Chapter - 5

Mixture and Alligation

Foundation

Solutions

1. (b); In the mixture quantity of milk are $\frac{7}{12} \times 60 = 35$ L

In mixture quantity of water are $\frac{5}{12} \times 60 = 25$ litre

Quantity of water is added by = 35 – 25 = 10 L.

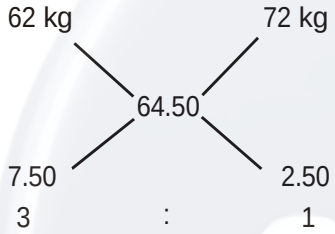
2. (a); Quantity of milk & water be $\left(\frac{30}{15} \times 8\right), \left(\frac{30}{15} \times 7\right)$

Milk = 16 Litre, Water = 14 Litre

Let x litre water be added

$\frac{16}{14+x} = \frac{4}{5} \Rightarrow 56 + 4x = 80 \Rightarrow x = 6$

3. (c); By mixture Alligation method:



4. (b); Quantity of water in a mixture of 60 litre is

$= \frac{20}{100} \times 60 = 12$ litre

quantity of milk = 60 lt. – 12 lt. = 48 lt.

In new mixture Water = 25%, Milk = 75%

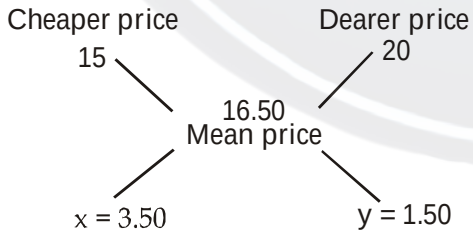
Let total quatity of new mixture be x litre

$x \times \frac{75}{100} = 48 \Rightarrow x = 64$

So, quantity of water = 64 – 48 = 16 litre

So, 4 ltr. water must be added

5. (c); By the rule of alligation:



∴ Required Ratio = 3.50 : 1.50 = 70 : 30 = 7 : 3

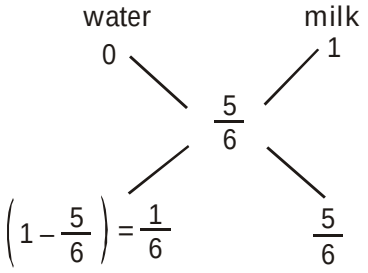
6. (b); Let CP of milk be 1 per litre.

Then SP of 1 litre of mixture = 1 Rs.

Gain obtained = 20%

CP of 1 litre of mixture $= \frac{100}{120} \times 1 = \frac{5}{6}$

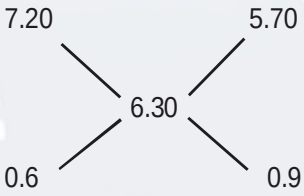
By the rule of alligation, we have



∴ Ratio of water and milk $= \frac{1}{6} : \frac{5}{6} = 1 : 5$

Required percentage $= \frac{1}{6} \times 100\% = 16.66\%$

7. (b); By the rule of alligation



Required Ratio = 6 : 9 = 2 : 3

8. (b); The recquired ratio will be same as the ratio of amount of their investment.

∴ Required Ratio = 45000 : 30000 = 3 : 2

9. (a); By the rule of alligation

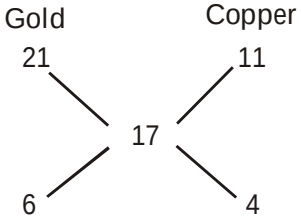
∴ Required ratio = 1 : 0.50 = 2 : 1

10. (c); Quantity of sugar in solution = 240 gram

Let quantity added = x gram

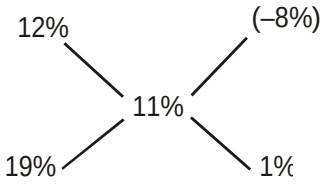
$\therefore \frac{240+x}{360} = \frac{1}{1} \Rightarrow x = 120$ grams

11. (d); By the rule of alligation



Required ratio = 6 : 4 = 3 : 2

12. (b);



$$\frac{\text{books sold at 12\% profit}}{\text{books sold at 8\% loss}} = \frac{19}{1}$$

$\therefore$ Required quantity of Book $= \frac{19}{20} \times 100$

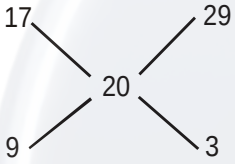
$= 19 \times 5 = 95$

13. (b); $\text{Milk} = \frac{5}{7} + \frac{4}{7} + \frac{3}{4} = \frac{20+16+21}{28} = \frac{57}{28}$

$\text{Water} = \frac{2}{7} + \frac{3}{7} + \frac{1}{4} = \frac{8+12+7}{28} = \frac{27}{28}$

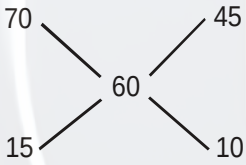
$\text{milk : water} = \frac{57}{28} : \frac{27}{28} = 57 : 27 = 19 : 9$

14. (d);



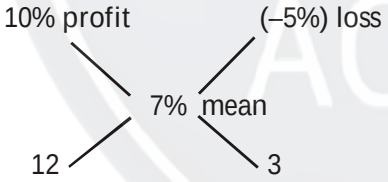
$\therefore$ Required proportion $= 9 : 3 = 3 : 1$

15. (d);



Required ratio $= 15 : 10 = 3 : 2$

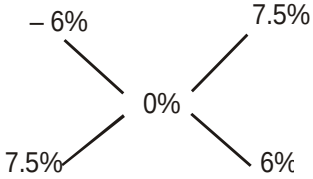
16. (b);



$$\frac{\text{quantity of rice sells at 10\% profit}}{\text{quantity of rice sells at 5\% loss}} = \frac{12}{3} = \frac{4}{1}$$

$\therefore$ Required quantity $= \frac{4}{5} \times 50 = 40$ kg.

17. (c);



$\therefore$ Ratio $= 7.5 : 6 = 75 : 60 = 5 : 4$

$\therefore$ 2nd cow cost $= \frac{4}{9} \times 2700 = \text{Rs. } 1200$

18. (d); Let Nutan invested x Rs.

$\therefore$ Sonal's contribution $= 5000 + x$

$\therefore$ Aditya's contribution $= 9000 + x$

$\therefore x + (5000 + x) + (9000 + x) = 50000$

$3x + 14000 = 50000$

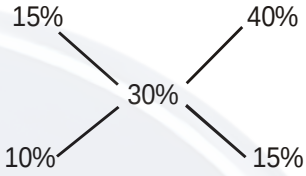
$3x = 36000 \Rightarrow x = 12000$

$\therefore$ Ratio $= 21000 : 17000 : 12000 = 21 : 17 : 12$

Amount that Aditya receive $= \frac{21}{50} \times 70000$

$= 21 \times 1400 = 29400$

19. (a);



$\therefore$ Required ratio $= 10 : 15 = 2 : 3$

20. (a); CP of 30 kgs $= 30 \times 9.50 = 285$

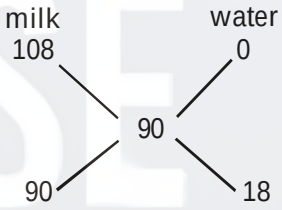
CP of 40 kgs $= 40 \times 8.50 = 340$

Total CP of 70 kgs $= 285 + 340 = 625$

SP of 70 kgs $= 70 \times 8.90 = 623$

$\therefore$ Loss $= 625 - 623 = \text{Rs. } 2$

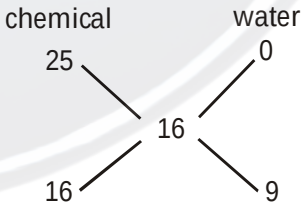
21. (d); The mean value is 90 paisa and the price of water is zero paisa



Ratio of milk and water $= 5 : 1$

Quantity of milk in the mixture $= 16 \times 5 = 80$ ltr.

22. (b); CP of mixture $= \frac{100}{(100+25)} \times 20 = \frac{100}{125} \times 20 = 16$



$\therefore$ Required ratio $= 16 : 9$

23. (c); Quantity of milk in the mixture

$= \frac{90}{100} \times 40 = 36$ ltr.

Quantity of water in the mixture

$= \frac{10}{100} \times 40 = 4$ ltr.

Let x ltr. of water be added

$\frac{36}{4+x}=\frac{80}{20} \Rightarrow (36) = 4\,(4 + x)$

$36 = 16 + 4x \Rightarrow 4x = 20 \Rightarrow x = 5$ ltr.

24. (b); Quantity of zinc in metal 1st $=\frac{1}{3}\times 2=\frac{2}{3}$

Quantity of copper in metal 1st $=\frac{2}{3}\times 2=\frac{4}{3}$

Quantity of zinc in mixture $=\frac{2}{3}+\frac{3}{4}=\frac{8+9}{12}=\frac{17}{12}$

Quantity of copper in mixture $=\frac{2}{3}\times 2+\frac{3}{4}\times 3$

$=\frac{4}{3}+\frac{9}{4}=\frac{16+27}{12}=\frac{43}{12}$

$\therefore$ Required ratio $=\frac{17}{12}:\frac{43}{12}=17:43$

25. (b); Let quantity of gold to be mixed = x g

$\frac{\frac{80}{100}\times 50+x}{\frac{20}{100}\times 50}=\frac{95}{5} \Rightarrow \frac{40+x}{10}=\frac{19}{1}$

$40 + x = 190 \Rightarrow x = 150$ g

26. (c); Let, 5–paise coin = x, 10–paise coin = y

$x + y = 80$ ...(i)

$\frac{5}{100}\times x+\frac{10}{100}\times y=6.40 \Rightarrow \frac{x}{20}+\frac{y}{10}=6.40$

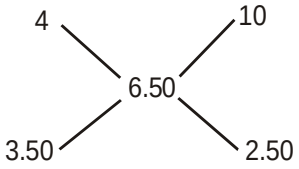
$\frac{x+2y}{20}=6.40 \Rightarrow x + 2y = 128$ ... (ii)

From (i) and (ii)

$x + y – x – 2y = 80 – 128$

$– y = – 48 \Rightarrow y = 48 \Rightarrow x = 80 – 48 = 32$

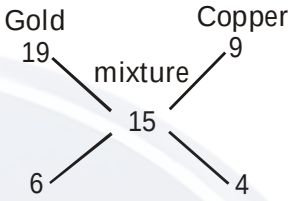
27. (d); By the rule of alligation



$\therefore$ Ratio of tea = 7 : 5

$\therefore$ Required quantity = 7 × 3 = 21 kg.

28. (b); By the rule of alligation



Required ratio = 6 : 4 = 3 : 2

29. (d); By alligation formula:

Quantity of milk left after 2 operations

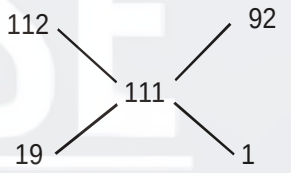
$=x\left(1-\frac{y}{x}\right)^2=81\left(1-\frac{27}{81}\right)^2=81\times\frac{2}{3}\times\frac{2}{3}$

= 4 × 9 = 36 ltr.

and water quantity in mixture = 81 – 36 = 45 ltr.

recquired ratio = 36 : 45 = 4 : 5

30. (d); profit loss



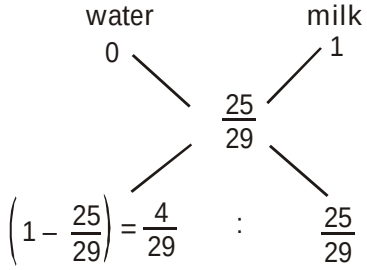
no. of pens were sold at 12% profit $=\frac{19}{20}\times 60=57$

Moderate

1. (b); Let cost price of 1 litre of milk = Rs. 1

SP of 1 litre of mixture = Rs. 1; Gain = 16%

CP of 1 litre of mixture $=\left(\frac{100}{100+16}\right)\times 1=\frac{25}{29}$

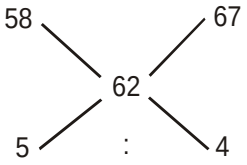


Recquired ratio $=\frac{4}{29}:\frac{25}{29}=4:25$

Shortcut:

Ratio = Profit% : 100 = 16 : 100 = 4 : 25

2. (d); CP of mixture $=\frac{100}{110}\times 68.20=62$



Required ratio = 5 : 4

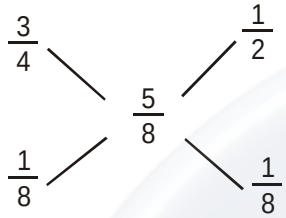
3. (b); Let cost of 1 litre of milk be Rs. 1

Milk in 1 litre mix in lst can $= \frac{3}{4}$

Milk in 1 litre mix in 2nd can $= \frac{1}{2}$

Milk in 1 litre of mix solution $= \frac{5}{8}$

Mean price $= \frac{5}{8}$

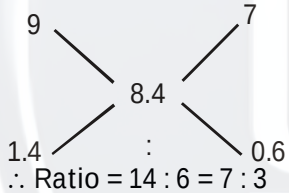


Ratio $= \frac{1}{8} : \frac{1}{8} = 1 : 1$

quantity of milk from each can $= \frac{1}{2} \times 12 = 6$ litre

4. (d); CP of mixture $= \frac{100}{110} \times 9.24 = \frac{42}{5} = 8.4$

(By rule of alligation)



∴ Ratio = 14 : 6 = 7 : 3

Quantity to be added = 9 × 7 = 63 kg.

5. (d); By rule:

Quantity of milk $= x\left(1 - \frac{y}{x}\right)^n$

$= 50\left(1 - \frac{5}{40}\right)^3 = 50\left(\frac{9}{10}\right)^3 = \frac{50 \times 9 \times 9 \times 9}{10 \times 10 \times 10}$

= 36.45 litres

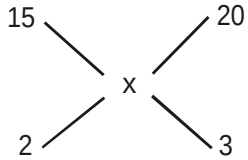
6. (d); Let quantity to be added = x litre

$\therefore \frac{9 + x}{21} = \frac{2}{1} \Rightarrow 9 + x = 42 \Rightarrow x = 42 - 9$

x = 33 litre

7. (a); Let the price per kg of the mixture = x

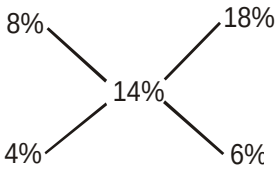
∴ By the rule of Alligation



$\therefore \frac{x - 15}{20 - x} = \frac{3}{2} \Rightarrow 2x - 30 = 60 - 3x$

$5x = 90 \Rightarrow x = 18$

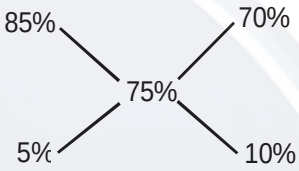
8. (c); By the rule of alligation



∴ ratio = 4 : 6 = 2 : 3

recquired quantity $= \frac{3}{5} \times 1000 = 600$ kg

9. (c); By the rule of alligation



∴ ratio of boys and girls = 1 : 2

∴ no. of girls passed $= \frac{2}{3} \times 900 = 2 \times 300 = 600$

10. (d); Quantity of salt in 400 gm of salt solution

$= \frac{40}{100} \times 400 = 160$ gm

Let quantity added = x

$\therefore \frac{160 + x}{(400 - 160)} = \frac{1}{1} \Rightarrow 160 + x = 240 \Rightarrow x = 80$

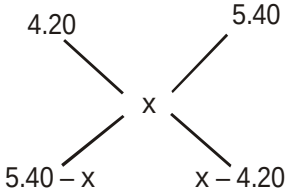
11. (d); Let price per dozen of the mixture = x

∴ By the rule of alligation

$\therefore \frac{12 - x}{x - 10} = \frac{5}{3} \Rightarrow 36 - 3x = 5x - 50 \Rightarrow 8x = 86$

x = 10.75

12. (a); Let mean price = x



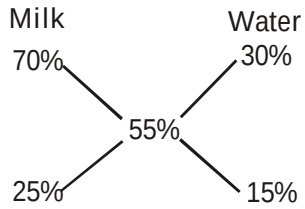
$\frac{x - 4.2}{5.4 - x} = \frac{5}{3} \Rightarrow 8x = 39.60 \Rightarrow x = 4.95$

13. (b); Let quantity to be added = x

$\therefore \frac{43.2}{4.8+x}=\frac{80}{20}$

$86.4 = 38.4 + 8x \Rightarrow 8x = 48 \Rightarrow x = 6$

14. (b); By the rule of alligation



ratio = 25 : 15 = 5 : 3

$\therefore$ Quantity of milk $=\frac{5}{8}\times 160 = 100$ ltr.

and, Quantity of water $=\frac{3}{8}\times 160 = 60$ ltr.

15. (c); Let amount of water to be added = x

$\therefore \frac{72}{8+x}=\frac{80}{20} \Rightarrow 72 = 32 + 4x$

$4x = 40 \Rightarrow x = 10$

16. (d); Let initially the amount of liquid P in the tub = 4x
initially the amount of liquid Q in the tub = x

$\therefore \frac{4x-\frac{4}{5}\times 10}{x-\frac{1}{5}\times 10+10}=\frac{2}{3} \Rightarrow \frac{4x-8}{x-2+10}=\frac{2}{3}$

$12x - 24 = 2x + 16 \Rightarrow 10x = 40 \Rightarrow x = 4$

$\therefore$ Quantity of liquid P = 4 × 4 = 16 litre

17. (d); Qantity of milk in new mixture-

$= x\left(1-\frac{y}{x}\right)^{x} = 27\left(1-\frac{9}{27}\right)^{2} = 27\times\frac{2}{3}\times\frac{2}{3} = 12$ litre.

Quantity of water in new mixture
= 27 – 12 = 15 litre
Required Ratio = 12 : 15 = 4 : 5

18. (d); Share in profit $=\frac{495}{1020-495}=\frac{495}{525}=\frac{33}{35}$

Let Aditya invested his money for x month then Manish will invest (36 – x).

$\therefore \frac{300\times x}{500(36-x)}=\frac{33}{35} \Rightarrow \frac{x}{36-x}=\frac{11}{7} \Rightarrow x = 22$

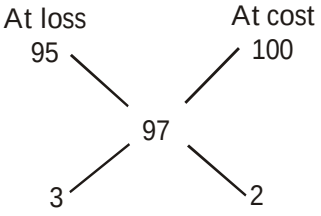
19. (c); Let Initial quantity of A and B = 4x and x

$\therefore \frac{3x-\frac{3}{5}\times 5}{2x-\frac{2}{5}\times 5+5}=\frac{2}{3} \Rightarrow \frac{3x-3}{2x+3}=\frac{2}{3}$

$9x - 9 = 4x + 6 \Rightarrow 5x = 15 \Rightarrow x = 3$

$\therefore$ quantity of A initially = 3 × 3 = 9 litres.

20. (c);



$\therefore$ Ratio = $\frac{3}{2}$

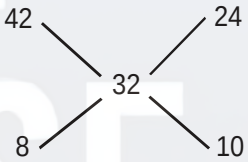
Quantity sold at cost price = $\frac{2}{5}\times 40 = 16$kg.

21. (c); Let amount of water to be added = x

$\therefore \frac{50}{25+x}=\frac{1}{2} \Rightarrow 100 = 25 + x \Rightarrow x = 75$ ltr.

22. (a); CP of the mixture $=\frac{100}{125}\times 40 = \frac{4}{5}\times 40 = 32$

By the rule of alligation



ratio of salts = 4 : 5
$\therefore$ required quantity = 5 × 4 = 20

23. (c); Let sugar to be added = x

$\therefore \frac{120+x}{180}=\frac{1}{1} \Rightarrow x = 60$

24. (d); When mix 40 litres of water with 100 litres of milk.
$\therefore$ Required proportion = 40 : 100 = 2 : 5

$\therefore$ % water = $\frac{2}{2+5}\times 100 = 28.56\%$

25. (c); Water in 200 litre mixture = $\frac{15}{100}\times 200 = 30$ L

milk in 200 litre mixture = (200 – 30) = 170 litre

$170 + x = \frac{875}{100\times 10}\times(200+x)$

$170 + x = \frac{7}{8}(200+x) \Rightarrow 1360 + 8x = 1400 + 7x$

x = 40 litre

26. (b); Let no. of rabbits = x, no. of pigeons = y

$\therefore$ x + y = 200 ... (i)

4x + 2y = 580 ... (ii)

equation (i) × (ii) – equation (ii)

$2x + 2y = 400$

$\underline{4x + 2y = 580}$

$-2x = -180$

$x = 90 \Rightarrow y = 110.$

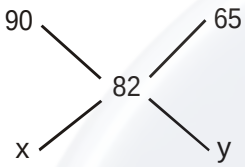
27. (b); Let x be the quantity to added; $\frac{55}{11+x} = \frac{5}{3}$

$165 = 55 + 5x \Rightarrow 5x = 110 \Rightarrow x = 22$

28. (b); average sum $= \frac{4100}{50} = 82$ paisa

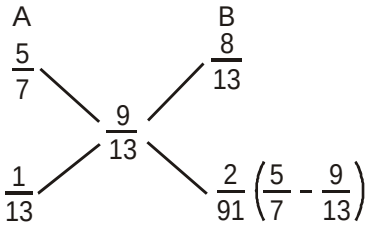
Let no. of boy = x, no. of girls = y

By the rule of alligation



$\therefore \frac{x}{y} = \frac{17}{8} \Rightarrow$ no. of boys $= \frac{17}{25} \times 50 = 34$

29. (a);



Required Ratio $= \frac{1}{13} : \frac{2}{91} = 7 : 2$

30. (b); Let no. of coins of 1 rupee = 3x

no. of coins of 50 paisa = 8x

no. of coins of 25 paisa = 20x

$\therefore 3x + \frac{8x}{2} + \frac{20x}{4} = 372 \Rightarrow 3x + 4x + 5x = 372$

$12x = 372 \Rightarrow x = 31$

$\therefore$ Total no. of coins = 31 × 31 = 961

Preparation Tips and Strategy