



Ratio and Proportion

Exercise-1

1. (a) $3:4$ (b) $4:7$

2. (a) $25:13$ (b) $13:25$

(c) Total number of students = $25 + 13 = 38$

Required ratio = $25:38$

3. (a) $17:24$ (b) $24:17$

The two ratios are not equal.

Exercise-2

1. (a) $\text{₹ } 36 : \text{₹ } 40 = \frac{36}{40} = \frac{36 \div 4}{40 \div 4} = \frac{9}{10} = 9:10.$

(b) $44 : 99 = \frac{44}{99} = \frac{44 \div 11}{99 \div 11} = \frac{4}{9} = 4:9.$

(c) $45 \ell : 30 \ell = \frac{45}{30} = \frac{45 \div 15}{30 \div 15} = \frac{3}{2} = 3:2.$

(d) $6 \text{ months} : 3 \text{ years} = 6 \text{ months} : 36 \text{ months} = \frac{6}{36} = \frac{6 \div 6}{36 \div 6} = \frac{1}{6} = 1:6$

(e) $2 \text{ kg} : 250 \text{ g} = 2000 \text{ g} : 250 \text{ g} = \frac{2000}{250} = \frac{2000 \div 250}{250 \div 250} = \frac{8}{1} = 8:1.$

(f) $75 \text{ p} : \text{₹ } 2.25 = 75 \text{ p} : 225 \text{ p} = \frac{75}{225} = \frac{75 \div 75}{225 \div 75} = \frac{1}{3} = 1:3.$

(g) $600 \text{ m} : 1.5 \text{ km} = 600 \text{ m} : 1500 \text{ m} = \frac{600}{1500} = \frac{600 \div 300}{1500 \div 300} = \frac{2}{5} = 2:5.$

(h) $24 \text{ cm} : 4 \text{ m} = 24 \text{ cm} : 400 \text{ cm} = \frac{24}{400} = \frac{24 \div 8}{400 \div 8} = \frac{3}{50} = 3:50.$

(i) $380 \text{ g} : 1 \text{ kg } 900 \text{ g} = 380 \text{ g} : 1900 \text{ g} = \frac{380}{1900} = \frac{380 \div 380}{1900 \div 380} = \frac{1}{5} = 1:5.$

(j) 3 hours 20 minutes : 1 hour 30 minutes

$$= 200 \text{ minutes} : 90 \text{ minutes} = \frac{200}{90} = \frac{200 \div 10}{90 \div 10} = \frac{20}{9} = 20:9.$$

2. Guitar players : Piano players = $32 : 24 = \frac{32}{24} = \frac{32 \div 8}{24 \div 8} = \frac{4}{3} = 4:3$

Thus, the ratio of guitar players to that of piano players is 4 : 3.

3. Number of books = 28

Number of notebooks = 42

Total number of books and notebooks = $28 + 42 = 70$

(a) Books : Notebooks = $28 : 42 = \frac{28^2}{42_3} = \frac{2}{3} = 2:3.$

(b) Notebooks : Total number of books and notebooks = $42 : 70$
 $= \frac{42^3}{70_5} = \frac{3}{5} = 3:5.$

4. Mohan's age = 9 years

His father's age = 36 years

Sum of their ages = $(9 + 36) \text{ years} = 45 \text{ years}.$

Difference in their ages = $(36 - 9) \text{ years} = 27 \text{ years}$

(a) Mohan's age : His father's age = $9 : 36 = \frac{9^1}{36_4} = \frac{1}{4} = 1:4.$

(b) Mohan's age : Sum of their ages = $9 : 45 = \frac{9^1}{45_5} = \frac{1}{5} = 1:5$

(c) His father's age : Difference in their ages = $36 : 27$
 $= \frac{36^4}{27_3} = \frac{4}{3} = 4:3.$

5. Income of Mr. Prasad = ₹ 60,000

His expenditure = ₹ 45,000

His savings = ₹ (60,000 - 45,000) = ₹ 15,000

(a) His income : His expenditure = ₹ 60,000 : ₹ 45,000

$$= \frac{60000}{45000} = \frac{60^4}{45_3} = \frac{4}{3} = 4:3$$

(b) His savings : His expenditure = ₹ 15,000 : ₹ 45,000

$$= \frac{15000}{45000} = \frac{15^1}{45_3} = \frac{1}{3} = 1:3$$

(c) His savings : His income = ₹ 15,000 : ₹ 60,000

$$= \frac{15000}{60000} = \frac{15^1}{60_4} = \frac{1}{4} = 1:4$$

(d) His expenditure : His savings = ₹ 45,000 : ₹ 15,000

$$= \frac{45000}{15000} = \frac{45^3}{15_1} = \frac{3}{1} = 3:1$$

Exercise-3

1. (a) $3:5 = \frac{3}{5}$ and $4:9 = \frac{4}{9}$

LCM of 5 and 9 = 45

Now, $\frac{3}{5} = \frac{3 \times 9}{5 \times 9} = \frac{27}{45}$ and $\frac{4}{9} = \frac{4 \times 5}{9 \times 5} = \frac{20}{45}$

Since, $\frac{27}{45} > \frac{20}{45}$

$\therefore \frac{3}{5} > \frac{4}{9}$ or $3:5 > 4:9$

Thus, 3:5 is greater.

$$(b) 2:3 = \frac{2}{3} \text{ and } 5:6 = \frac{5}{6}$$

LCM of 3 and 6 is 6.

$$\text{Now, } \frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6} \text{ and } \frac{5}{6} = \frac{5 \times 1}{6 \times 1} = \frac{5}{6}$$

$$\text{Since, } \frac{5}{6} > \frac{4}{6}$$

$$\therefore \frac{5}{6} > \frac{2}{3} \text{ or } 5:6 > 2:3.$$

Thus, 5:6 is greater.

$$(c) 45:30 = \frac{45}{30} = \frac{3}{2} \text{ and } 35:21 = \frac{35}{21} = \frac{5}{3}$$

LCM of 2 and 3 = 6

$$\text{Now, } \frac{3}{2} = \frac{3 \times 3}{2 \times 3} = \frac{9}{6}, \frac{5}{3} = \frac{5 \times 2}{3 \times 2} = \frac{10}{6}$$

$$\text{Since, } \frac{10}{6} > \frac{9}{6}$$

$$\therefore \frac{5}{3} > \frac{3}{2} \text{ or } 35:21 > 45:30.$$

Thus, 35:21 is greater.

$$(d) 50:70 = \frac{50}{70} = \frac{5}{7}$$

$$40:90 = \frac{40}{90} = \frac{4}{9}$$

LCM of 7 and 9 is 63.

$$\text{Now, } \frac{5}{7} = \frac{5 \times 9}{7 \times 9} = \frac{45}{63} \text{ and } \frac{4}{9} = \frac{4 \times 7}{9 \times 7} = \frac{28}{63}$$

$$\text{Since, } \frac{45}{63} > \frac{28}{63}$$

$$\therefore \frac{5}{7} > \frac{4}{9} \text{ or } 5:7 > 4:9 \text{ or } 50:70 > 40:90$$

Thus, 50:70 is greater.

$$2. (a) 3:7 = \frac{3}{7}$$

$$\frac{3}{7} = \frac{3 \times 2}{7 \times 2} = \frac{6}{14}$$

$$\frac{3}{7} = \frac{3 \times 3}{7 \times 3} = \frac{9}{21}$$

$$\frac{3}{7} = \frac{3 \times 4}{7 \times 4} = \frac{12}{28}$$

$$3:7 = 6:14 = 9:21 = 12:28$$

$$(b) 8:11 = \frac{8}{11}$$

$$\frac{8}{11} = \frac{8 \times 2}{11 \times 2} = \frac{16}{22}$$

$$\frac{8}{11} = \frac{8 \times 3}{11 \times 3} = \frac{24}{33}$$

$$\frac{8}{11} = \frac{8 \times 4}{11 \times 4} = \frac{32}{44}$$

$$8:11 = 16:22 = 24:33 = 32:44$$

$$(c) 36:54 = \frac{36}{54}$$

$$\frac{36}{54} = \frac{36 \div 2}{54 \div 2} = \frac{18}{27}$$

$$\frac{36}{54} = \frac{36 \div 3}{54 \div 3} = \frac{12}{18}$$

$$\frac{36}{54} = \frac{36 \div 6}{54 \div 6} = \frac{6}{9}$$

$$36:54 = 18:27 = 12:18 = 6:9$$

$$(d) 48:60 = \frac{48}{60}$$

$$\frac{48}{60} = \frac{48 \div 2}{60 \div 2} = \frac{24}{30}$$

$$\frac{48}{60} = \frac{48 \div 3}{60 \div 3} = \frac{16}{20}$$

$$\frac{48}{60} = \frac{48 \div 4}{60 \div 4} = \frac{12}{15}$$

$$48:60 = 24:30 = 16:20 = 12:15$$

$$3. (a) \frac{3}{5} = \frac{12}{\boxed{?}},$$

$$3 \times 4 = 12, 5 \times 4 = 20. \text{ Thus, } 3:5 = 12:\boxed{20}$$

$$(b) \frac{18}{16} = \frac{\boxed{?}}{8},$$

$$16 \div 2 = 8, 18 \div 2 = 9. \text{ Thus, } 18:16 = \boxed{9}:8$$

$$(c) \frac{6}{7} = \frac{36}{\boxed{?}},$$

$$6 \times 6 = 36, 7 \times 6 = 42. \text{ Thus, } 6:7 = 36:\boxed{42}$$

$$(d) \frac{\boxed{?}}{49} = \frac{2}{7},$$

$7 \times 7 = 49$, $2 \times 7 = 14$. Thus, $\boxed{14}:49 = 2:7$

$$4. \frac{6 \text{ cups}}{18 \text{ cupcakes}} = \frac{12 \text{ cups}}{\boxed{?}}$$

$$\frac{6}{18} = \frac{12}{?}, \text{ Here, } 6 \times 2 = 12, \quad 18 \times 2 = 36$$

Mrs. Roy will make 36 cupcakes.

$$5. \frac{120 \text{ km}}{3 \text{ hours}} = \frac{360 \text{ km}}{\boxed{?}}$$

$$120 \times 3 = 360$$

$$\text{So, } 3 \times 3 = 9$$

The car will take 9 hours to travel 360 km.

$$6. \text{ Cost of tomatoes per kg for Rohit} = ₹ \frac{105}{5} = ₹ 21$$

$$\text{Cost of tomatoes per kg for Anuj} = ₹ \frac{90}{4}$$

The two ratios are $21:1$ and $90:4$.

$$21:1 = \frac{21}{1} = \frac{21 \times 4}{1 \times 4} = \frac{84}{4}$$

$$\text{Since } \frac{84}{4} < \frac{90}{4}$$

Therefore, Rohit made a better bargain.

Exercise-4

$$1. (a) \text{ Sum of the terms of the ratio} = 3 + 7 = 10$$

$$\text{First share} = \frac{3}{10} \times ₹ 100 = ₹ 3 \times 10 = ₹ 30$$

$$\text{Second share} = \frac{7}{10} \times ₹ 100 = ₹ 7 \times 10 = ₹ 70$$

(b) Sum of the terms of the ratio = $6 + 11 = 17$

$$\text{First share} = \frac{6}{\cancel{17}_1} \times \cancel{85}^5 = 6 \times 5 = 30$$

$$\text{Second share} = \frac{11}{\cancel{17}_1} \times \cancel{85}^5 = 11 \times 5 = 55$$

(c) Sum of the terms of the ratio = $4 + 5 = 9$

$$\text{First share} = \frac{4}{\cancel{9}_1} \times \cancel{450}^{50} \text{ g} = 4 \times 50 \text{ g} = 200 \text{ g}$$

$$\text{Second share} = \frac{5}{\cancel{9}_1} \times \cancel{450}^{50} \text{ g} = 5 \times 50 \text{ g} = 250 \text{ g}$$

(d) Sum of the terms of the ratio = $4 + 7 = 11$

$$\text{First share} = \frac{4}{\cancel{11}_1} \times \cancel{6655}^{605} = 4 \times 605 = 2420$$

$$\text{Second share} = \frac{7}{\cancel{11}_1} \times \cancel{6655}^{605} = 7 \times 605 = 4235$$

(e) $7 \text{ kg } 200 \text{ g} = (7000 + 200) \text{ g} = 7200 \text{ g}$

Sum of the terms of the ratio = $3 + 5 = 8$

$$\text{First share} = \frac{3}{\cancel{8}_1} \times \cancel{7200}^{900} \text{ g} = 3 \times 900 \text{ g} = 2700 \text{ g} = 2 \text{ kg } 700 \text{ g}$$

$$\text{Second share} = \frac{5}{\cancel{8}_1} \times \cancel{7200}^{900} \text{ g} = 5 \times 900 \text{ g} = 4500 \text{ g} = 4 \text{ kg } 500 \text{ g}$$

(f) $2 \text{ l } 400 \text{ ml} = (2000 + 400) \text{ ml} = 2400 \text{ ml}$

Sum of the terms of the ratio = $1 + 5 = 6$

$$\text{First share} = \frac{1}{\cancel{6}_1} \times \cancel{2400}^{400} \text{ ml} = 1 \times 400 \text{ ml} = 400 \text{ ml}$$

$$\text{Second share} = \frac{5}{\cancel{6}_1} \times \cancel{2400}^{400} \text{ ml} = 5 \times 400 \text{ ml} = 2000 \text{ ml} = 2 \text{ l}$$

2. Sum of the terms of the ratio = $9 + 11 = 20$

$$\text{Aarti's share} = \frac{9}{20} \times \cancel{4000}^{200} = ₹ 9 \times 200 = ₹ 1800$$

$$\text{Julie's share} = \frac{11}{20} \times \cancel{4000}^{200} = ₹ 11 \times 200 = ₹ 2200$$

3. Sum of the terms of the ratio = $5 + 8 = 13$

$$\text{Wife's share} = \frac{5}{13} \times \cancel{65000}^{5000} = ₹ 5 \times 5000 = ₹ 25000.$$

$$\text{Daughter's share} = \frac{8}{13} \times \cancel{65000}^{5000} = ₹ 8 \times 5000 = ₹ 40000.$$

4. Sum of the terms of the ratio = $5 + 7 = 12$

$$\text{First share} = \frac{5}{12} \times \cancel{48}^4 \text{ cm} = 5 \times 4 \text{ cm} = 20 \text{ cm}.$$

$$\text{Second share} = \frac{7}{12} \times \cancel{48}^4 \text{ cm} = 7 \times 4 \text{ cm} = 28 \text{ cm}.$$

Thus, the lengths of two parts are 20 cm and 28 cm.

5. $40 \text{ kg } 500 \text{ g} = (40000 + 500) \text{ g} = 40500 \text{ g}$

Sum of the terms of the ratio = $8 + 7 = 15$

$$\text{First share} = \frac{8}{15} \times \cancel{40500}^{2700} \text{ g} = 8 \times 2700 \text{ g} = 21600 \text{ g} = 21 \text{ kg } 600 \text{ g}$$

$$\text{Second share} = \frac{7}{15} \times \cancel{40500}^{2700} \text{ g} = 7 \times 2700 \text{ g} = 18900 \text{ g} = 18 \text{ kg } 900 \text{ g}$$

So, the weights of two bags are 21 kg 600 g and 18 kg 900 g.

Exercise-5

1. (a) Product of extremes = $7 \times 30 = 210$

$$\text{Product of means} = 5 \times 42 = 210$$

$$\text{Product of extremes} = \text{Product of means}$$

Hence, 7, 5, 42, 30 are in proportion.

(b) Product of extremes = $3 \times 44 = 132$

Product of means = $11 \times 33 = 363$

Product of extremes \neq Product of means

Hence, 3, 11, 33, 44 are not in proportion.

(c) Product of extremes = $10 \times 13 = 130$

Product of means = $14 \times 9 = 126$

Product of extremes \neq Product of means

Hence, 10, 14, 9, 13 are not in proportion.

(d) Product of extremes = $3 \times 24 = 72$

Product of means = $4 \times 18 = 72$

Product of extremes = Product of means

Hence, 3, 4, 18, 24 are in proportion.

2. Product of extremes = Product of means

First term \times Fourth term = Second term \times Third term

$\Rightarrow 5 \times 88 = \text{Second term} \times 55$

$\Rightarrow \text{Second term} = \frac{5 \times 88}{55} = 8$

Thus, the second term of the proportion is 8.

3. Given that,

length : width :: 5 : 3

45 : width :: 5 : 3

$\Rightarrow 45 \times 3 = \text{width} \times 5$

$\Rightarrow \text{Width} = \frac{45 \times 3}{5} = 9 \times 3 = 27 \text{ m.}$

Thus, the width of the cloth is 27 m.

4. Given that,

Boys : Girls :: 7 : 3

$\Rightarrow \text{Boys} : 240 :: 7 : 3$

$\Rightarrow \text{Boys} \times 3 = 240 \times 7$

$\Rightarrow \text{Boys} = \frac{7 \times 240}{3} = 7 \times 80 = 560.$

Thus, the number of boys is 560.

5. Ratio of milk and water = 1 : 3

Quantity of water = 90 ml

$$\therefore 1 : 3 :: (?) : 90$$

$$\Rightarrow 1 \times 90 = (?) \times 3$$

$$\Rightarrow (?) = \frac{90}{3} = 30$$

So, 30 ml milk is used.

6. Given that,

Ratio of heights of Sushil and Manoj = 4 : 3

Height of Sushil = 1.6 m

$$\therefore 4 : 3 :: 1.6 : (?)$$

$$\Rightarrow 4 \times (?) = 3 \times 1.6$$

$$\Rightarrow (?) = \frac{3 \times 1.6}{4} = 1.2$$

Thus, the height of Manoj is 1.2 m.

Mental Maths Corner

1. (c)

2. (c)

3. (d)

4. (b)

Review Exercise

1. (a) ₹ 20 : 50 p = 2000 p : 50 p = $\frac{2000}{50} = 40 = 40 : 1$

(b) 4 l 900 ml : 5600 ml = 4900 ml : 5600 ml

$$= \frac{4900}{5600} = \frac{49^7}{56^8} = \frac{7}{8} = 7 : 8$$

(c) 2 m 40 cm : 3 m 80 cm = 240 cm : 380 cm

$$= \frac{240}{380} = \frac{24^{12}}{38^{19}} = \frac{12}{19} = 12 : 19$$

2. Total students trained = 96,

Number of students selected = 54

Number of students not selected = 96 - 54 = 42

(a) Total students trained : students selected

$$= 96 : 54 = \frac{96^{16}}{54_9} = \frac{16}{9} = 16 : 9$$

(b) Selected students : non-selected students

$$= 54 : 42 = \frac{54^9}{42_7} = \frac{9}{7} = 9 : 7$$

3. 10 a.m. to 6 p.m. = 8 hours = 480 minutes

Duration of lunch break = 30 minutes

Working hours = (480 - 30) minutes = 450 minutes

lunch time : working hours

$$= 30 \text{ minutes} : 450 \text{ minutes}$$

$$= \frac{30^1}{450_{15}} = \frac{1}{15} = 1 : 15$$

Thus, the ratio of lunch time to working hours is 1 : 15.

$$4. (a) 7 : 11 = \frac{7}{11}, \quad 8 : 13 = \frac{8}{13}$$

$$\text{LCM of 11 and 13} = 11 \times 13 = 143$$

$$\frac{7}{11} = \frac{7 \times 13}{11 \times 13} = \frac{91}{143}, \quad \frac{8}{13} = \frac{8 \times 11}{13 \times 11} = \frac{88}{143}$$

$$\text{Now, } \frac{91}{143} > \frac{88}{143} \quad \text{or} \quad \frac{7}{11} > \frac{8}{13}$$

Thus, 7 : 11 $\boxed{>}$ 8 : 13.

$$(b) 45 : 54 = \frac{45}{54} = \frac{45 \div 9}{54 \div 9} = \frac{5}{6}$$

$$50 : 60 = \frac{50}{60} = \frac{50 \div 10}{60 \div 10} = \frac{5}{6}$$

$$\frac{5}{6} = \frac{5}{6}$$

Thus, 45 : 54 $\boxed{=}$ 50 : 60.

$$(c) \quad 3:7 = \frac{3}{7} \quad \text{and} \quad 8:28 = \frac{8}{28} = \frac{8 \div 4}{28 \div 4} = \frac{2}{7}$$

$$\frac{3}{7} > \frac{2}{7}$$

Thus, $3:7 \boxed{>} 8:28$.

5. Sum of the terms of the ratio = $9 + 14 = 23$

$$\text{Rohit's share} = \frac{9}{23} \times \cancel{\text{₹ } 46000}^{2000} = \text{₹ } 9 \times 2000 = \text{₹ } 18000$$

$$\text{Aman's share} = \frac{14}{23} \times \cancel{\text{₹ } 46000}^{2000} = \text{₹ } 14 \times 2000 = \text{₹ } 28000$$

So, Rohit and Aman will get ₹ 18,000 and ₹ 28,000 respectively.

6. (a) Product of extremes = $7 \times 90 = 630$

$$\text{Product of means} = 8 \times 84 = 672$$

$$\text{Product of extremes} \neq \text{Product of means}$$

So, 7, 8, 84, 90 are not in proportion.

- (b) Product of extremes = $112 \times 5 = 560$

$$\text{Product of means} = 140 \times 4 = 560$$

$$\text{Product of extremes} = \text{Product of means}$$

So, 112, 140, 4, 5 are in proportion.

7. Income : Savings = $7:3$

$$\Rightarrow \text{Income} : \text{₹ } 36000 = 7:3$$

$$\Rightarrow \text{Income} \times 3 = 7 \times \text{₹ } 36000$$

$$\Rightarrow \text{Income} = \frac{7 \times \cancel{\text{₹ } 36000}^{12000}}{3} = \text{₹ } 84000$$

So, the income of Mr Sharma is ₹ 84000.

8. Product of extremes = Product of means

First term \times Fourth term = Second term \times Third term

$$\Rightarrow 57 \times 85 = 95 \times \text{Third term}$$

$$\Rightarrow \text{Third term} = \frac{3 \cancel{57}^1 \times \cancel{85}^{17}}{\cancel{95}_1} = 3 \times 17 = 51.$$

Thus, the third term is 51.

HOTS

1. Siddharth gets double of what Sameer gets and Sameer gets double of what Aakash gets.

So, ₹ 30,100 will be divided in the ratio 1 : 2 : 4 among Aakash, Sameer and Siddharth.

Sum of the terms of the ratio = $1 + 2 + 4 = 7$

$$\text{Share of Aakash} = \frac{1}{7} \times ₹ 30,100 = ₹ \frac{30100}{7} = ₹ 4,300$$

$$\text{Share of Sameer} = 2 \times \text{share of Aakash} = 2 \times ₹ 4,300 = ₹ 8,600$$

$$\text{Share of Siddharth} = 2 \times \text{share of Sameer} = 2 \times ₹ 8,600 = ₹ 17,200$$

So, ₹ 30,100 will be divided among Aakash, Sameer and Siddharth as ₹ 4,300, ₹ 8,600 and ₹ 17,200 respectively.

2. Cost of tea = ₹ 85 per kg.

$$\text{Cost of coffee} = ₹ 3.40 \text{ per } 10 \text{ g}$$

$$= ₹ 3.40 \times 100 \text{ per kg}$$

$$= ₹ 340 \text{ per kg}$$

Ratio of price of tea to coffee = ₹ 85 : ₹ 340

$$= \frac{\cancel{85}^1}{\cancel{340}_{20_4}} = \frac{1}{4} = 1 : 4$$

So, the ratio of price of tea to coffee is 1 : 4.