The average age of a class of 19 students is 15 years. If the age of the teacher be included, then the average increases by 9 months. Find the age of the teacher.

A) 40 B) 25 C) 30 D) 35

$$T = 15 + \frac{\cancel{9}^{3}}{\cancel{12}_{4}} \times \cancel{20}^{5}$$

$$= 30$$

$$\frac{19 \times 15 + T}{20} = 15 + \frac{\cancel{9}^{3}}{\cancel{12}_{4}}$$

$$19 \times 15 + T = 20 \times 15 + \cancel{20}^{5} \times \frac{3}{4}$$

$$= 15(20 + 1)$$

$$T = 15 \times 21 - 19 \times 15$$

$$= 15(21 - 19) = 30$$

5. If the average weight of 4 men increases by 3kg when one of them weighing 90kg is replaced by another man, then the weight of the new man is?

A) 80kg B) 112kg C) 78kg ✓ D) 102kg

Old P = 90 New P = N

Old Avg = A New Avg = A+3

$$\frac{4A - 90 + N}{4} = A + 3$$

$$4A - 90 + N = 4A + 12$$

$$N = 12 + 90$$

$$= 102$$

New = Old ± Diff × No. of Ppl

$$N = 90 + 3 \times 4$$

$$= 90 + 12$$

$$= 102$$

6. If the average weight of 4 men increases by 3kg when one of them is replaced by another man weighing 90kg, then the weight of the replaced man is?

A) 80kg B) 112kg C) 78kg D) 102kg

Old P = θ New P = 90

Old Avg = A New Avg = A + 3

$$\frac{4A - \theta + 90}{4} = A + 3$$

$$4A - \theta + 90 = 4A + 12$$

$$\theta = 90 - 12 = 78$$

New P = 90

Diff = 3 × 4 = 12

Old = 90 + 12

90 − 12 = 78

7. The average age of 8 men is decreased by 2 years when one of them is replaced by a 40-year-old woman. What is the age of the man who was replaced?

A) 56 years B) 48 years C) 32 years D) 24 years

$$\frac{8A - O + 40}{8} = A - 2$$

$$8A - O + 40 = 8A - 16$$

$$O = 40 + 16$$

$$= 56$$

New = 40

Diff = 2 x 8 = 16

Old = 40 + 16 = 56

40 - 16

8. Ross Geller finds the average of 10 two-digit positive integers. By mistake, he interchanges the digits of one number, say AB. Due to this, the average becomes 1.8 less than the correct one. Find the value of |A-B|.

A) 3 B) 6 C) 2 D) 4

Old Num = AB
= 10A + B

New Num = BA
= 10B + A

Correct Avg = x

Wrong Avg = x − 1.8

$$\frac{10x - (10A+B) + (10B+A)}{10} = x - 1.8$$

$$10x - 10A - B + 10B + A = 10x - 18$$

$$-9A + 9B = -18$$

$$A - B = 18/9 = 2$$

Correct Num = AB
= 10A + B

Wrong Num = BA
= 10B + A

Diff = 10 × 1.8 = 18

$$10A + B - (10B + A) = 18$$

$$9A - 9B = 18$$

$$A - B = 18/9 = 2$$

9. The average weight of three men A, B and C is 84kg. Another man D joins the group and the average now becomes 80kg. If another man E, whose weight is 3kg more than that of D, replaces A, then the average weight of B, C, D and E becomes 79kg. The weight of A is:

A) 67kg B) 72kg C) 75kg D) 80kg

Avg (A, B, C) = 84

Avg (A, B, C, D) = 80

D = 84 − 4 × 4

= 68

E = 68 + 3 = 71

Avg (B, C, D, E) = 79

Diff = 1 × 4 = 4

A = 71 + 4 = 75

71 − 4

Avg (A, B, C) = 80

Avg (A, B, C, D) = 85

E = D − 10

Avg (B, C, D, E) = 75

A = ?

A + B + C = 80 × 3

A + B + C + D = 85 × 4

D = 85 × 4 − 80 × 3

= 100

E = 100 − 10 = 90

D = 80 + 5 × 4 = 100

E = 100 − 10 = 90

Diff = 10 × 4 = 40

A = 90 + 40 = 130

90 − 40

B + C + D + E = 75 × 4 = 300

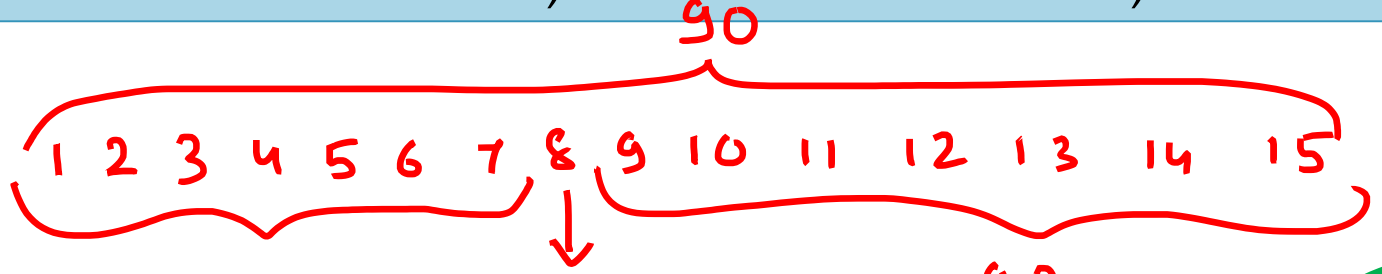
A − E = 340 − 300 = 40

A − 90 = 40

A = 130

10. The average wages of a worker during a fortnight comprising 15 consecutive working days was Rs.90 per day. During the first 7 days, his average wages was Rs.87/day and the average wages during the last 7 days was Rs.92 /day. What was his wage on the 8th day?

A) 83 B) 92 C) 90 ~~D) 97~~



$7 \times (90-3)$ $\quad$ $7 \times (90+2)$

$15 \times 90 = 7 \times 87 + x + 7 \times 92$

$= 7(87+92) + x$

$x = 15 \times 90 - 7(87+92)$

Units place

$10 - 7 \times 9$

$10 - 3 = 7$

Ans = 97

$90 = 7(-3) + x + 7(2)$

$= 7(-3+2) + x$

$= -7 + x$

$x = 90 + 7$

$= 97$

11. Ten years ago, the ages of the members of a joint family of eight people added up to 231 years. Three years later, one member died at the age of 60 years and a child was born during the same year. After another three years, one more member died, again at 60, and a child was born during the same year. The current average age of this eight-member joint family is nearest to:

A) 25 B) 24 C) 26 D) 22

$-10y$	$231y$
$-7y$	$231 + 3\times8 - 60 + 0 = 195$
$-4y$	$195 + 3\times8 - 60 + 0 = 159$
Present	$159 + 4\times8 = 159 + 32 = 191$

$$\text{Avg} = \frac{191}{8} \simeq \frac{192}{8} = 24$$

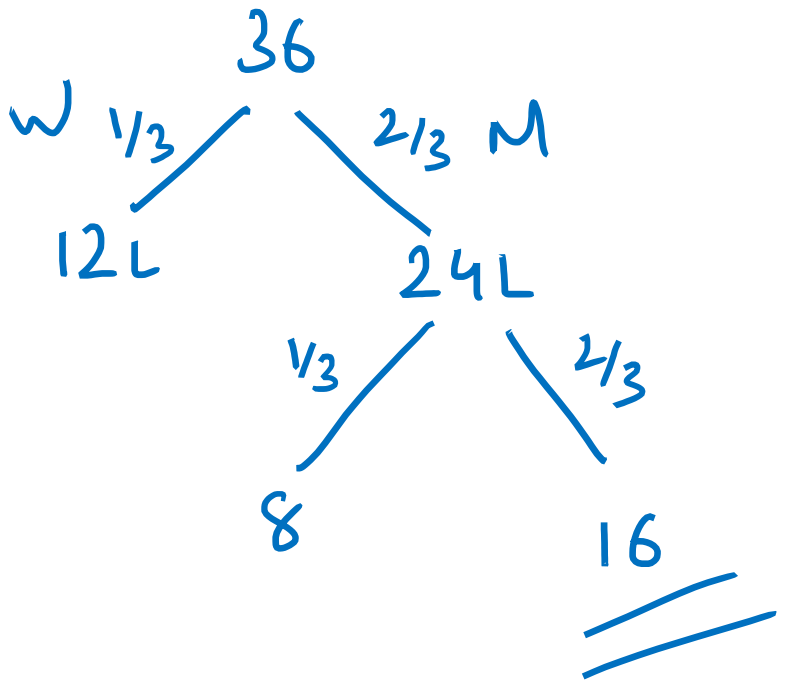
12. A vessel contains 36L of milk. 12L of milk is taken out and replaced by an equal amount of water. If this process is repeated once proportionally, what is the final quantity of milk in the vessel?

A) 10 B) 12 C) 16 D) 24

$$36\left(1-\frac{12}{36}\right)^2$$

$$\overset{4}{\cancel{36}} \times \frac{2}{\cancel{3}} \times \frac{2}{3}$$

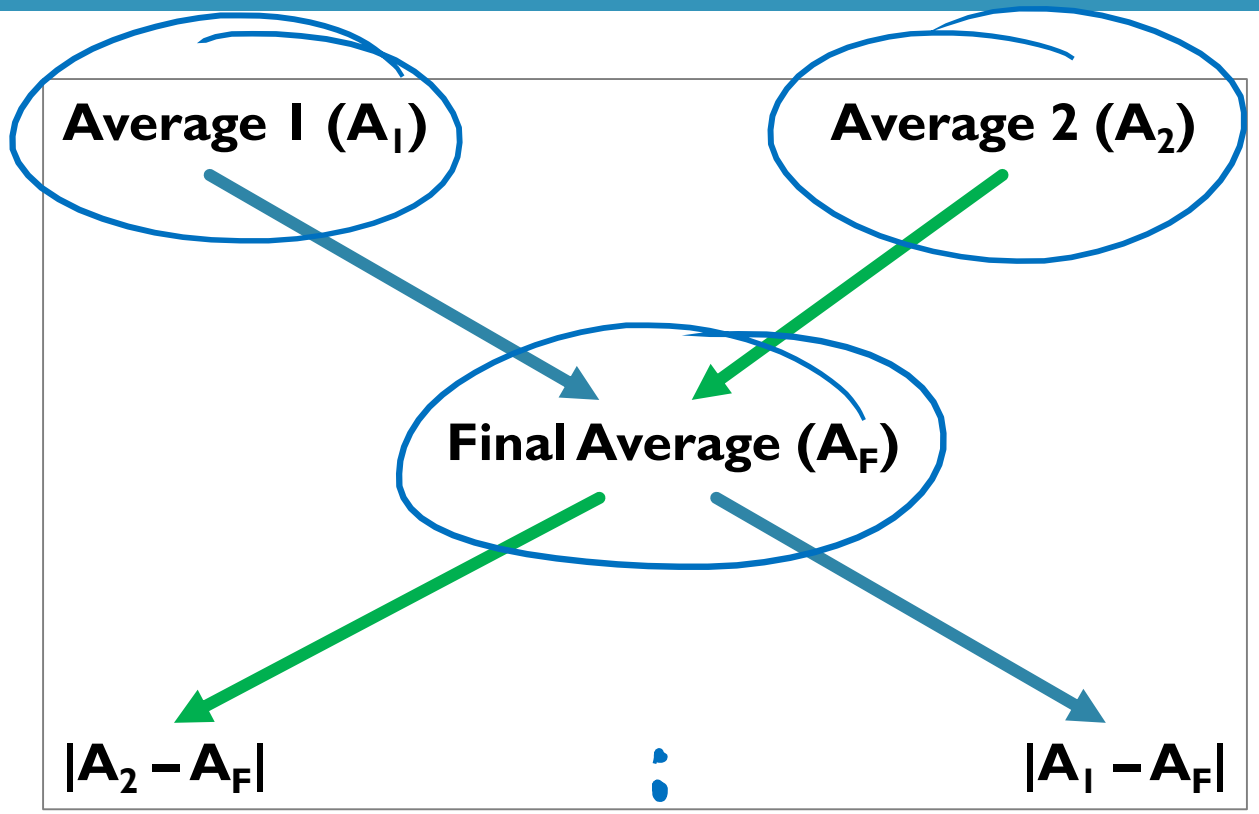
$$= 16$$



MIXTURES & ALLIGATION

- KOUSTAV

CONCEPT



13. 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 per kg?

A) 3 : 7 B) 5 : 7 C) 7 : 3 D) 7 : 5

15 20

x : y

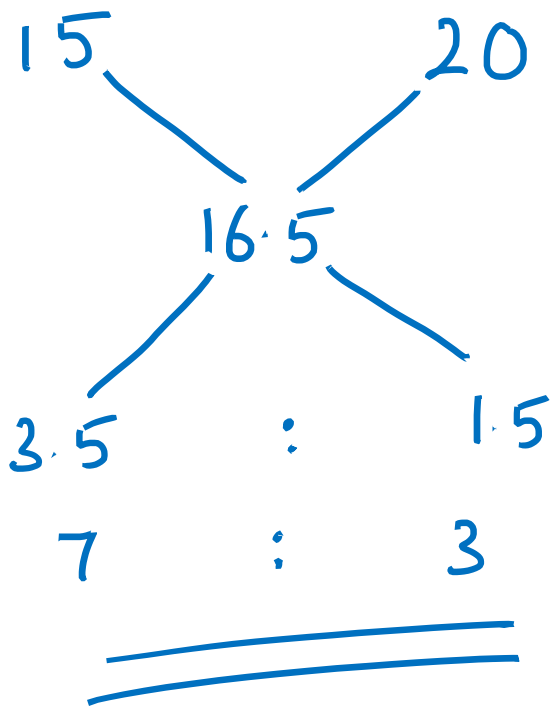
$$\frac{15x + 20y}{x + y} = 16.5$$

$15x + 20y = 16.5x + 16.5y$

$16.5x - 15x = 20y - 16.5y$

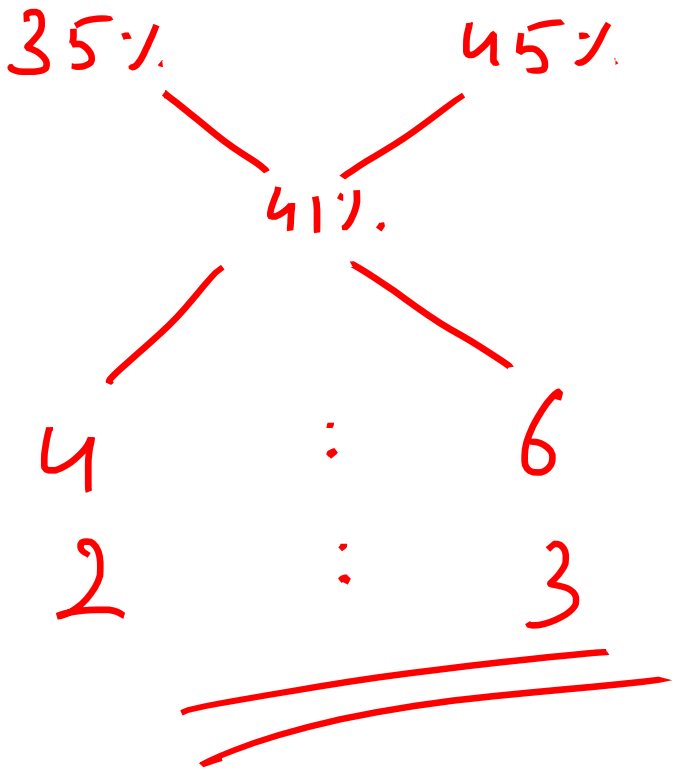
$1.5x = 3.5y$

$\frac{x}{y} = \frac{3.5}{1.5} = 7 : 3$



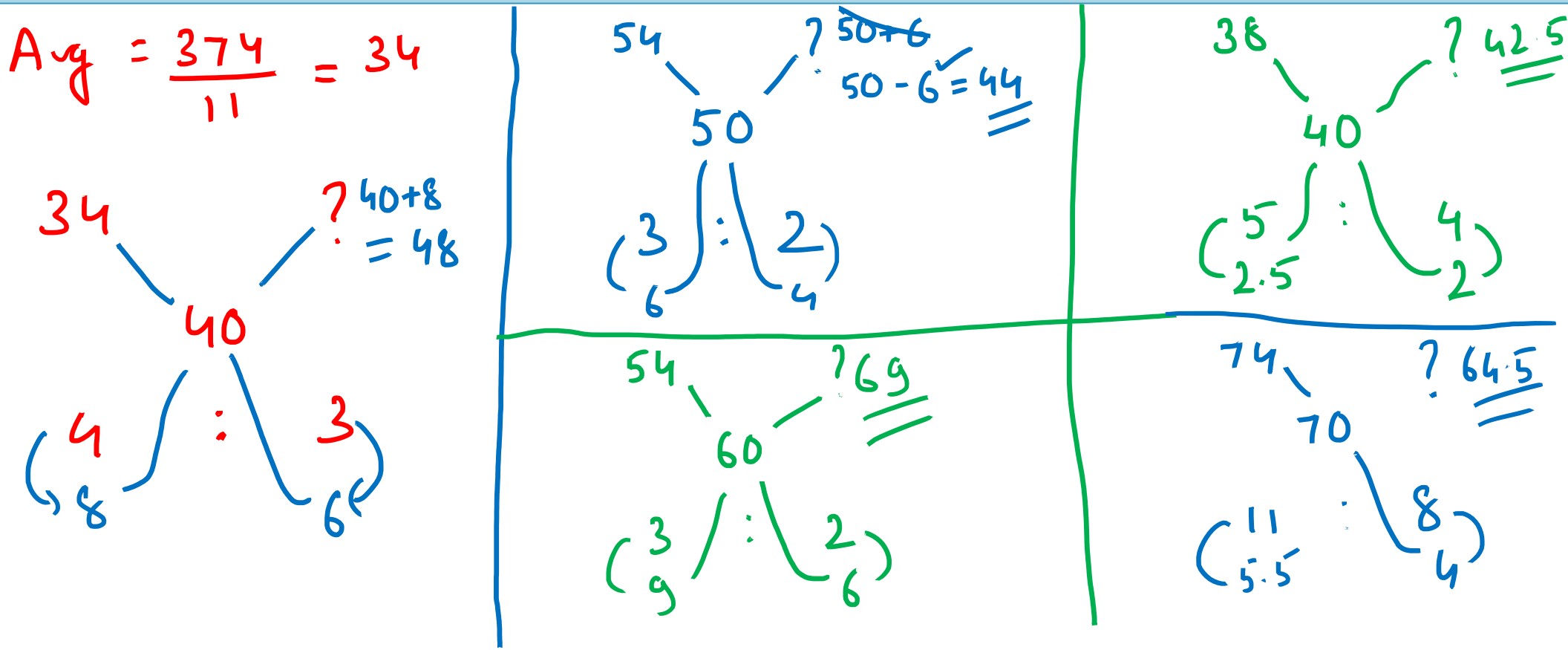
14. The ratio in which 35% alcohol solution should be mixed with 45% solution in order to get a 41% solution:

A) 2:1 B) 1:3 C) 3:1 D) 2:3



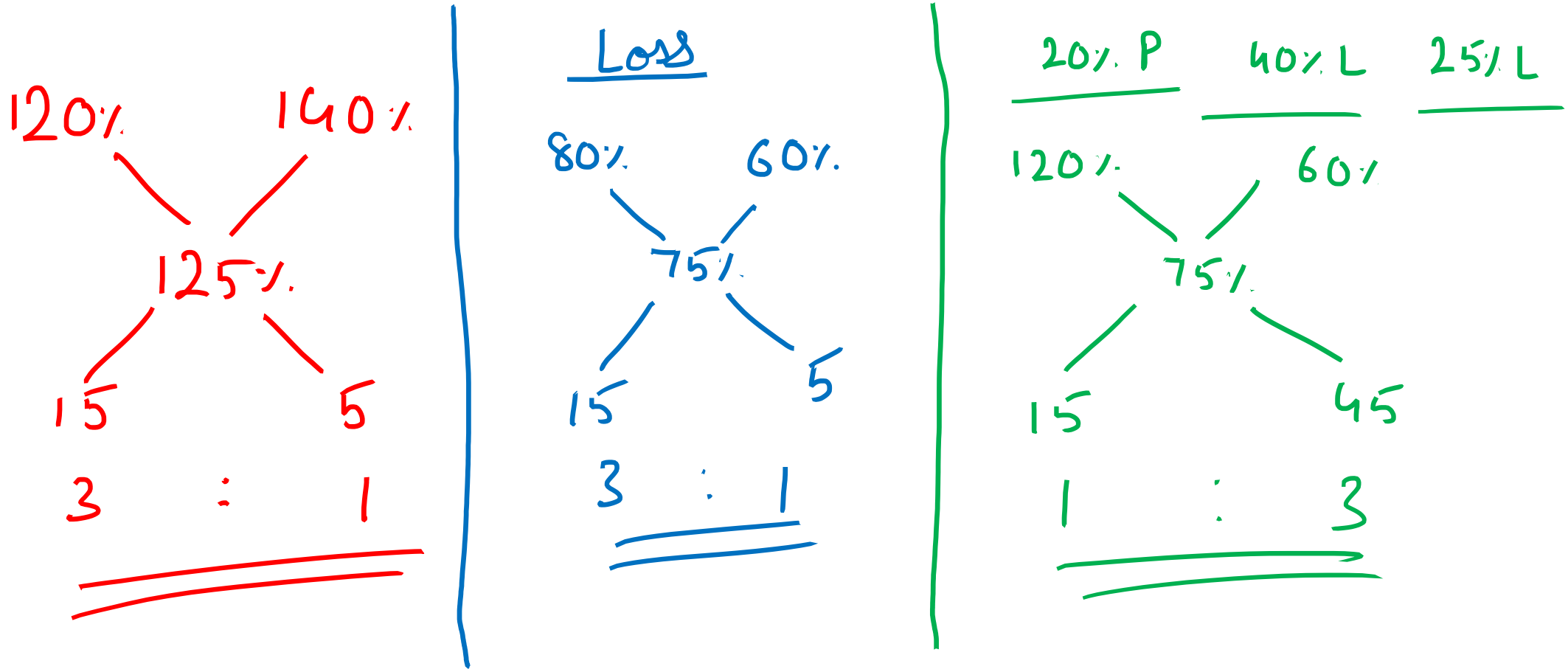
15. A dealer buys 11 kg of wheat at Rs.374 and mixes it with another quality of wheat in the ratio of 4:3. The price of the resulting mixture is Rs.40 per kg. The price of the other quality of wheat is _____?

A) Rs.48/kg B) Rs.50/kg C) Rs.42/kg D) Rs.32/kg



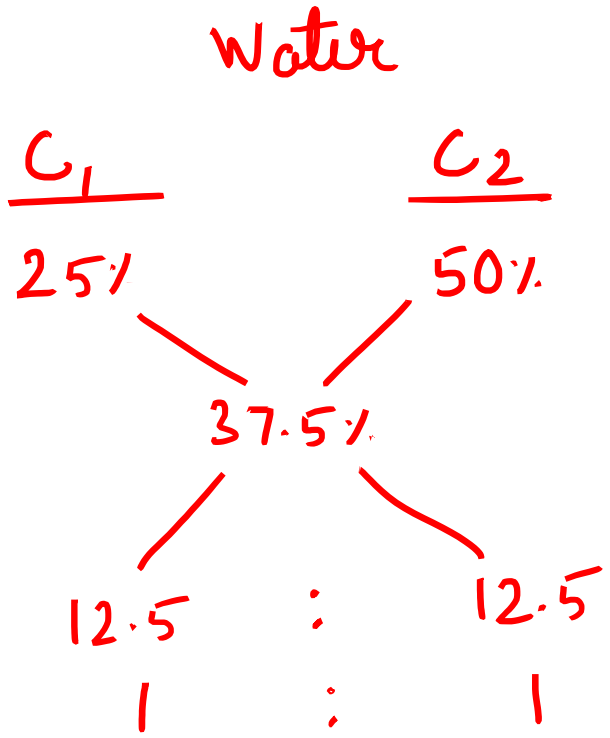
16. A shopkeeper has 50kg of rice. He sells a part of it at 20% profit and the rest at 40% profit. He gains 25% on the whole. Find the ratio of the two parts.

A) 3 : 1 B) 2 : 1 C) 1 : 3 D) 4 : 1



17. 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 container 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



$\% w = \frac{3}{8} \times 100$

$= 37.5\%$

18. 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) 36kg B) 42kg C) 54kg D) 63kg ✓

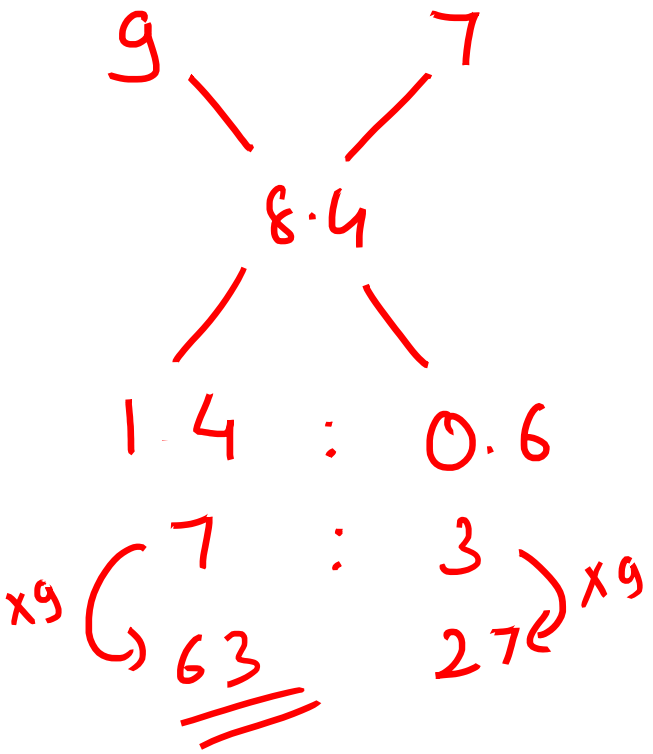
SP = 9.24

G = 10%

$SP = \frac{110}{100} CP$

$CP = \frac{100}{110} \times 9.24$

$= 8.4$



19. 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) 6% C) 20% D) 25%

M = 100 L

W = 25 L

MW = 125 L

$\therefore W = \frac{25}{125} \times 100 = 20\%$

20. In what ratio must a grocer mix three varieties of sugar costing Rs.50, Rs.70 and Rs.80 per kg respectively so as to get a mixture worth Rs.60 per kg?

A) 2 : 1 : 1 B) 2 : 2 : 1 C) 3 : 1 : 1 D) 3 : 2 : 1

Trial & Error

Weighted Average

$$\frac{50 \times 3 + 70 \times 1 + 80 \times 1}{3+1+1}$$

$$\frac{300}{5} = 60$$

EXTRA QUESTIONS:

21. The average monthly salary of 12 workers and 3 managers in a factory was Rs.600. When one of the managers whose salary was Rs.720, was replaced with a new manager, the average salary of the team went down to Rs.580. What is the salary of the new manager? (Cisco-2018)

A. Rs.420 B. Rs.690 C. Rs.640 D. Rs.610

22. The average salary of all the employees in the company is 8000. The average salary of 7 designers is 12000 and the average salary of the rest is 6000. The total number of employees in the company is

A. 23 B. 22 C. 21 D. 20

23. The average age of eight men got increased by 2 years when 2 of them whose ages are 21 years and 23 years are replaced by two new men. The average age of the two new men is:

A. 22 B. 28 C. 30 D. 34

24. A dealer buys wheat at Rs.46 per kg and mixes it with another quality of wheat in the ratio of 4:3. The price of the resulting mixture is Rs.40 per kg. The price of the other quality of wheat is _____?

A) Rs.48/kg B) Rs.50/kg C) Rs.42/kg D) Rs.32/kg

25. Two liquids X and Y are in the ratio 1 : 3 in container C_1 and in 5 : 1 in container C_2. In what ratio should the contents of the two containers be mixed so as to obtain a mixture of X and Y in the ratio 1:1?

A. 1 : 2 B. 3 : 2 C. 5 : 6 D. 4 : 3

ANSWER KEY – AVERAGES, MIXTURES & ALLIGATION

QUESTION	ANSWER	QUESTION	ANSWER	QUESTION	ANSWER
1	C	11	B	21	A
2	B	12	C	22	C
3	D	13	C	23	C
4	C	14	D	24	D
5	D	15	A	25	D
6	C	16	A		
7	A	17	B		
8	C	18	D		
9	C	19	C		
10	D	20	C		