EXERCISE 1

1. (a) Given, \( \frac{3}{21} \times \frac{x}{35} \Rightarrow x = \frac{3 \times 35}{21} = 5 \)

2. (c) Let the numbers be 5x and 4x.
   
   \[
   \text{Now, difference of numbers} = 10 \\
   \text{i.e.} \ 5x - 4x = 10 \Rightarrow x = 10 \\
   \therefore \ \text{Larger number} = 10 \times 5 = 50
   \]

3. (d) Suppose the first number is x and the second number y:
   
   Therefore, 40% of x = \( \frac{2}{3} \) of y
   
   \[ \therefore \ \frac{x}{y} = \frac{2 \times 100}{3 \times 40} = \frac{5}{3} \]

4. (a) Let the salaries of A and B be 9x and 4x.
   
   \[
   9x \times \frac{115}{100} = 5175 \\
   \therefore \ x = 500 \\
   \therefore \ \text{salary of } B = 500 \times 4 = \text{Rs}2000
   \]

5. (a) Reqd ratio 5 : 140 : 7 : 150 : 8 : 175
   
   \[
   = 5 \times 140 : 7 \times 150 : 8 \times 175 = 2 : 3 : 4
   \]

6. (d) Total number of students in the school = 819
   
   Number of girls = 364
   
   \[
   \therefore \ \text{Number of boys} = 819 - 364 = 455 \\
   \therefore \ \text{Required ratio} = 435 : 364 = 5 : 4
   \]

7. (d) Share of Urmila in dividend
   
   \[
   = \left( \frac{2}{6} \times 57834 \right) = \text{Rs}19278
   \]

8. (c) Let the present ages of Sushama and Karishma be 6x and 7x respectively.
   
   \[
   6x + 8 = 8 \\
   \text{or} \ 56x + 64 = 54x + 72 \\
   \therefore \ x = \frac{8}{2} = 4
   \]
   
   \[
   \text{Required ratio} = \frac{6 \times 4 + 12}{7 \times 4 + 12} = \frac{36}{40} = 9 : 10
   \]

9. (e) Let the number of girls = x
   
   \[
   \therefore \ \text{Number of boys} = 1.16 \times x
   \]

10. (d) According to the question,
    
    \[
    \frac{A}{B} = \frac{4}{7} \quad \text{... (i)}
    \]
    
    \[
    \text{and} \ \frac{A \left(1 + \frac{50}{100}\right)}{B \left(1 - \frac{25}{100}\right)} = \frac{8}{7} \quad \text{... (ii)}
    \]
    
    From equations (i) and (ii), we cannot find the earning of A and B.

11. (d) Ratio of the amounts received by A, B and C = 7 : 8 : 6
    
    \[
    \therefore \ \text{Sum of the ratios} = 7 + 8 + 6 = 21
    \]
    
    \[
    \text{Sum received by} \ \text{Pinku} = \frac{7}{21} \times 4200 = \text{Rs}1400
    \]
    
    \[
    \text{Rinku} = \frac{8}{21} \times 4200 = \text{Rs}1600
    \]
    
    \[
    \text{Tinku} = \frac{6}{21} \times 4200 = \text{Rs}1200
    \]
    
    According to the question,
    
    On adding Rs200 to the share of each one, the required ratio
    
    \[
    = 1600 : 1800 : 1400 = 8 : 9 : 7
    \]

12. (c) Total number of students = 1495
    
    \[
    \therefore \ \text{Number of boys} = 3250 - 1495 = 1755 \\
    \therefore \ \text{Required ratio} = 1755 : 1495 = 27 : 23
    \]

13. (e) Ratio of the capital of Rinku and Pooja
    
    \[
    = \frac{5100}{6600} = \frac{17}{22}
    \]
    
    \[
    \therefore \ \text{Rinku's share} = \frac{2730 \times 17}{17 + 22} = \text{Rs}1190
    \]

14. (b) Let the present ages of Richa and Shelly be 5x and 8x years.
    
    According to the question,
    
    After 10 years,
    
    \[
    \frac{5x + 10}{8x + 10} = \frac{7}{10} \\
    \text{or,} \ 56x + 70 = 50x + 100 \\
    \text{or,} \ 56x - 50x = 100 - 70 \\
    \text{or,} \ 6x = 30
    \]
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RATIO AND PROPORTION

\[ \text{If } \frac{x}{y} = \frac{5}{7}, \text{ then } x = \frac{5y}{7} \]

15. (d) The sum of money is not known.

16. (a) Let the age of woman be 2x years and that of her daughter be x years.

According to the question,

\[ 2x + x = 2 \times 42 \]

or, \[ 3x = 84 \]

or, \[ x = \frac{84}{3} = 28 \]

\[ \therefore \text{ Daughter's age = 28 years} \]

17. (c) Let the number of girls be = x

\[ \therefore \text{ Number of the boys = } \frac{115x}{100} \]

\[ \therefore \text{ Required ratio } = \frac{115x}{100} \cdot x = 23 : 20 \]

18. (a) Let the present ages of Smita and Kavita be 3x and 8x years respectively

According to questions,

\[ \frac{3x + 7}{8x + 7} = \frac{4}{9} \]

or, \[ 32x + 28 = 27x + 63 \]

or, \[ 32x - 27x = 63 - 28 \]

or, 5x = 35

or, \[ x = \frac{35}{5} = 7 \]

\[ \therefore \text{ Kavita's present age = 8x} \]

\[ = 8 \times 7 = 56 \text{ years} \]

19. (a) Let the ages of man and his son be 5x and 3x respectively.

\[ \therefore 5x + 3x = 2 \times 48 \]

\[ \Rightarrow 8x = 96 \]

\[ \Rightarrow x = \frac{96}{8} = 12 \]

\[ \therefore \text{ Son's age } = 12 \times 3 = 36 \text{ years} \]

20. (d) Difference in age

\[ = \frac{9 \times 6 - 5 \times 9}{6 \times 8 - 9 \times 5} \]

\[ = \frac{9 \times 11}{3} = 3 \text{ years} \]

21. (e) Let Arun’s present age be x years.

Then, Deepak’s present age = (x + 14) years

\[ \Rightarrow \frac{x}{7} = \frac{5}{7} \]

\[ \Rightarrow x = \frac{5 \times 7}{7} \]

\[ \Rightarrow x = 5 \times 7 \]

\[ \therefore \text{ Deepak’s present age} \]

\[ = 42 + 14 = 56 \text{ years} \]

22. (d) Data is given in ratio. So age can’t be determined.

23. (a) Let number of students in Arts and Commerce were 4x and 5x respectively.

Then,

\[ \frac{4x}{5x + 65} = \frac{8}{11} \]

\[ \Rightarrow 44x - 40x = 520 \]

\[ \Rightarrow x = \frac{520}{4} = 130 \]

\[ \therefore \text{ Number of students in Arts} \]

\[ = 4 \times 130 \]

\[ = 520 \]

24. (d) Ratio of capital

\[ = \frac{50000 \times 12}{80000 \times 6} \]

\[ = 5 : 4 \]

\[ \therefore \text{ Sarita’s share } = \frac{18000 \times 5}{(5 + 4)} \]

\[ = \text{ Rs. 10000} \]

25. (c) Let the original number of boys and girls be 6x and 5x respectively.

Then,

\[ \frac{6x}{5x} = \frac{8}{11} \]

\[ \Rightarrow \frac{55x}{42x} = \frac{56}{22} \]

\[ \Rightarrow x = \frac{78}{13} \]

\[ \therefore \text{ Number of boys} \]

\[ = 6 \times 13 = 44 \]

26. (a) Let the present ages of P and Q be 3x and 4x respectively.

Then,

\[ (4x + 4) - (3x + 4) = 5 \]

\[ \Rightarrow 4x - 3x = 5 \]

\[ \Rightarrow x = 5 \]

\[ \therefore \text{ P’s present age} \]

\[ = 3 \times 5 = 15 \text{ yrs.} \]

27. (a) Present age of Meena

\[ = \frac{8 \times 8 \times (10 - 3)}{24 - 10} \]

\[ = \frac{8 \times 8 \times 7}{14} = 32 \text{ years} \]

28. (b) Ratio of the salaries of Sumit and Rajan
Rajan's salary = \( \frac{5}{9} \times 36000 = \text{Rs} \ 20000 \)

29. (a) \( \frac{189}{84} \)?

or \( \frac{?^2}{?} = 84 \times 189 \)

or \( \frac{?^2}{?} = 21 \times 4 \times 21 \times 9 \)

or \( \frac{?^2}{?} = 21^2 \times 2^2 \times 3^2 \)

\( \therefore \) \( ? = 21 \times 2 \times 3 = 126 \)

(b) Let the present age of father and son be 17x and 7x respectively.

Then, \( 17x - 6 = \frac{3}{7x - 6} \times 1 \)

\( \Rightarrow 21x - 17x = 18 - 6 \)

\( \Rightarrow x = 12 \div 4 = 3 \)

\( \therefore \) Father’s present age = 17 \times 3 = 51 years.

30. (c) Required amount

\( = \frac{2580 \times (3 + 10)}{9 - 4} \)

\( = \frac{2580 \times 13}{5} = \text{Rs} \ 6708 \)

31. (d) Smallest angle

\( = (13 + 12) \times \frac{20}{100} = 5 \)

\( \therefore \) Ratio of angles = 13 : 12 : 5

\( \therefore \) Sum of smallest and second largest angles

\( = \frac{180 \times (12 + 5)}{13 + 12 + 5} \)

\( = \frac{180 \times 17}{30} = 102^\circ \)

32. (a) Required number of gold coins

\( = \frac{950 - (25 + 15 + 30)}{29 + 73 + 83} \times 73 + 15 \)

\( = 365 + 15 \)

\( = 380 \)

33. (b) Let the present ages be 4x and 5x respectively.

Then, \( \frac{4x + 6}{5x + 6} = \frac{6}{7} \)

\( \Rightarrow 30x - 28x = 42 - 36 \)

\( \Rightarrow x = \frac{6}{2} = 3 \)

\( \therefore \) Difference in age = 5x – 4x

34. (d) Smallest angle

\( = \frac{20}{100} \times (1 + \frac{r}{100})^2 \)

\( \Rightarrow \frac{6}{5} \Rightarrow \left( \frac{1 + \frac{r}{100}}{\frac{p}{p+r}} \right) = \frac{6}{5} \Rightarrow r = 20\% \)

35. (b) Let the fourth proportional to 5, 8, 15 be x.

Then, \( 5 : 8 : 15 : x \Rightarrow 5x = (8 \times 15) \Rightarrow x = \frac{(8 \times 15)}{5} = 24. \)

36. (b) \( x \times 5 = (0.75 \times 8) \Rightarrow x = \frac{6}{5} = 1.20. \)

37. (d) Given the ratio \( = \frac{1}{2} : \frac{2}{3} : \frac{3}{4} \)

\( \therefore 1 \text{st part} = \text{Rs} \left( \frac{782 \times 6}{23} \right) = \text{Rs} \ 204. \)

38. (d) Number of nurses = \( \frac{7}{12} \times 240 = 140 \)

**EXERCISE 2**

1. (c) Suppose the salaries of A, B and C were 300k, 500k and 700k respectively.

After increment salary of

A = 300k + 50% of 300k = 450k

B = 500k + 60% of 500k = 800k

C = 700k + 50% of 700k = 1050k

Hence, new ratio of the respective salaries of A, B and C = 450k : 800k : 1050k = 9 : 16 : 21

2. (b) Let, weight of sugar costing \( \text{Rs} \ 5.75 \) per kg = \( x \) kg

\( x \times 5.75 + 75 \times 4.50 = 5.50 \times (x + 75) \)

\( \Rightarrow 5.75x + 337.50 = 5.50x + 412.50 \)

\( \Rightarrow 0.25x = 75 \)

\( \therefore x = 300 \) kg

3. (c) Ratio of the amount is

\[ \frac{p\left(1+\frac{r}{100}\right)^2}{p+\frac{pr}{100}} \]

\[ \Rightarrow \frac{6}{5} \Rightarrow \left(1+\frac{r}{100}\right) = \frac{6}{5} \Rightarrow r = 20\% \]

4. (d) All the given options are wrong.

Let the passengers in A.C. Sleeper Class, 1st Class and Sleeper Class be \( x, 2x \) and \( 3x \) respectively and the fares in these classes be 5y, 4y and 2y respectively.

Hence the incomes from these classes are 5xy, 8xy, 6xy respectively.

Required income = \( \frac{5}{19} \times 54000 = \text{Rs} \ 14210 \)
5. (d) The number of police involved: \( \frac{3}{5} \) of 135 = 81

Required number of supporters = 81 - 9 = 72

6. (b) Let actual distance be x km. Then,

\[ \frac{3}{4} : 1 :: 60 : x \]

\( \implies \frac{3}{4} \times x = 60 \implies x = \frac{240}{3} = 80 \text{ km} \)

7. (c) Number of girls = \( \frac{5}{2+5} \times 350 = 250 \)

8. (b) 18 carat gold

\[ = \frac{3}{4} \times 24 = 18 \text{ carat gold} \]

20 carat gold

\[ = \frac{5}{6} \times 24 = 20 \text{ carat gold} \]

Required ratio = 18 : 20 = 9 : 10

9. (b) Let the no. of one rupee, 50 paise and 25 paise coins be 2x, 3x and 4x respectively. According to question,

\[ 3x + 4x + 8x = 216 \implies 8x + 6x + 4x = 216 \]

\( \implies x = 48 \)

\( \therefore \) Number of 50 paise coins = 48 \times 3 = 144

10. (d) Let A = 2x, B = 3x and C = 4x. Then,

\[ \frac{A}{B} = \frac{2x}{3x} = \frac{2}{3}, \quad \frac{B}{C} = \frac{3x}{4x} = \frac{3}{4}, \quad \text{and} \quad \frac{C}{A} = \frac{4x}{2x} = 2 \]

\( \therefore \) \( \frac{A}{B} : \frac{B}{C} : \frac{C}{A} = \frac{2}{3} : \frac{3}{4} : 2 \)

11. (c) Let the shares of A, B, C and D be \( \text{₹} 5x, \text{₹} 2x, \text{₹} 4x \) and \( \text{₹} 3x \) respectively. Then, \( 4x - 3x = 1000 \implies x = 1000 \)

\( \therefore \) B’s Share = \( \text{₹} 2x = \text{₹} 2000 \)

12. (c) Let A = 2k, B = 3k and C = 5k.

A’s new salary = \( \frac{115}{100} \text{ of } 2k = \left( \frac{115}{100} \times 2k \right) = \frac{23}{10} k \)

B’s new salary = \( \frac{110}{100} \text{ of } 3k = \left( \frac{110}{100} \times 3k \right) = \frac{33}{10} k \)

C’s new salary = \( \frac{120}{100} \text{ of } 5k = \left( \frac{120}{100} \times 5k \right) = 6k \)

\( \therefore \) New ratio = \( \frac{23k}{10} : \frac{33k}{10} : 6k = 23 : 33 : 60 \)

13. (d) Let number of passengers = x, 2x, 7x and Rate = 5y, 4y, 2y

Now, since income = Rate \times \text{Number of passengers}

\( \therefore \) Income of passengers = 5xy, 8xy, 14xy

\( \therefore \) Income in ratio = 5 : 8 : 14

\( \therefore \) Income from A.C. sleeper class

\[ = \frac{5}{5+8+14} \times 54,000 \]

\[ = \text{₹} 10,000 \]

14. (a) Let the ratio be \( x : (x + 40) \). Then,

\[ \frac{x}{(x + 40)} = \frac{2}{7} \implies 7x = 2x + 80 \implies x = 16. \]

\( \therefore \) Required ratio = 16 : 56.

15. (c) Total age of 3 boys = (25 \times 3) years = 75 years

Ratio of their ages = 3 : 5 : 7.

Age of the youngest boy = \( \left( 75 \times \frac{3}{15} \right) \) years = 15 years

16. (c) Let enlarged breadth be x inches. Then,

\[ \frac{5}{2} : \frac{15}{8} :: : x \]

\[ \implies \frac{5}{2} x = 4 \times \frac{15}{8} \implies x = 3 \text{ inches} \]

17. (c) Originally, let the number of boys and girls in the college be 7x and 8x respectively. Their increased number is (120% of 7x) and (110% of 8x)

\[ i.e., \left( \frac{120}{100} \times 7x \right) \text{ and } \left( \frac{110}{100} \times 8x \right) \]

\[ i.e., \frac{42x}{5} \text{ and } \frac{44x}{5} \]

\( \therefore \) Required ratio = \( \frac{42x}{5} : \frac{44x}{5} = 21 : 22 \)

18. (c) Quantity of milk = \( \frac{45}{5} = 9 \) litres

Quantity of water = \( \frac{45 \times 1}{5} = 9 \) litres

Let x litres of water be added.

Then, \( \frac{36}{9+x} = \frac{3}{2} \)

\( \implies 72 = 27 + 3x \text{ or } 3x = 45 \)

or \( x = 15 \) litres

19. (e) Let number be divided in ratio \( x : y \). Then

First part \( \frac{x}{x} \), second part \( \frac{y}{y} \)
20. (c) For 9 kg zinc, mixture melted = (9 + 11) kg.
   For 28.8 kg zinc, mixture melted = \( \frac{20}{9} \times 28.8 \) kg = 64 kg.

21. (b) Let there be x men at the beginning.
   Less men, More days (Indirect Proportion)
   \[
   \frac{\text{Men}}{x} : \frac{\text{Men}}{x-6} \propto \frac{\text{Days}}{15} : \frac{\text{Days}}{9}
   \]
   \[\therefore 15 : 9 :: (x-6) : x \Rightarrow 15(x-6) = 9x \]
   \[\Rightarrow 6x = 90 \Rightarrow x = 15 \]

22. (b) Let A’s share = \( \text{Rs} \) 2x, B’s share = \( \text{Rs} \) 3x and C’s share = \( \text{Rs} \) 7x
   Now, \( 7x \times (2x \times 3x) = 1500 \times x = 750 \)
   \[\therefore \text{A’s share} = \frac{\text{Rs} \times 2x = \text{Rs} 1500}{2} \]

23. (a) \[\frac{V}{C} = \frac{2}{3} \quad \text{and} \quad \frac{V+4}{C} = \frac{3}{4} \]
   \[\therefore C = \frac{3V}{2} \Rightarrow \frac{V+4}{3V/2} = \frac{3}{4} \quad \text{[From (1)]} \]
   where \( V \) denoted for vanilla and \( C \) for chocolate.
   \[\Rightarrow 4V + 16 = \frac{9V}{2} \Rightarrow 8V + 32 = 9V \Rightarrow V = 32 \]

24. (d) Let the required price be \( \text{Rs} \) x.
   Then, Less toys, Less cost (Direct Proportion).
   \[\therefore 6 : 5 :: 264.37 : x \Rightarrow 6x = (5 \times 264.37) \]
   \[\Rightarrow x = \frac{(5 \times 264.37)}{6} \Rightarrow x = 220.308 \]
   \[\therefore \text{Approximate price of 5 toys} = \text{Rs} 220. \]

25. (a) Let the required men be x.
   More hours, less men (Indirect proportion)
   More days, less men (Indirect proportion)
   \[\begin{align*}
   \text{Hours} & : 5 : 8 \quad \therefore x : 18 \\
   \text{Days} & : 8 : 6 \quad \therefore 5 \times 8 \times 18 = 8 \times 6 \times x \\
   \Rightarrow x & = \frac{5 \times 8 \times 18}{8 \times 6} = 15
   \end{align*} \]

26. (d) Let the required number of mats be x.
   More weavers, More mats (Direct Proportion)
   More days, More mats

27. (a) Let the required days be x.
   More men, less days (Indirect proportion)
   More size, more days (Direct proportion)
   \[\begin{align*}
   \text{Men} & : 20 \quad 12 \quad \therefore 20 \times 3 \times 0.5 \quad 60 \times 4 \times 0.25 \quad \therefore 25 : x \\
   \Rightarrow 20 \times 100 \times 3 \times 0.5 \times x & = 12 \times 60 \times 4 \times 0.25 \times 25 \\
   \Rightarrow x & = 6 \text{ days}
   \end{align*} \]

28. (c) Let the required number of days be x.
   Less cows, More days (Indirect Proportion)
   Less bags, Less days (Direct Proportion)
   \[\begin{align*}
   \text{Cows} & : 1:40 \quad \therefore x : 40 \quad \therefore 1 \times 140 = 40 \times x \Rightarrow x = 40. \\
   \text{Bags} & : 40:1 \quad \therefore \text{men} = 30 \text{ men.}
   \end{align*} \]

29. (b) There is a meal for 200 children. 150 children have taken the meal.
   Remaining meal is to be catered to 50 children.
   Now, 200 children \( \equiv \frac{120}{200} \times 50 \) \text{ men} = 30 \text{ men.}

30. (b) Let the required number of days be x.
   Less persons, More days (Indirect Proportion)
   More working hrs per day, Less days (Indirect Proportion)
   \[\begin{align*}
   \text{Persons} & : 30 : 39 \quad \therefore x : 12 \quad \therefore 30 \times 6 \times x = 39 \times 5 \times 12 \\
   \Rightarrow x & = \frac{39 \times 5 \times 12}{30 \times 6} \Rightarrow x = 13.
   \end{align*} \]

31. (b) Initially, let there be x men having food for y days.
   After 15 days, x men had food for \( (y - 15) \) days.
   Also, \( \left( x - \frac{x}{4} \right) \) men had food for y days.
   \[\begin{align*}
   \therefore \frac{3x}{4} : x & :: (y - 15) : y \\
   \Rightarrow \frac{3x}{4} \times y & = x(y - 15) \\
   \Rightarrow 3y & = 4y - 60 \Rightarrow y = 60 \text{ days}
   \end{align*} \]
32. (c) In 2 days, 5 men set tiles = \(180 \times 2 \times 5 = 1800\) tiles

\[\therefore \text{Area of floor} = \text{Number of tiles} \times \text{Area of each tile}\]

\[= 1800 \times 2 \times \frac{3}{4} = 2700 \text{ ft}^2\]

33. (a) 3000 men taking 900 gms per head have provision for 

\[25 - 11 = 14\] days.

Less ratio per head, more men (Indirect Proportion)

Less days, more men (Indirect Proportion)

\[
\begin{align*}
\text{Ratio} & \quad 840 : 900 \\
\text{Days} & \quad 10 : 14
\end{align*}
\]

\[\therefore 840 \times 10 \times x = 900 \times 14 \times 3000\]

\[\Rightarrow x = 4500\]

\[\therefore \text{strength of reinforcement} = 4500 - 3000 = 1500\] men

34. (b) Let the required number of days be \(x\).

\[8 \text{ men} = 17 \text{ boys} \Rightarrow 4 \text{ men} = \frac{17}{2} \text{ boys}\]

\[\therefore 4 \text{ men and 24 boys} = \left(\frac{17}{2} + 24\right) \text{ boys} = \frac{65}{2} \text{ boys}\]

Now, More boys, less days (Indirect Proportion)

\[\therefore \frac{65}{2} : 17 :: 26 : x\]

\[\Rightarrow \frac{65}{2} \times x = 17 \times 26\]

\[\Rightarrow x = \frac{17 \times 26 \times 2}{65}\]

\[\Rightarrow x = \frac{17 \times 26 \times 2}{65} = 612\] days

But work \(\longrightarrow 50 \times 0.9\) times

\[\therefore \text{Required days} = 50 \times 0.9 \times \frac{17 \times 26 \times 2}{65} = 612\] days

35. (b) Let the required number of hours be \(x\).

Speeds of working of first and second type of men are \(\frac{1}{2}\) and \(\frac{1}{3}\).

More work, More time (Direct Proportion)

Less speed, More time (Indirect Proportion)

\[
\begin{align*}
\text{Work} & \quad 1 : 2 \\
\text{Speed} & \quad 1 : \frac{1}{2} \; :: \; 25 : x
\end{align*}
\]

\[\therefore \left(\frac{1}{3} \times x\right) = \left(2 \times \frac{1}{2} \times 25\right) \Rightarrow x = 75.\]

**EXERCISE 3**

1. (d) Let, the number of passengers travelling by I and II class be \(x\) and \(50x\) and, fares of I and II class be \(3y\) and \(y\).

\[\therefore \text{Revenue is } x \times 3y + 50x \times y = \text{ Rs} \; 1325\]

\[53xy = 1325\]

\[\Rightarrow xy = 25\]

\[\therefore \text{Amount collected from the II class passengers} = 50xy = 50 \times 25 = \text{ Rs} \; 1250.\]

2. (b) Weight of dry grapes without water

\[= 250 \times \frac{90}{100} = 225 \text{ kg}\]

Let weight of fresh grapes be \(x\) kg.

According to question,

\[x \times \frac{20}{100} = 225 \Rightarrow x = \frac{225 \times 100}{20} = 1125 \text{ kg}\]

3. (c) Let the questions with right answer be \(x\).

Questions with wrong answer = 90 – \(x\)

Marks obtained = 387

\[5x - 2(90 - x) = 387\]

\[\Rightarrow 5x - 180 + 2x = 387\]

\[\Rightarrow 7x = 387 + 180 = 567 \Rightarrow x = 81\]

\[\therefore \text{Questions with wrong answers} = 90 - 81 = 9\]

4. (d) Fare after reduction.

\[
\begin{array}{ccc}
\text{1st} & \text{2nd} & \text{3rd} \\
\hline
8 - \frac{8}{6} & 6 - \frac{6}{12} & 3 \\
\Rightarrow \frac{20}{3} & \frac{11}{2} & 3 \\
\Rightarrow 40 & 33 & 18
\end{array}
\]

Ratio of revenue

\[
\begin{array}{ccc}
\text{1st} & \text{2nd} & \text{3rd} \\
\text{Ratio of revenue}
\end{array}
\]
5. (b) Ratio of revenue of all three classes = 10 : 11 : 13

\[ \text{Collection for 1st class} = \frac{10}{34} \times 320 = \text{Rs } 78 \]

6. (c)

Let the numbers be 10x, 15x, and 24x.

Then,

\[ 10x + 15x + 24x = 98 \]
\[ 49x = 98 \]
\[ x = 2 \]

Second number = 15x = 30

7. (b)

Let the numbers be 10x, 15x, and 24x.

Then,

\[ 10x + 15x + 24x = 98 \]
\[ 49x = 98 \]
\[ x = 2 \]

Second number = 15x = 30

8. (a)

Let number of each type of coin = x. Then,

\[ 1x + .50x + .25x = 35 \]
\[ 1.75x = 35 \]
\[ x = 20 \text{ coins} \]

9. (b)

We have, 43S + 21T = 535

By hit and trial, S = 10, T = 5

10. (a)

Let A’s share be \( \text{Rs } x \),

B’s share be \( \text{Rs } y \). Then,

\[ 671 - (x + y) \]

Now, \( x + 3 : y + 7 : 671 - (x + y) + 9 = 1:2:3 \)
\[ x + 3 : y + 7 : 680 - (x + y) = 1:2:3 \]
\[ \Rightarrow x + 3 = \frac{1}{6} \times 690 = 115 \]
\[ \Rightarrow x = \text{Rs } 112 \]

Also \( y + 7 = \frac{2}{6} \times 690 = 230 \)
\[ \Rightarrow y = \text{Rs } 223 \]

11. (d)

Let the income of two persons be \( \text{Rs } 4x \) and \( \text{Rs } 5x \) and their expenses be \( \text{Rs } 7y \) and \( \text{Rs } 9y \).

Therefore, \( 4x - 7y = 50 \) \hspace{1cm} ... (i)

and \( 5x - 9y = 50 \) \hspace{1cm} ... (ii)

From (i) and (ii), we get \( x = 100 \) and \( y = 50 \)

Therefore, the income of the two persons are \( \text{Rs } 400 \) and \( \text{Rs } 500 \), respectively.

12. (b)

Let income of A = \( \text{Rs } 3x \), income of B = \( \text{Rs } 2x \)

and expenditure of A = \( \text{Rs } 5y \),

expenditure of B = \( \text{Rs } 3y \)

Now, saving = income – expenditure

\[ 3x - 5y = 2x - 3y = 200 \]
\[ \Rightarrow x = 2y \text{ and } y = 200 \]

A’s income = \( \text{Rs } 1200 \)

13. (b)

Let A’s share = \( \text{Rs } \frac{15}{4} x \), B’s share = \( \text{Rs } 4x \) and C’s share = \( \text{Rs } 5.5x \)

Given \( \frac{15}{4} x \times 30 \times 8 \)

\[ \Rightarrow \text{Total amount} = 30 + 32 + 44 = \text{Rs } 106 \]

14. (c)

Gold in C = \( \left( \frac{7}{9} + \frac{7}{18} \right) \text{ units} = \frac{7}{6} \text{ units} \)

Copper in C = \( \left( \frac{2}{9} + \frac{11}{18} \right) \text{ units} = \frac{5}{6} \text{ units} \)

\[ \Rightarrow \text{Gold : Copper} = \frac{7}{6} : \frac{5}{6} = 7 : 5 \]

15. (c)

Let the three containers contain 3x, 4x and 5x litres of mixtures, respectively.

Milk in 1st mix. = \( \left( \frac{3}{5} \times 4 \right) \text{ litres} = \frac{12}{5} \text{ litres} \)

Water in 1st mix. = \( \left( \frac{3}{5} \times \frac{12}{5} \right) \text{ litres} = \frac{36}{25} \text{ litres} \)

Milk in 2nd mix. = \( \left( \frac{4}{5} \times \frac{3}{4} \right) \text{ litres} = \frac{3}{5} \text{ litres} \)

Water in 2nd mix. = \( \left( \frac{4}{5} \times \frac{3}{4} \right) \text{ litres} = \frac{3}{5} \text{ litres} \)

Milk in 3rd mix. = \( \left( \frac{5}{7} \times \frac{5}{7} \right) \text{ litres} = \frac{25}{7} \text{ litres} \)

Water in 3rd mix. = \( \left( \frac{5}{7} \times \frac{25}{7} \right) \text{ litres} = \frac{10}{7} \text{ litres} \)

Total milk in final mix.

\[ \left( \frac{12}{5} + 3x + \frac{25}{7} \right) \text{ litres} = \frac{314}{35} \text{ litres} \]

Total water in final mix.

\[ \left( \text{Rs } \frac{12}{5} \right) \times x \times \frac{314}{35} \]
Required ratio of milk and water
\[
= \frac{314 \times 106}{35} : \frac{157 \times 53}{35} = 157 : 53.
\]

16. (b) Let the fixed amount be ₹ x and the cost of each unit be ₹ y. Then,
\[
540y + x = 1800 \quad \ldots \text{(i)}
\]
and
\[
620y + x = 2040 \quad \ldots \text{(ii)}
\]
On subtracting (i) from (ii), we get 80y = 240
\[
\Rightarrow y = 3.
\]
Putting y = 3 in (i), we get:
\[
x = (1800 - 1620) = 180.
\]
∴ Fixed charges = ₹ 180, Charge per unit = ₹ 3.
Total charges for consuming 500 units
\[
= (180 + 500 \times 3) = ₹ 1680.
\]

17. (b) Given \( A + B + C = 4898 \quad \ldots \text{(i)} \)
Also \( B = \frac{120}{100} A \quad \text{and} \quad B = \frac{125}{100} C \)
∴ By (i),
\[
\frac{100}{120} B + B + \frac{100}{125} B = 4898
\]
\[
\Rightarrow B = \frac{4898 \times 30}{79} = \text{Rs}1,860
\]

18. (c) Since, \( A : B = 2 : 3 \) and \( B : C = 6 : 5 \)
∴ \( A : B : C = 4 : 6 : 5 \)
Then, A’s share = \( \frac{4}{4+6+5} \times 750 = \text{Rs}200 \)

19. (a) Let the basic salary of A be ₹ x and that of B be ₹ y.
Now,
\[
x \times \frac{65}{100} = y \times \frac{80}{100} \quad \Rightarrow x : y = 16 : 13
\]

20. (a) Let the number of male and female participants be 3x and x respectively.
Therefore total no. of participants are 4x.
During the tea break, the number of male participants are
\[
(4x - 16) \times \frac{3}{4} = 3x - 12 \quad \ldots \text{(i)}
\]
and the number of female participants are
\[
(4x - 16) \times \frac{1}{4} + 6 = x + 2 \quad \ldots \text{(ii)}
\]
\[
\text{Now,} \quad \frac{3x - 12}{x + 2} = \frac{2}{1}
\]
\[
\Rightarrow 3x - 12 = 2x + 4 \quad \Rightarrow x = 16.
\]
Therefore, the total number of participants are
\[
= 4 \times 16 = 64.
\]

21. (b) Number of males = \( \frac{2}{3} \times 25 = 10 \)

Number of females = \( \frac{3}{5} \times 25 = 15 \)
Amount distributed among males and females
\[
= 275 \times 80\% = 220
\]
Let the wage paid to a male be ₹ 5x and that to a female be ₹ 4x. Therefore,
\[
10 \times 5x + 15 \times 4x = 220
\]
\[
\Rightarrow 50x + 60x = 220 \quad \Rightarrow x = 2
\]
Wage received by a female labourer
\[
= 2 \times 4 = ₹ 8
\]

22. (c) Let x pairs of brown socks were ordered.
Let P be the price of a brown pair.
Therefore, price of the black pair of sock = 2P
Now, \( 4P + 2Px = 1.5 \) (P + 8P)
\[
\Rightarrow 4P + 2Px = \frac{3}{2}(P + 8P)
\]
\[
\Rightarrow 8P + 4Px = 3Px + 24P
\]
\[
\Rightarrow Px = 16P \quad \Rightarrow x = 16
\]
∴ Required ratio = \( \frac{4}{16} = 1:4 \)

23. (b) Let the required length be x metres.
More breadth, Less length  \quad \text{(Indirect Proportion)}
More depth, Less length  \quad \text{(Indirect Proportion)}
More days, More length  \quad \text{(Direct Proportion)}

Breadth 20:50
Depth 15:10 \quad : : 100 : x
Days 10:30
\[
\Rightarrow 20 \times 15 \times 10 \times x = 50 \times 10 \times 30 \times 100
\]
\[
\Rightarrow x = \frac{50 \times 10 \times 30 \times 100}{20 \times 15} \quad \Rightarrow x = 500.
\]

24. (a) \( (100 \times 35 + 200 \times 5) \) men can finish the work in 1 day.
i.e., 4500 men can finish the work in 1 day
∴ 100 men can finish the work in 45 days
∴ The work would be 5 days behind the schedule.

25. (d) Remaining work = \( 1 - \frac{2}{5} = \frac{3}{5} \)
Remaining time = 56 – 30 = 26 days
More work, more men \quad \text{(Direct Proportion)}
Less days, more men \quad \text{(Indirect Proportion)}
More hours, Less men \quad \text{(Indirect Proportion)}
26. (c) After 5 days : 250 students had provision for 30 days.
Now, let 275 students had provision for x days. Then, more persons, less days
(Indirect Proportion)
∴ 275 : 250 :: 30 : x
⇒ 275 × x = 250 × 30 ⇒ x = \frac{300}{11}\text{ days}
Again, after 10 days : 275 students had provision
for \left(\frac{300}{11} - 10\right) = \frac{190}{11}\text{ days}.
Let (275 - 25) = 250 students had provision for y days
Less persons, more days
(Indirect Proportion)
∴ 250 : 275 :: \frac{190}{11} : y
⇒ 250 × y = 275 × \frac{190}{11} ⇒ y = 19\text{ days}

27. (b) More machines, less hours (Indirect Proportion)
Less days, more hours (Indirect Proportion)
More amount of coal, more hours
(Direct Proportion)
Less efficiency, more hours
(Indirect Proportion)

Machine \begin{array}{l} 3 : 2 \\ 6 : 8 \end{array}
Days \begin{array}{l} 3 \times 6 \times 9,000 \times 0.8 \times x \\ 2 \times 8 \times 12,000 \times 0.9 \times 12 \end{array}
⇒ x = 16\text{ hrs}

28. (a) Let 4 men left the work after x days.
Then, after x days,
10 men should completed work in (40 - x) days
but, 6 men completed work in (50 - x) days.
∴ 10 : 6 :: (50 - x) : (40 - x)
⇒ 6 (50 - x) = 10 (40 - x)
⇒ 4x = 400 - 300 ⇒ x = \frac{100}{4} = 25\text{ days}

Alternate:
Since, 10 men completed the work in 40 days.
∴ 1 man completed the work in 400 days.
∴ Work of One day of a man = \frac{1}{400}\text{ th part.}
Suppose 4 men left the work after x days.
Then, work done by 10 men in x days + work
done by 6 men in (50 - x) days = 1
⇒ \frac{1}{400} × 10 × x + \frac{1}{400} × 6 × (50 - x) = 1
⇒ 10x + 300 - 6x = 400
⇒ 4x = 100 ⇒ x = 25\text{ days}

29. (b) Let M denotes man and B denotes boy.
(M + B)'s 1 day's work = \frac{1}{40}
i.e. \frac{1}{M} + \frac{1}{B} = \frac{1}{40}
Ratio of their skill = \frac{8}{5} i.e. \frac{1}{M} = \frac{1}{B} = \frac{8}{5}
Let efficiency of a man of 1 days work = x
i.e. \frac{1}{M} \times x
Now, \frac{1}{B} \times \frac{1}{5} \times \frac{1}{B} \times \frac{5x}{8}
Now, \frac{13x}{8} \times \frac{1}{5} \times \frac{1}{65} ⇒ M = 65 and
\frac{1}{B} \times \frac{1}{104}