20 RATIO PROPORTION AND UNITARY METHOD

1. If $A : C = 2 : 3$ and $B : C = 5 : 6$, find $A : B$.

Ans. Given, $A : C = 2 : 3$

$$\Rightarrow \quad \frac{A}{C} = \frac{2}{3} \qquad \ldots(i)$$

and $B : C = 5 : 6$

$$\Rightarrow \quad \frac{B}{C} = \frac{5}{6} \qquad \ldots(ii)$$

Dividing equation (i) by (ii), we have

$$\frac{\frac{A}{C}}{\frac{B}{C}} = \frac{\frac{2}{3}}{\frac{5}{6}}$$

$$\Rightarrow \quad \frac{A}{C} \times \frac{C}{B} = \frac{2}{3} \times \frac{6}{5} \quad \Rightarrow \quad \frac{A}{B} = \frac{4}{5}$$

Hence, $A : B = 4 : 5$

2. Find $A : B : C$, when

(i) $A : B = 2 : 3$ and $B : C = 4 : 11$

(ii) $A : B = \frac{1}{4} : \frac{1}{5}$ and $B : C = \frac{1}{7} : \frac{1}{6}$

Ans. (i) LCM of two values of B *i.e.* 3 and 4 = 12

Thus $A : B = 2 : 3 = \frac{2}{3} = \frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$

$$B : C = 4 : 11 = \frac{4}{11} \times \frac{3}{3} = \frac{12}{33}$$

$\therefore \quad A : B : C = 8 : 12 : 33$

which is in the simplest form.

(*ii*) $A : B = \frac{1}{4} : \frac{1}{5} = \frac{1}{4} \times 20 : \frac{1}{5} \times 20 = 5 : 4$

and $B : C = \frac{1}{7} : \frac{1}{6} = \frac{1}{7} \times 42 : \frac{1}{6} \times 42 = 6 : 7$

LCM of two values of B *i.e.* 4 and 6 = 12

Thus $A : B = 5 : 4 = \frac{5}{4} = \frac{5}{4} \times \frac{3}{3} = \frac{15}{12}$

$B : C = 6 : 7 = \frac{6}{7} = \frac{6}{7} \times \frac{2}{2} = \frac{12}{14}$

$\therefore \quad A : B : C = 15 : 12 : 14$

which is in the simplest form.

3. Divide Rs 1050 among Champa and Tara in ratio = $2\frac{2}{3} : 6\frac{2}{3}$.

Ans. Total amount to be divided = Rs 1050

Champa : Tara = $2\frac{2}{3} : 6\frac{2}{3} = \frac{8}{3} : \frac{20}{3} = 8 : 20 = 2 : 5$

Sum of ratio = 2 + 5 = 7

Champa's share = Rs $\frac{2}{7} \times 1050$ = Rs 2 × 150 = Rs 300

Tara's share = Rs $\frac{5}{7} \times 1050$ = Rs 5 × 150 = Rs 750

4. Divide 220 into three parts in the ratio $1 : \frac{1}{2} : \frac{1}{3}$

Ans. Total amount to be divided = 220

Sum of ratio $= 1 + \frac{1}{2} + \frac{1}{3} = \frac{6+3+2}{6} = \frac{11}{6}$

First part $= \frac{1}{\left(\frac{11}{6}\right)} \times 220 = \frac{6 \times 220}{11} = 6 \times 20 = 120$

$$\text{2nd part} = \frac{\left(\frac{1}{2}\right)}{\left(\frac{11}{6}\right)} \times 220 = \frac{1}{2} \times \frac{6}{11} \times 220 = 3 \times 20 = 60$$

$$\text{3rd part} = \frac{\left(\frac{1}{3}\right)}{\left(\frac{11}{6}\right)} \times 220 = \frac{1}{3} \times \frac{6}{11} \times 220 = 2 \times 20 = 40$$

5. Karim secured 35 marks out of 50 in English and 29 marks out of 40 in science. In which subject did he perform better ?

Ans. Marks secured in English $= \frac{35}{50} = \frac{7}{10}$

Marks secured in Science $= \frac{29}{40}$

Now $\frac{7}{10} = \frac{7}{10} \times \frac{4}{4} = \frac{28}{40}$ and $\frac{29}{40} = \frac{29}{40} \times \frac{1}{1} = \frac{29}{40}$

Since $\frac{29}{40} > \frac{28}{40}$

Hence, Karim performed better in Science.

6. A line of 1.2 metre length is divided into two parts such that the first part is $\frac{2}{3}$ of the second part. Find length of two parts in centimetres.

Ans. Let the length of 2nd part = x m

Then first part $= \frac{2}{3} \times x\,\text{m} = \frac{2x}{3}\,\text{m}$

Total length $= x + \frac{2x}{3}$

$\Rightarrow \quad 1.2 = \frac{3x + 2x}{3} \quad \Rightarrow \quad 1.2 = \frac{5x}{3}$

$\Rightarrow \quad 1.2 \times 3 = 5x$

$\Rightarrow \quad x = \frac{1.2 \times 3}{5}\text{m} = \frac{1.2 \times 3 \times 100}{5}$ cm = 1.2 × 3 × 20 = 72 cm

Hence, length of 2nd part = 72 cm

and length of Ist part $= \frac{2}{3} \times 72$ cm = 2 × 24 cm = 48 cm

7. Divide Rs 747 among A, B, C such that $4A = 5B = 7C$.

Ans. Amount = Rs 747

$4A = 5B = 7C = 1$ (Suppose)

$\therefore \quad A = \frac{1}{4}, B = \frac{1}{5}, C = \frac{1}{7}$

Ratio A : B : C $= \frac{1}{4} : \frac{1}{5} : \frac{1}{7} = \frac{35 : 28 : 20}{140} = 38 : 28 : 20$

Sum of ratios = 35 + 28 + 20 = 83

$\therefore$ A's share = Rs $\frac{747 \times 35}{83} = 9 \times 35$ = Rs 315

B's share = Rs $\frac{747 \times 28}{83} = 9 \times 28$ = Rs 252

C's share = Rs $\frac{747 \times 20}{83} = 9 \times 20$ = Rs 180

8. A bag contains one rupee, 50 paise and 25 paise coins in the ratio 5 : 6 : 8 amounting to Rs 210. Find the number of coins of each type.

Ans. Ratio of 1 rupee, 50 paise and 25 paise coins 5 : 6 : 8

= 100 × 5 : 50 × 6 : 25 × 8 = 500 : 300 : 200 = 5 : 3 : 2

Sum of ratios = 5 + 3 + 2 = 10

Number of 1 rupee coins $= \frac{5}{10} \times 210 = 105$

Number of 50 paise coins $= \left(\frac{3}{10} \times 210\right) \times 2$ = 63 × 2 = 126

Number of 25 paise coins $= \left(\frac{2}{10} \times 210\right) \times 4$ = 42 ×4 = 168

9. Two numbers are in the ratio 6 : 11. On adding 2 to the first and 7 to the second, their ratio becomes 8 : 15. Find the numbers.

Ans. Two numbers are in the ratio = 6 : 11

Let first number = $6x$

then, second number = $11x$

According to the sum $= \frac{6x+2}{11x+7} = \frac{8}{15}$

$\Rightarrow$ $15(6x + 2) = 8\ (11x + 7)$ (By cross multiplication)

$\Rightarrow$ $90x + 30 = 88x + 56$

$\Rightarrow$ $90x - 88x = 56 - 30$

$\Rightarrow$ $2x = 26 \Rightarrow x = \frac{26}{2} = 13$

First number = $6x = 6 \times 13 = 78$

and second number = $11x = 11 \times 13 = 143$

Hence, numbers are 78 and 143.

10. Two numbers are in the ratio 7 : 4. If their difference is 72, find the numbers.

Ans. Ratio between two numbers = 7 : 4

Let first number = $7x$ then second number = $4x$

$\Rightarrow$ Difference = $7x - 4x = 3x$

$\Rightarrow$ $3x = 72 \Rightarrow x = \frac{72}{3} = 24$

First number = $7 \times 24 = 168$ and

Second number = $4x = 4 \times 24 = 96$

11. A certain sum of money is divided among A, B, C in the ratio 5 : 6 : 7. If A's share is Rs 175, find the total amount and the share of each one of B and C.

Ans. Ratio in A, B and C = 5 : 6 : 7

Let A's share = $5x$

B's share = $6x$

and C's share = $7x$

$\therefore$ Total sum = $5x + 6x + 7x = 18x$

But A's share = Rs 175

$\therefore$ $5x = 175 \Rightarrow x = \frac{175}{5} = 35$

$\therefore$ Total amount = $18x = 18 \times 35$ = Rs 630

$\therefore$ B's share = $6x = 6 \times 35$ = Rs 210

and C's share = $7x = 7 \times 35$ = Rs 245.

12. The ratio of number of boys to the number of girls in a school of 1440 students is 7 : 5. If 40 new boys are admitted, find how many new girls may be admitted to make this ratio 4 : 3.

Ans. Total number of students = 1440

Ratio of boys and girls = 7 : 5

$\therefore$ Sum of ratios = 7 + 5 = 12

$\therefore$ Number of boys $= 1440 \times \frac{7}{12} = 840$

and number of girls $= 1440 \times \frac{5}{12} = 600$

Number of new boys admitted = 40

Let number of girls admitted = x

Then total number of boys = 840 + 40 = 880

and number of girls = $600 + x$

According to the problem,

$$\frac{880}{600 + x} = \frac{4}{3}$$

By cross multiplication,

$4 (600 + x) = 3 \times 880$

$\Rightarrow$ $2400 + 4x = 2640$

$\Rightarrow$ $4x = 2640 - 2400 = 240$

$$\Rightarrow \qquad x = \frac{240}{4} = 60$$

Hence, number of new girls admitted is 60

13. The ratio of the number of boys to the number of girls in a school of 672 students is 5 : 7. When some new boys and girls are admitted, the number of girls increases by 8 and ratio of boys to girls changes to 3 : 4. Calculate, the number of new boys admitted.

Ans. Total number of students = 672

Boys : Girls

5 : 7

Sum of ratios = 5 + 7 = 12

$$\text{Number of boys} = \frac{5}{12} \times 672 = 5 \times 56 = 280$$

$$\text{Number of girls} = \frac{7}{12} \times 672 = 7 \times 56 = 392$$

In the condition, when boys and girls are admitted :

Number of girls = 392 + 8 = 400

Ratio of boys and girls changes to = 3 : 4

If the number of girls are 4, then number of boys = 3

If the number of girl is 1, then number of boys $= \frac{1}{3}$

If the number of girs is 400, then number of boys

$$= \frac{3}{4} \times 400 = 300$$

The number of new admitted boys = 300 – 280 = 20

14. The weights of Mr. Gupta and Mrs. Gupta are in the ratio 7 : 8 and their combined (total) weight is 120 kg. After taking a dieting course, the weight of Mr. Gupta reduces by 6 kg and the ratio between their weights changes to 5 : 6. Find the reduction of weight of Mrs. Gupta due to their dieting course.

Ans. Ratio of weights of Mr. Gupta and Mrs.Gupta = 7 : 8

Total weight of Mr. and Mrs. Gupta = 120 kg

Sum of ratios = 7 + 8 = 15

$$\text{Weight of Mr. Gupta} = \frac{7}{15} \times 120 = 56 \text{ kg}$$

$$\text{Weight of Mrs. Gupta} = \frac{8}{15} \times 120 = 64 \text{ kg}$$

After dieting, the weight of Mr. Gupta = 56 – 6 = 50 kg

After dieting new ratio of the weights of Mr. Gupta and Mrs. Gupta

= 5 : 6

After dieting if the weight of Mr. Gupta is 5 kg, then weight of Mrs. Gupta = 6 kg

After dieting if the weight of Mr. Gupta is 1 kg,

then the weight of Mrs. Gupta = $\frac{6}{5}$ kg

After dieting if the weight of Mr. Gupta is 50 kg

then weight of Mrs. Gupta is = $\frac{6}{5} \times 50$ = 60 kg

$\therefore$ Reduction in weight of Mrs. Gupta due to dieting

= 64 – 60 kg = 4 kg.

15. Rs 1200 is to be divided between *A*, *B* and *C*. If A receives twice as *B*, and *B* recevies three as *C*, find what C receives.

Ans. Let *C* receives Rs x

$\therefore$ *B* receives thrice as *C* = 3 × Rs x = Rs $3x$

Also, *A* receives twice as *B* = 2 × Rs $3x$ = Rs $6x$

$\therefore$ Total amount = 1200

$\Rightarrow$ $6x + 3x + x = 1200$

$\Rightarrow$ $10x = 1200$ $\Rightarrow$ $x = \text{Rs}\frac{1200}{10}$

$\Rightarrow$ x = Rs 120

Hence, *C* receives Rs 120.

16. Divide Rs 2040 between A, B and C so that A gets $\frac{2}{3}$ of what B gets and B gets $\frac{1}{4}$ of what C gets. Find the share of each.

Ans. Let C gets Rs x.

Then, B gets = Rs $\frac{x}{4}$ and A gets = Rs $\frac{2}{3}\times\frac{x}{4}$ *i.e.* Rs $\frac{x}{6}$

Total amount = 2040

$$\therefore \quad \frac{x}{6}+\frac{x}{4}+x=2040$$

$$\Rightarrow \quad \frac{2x+3x+12x}{12}=2040 \Rightarrow \quad \frac{17x}{12}=2040$$

$$\Rightarrow \quad 17x=2040\times 12 \Rightarrow \quad x=\frac{2040\times 12}{17}$$

$$\Rightarrow \quad x=120\times 12 \Rightarrow \quad x=1440$$

Hence, A gets Rs $\frac{x}{6}$ *i.e.*, Rs $\frac{1440}{6}$ *i.e.* Rs 240

B gets Rs $\frac{x}{4}$ *i.e.* $\frac{1440}{4}$ *i.e.* Rs 360

and C gets Rs x *i.e.* Rs 1440.

17. Divide Rs 1312 into three parts such that first part is $\frac{2}{3}$ of the second and the ratio between second and third parts in 4 : 7.

Ans. Given ratio of 2nd and 3rd parts in 4 : 7

Let 2nd part = Rs $4x$ and 3rd part = Rs $7x$

Then, Ist part $=\frac{2}{3}$ of second part = Rs $\frac{2}{3}\times 4x$ = Rs $\frac{8x}{3}$

Total amount = 1312

$$\Rightarrow \quad \frac{8x}{3}+4x+7x=1312 \qquad \Rightarrow \quad \frac{8x+12x+21x}{3}=1312$$

$\Rightarrow \quad \frac{41x}{3} = 1312 \quad \Rightarrow \quad x = 1312 \times \frac{3}{41}$

$\Rightarrow \quad x = 32 \times 3 \quad \Rightarrow \quad x = 96$

Hence, Ist part = Rs $\frac{8x}{3}$ = Rs $\frac{8}{3} \times 96$

= Rs 8×32 = Rs 256

2nd part = $4x$ = Rs 4×96 = Rs 384

3rd part = Rs $7x$ = Rs 7×96 = Rs 672

18. Concrete is made of $1\frac{1}{2}$ parts of lime, 4 parts of gravel and $1\frac{1}{2}$ parts of sand.

Out of 480 kg of concrete; how much is lime ?

Ans. Lime : Gravel : Sand $= 1\frac{1}{2} : 4 : 2\frac{1}{2}$

$= \frac{3}{2} : 4 : \frac{5}{2} = \left(\frac{3}{2} \times 2\right) : (4 \times 2) : \left(\frac{5}{2} \times 2\right)$

= 3 : 8 : 5

Sum of ratios = 3 + 8 + 5 = 16

Total weight of concrete = 480 kg

Quantity of lime = $3 \times \frac{480}{16} = 3 \times 30$ = 90 kg

19. Divide Rs 2,800 among three persons *A*, *B* and *C*. If the shares of *A* and *B* are in the ratio 12 : 13 and *C*'s share is 40% of the total or shares of *A* and *B*; find the shares of *A*, *B* and *C*.

Ans. Given amount = Rs 2,800

A : *B* = 12 : 13

C's share = 40% of (12 + 13) = $\frac{40}{100} \times 25 = 10$

$\therefore$ Share of *A*, *B* and *C* are in the ratio of 12 : 13 : 10.

Sum of the ratios = 12 + 13 + 10 = 35

$\therefore$ A's share $= \frac{12}{35} \times 2800 = 12 \times 80 =$ Rs 960

B's share $= \frac{13}{35} \times 2800 = 13 \times 80 =$ Rs 1040

C's share $= \frac{10}{35} \times 2800 =$ Rs $10 \times 80 =$ Rs 800

20. A purse contains Re 1,50 paise and 25 paise coins by number in the ratio 3 : 8 : 16. If the total value of all the coins be Rs 605; find the number of each type of coins.

Ans. Since the ratio between Re 1,50 paise and 25 paise coins (by number)

$= 3 : 8 : 16.$

the ratio between these coins (by value in Rs.)

$$= 3 \times 1 : 8 \times \frac{1}{2} : 16 \times \frac{1}{4} = 3 : 4 : 4$$

[Since 50 paise = Rs $\frac{50}{100}$ = Rs $\frac{1}{2}$ and 25 paise = Rs $\frac{25}{100}$ = Rs $\frac{1}{4}$]

Sum of the ratios = 3 + 4 + 4 = 11

Total money = Rs 605

$\therefore$ Re 1 coins $= \frac{3}{11} \times 605 = 3 \times 55 =$ Rs 165

Value of 25 paise coins $= \frac{4}{11} \times 605 = 4 \times 55 =$ Rs 220

Value of 50 paise coins $= \frac{4}{11} \times 605 = 4 \times 55 =$ Rs 220

Hence, number of Re 1 coins = 165

Number of 50 paise coins = 220 × 2 = 440

And number of 25 paise coins = 220 × 4 = 880

21. Divide Rs 1870 into three parts in such a way that half of the first part, one third of the second part and one-sixth of the third all are equal.

Ans. Let $\frac{1}{2}$ (1st part) $= \frac{1}{3}$(2nd part)

$= \frac{1}{6}$(3rd part) $= x$

$\Rightarrow$ 1st part = Rs $2x$

2nd part = Rs $3x$

3rd part = Rs $6x$

As per condition,

$2x + 3x + 6x = 1870$

$\Rightarrow$ $11x = 1870$ $\Rightarrow$ $x = \frac{1870}{11}$

$\Rightarrow$ $x = 170$

Hence, 1st part = Rs $2x$ = Rs 2×170 = Rs 340

2nd part = Rs $3x$ = Rs 3×170 = Rs 510

3rd part = Rs $6x$ = Rs 6×170 = Rs 1020.

22. When the fare of a certain journey by an air-line was increased in the ratio 5 : 7, the cost of a ticket for the journey became Rs 14210. Find the increase in fare.

Ans. Let the increased fare be Rs x

The increased cost of a ticket for the journey = Rs 14210.

$\therefore$ Original cost of a ticket for the journey = Rs $(14210 - x)$

As per condition,

$\frac{\text{Rs}(14210 - x)}{\text{Rs}14210} = \frac{5}{7}$ $\Rightarrow$ $\frac{14210 - x}{1410} = \frac{5}{7}$

$\Rightarrow$ $7\,(14210 - x) = 5 \times 14210$ $\Rightarrow$ $99470 - 7x = 71050$

$\Rightarrow$ $99470 - 71050 = 7x$ $\Rightarrow$ $7x = 28420$

$\Rightarrow$ $x = \frac{28420}{7}$

Thus $x = 4060$

Hence, the increased fare is Rs 4060.

23. If 50 is the third proportional to 8 and x, find the value of x.

Ans. Since 50 is the third proportional to 8 and x

Then 8, x and 50 are in continued proportion.

$$\Rightarrow \quad \frac{8}{x} = \frac{x}{50} \quad \Rightarrow \quad 8 \times 50 = x \times x$$

$$\Rightarrow \quad x^2 = 400 \quad \Rightarrow \quad x = \sqrt{400}$$

$$\Rightarrow \quad x = \sqrt{20 \times 20} = 20$$

24. (*i*) Find the fourth propotional to 6, 7, 8, correct to one decimal place.

(*ii*) Find the third proportional to 7 and 8, correct to two decimal places.

(*iii*) Find the mean proportional between 2.7 and 3.8, correct to two significant figures.

Ans. (*i*) Let the fourth proportional be x,

Since, 6, 7, 8 and x are in proportion.

$\therefore \; 6 : 7 = 8 : x$

$$\Rightarrow \frac{6}{7} = \frac{8}{x} \Rightarrow 6 \times x = 8 \times 7 \Rightarrow x = \frac{8 \times 7}{6}$$

$$\Rightarrow x = \frac{4 \times 7}{3} \Rightarrow x = \frac{28}{3}. \text{ Thus, } x = 9.3$$

Hence, the fourth proportional is 9.3.

(*ii*) Let the third proportional be x.

Since, 7, 8 and x are in proportional.

$$\therefore \; 7 : 8 = 8 : x \Rightarrow \frac{7}{8} = \frac{8}{x} \Rightarrow 7 \times x = 8 \times 8$$

$$\Rightarrow x = \frac{8 \times 8}{7} \Rightarrow x = \frac{64}{7}. \text{ Thus, } x = 9.14$$

Hence, the third proportional is 9.14.

(*iii*) Let the mean proportional be x.

$$\therefore \quad x = \sqrt{2.7 \times 3.8} = \sqrt{\frac{27}{10} \times \frac{38}{10}}$$

$$= \sqrt{\frac{3 \times 3 \times 3 \times 2 \times 19}{10 \times 10}} = \frac{3}{10}\sqrt{114}$$

$$= \frac{3}{10} \times 10.67 = \frac{32.01}{10} = 3.2$$

25. Find the sum of money which bears the same ratio to Rs 27 that Rs 11 bears to Rs 9.

Ans. Let the sum of money be Rs x

According to the given condition,

$$\text{Rs } x : \text{Rs } 27 = \text{Rs } 11 : \text{Rs } 9$$

$$\Rightarrow \quad \frac{\text{Rs } x}{\text{Rs } 27} = \frac{\text{Rs } 11}{\text{Rs } 9} \qquad \Rightarrow \quad \frac{x}{27} = \frac{11}{9}$$

$$\Rightarrow \quad x = \frac{11}{9} \times 27 = 11 \times 3 = 33$$

Hence, the sum of money = Rs 33.

26. Find the fourth proportional to $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}$.

Ans. Let the fourth proportional be x.

Then $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}, x$ are in proportion.

$$\therefore \quad \frac{1}{3} : \frac{1}{4} = \frac{1}{5} : x$$

$$\Rightarrow \quad \frac{\frac{1}{3}}{\frac{1}{4}} = \frac{\frac{1}{5}}{x} \qquad \Rightarrow \quad \frac{1}{3} \times \frac{4}{1} = \frac{1}{5 \times x}$$

$$\Rightarrow \quad \frac{4}{3} = \frac{1}{5x} \qquad \Rightarrow \quad 4 \times 5x = 3 \times 1$$

$\Rightarrow \quad 20x = 3 \qquad \Rightarrow \qquad x = \frac{3}{20}$

Hence, the fourth proportional $= \frac{3}{20}$.

27. Find the third proportional to Rs. 4 and Rs. 5.

Ans. Let third proportional be Rs x

Then, Rs 4, Rs 5 and Rs x are in proportion.

$\therefore$ Rs 4 : Rs 5 = Rs 5 : Rs x

$\Rightarrow \quad \frac{\text{Rs}\,4}{\text{Rs}\,5} = \frac{\text{Rs}\,5}{\text{Rs}\,x} \qquad \Rightarrow \quad \frac{4}{5} = \frac{5}{x}$

$\Rightarrow \quad 4x = 5 \times 5 \qquad \Rightarrow \quad x = \frac{5\times 5}{4}$

$\Rightarrow \quad x = \frac{25}{4}$

Thus, $x = 6.25$

Hence, the third proportional is Rs 6.25.

28. Find the mean proportional between 0.5 kg and 4.5 kg.

Ans. Mean proportional between 0.5 kg and 4.5 kg

$$= \sqrt{0.5\,\text{kg} \times 4.5\,\text{kg}} = \sqrt{0.5 \times 4.5}\ \text{kg}$$

$$= \sqrt{\frac{5\times 45}{100}}\text{kg} = \sqrt{\frac{5\times 5\times 3\times 3}{10\times 10}}\ \text{kg}$$

$$= \frac{5\times 3}{10}\text{kg} = \frac{3}{2}\text{kg} = 1.5\ \text{kg}$$

29. A woman reduces her weight in the ratio 7 : 5. What does her weight become if originally it was 84 kg ?

Ans. Original weight = 84 kg

Let the reduced weight be x kg

Thus, 84 : x = 7 : 5

$\Rightarrow \quad \frac{84}{x} = \frac{7}{5} \qquad \Rightarrow \quad 84 \times 5 = 7 \times x$

$\Rightarrow \quad 7x = 84 \times 5 \quad \Rightarrow \quad x = \frac{84 \times 5}{7}$

$\Rightarrow \quad x = 12 \times 5 \quad \Rightarrow \quad x = 60$

Hence, her new weight is 60 kg.

30. Simplest form of a ratio is 4 : 7. If the antecedent is 22, find its consequent.

Ans. Simplest form of given ratio is 4 : 7

and given antecedent = 22

$\therefore$ 22 : consequent = 4 : 7

$\Rightarrow \quad \frac{22}{\text{consequent}} = \frac{4}{7} \quad \Rightarrow \quad 22 \times 7 = 4 \times \text{consequent}$

$\Rightarrow \quad \text{Consequent} = \frac{22 \times 7}{4} \quad \Rightarrow \quad \text{Consequent} = \frac{11 \times 7}{2}$

$\Rightarrow \quad \text{Consequent} = \frac{77}{2} \quad \Rightarrow \quad \text{Consequent} = 38.5$

Hence, the value of consequent is 38.5.

31. Two numbers are in the ratio 9 : 10. When 3 is subtracted from the first and 10 is subtracted from the second, they are in the ratio 3 : 2 find the numbers.

Ans. Let the numbers are $9x$ and $10x$

As per condition,

$(9x - 3) : (10x - 10) = 3 : 2$

$\Rightarrow \quad \frac{9x - 3}{10x - 10} = \frac{3}{2} \quad \Rightarrow \quad 2(9x - 3) = 3\,(10x - 10)$

$\Rightarrow \quad 18x - 6 = 30x - 30 \quad \Rightarrow \quad 18x - 30x = -30 + 6$

$\Rightarrow \quad -12x = -24 \quad \Rightarrow \quad x = \frac{-24}{-12} \quad \Rightarrow \quad x = 2$

Hence, the numbers are $9x$ and $10x$. *i.e.*, 18 and 20.

32. What would be the cost of 23 metres of cloth, if 5 metres of cloth costs Rs 48 ?

Ans. Let the cost of 23 metres of cloth be Rs x

Cost of 5 metres of cloth = Rs 48

Ratio of 5 metres to 23 metres

= Ratio of cost of 5 metres to cost of 23 metres

$\therefore \quad \frac{5}{23} = \frac{48}{x}$

$\Rightarrow \quad 5x = 48 \times 23 \qquad \Rightarrow \qquad 5x = 1104$

$\Rightarrow \quad x = \frac{1104}{5} \qquad \Rightarrow \qquad x = 220.80$

Hence, cost of 23 metres of cloth is Rs 220.80.

33. Mohan bought 8 oranges for Rs 4.80. If John has Rs 7.20, how many oranges, more than Mohan, can he buy ?

Ans. Number of oranges bought for Rs 4.80 = 8

Let, number of oranges bought for Rs 7.20 = x

Ratio of x oranges to 8 orange

= Ratio of cost of x oranges to cost of 8 oranges

$\therefore \quad \frac{x}{8} = \frac{7.20}{4.80} \quad \Rightarrow \quad \frac{x}{8} = \frac{720}{480}$

$\Rightarrow \quad x \times 480 = 8 \times 720$ (By cross multiplying)

$\Rightarrow \quad x = \frac{8 \times 720}{480} \quad \Rightarrow \quad x = \frac{720}{60} \quad \Rightarrow \quad x = 12$

Number of oranges bought by John = 12

Hence, number of oranges which John can buy more than Mohan = 12 – 8 = 4.

34. If a car travels 67.5 km in 4.5 litres of petrol, how many kilometres will it travel in 26.4 litres of petrol ?

Ans. In 4.5 litre of petrol a car travels = 67.5 km

$\therefore \quad$ In 1 litre of petrol a car travels $= \frac{67.5}{4.5}$ km

$\therefore$ In 26.4 litre of petrol a car travels

$$= \frac{67.5}{4.5} \times 26.4\,\text{km} = \frac{675}{45} \times 26.4\,\text{km}$$

$$= 15 \times 26.4\ \text{km} = 396\ \text{km}$$

35. Pooja has enough money to buy 36 oranges at the rate of Rs 1.50 per orange. How many oranges she can buy if the price of each orange is increased by 30 paise ?

Ans. The price of 36 oranges at the rate of Rs 1.50 per orange

$$= \text{Rs}\ (36 \times 1.50) = \text{Rs}\ 54$$

Thus, Pooja has Rs 54

New price for each orange = Rs 1.50 + 30 paise

$$= \text{Rs}\ 1.50 + \text{Rs}\ 0.30 = \text{Rs}\ 1.80$$

Now for Rs 1.80, the number of orange available = 1

$\therefore$ for Rs 1, the number of orange available $= \frac{1}{1.80}$

$\therefore$ for Rs 54, the number of oranges available $= \frac{54}{1.80}$

$$= \frac{54}{180} \times 100 = 30$$

Hence, number of oranges available are 30.

36. In a zoo, 28 parrots consume 7420 g of nuts in a day. If 8 parrots are sent to another zoo, what quantity of nuts will be required in a day ?

Ans. Number of parrots in the beginning = 28

Number of parrots sent to another zoo = 8

Thus, remaining parrots = 28 – 8 = 20

Now, 28 parrots can consume nuts in a day = 7420 g

1 parrots can consume nuts in a day $= \frac{7420}{28}$ g

Hence, 20 parrots will consume nuts in a day

$$= \frac{7420 \times 20}{28} = 5300\,\text{g}.$$

37. If 5 labourers earn Rs 9000 in 15 days, how many labourers can earn Rs 6720 in 8 days ?

Ans. $\left.\begin{matrix}\text{Rs } 9000 : \text{Rs } 6720 \\ 8 \text{ days} : 15 \text{ days}\end{matrix}\right\} 5 \text{ labourers} : x$

By direct variation $\left[\begin{matrix}\text{less earning,} \\ \text{less labourers}\end{matrix}\right.$

and by inverse variation $\left[\begin{matrix}\text{less days,} \\ \text{more labourers}\end{matrix}\right.$

$\therefore \quad \left.\begin{matrix}9000 : 6720 \\ 8 : 15\end{matrix}\right\} 5 : x$

$$x = \frac{6720 \times 15 \times 5}{9000 \times 8} = 7$$

Hence, number of labourers are 7.

38. A fort had provisions for 450 men for 80 days. After 10 days, 50 more men arrived. How long will the remaining food last at the same rate ?

Ans. Total period = 80 days

After 10 days period will be = 80 – 10 = 70 days

Number of men in the beginning = 450

Number of more men arrived after 10 days = 50

Total men= 450 + 50 = 500

450 men : 500 men : : 70 days : x days

By inverse variation

$$500 : 450 : : 70 : x$$

$$\therefore \quad x = \frac{450 \times 70}{500} = 63 \text{ days}$$

Hence, period = 63 days.

39. 3 typists working 7 hours a day, type a thesis in 10 days. For how many hours per day should 2 typists work to finish it in 12 days ?

Ans. In 10 days 3 typists complete the thesis by working 7 hours a day

In 10 days 1 typist complete the thesis by working 7×3 hours a day

In 10 days 2 typists complete the thesis by working $\frac{7 \times 3}{2}$ hours a day

In 12 days 2 typists complete the thesis by working $\frac{7 \times 3 \times 10}{2 \times 12}$ hours a day $= 8\frac{3}{4}$ hours a day.

40. 50 labourers can dig a pond in 16 days. How many labourers will be required to dig an another pond, double in size in 20 days ?

Ans. In 16 days for diging a pond labour required = 50

In 1 day, labour required = 50×16

In 20 days, labour required = $\frac{50 \times 16}{20}$

In 20 days, with double work, labour required

$$= \frac{50 \times 16 \times 2}{20} = 5 \times 8 \times 2 = 80$$

Hence, laboures required = 80

41. Eight taps through which water flows at the same rate can fill a tank in 27 minutes. If two taps go out of order, how long will the remaning taps take to fill the tank ?

Ans. Eight taps through which water flows can fill a tank in 27 minutes.

Two taps go out of order then remaining taps = 8 – 2 = 6

$\therefore$ 1 taps through which water flows can fill a tank in 27×8 minutes

$\therefore$ 6 taps through which water flows can fill a tank in $\frac{27 \times 8}{6}$ minutes

$= \frac{27 \times 4}{3}$ minutes = 36 minutes.

42. A hostel has enough food for 250 students for 12 days. How long will the food last if 50 more students join them ?

Ans. 50 more students join the hostel so number of students in the hostel

$$= 250 + 50 = 300$$

Since for 250 students food is enough for 12 days

Thus, for 1 students food is enough for 12×250 days

Thus, for 300 students food is enough for

$$= \frac{12 \times 250}{300} \text{days} = \frac{12 \times 5}{6} \text{days} = 10 \text{ days}$$

43. A fort is provided with provisions for 80 soldiers to last for 60 days. Find how long would the food last if 20 additional soldiers join after 15 days.

Ans. After 15 days, the food is sufficient for 80 soldiers for (60 –15)days *i.e*. 45 days.

After 15 days, 20 additional soldiers join the fort. So number of soldiers in the fort = 80 + 20 = 100

Since for 80 soldiers, the food is sufficient for 45 days

$\therefore$ for 1 soldier the food is sufficient for (80×45) days

Hence, for 100 soldiers, the food is sufficient for $= \frac{80 \times 45}{100}$ days = 36 days.

44. A fort had provisions for 600 men for 180 days. After 40 days, 100 men left the fort. How long will the food last at the same rate ?

Ans. Food provisions for 600 men is for 180 days

100 men left the fort after 40 days.

Remaining men = 600 – 100 = 500

Remaining days = 180 – 40 = 140

Now food provision for 600 men is for 140 days

$\therefore$ Food provisions for 500 men will be for more time

Let the food now lasts for x days

$$\Rightarrow \quad \frac{500}{600} = \frac{140}{x}$$

$$\Rightarrow 500 \times x = 600 \times 140 \quad \Rightarrow \quad x = \frac{600 \times 140}{500}$$

$\Rightarrow \quad x = \frac{84000}{500} \quad \Rightarrow \quad x = \frac{840}{5}$

$\Rightarrow \quad x = 168$ days

Hence, remaining food will last for 168 days.

45. A fort had provisioned for 42 days, after 10 days a reinforcement of 200 men arrive and the food will now last only for 24 days. How many men were there in the fort ?

Ans. A fort had provisioned for = 42 days

Let there were x men in the fort.

After 10 days 200 more men arrived.

$\therefore$ Now number of men = $(x + 200)$

After 10 days food (for x men) will last for = $42 - 10 = 32$ days

But we are given that food for $(x + 200)$ men will last for 24 days.

$\therefore \quad 32 : 24 = (200 + x) : x$

i.e. $\frac{32}{24} = \frac{200 + x}{x}$

$\Rightarrow \quad \frac{4}{3} = \frac{200 + x}{x} \quad \Rightarrow \quad 4x = 3(200 + x)$

$\Rightarrow \quad 4x = 600 + 3x \Rightarrow \quad 4x - 3x = 600$

$\Rightarrow \quad x = 600$ men

$\therefore$ Men in the fort were 600.