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Sahi Prep Hai Toh Life Set Hai

MIXTURE & ALLIGATION

Part-1

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Agenda

What is Mixture

Alligation

* Is Alligation a better Approach
  Should we always use Alligation
  Can we solve without Alligation

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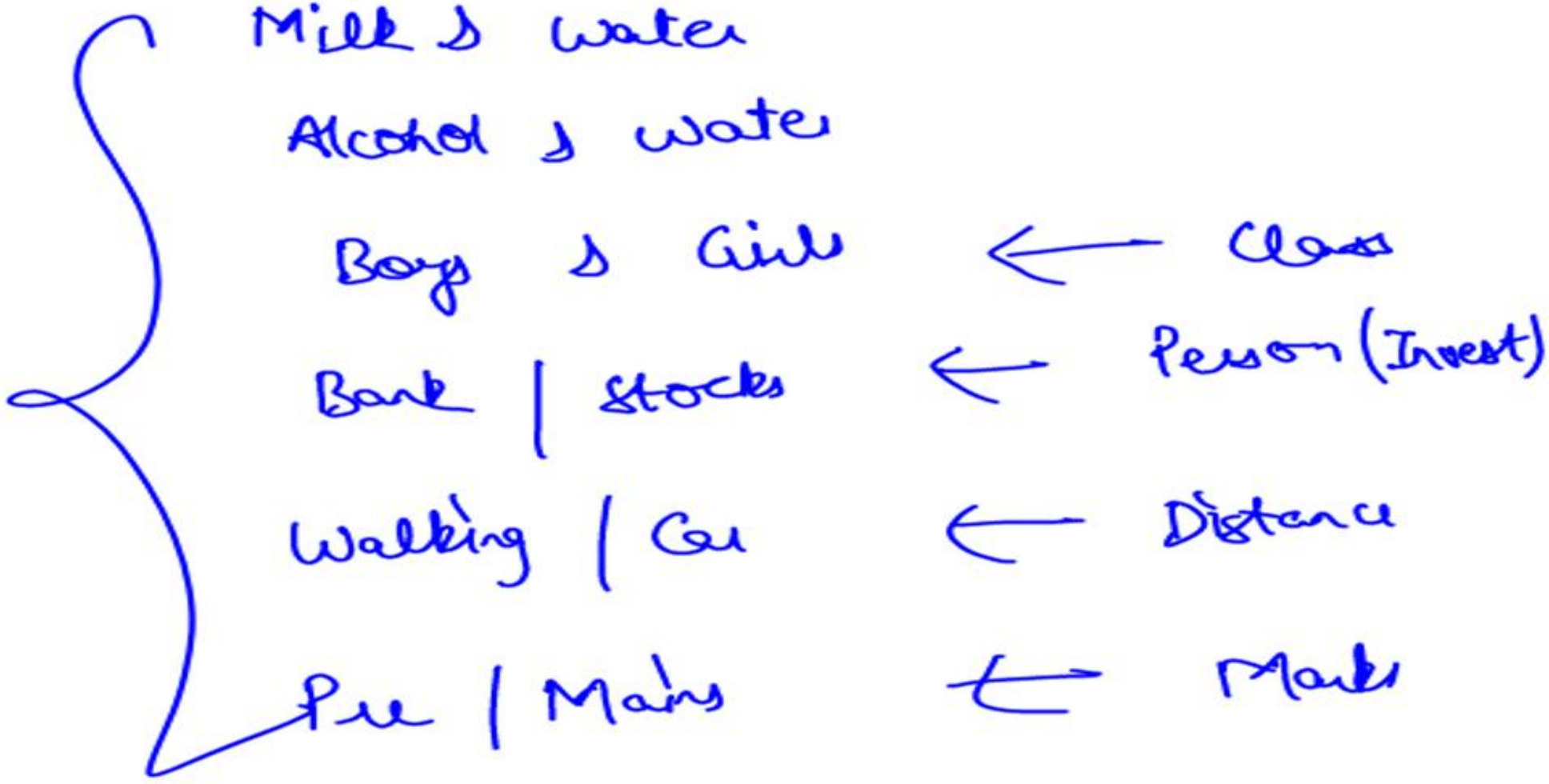
Mixture can be of different types, like:



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What is Alligation?

It is an approach to solve questions on mixtures.

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Eg. In a class, the average weight of boys is 70 kg and average weight of girls is 60 kg. Find the average weight of the whole class?

Boys → 70kg

Girls → 60kg

Average weight of whole class → Can't be determined

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Note:

We can calculate average weight of the whole class only if :

(i) We know how many boys and girls are there?

Or

(ii) Ratio of numbers of boys and girls.

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If Average weight of Boys = 70 kg

Average weight of Girls = 60 kg

$$60 \leq \text{Average weight of class} \leq 70$$

But if atleast one boy is on girl is there

$$60 < \text{Avg wt of class} < 70$$

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Eg Average weight of Boys = 50
Avg weight of Girls = 40

Avg wt of class is a Prime no & (no. of Boys > no. of Girls)

what is the Avg wt of class ??

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Eg. In a class, the average weight of boys is 70 kg and average weight of girls is 60 kg. If average weight of the whole class is 64 kg. Find the ratio of boys and girls.

Ist Simple eq^{n} approach

Boys → 70 Girls → 60

Class → 64

Let no. of Boys → B

no. of Girls → G

$$\frac{70B + 60G}{B+G} = 64$$

$$70B + 60G = 64B + 64G$$

$$6B = 4G$$

$$\frac{B}{G} = \frac{4}{6} = \frac{2}{3}$$

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ALLIGATION APPROACH

Avg wt of Boys = 70 Kg Avg wt of Girls = 60 Kg

Avg wt of class = 64 Kg

Boys Girl

↑6Kg ↓4Kg

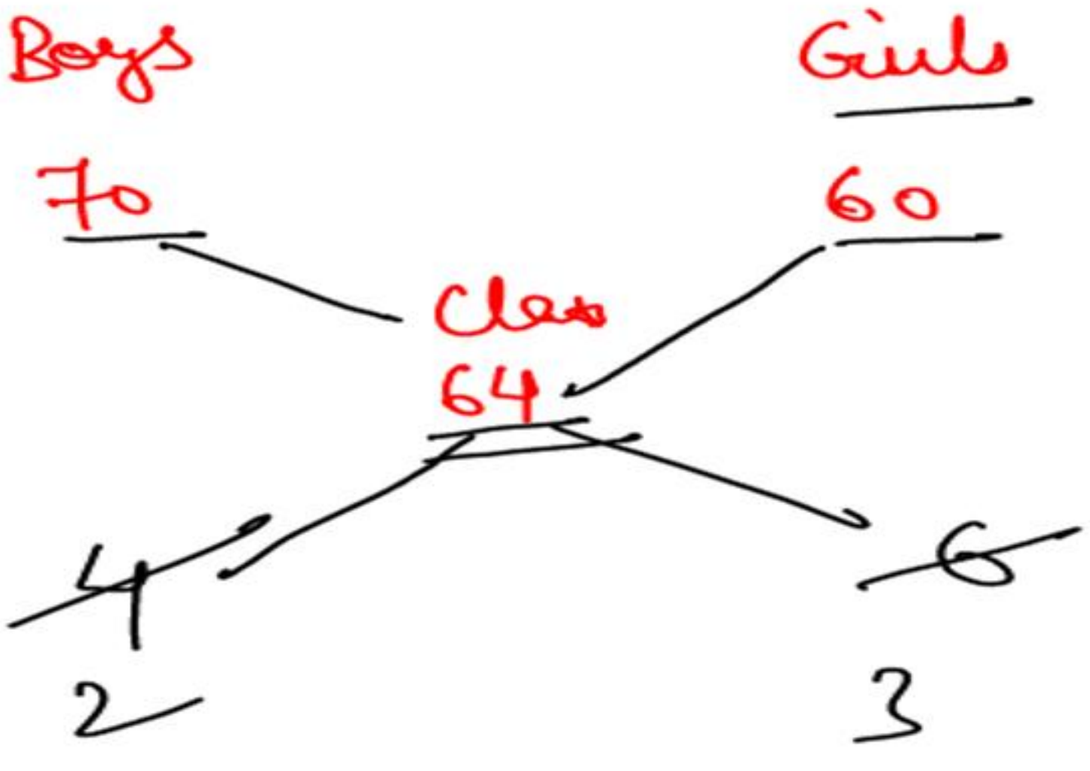
↑6 ↓

↑6 ↓

↑6 ↓

↓

↓



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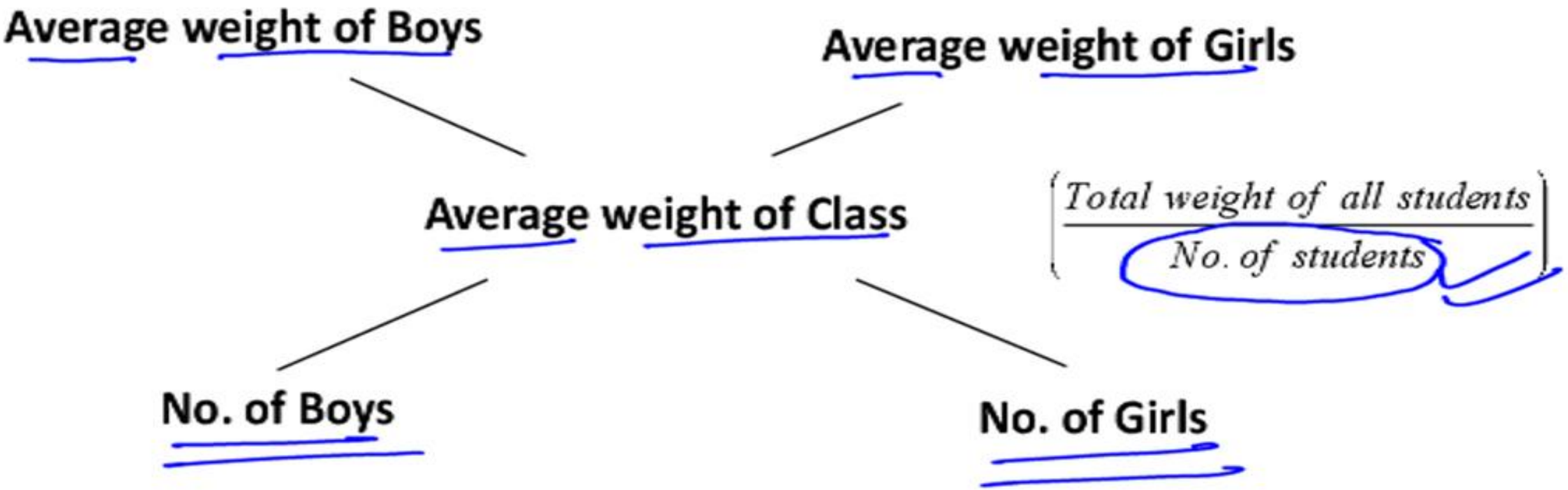
DIFFERENT SCENARIOS OF ALLIGATION



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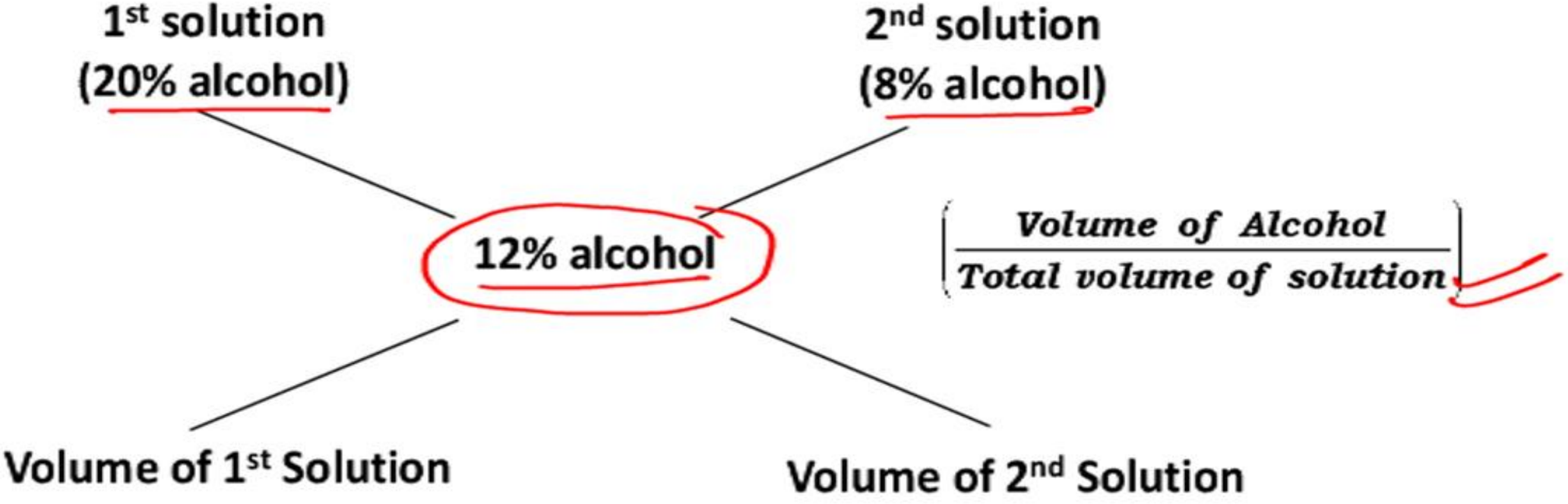
II nd



Volume of Sol^{n} 1 : Volume of Sol^{n} 2

1 : 2

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III rd

Prelims
(80% Marks)

Mains
(95% Marks)

90% Marks

$$\left(\frac{\textit{Marks obtained}}{\textit{Total Marks (Max. Marks}}\right)$$

80 → 1

100 → 2

1 : 2

Max Marks of Pre : Max Marks of Mains

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IV th

30 km/hr

50 km/hr

38 km/hr

$$\frac{\text{Total Distance}}{\text{Total Time}}$$

12 : 8

3 : 2

Time for which he travels @ 30 km/hr : Time for which he travels @ 50 km/hr

3 : 2

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V

Bank
(10% per annum)

Mutual Funds
(20% per annum)

12% per annum

$$\left(\frac{\text{Interest}}{\text{Principal}} \times 100\right)$$

8 : 2

4 : 1

Amount invested in Bank

Amount invested in Mutual Funds

4 : 1

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APPLICATION OF MIXTURE & ALLIGATION IN PROFIT & LOSS

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Eg. A person purchased 2 articles in Rs.500, on the first article he earned 20% and on the second article he looses 8% and in the overall transaction he earned 0.4%. Find the cost price of both the articles.

I II

20% profit 8% loss

0.4% profit

Profit/Loss

CP

20 −8

0.4

8 4

2 1

3

12 8

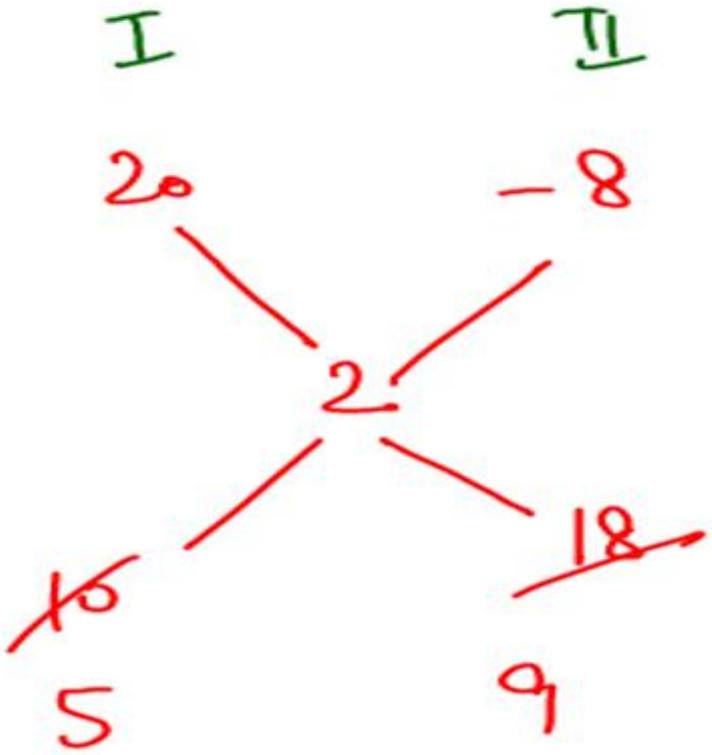
4 2

7

3 : 7

$\frac{3}{10} \times 500 = 150$ Rs

$\frac{7}{10} \times 500 = 350$ Rs



Eg. A person sold 2 watches, on the first watch he gains 20% and on the second watch he looses 8%. If in the overall transaction he gains 2%. Find the ratio of cost price of 2 watches.

$2-(-8)=10$

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(i) $CP_1 : CP_2$ (If quantity is same)

(ii) $Q_1 : Q_2$ (If cost price is same)

(iii) $CP_1\ Q_1 : CP_2\ Q_2$

(If neither cost price nor quantity is same)

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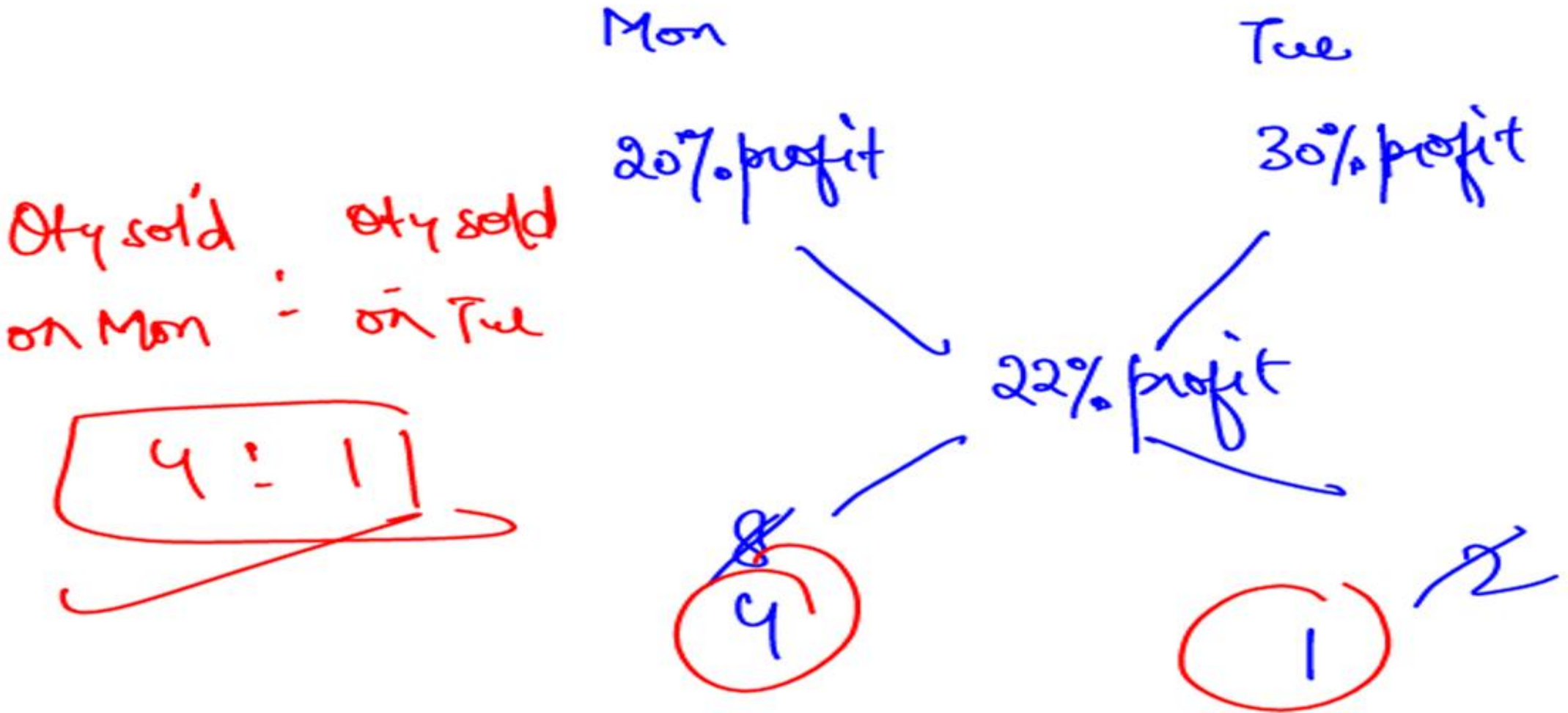
eg Q of all pens are same



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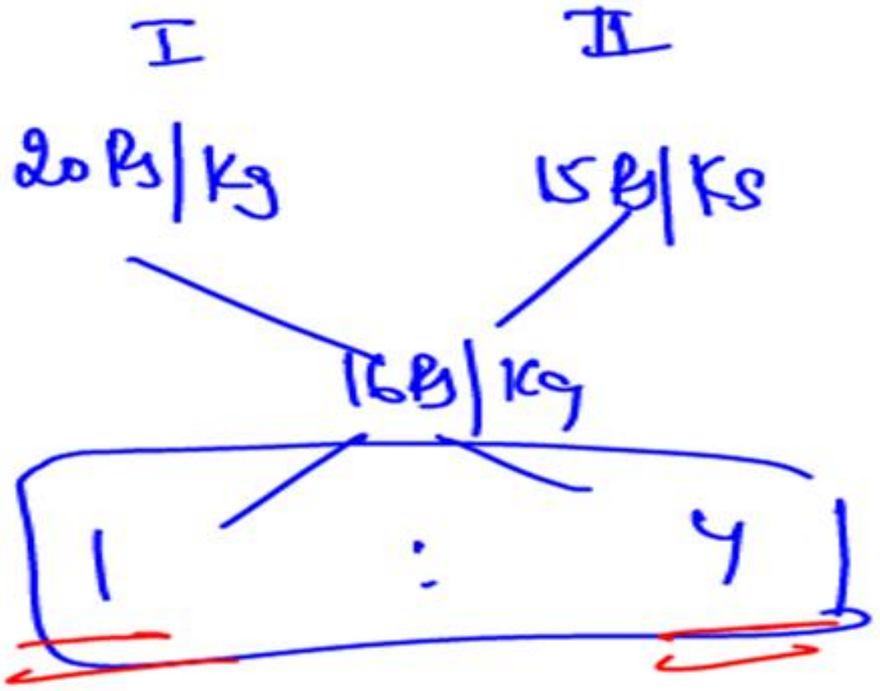

Ratio of Qty

Q. The ratio of the quantities of sugar, in which sugar costing Rs.20 per kg. and Rs. 15 per kg. should be mixed so that there will be neither loss nor gain on selling the mixed sugar at the rate of Rs. 16 per kg, is

(a) 2 : 1
(b) 1 : 2
(c) 4 : 1
(d) 1 : 4

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Ans. (d)

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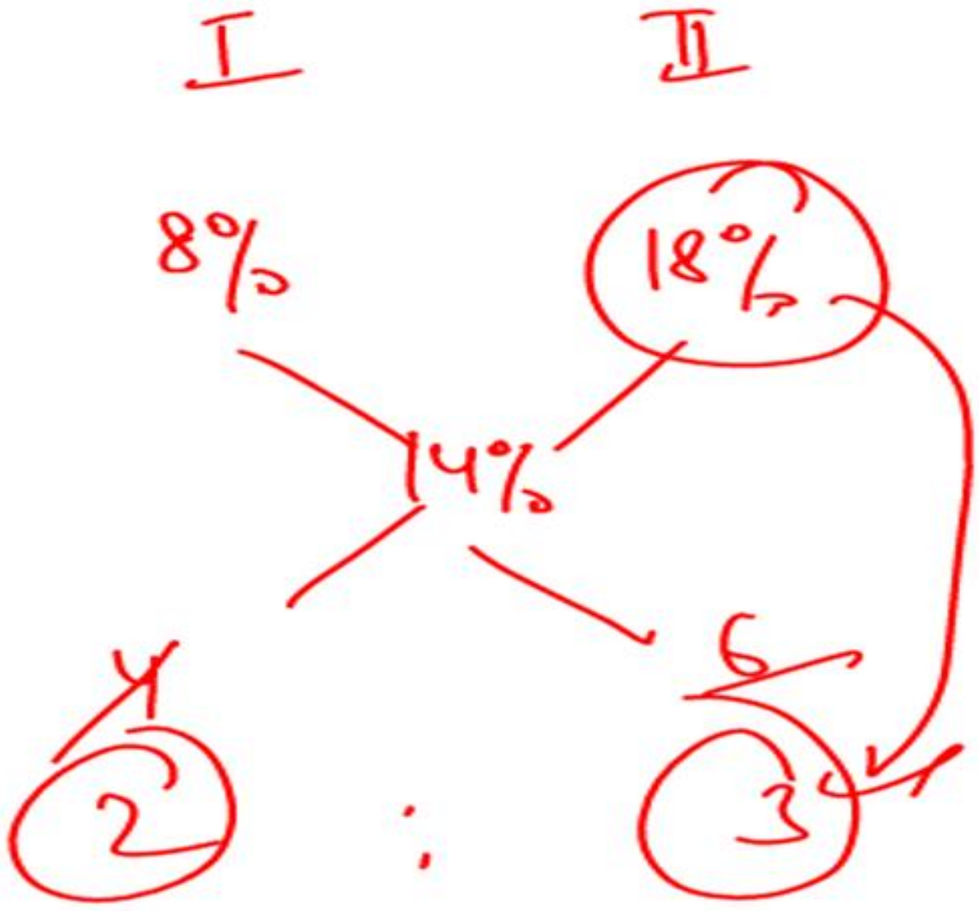

Q. A trader has 50 kg of pulses, part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. What is the quantity sold at 18% profit?

(a) 20 (b) 30

(c) 25 (d) 10

$\frac{3}{5} \times 50 = 30$

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Ans. (b)

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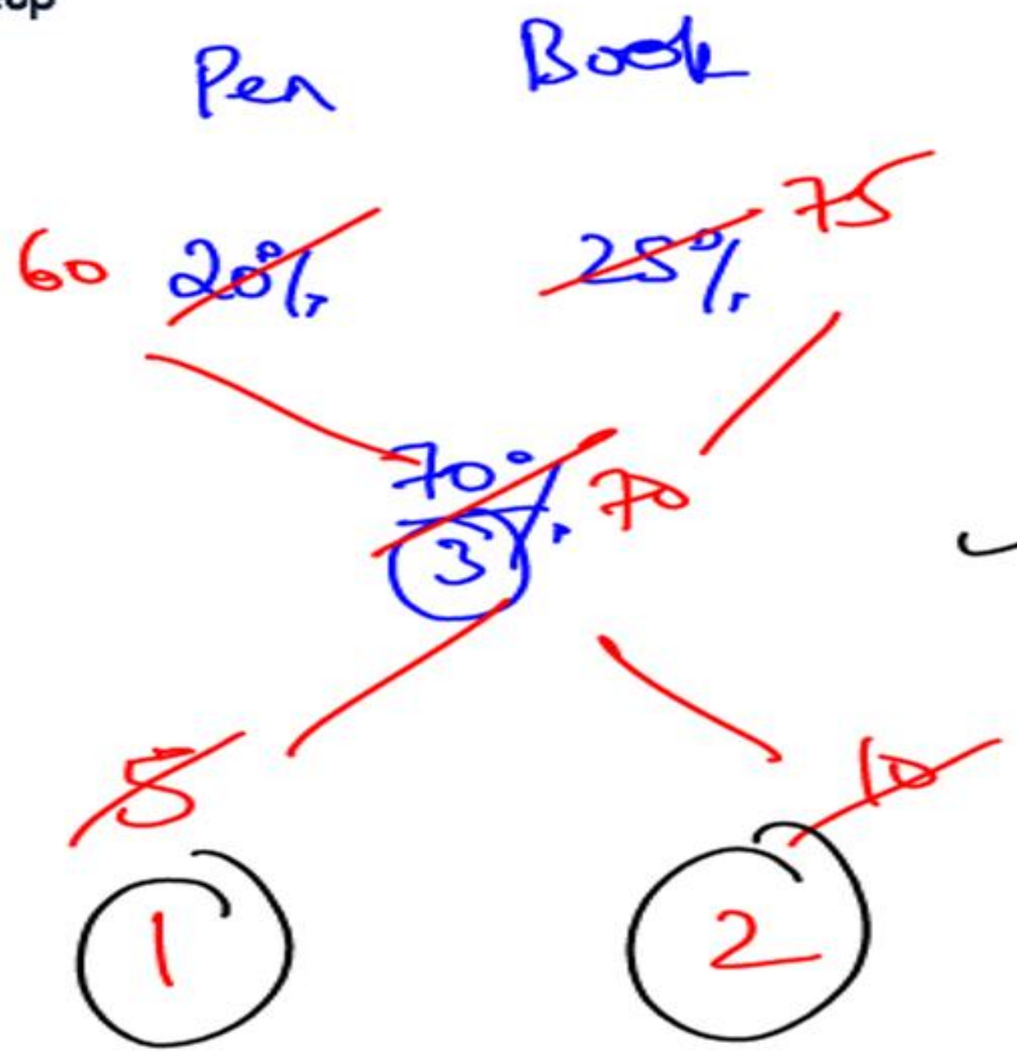

Q. A man purchased a pen & book for Rs. 1200. He sold the pen at a profit of 20% and the book at a profit of 25%. In this way, his total profit was $23\frac{1}{3}$%. Find the cost price of book?

(a) 800
(b) 500
(c) 700
(d) 600

$\frac{2}{3} \times 1200 = 800$

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Ans. (a)

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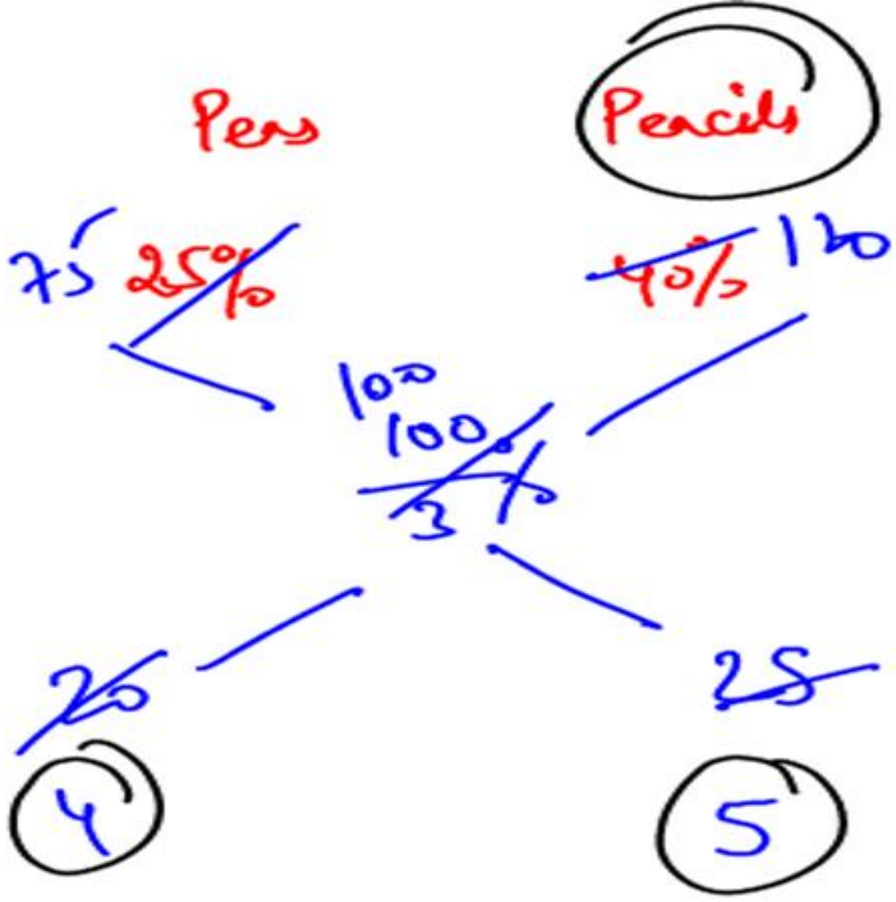

Q. 20 pens and 16 pencils are purchased by a man for Rs. 360. He sold the pens at 25% profit and pencils at 7/5 of its cost price. Find the price of each pencil, if he earns profit of Rs. 120 at the end?

(a) 8 (b) 10

(c) 12.5 (d) 16

$\frac{5}{9} \times 360 = 200$ Rs

$\frac{200}{16}\ \frac{25}{2} \Rightarrow 12.5$ Rs

$\frac{7}{5} \times 100\% \rightarrow 140\%$

$\frac{120}{360} \cdot 100$

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Ans. (c)

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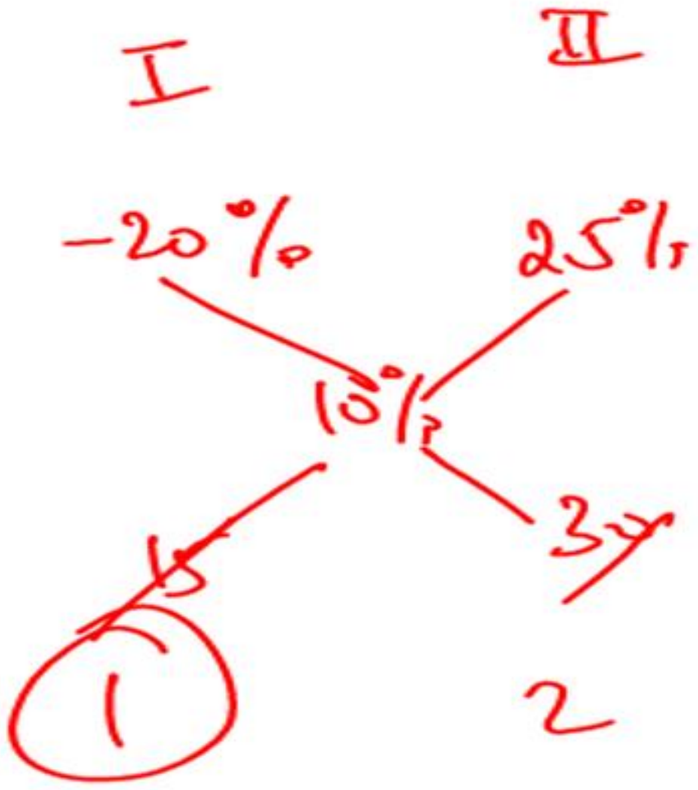

$\frac{1}{3} \times 900$

$= 300$

Q. A man purchased two chairs in Rs. 900, he sells the first chair at 4/5 of its cost price while and second chair is sold at 5/4 of its cost price. If during the whole transaction he earns a profit of Rs.90. Find the cost price of cheaper chair?

(a) 300 (b) 350

(c) 600 (d) 450

$\frac{4}{5} \times 100 = 80\%$

$\frac{5}{4} \times 100 \rightarrow 125$

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Ans. (a)

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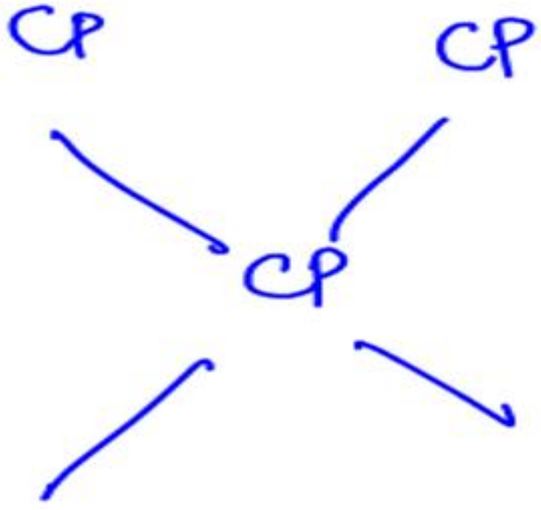
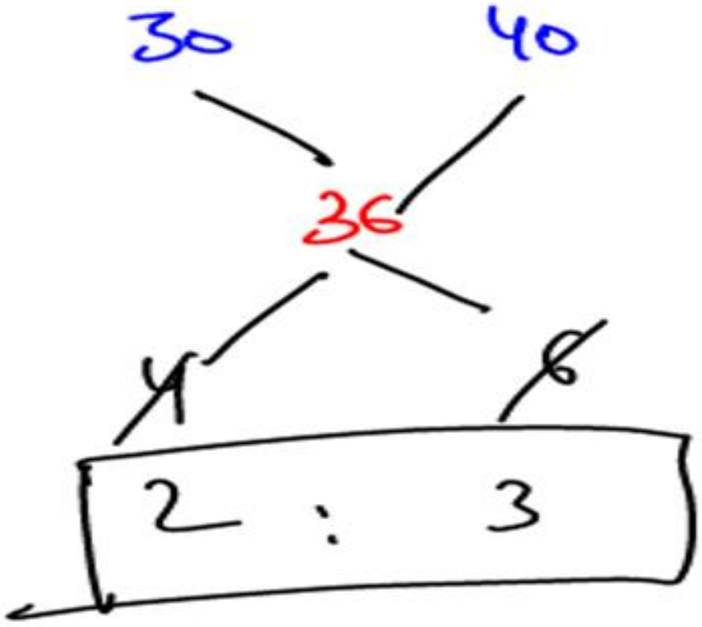
Eg. Cost price of 1st (Wheat) → Rs.30/kg
Cost price of 2nd (Wheat) → Rs.40/kg
Selling price mixture → Rs.45/kg
Profit → 25%

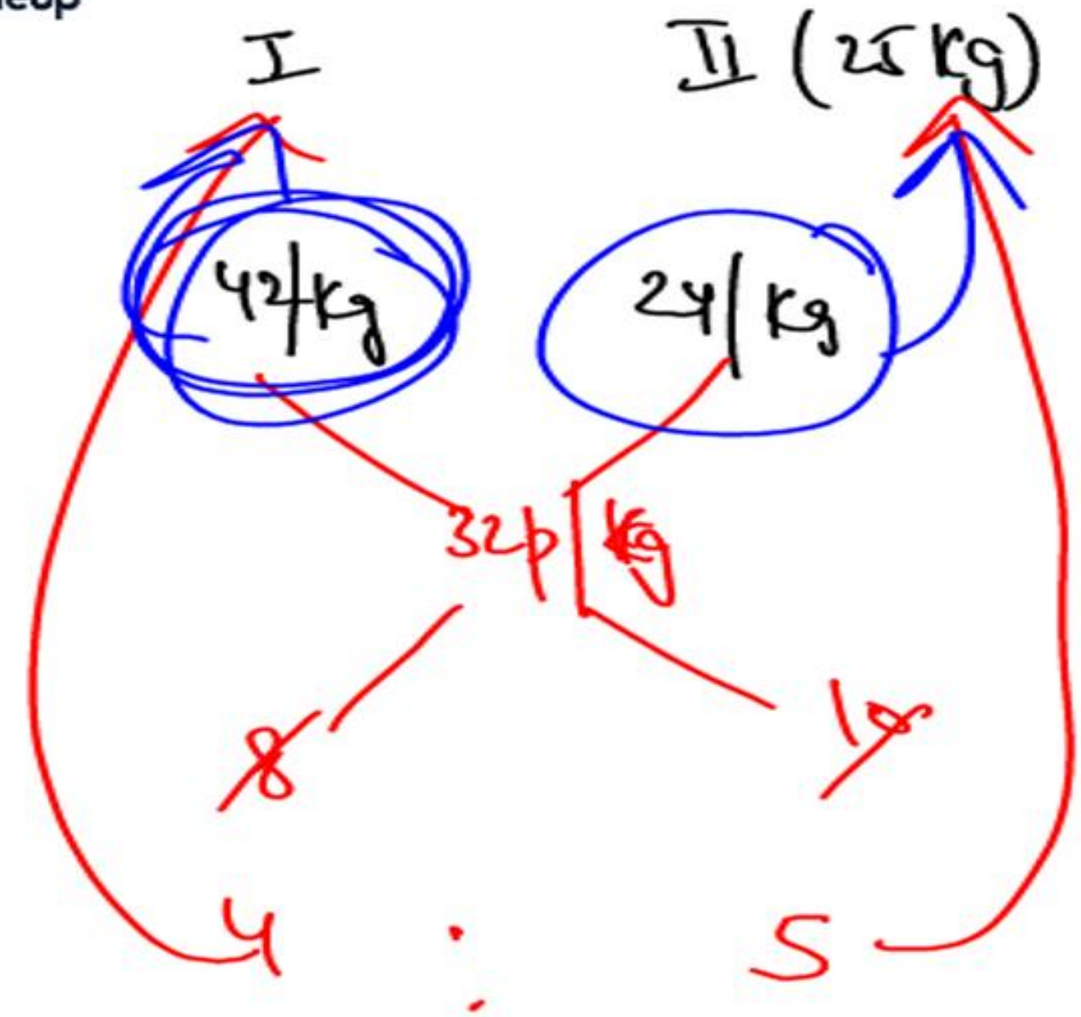
Profit → 25% (1/4)

CP → 36

In what ratio we have mixed the 2 varieties.

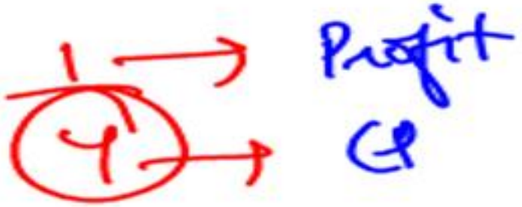


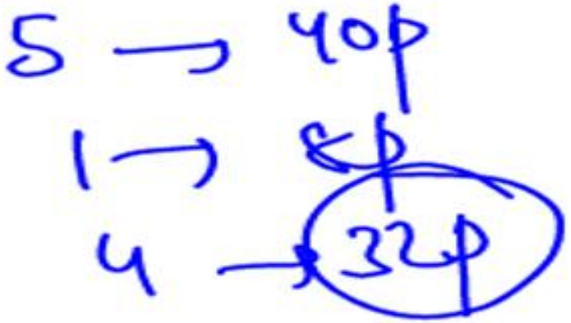




Q. How many kg of salt at 42 P per kg must a man mix with 25 kg of salt at 24 P per kg, so that he may, on selling the mixture at 40 P per kg, gain 25% on the outlay?

(a) 15
(b) 20
(c) 25
(d) 30





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Ans. (b)

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Milk : Water

4 : 1

Eg. A milkman professes to sell his milk at cost price. If he mixes milk & water in the ratio 4:1. Find his profit % .

In these question no need of using Allegation

Profit% $\rightarrow$ $\frac{\text{water}}{\text{Milk}} \times 100$

$\frac{1}{4} \times 100$

$= 25\%$ profit

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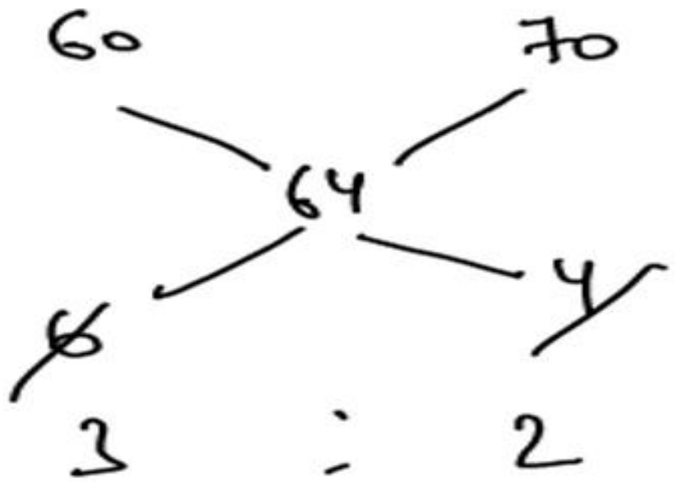

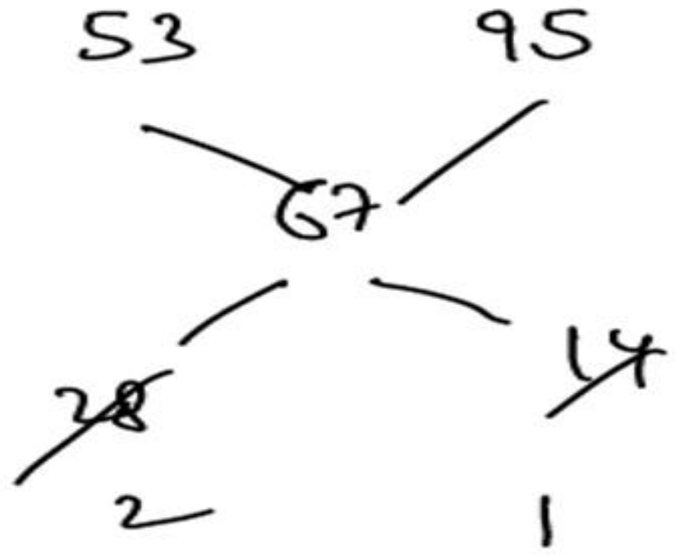

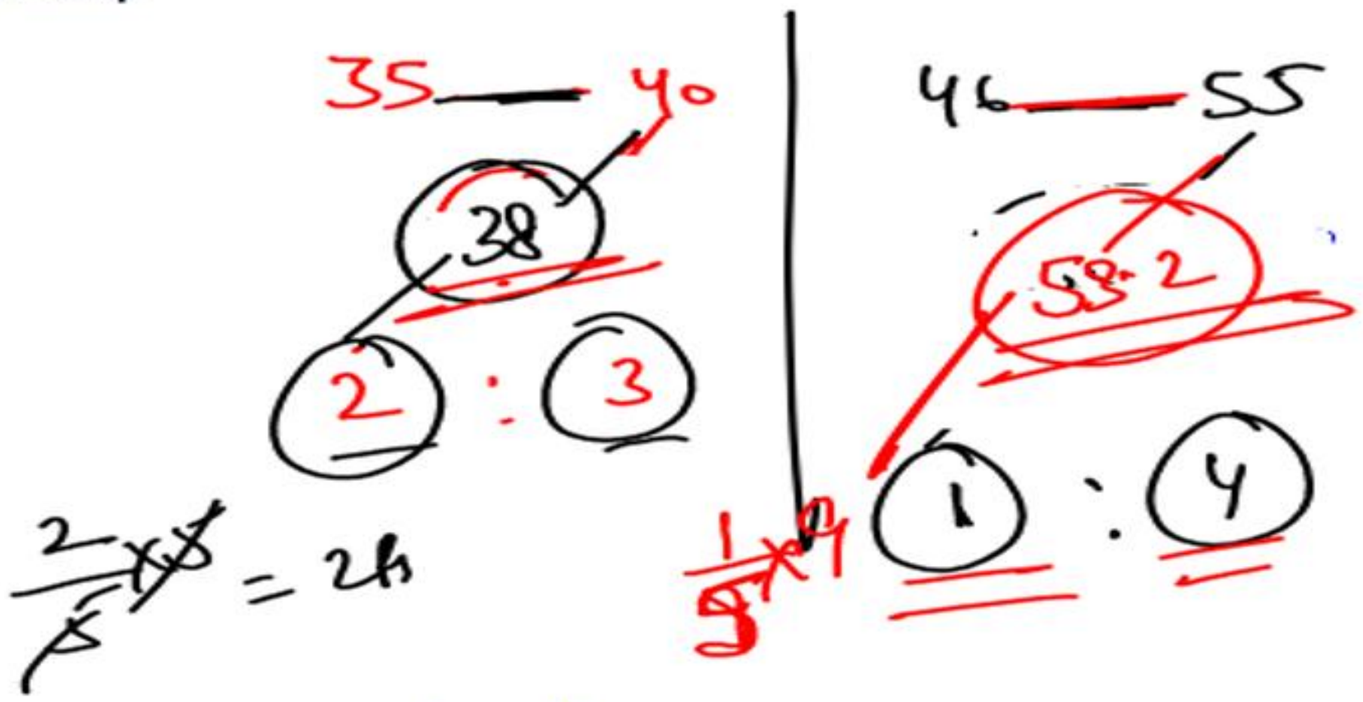

Q. Two blends of a commodity costing Rs. 35 and Rs. 40 per kg respectively are mixed in the ratio 2:3 by weight. If one-fifth of the mixture is sold at Rs. 46 per kg and the remaining at the rate Rs. 55 per kg, the profit percent is.

(a) 50 (b) 20

(c) 40 (d) 30

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Ans. (c)

II^nd Approach

35 Rs/kg 40 Rs/kg

2kg : 3kg

CP = 35·2 + 40·3 = 190 Rs

SP = 1 × 76 + 4 × 55 = 266 Rs

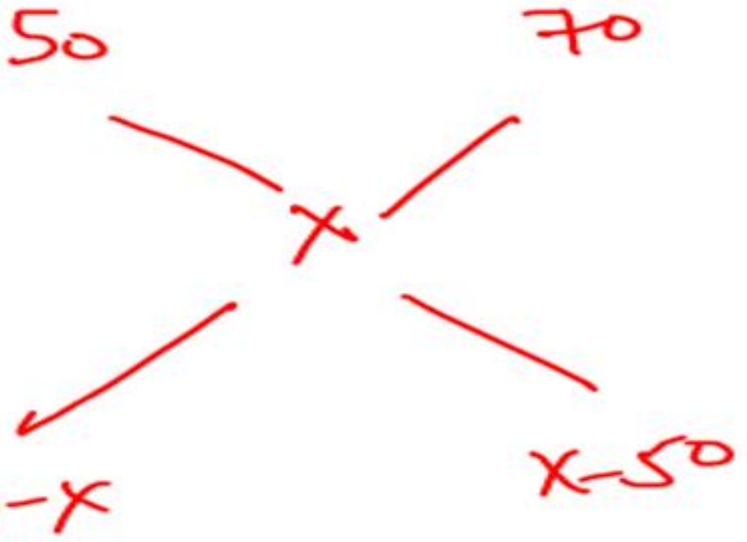
$\frac{76}{190} \times 100$

40%

??

2 : 3

I^st Detailed App



$\frac{70-X}{X-50} = \frac{2}{3}$

$210 - 3X = 2X - 100$

$X = 62$

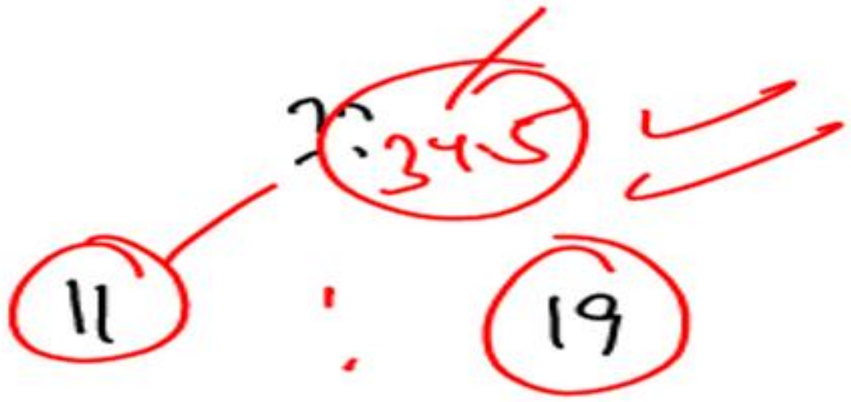
II^nd

Diff → 20

$\frac{2}{5} \times 20 = 8$

50 62 70

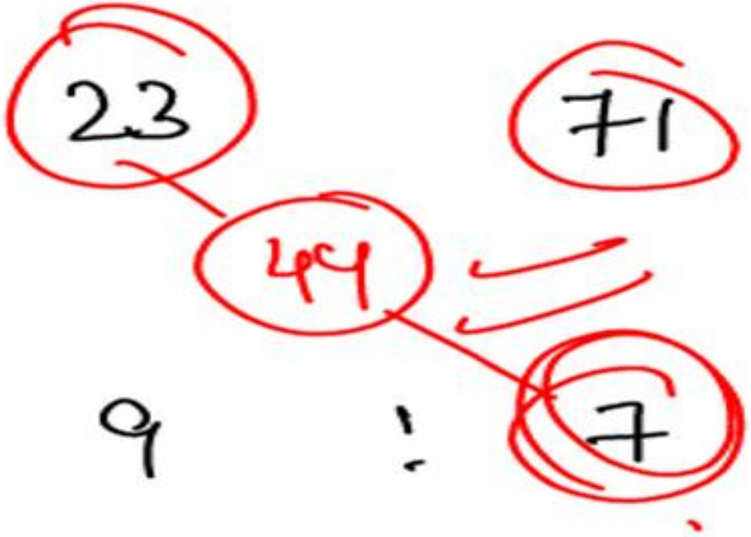
Q 25 40



Gap → 15

$\frac{11}{30} \times 15 = 5.5$

Q



Gap = 48

$\frac{7}{16} \times 48^{3} = 21$