

Chapter-8

Ratio and Proportion

Exercise 8.1

①

(i) Cost of 2 books = $2 \times ₹28 = ₹56$

Cost of 3 notebooks = $3 \times ₹20 = ₹60$

Required Ratio = $\frac{₹56}{₹60} = \frac{14}{15} = 14:15$

(ii) Not possible

(iii) Required Ratio = $\frac{135}{150} = \frac{9}{10} = 9:10$

(iv) Not possible

(v) 6 hours

2 days = $2 \times 24 \text{ hours} = 48 \text{ hours}$

Required Ratio = $\frac{6 \text{ hours}}{48 \text{ hours}} = \frac{1}{8} = 1:8$

(vi) 5 hours = $5 \times 60 \text{ minutes} = 300 \text{ minutes}$

Required Ratio = $\frac{40 \text{ minutes}}{300 \text{ minutes}} = \frac{2}{15} = 2:15$

②

(i) Renuka's age = 12 years

Sanjay's age = $12 + 3 = 15$ years

Ratio between Renuka's and Sanjay's age

$$= \frac{12 \text{ years}}{15 \text{ years}} = \frac{4}{5} = 4:5$$

(ii)

Ratio between Sanjay's and his mother's age

$$= \frac{15 \text{ years}}{40 \text{ years}} = \frac{3}{8} = 3:8$$

③

(i) Total income = ₹ 7700 + ₹ 5500 = ₹ 13,200

Expenditure = ₹ 11,000

$$\begin{aligned} \therefore \text{Required Ratio} &= \frac{\text{₹ } 11000}{\text{₹ } 13200} = \frac{110}{132} \\ &= \frac{55}{66} = \frac{5}{6} \\ &= 5:6 \end{aligned}$$

(ii)

$$\begin{aligned} \text{Monthly saving} &= \text{Income} - \text{Expenditure} \\ &= ₹13200 - ₹11000 \\ &= ₹2200 \end{aligned}$$

$$\begin{aligned} \therefore \text{Required Ratio} &= \frac{₹2200}{₹13200} = \frac{22}{132} = \frac{1}{6} \\ &= 1:6 \end{aligned}$$

(4)

$$\begin{aligned} \text{(i) Marks obtained in English} &= 88 \\ \text{Marks obtained in Hindi} &= 92 \end{aligned}$$

$$\therefore \text{Required Ratio} = \frac{88}{92} = \frac{44}{46} = \frac{22}{23} = 22:23$$

$$\text{(ii) Total maximum marks} = 500$$

$$\begin{aligned} \text{Total marks obtained} &= 88 + 99 + 92 + 96 + 95 \\ &= 470 \end{aligned}$$

$$\therefore \text{Required Ratio} = \frac{470}{500} = \frac{47}{50} = 47:50$$

(iii)

Marks obtained in Maths = 99

Marks obtained in Science = 96

$$\therefore \text{Required Ratio} = \frac{99}{96} = \frac{33}{32} = 33:32$$

(5)

(i) Number of students opting dramatics = 24

Number of students opting painting = 10

$$\therefore \text{Required Ratio} = \frac{24}{10} = \frac{12}{5} = 12:5$$

(ii) Number of students for dance = 16

Number of students opting dramatics = 24

$$\therefore \text{Required Ratio} = \frac{16}{24} = \frac{2}{3} = 2:3$$

(iii) Number of students for dance = 16

Number of students for painting = 10

$$\therefore \text{Required Ratio} = \frac{16}{10} = \frac{8}{5} = 8:5$$

⑥ URad dal = 250 grams
Rice = 1 kg = 1000 grams

∴ Required Ratio between Rice and dal

$$= 1000 \text{ grams} : 250 \text{ grams}$$

$$= \frac{1000 \text{ grams}}{250 \text{ grams}} = \frac{4}{1} = 4:1$$

⑦

Number of people who like tea = 15

Number of people who like coffee = 12

Number of people who like juice

$$= 30 - (15 + 12) = 30 - 27 = 3$$

(i) Required Ratio between number of people who like tea and juice = $\frac{15}{3} = \frac{5}{1} = 5:1$

(ii) Required Ratio between number of people who like coffee and tea = $\frac{12}{15} = \frac{4}{5} = 4:5$

(iii)

Number of people who like tea or coffee
 $= 15 + 12 = 27$

Number of people who like juice $= 3$

$$\therefore \text{Required Ratio} = \frac{27}{3} = \frac{9}{1} = 9:1$$

⑧

$$25:40 = \frac{25}{40} = \frac{5}{8}$$

$$35:50 = \frac{35}{50} = \frac{7}{10}$$

$$25:35 = \frac{25}{35} = \frac{5}{7}$$

Thus, the given ratios are not equivalent.

⑨

4 equivalent ratios for $2:5$ are:

$$2:5 = \frac{2 \times 2}{5 \times 2} = \frac{4}{10} = 4:10$$

$$2:5 = \frac{2 \times 3}{5 \times 3} = \frac{6}{15} = 6:15$$

$$2:5 = \frac{2 \times 10}{5 \times 10} = \frac{20}{50} = 20:50$$

$$2:5 = \frac{2 \times 5}{5 \times 5} = \frac{10}{25} = 10:25$$

⑩

$$\frac{48}{60} = \frac{12}{15} = \frac{4}{5} = \frac{32}{40}$$

Exercise 8.2

①

$$(i) \quad 5:6 = \frac{5 \times 9}{6 \times 9} = \frac{45}{54}$$

$$7:9 = \frac{7 \times 6}{9 \times 6} = \frac{42}{54}$$

$$\text{Thus } \frac{45}{54} > \frac{42}{54}$$

$$\therefore 5:6 > 7:9$$

Hence, 7:9 is smaller.

(ii)

$$2:5 = \frac{2 \times 3}{5 \times 3} = \frac{6}{15}$$

$$1:3 = \frac{1 \times 5}{3 \times 5} = \frac{5}{15}$$

$$\text{Thus } \frac{6}{15} > \frac{5}{15}$$

$$\text{i.e. } 2:5 > 1:3$$

Hence, 1:3 is smaller.

(iii)

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

$$3:8 = \frac{3 \times 2}{8 \times 2} = \frac{6}{16}$$

Thus, $\frac{8}{16} > \frac{6}{16}$

$\therefore 1:2 > 3:8$

Hence 3:8 is smaller.

(iv)

$$5:12 = \frac{5 \times 5}{12 \times 5} = \frac{25}{60}$$

$$17:30 = \frac{17 \times 2}{30 \times 2} = \frac{34}{60}$$

Thus, $\frac{34}{60} > \frac{25}{60}$

$\therefore 17:30 > 5:12$

Hence, 5:12 is smaller.

(v) $3:7 = \frac{3 \times 9}{7 \times 9} = \frac{27}{63}$

$$4:9 = \frac{4 \times 7}{9 \times 7} = \frac{28}{63}$$

Thus, $\frac{20}{63} > \frac{27}{63}$

ie $4:9 > 3:7$

Hence $3:7$ is smaller.

(vi)

$$1:2 = \frac{1 \times 27}{2 \times 27} = \frac{27}{54}$$

$$13:27 = \frac{13 \times 2}{27 \times 2} = \frac{26}{54}$$

Thus, $\frac{27}{54} > \frac{26}{54}$

ie $1:2 > 13:27$

Hence, $13:27$ is smaller.

(2)

Ratio between the parts = $2:3$

Sum of Ratio terms = $2+3=5$

Total amount = ₹ 625

$$\text{Alok's share} = ₹ 625 \times \frac{2}{5} = ₹ 250$$

$$\text{Seema's share} = ₹ 625 \times \frac{3}{5} = ₹ 375$$

(3) Ratio of children between sons and daughter
= 2:3:2

Sum of ratio terms = $2+3+2 = 7$

$$\therefore \text{Share of first son} = ₹ 735000 \times \frac{2}{7} \\ = ₹ 2,10,000$$

$$\therefore \text{Share of second son} = ₹ 735000 \times \frac{3}{7} \\ = ₹ 315000$$

$$\text{Share of daughter} = ₹ 735000 \times \frac{2}{7} \\ = ₹ 2,10,000$$

(4) Given that, ratio of milk and rice = 8:3

Let x cups milk be used if Rajat wants to use 9 cups of rice.

$$\text{Now } 8:3 = x:9$$

$$\therefore \frac{8}{3} = \frac{x}{9} \Rightarrow x = \frac{8 \times 9}{3} = 24$$

Hence, 24 cups of milk is required.

⑤

Ratio between three angles = 5:6:7

$$\text{Sum of Ratio terms} = 5+6+7 = 18$$

$$\text{Sum of angles} = 180^\circ$$

Therefore,

$$\text{First angle} = 180^\circ \times \frac{5}{18} = 50^\circ$$

$$\text{Second angle} = 180^\circ \times \frac{6}{18} = 60^\circ$$

$$\text{Third angle} = 180^\circ \times \frac{7}{18} = 70^\circ$$

⑥

Ratio between the cost of a washing machine and a television = 4:9

$$\text{Sum of ratio terms} = 4+9 = 13$$

$$\text{Total amount spent} = ₹ 32500$$

$$\begin{aligned} \therefore \text{Cost of a washing machine} &= ₹ 32500 \times \frac{4}{13} \\ &= ₹ 10000 \end{aligned}$$

$$\begin{aligned}\text{Cost of a television} &= ₹ 32500 \times \frac{9}{13} \\ &= ₹ 22,500\end{aligned}$$

⑦

Given that ratio of copper and zinc = 5:3

Quantity of copper = 30.5 grams.

Let the quantity of zinc be x grams.

Then, according to question,

$$\frac{5}{3} = \frac{30.5}{x}$$

$$\Rightarrow x = \frac{30.5 \times 3}{5} = 18.3$$

Hence, the weight of the zinc in the alloy is 18.3 grams.

Exercise 8.3

①

① When a, b, c, d are in proportion, then

$$\frac{a}{b} = \frac{c}{d}$$

(i) $8:9 :: 27:24$

$$\frac{8}{9} = \frac{27}{24} \Rightarrow \frac{8}{9} \neq \frac{9}{8}$$

\therefore It is false

(ii) $55:33 :: 60:48$

$$\frac{55}{33} = \frac{60}{48} \Rightarrow \frac{5}{3} \neq \frac{5}{4}$$

\therefore It is false

(iii) $35:49 :: 24:40$

$$\frac{35}{49} = \frac{24}{40} \Rightarrow \frac{5}{7} \neq \frac{3}{5}$$

\therefore It is false

(iv) $16:48::20:60$

$$\frac{16}{48} = \frac{20}{60} \Rightarrow \frac{1}{3} = \frac{1}{3}$$

\therefore It is true. 16, 48, 20, 60 are in Proportion.

(2) Fill in the blanks.

(i) $12\text{m} : \boxed{72\text{m}} :: 5\text{m} : 30\text{m}$

(ii) $\text{₹}72 : \text{₹}3 :: 48\text{kg} : \boxed{2\text{kg}}$

(iii) $4\text{ books} : 6\text{ books} :: \boxed{44\text{ books}} : 66\text{ books}$

(iv) $2\text{ hours} : 1\text{hr } 30\text{ min} :: 8\text{ hours} : \boxed{6\text{ hours}}$

(v) $\boxed{10\text{ boys}} : 14\text{ boys} :: 15\text{ girls} : 21\text{ girls}$

(3)

(i) We have $27:18::36:24$

Here, product of extremes = $27 \times 24 = 648$

and product of means = $18 \times 36 = 648$

\therefore product of extremes = product of means.

Yes, the above numbers are in proportion.

(ii)

We have, $50:25::75:150$

Here, product of extremes = 50×150
= 7500

and product of means = $25 \times 75 = 1875$

\therefore product of extremes \neq product of means

Thus, above numbers are not in proportion.

(iii) We have, $25:60::120:50$

Here, product of extremes = $25 \times 50 = 1250$

and product of means = $60 \times 120 = 7200$

\therefore product of extremes \neq product of means

Thus, above numbers are not in proportion.

(iv) We have, $125 : 50 :: 20 : 8$

Here, product of extremes = $125 \times 8 = 1000$

and product of means = $50 \times 20 = 1000$

\therefore product of extremes = product of means

Thus, the above numbers are in proportion.

4)

(i) We have, 15, 24, 48, 30

We can arrange them as $15 : 30 :: 24 : 48$

Thus $\frac{15}{30} = \frac{24}{48}$

$\Rightarrow \frac{1}{2} = \frac{1}{2}$

Thus, $15 : 30 :: 24 : 48$ are in proportion.

(ii) We have, 10, 15, 21, 14

We can arrange them as $10 : 15 :: 14 : 21$

Thus, $\frac{10}{15} = \frac{14}{21} \Rightarrow \frac{2}{3} = \frac{2}{3}$

Thus, $10 : 15 :: 14 : 21$ are in proportion.

(iii) We have, 28, 35, 100, 80

We can arrange them as 28:35::80:100

$$\text{Thus, } \frac{28}{35} = \frac{80}{100}$$

$$\Rightarrow \frac{4}{5} = \frac{4}{5}$$

Thus, 28:35::80:100 are in proportion.

(iv) We have, 25, 96, 40, 60

We can arrange them as 25:40::60:96

$$\text{Thus, } \frac{25}{40} = \frac{60}{96}$$

$$\Rightarrow \frac{5}{8} = \frac{5}{8}$$

Thus, 25:40::60:96 are in proportion.

(5) If 20, 80, 320 are in continued proportion, then 20:80::80:320 are in proportion.

To verify that, we have to check

Product of extremes = product of means

$$\begin{aligned} \text{i.e. } 20 \times 320 &= 80 \times 80 \\ 6400 &= 6400 \end{aligned}$$

\therefore product of extremes = product of means

Thus, 20, 80, 320 are in continued proportion.

⑥

(i) If 3, x, 147 are in continued proportion,

we have $3 : x :: x : 147$

$$\text{i.e. } 3 \times 147 = x \times x \quad \left[\begin{array}{l} \text{Product of extremes} = \\ \text{Product of means} \end{array} \right]$$

$$441 = x \times x$$

$$\Rightarrow 21 \times 21 = x \times x$$

$$\therefore x = 21$$

(ii) If $x, 20, 25$ are in continued proportion, we have $x:20::20:25$

$$\text{i.e. } x \times 25 = 20 \times 20$$

[Product of extremes = Product of means]

$$x \times 25 = 400$$

$$\Rightarrow x = \frac{400}{25} = 16$$

(iii) If $9, 12, x$ are in continued proportion, we have $9:12::12:x$.

$$\text{i.e. } 9 \times x = 12 \times 12$$

[Product of extremes = Product of means]

$$\Rightarrow 9 \times x = 144$$

$$\Rightarrow x = \frac{144}{9} = 16$$

⑦ Let the breadth of a rectangular field be x m.

Then, according to question,

$$9:4::63:x$$