

Board -CBSE

Class - 6<sup>th</sup>

Topic - Ratios and Proportions Ex:12.1

## Exercise 12.1

1. There are 20 girls and 15 boys in a class.
- (a) What is the ratio of the number of girls to the number of boys?
- (b) What is the ratio of the number of girls to the number of students in the class?

**Ans.** (a) Number of girls = 20

Number of boys = 15

Total number of students = 20 + 15 = 35

∴ Ratio of the number of girls to the number of boys

$$= \frac{\text{Number of girls}}{\text{Number of boys}} = \frac{20}{15}$$

$$= \frac{20 \div 5}{15 \div 5} = \frac{4}{3} \text{ or } 4 : 3$$

Thus, the required ratio is 4 : 3.

(b) Ratio of the number of girls to the number of students

$$= \frac{\text{Number of girls}}{\text{Number of boys}} = \frac{20}{35}$$

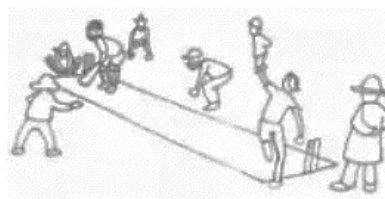
$$= \frac{20 \div 5}{35 \div 5} = \frac{4}{7} \text{ or } 4 : 7$$

Thus, the required ratio is 4 : 7.

2. Out of 30 students in a class, 6 like football, 12 like cricket and remaining like tennis. Find the ratio of

(a) Number of students liking football to the number of students liking tennis.

(b) Number of students liking cricket to the total number of students.



**Ans.** Number of students in the class = 30

Number of students liking football = 6

Number of students liking cricket = 12

Number of students liking tennis =  $30 - (6 + 12) = 30 - 18 = 12$

(a) Ratio of the number of the students liking football to the number of students liking tennis

$$\frac{\text{Number of students liking football}}{\text{Number of students liking tennis}}$$

tennis

$$= \frac{6}{12} = \frac{6 \div 6}{12 \div 6} = \frac{1}{2} \text{ or } 1 : 2$$

Thus, the required ratio is 1 : 2.

(b) Ratio of the number of students liking cricket to the total number of students

$$\frac{\text{Number of students liking cricket}}{\text{Total number of students}}$$
$$= \frac{12}{30} = \frac{12 \div 6}{30 \div 6} = \frac{2}{5} \text{ or } 2 : 5$$

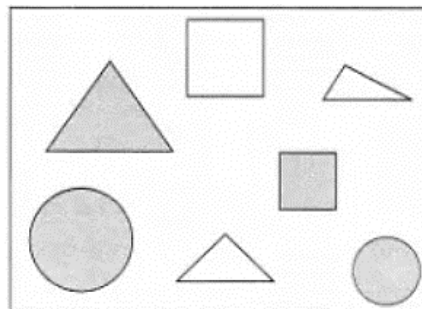
Thus, the required ratio is 2 : 5.

3. See the figure and find the ratio of

(a) The number of triangles to the number of circles inside the rectangle.

(b) The number of squares to all the figures inside the rectangle.

(c) The number of circles to all the figures inside the rectangle.



**Ans.** (a) Number of triangles 3

Number of circles = 2

∴ Ratio of number of triangles to the number of circles

$$= \frac{\text{Number of triangles}}{\text{Number of circles}} = \frac{3}{2} \text{ or } 3 : 2$$

Thus, the required ratio is 3 : 2.

(b) Number of squares = 2

Number of all figures = 7

∴ Ratio of number of squares to the number of all the figures

$$= \frac{\text{Number of squares}}{\text{Number of all the figures}} = \frac{2}{7} \text{ or } 2 : 7$$

Thus, the required ratio is 2 : 7.

(c) Ratio of number of circles to the number of all the figures

$$= \frac{\text{Number of circles}}{\text{Number of all the figures}} = \frac{2}{7} \text{ or } 2 : 7$$

Thus, the required ratio is 2 : 7.

4. Distances traveled by Hamid and Akhtar in an hour are 9 km and 12 km.

Find the ratio of the speed of Hamid to the speed of Akhtar.

**Ans.** Distance traveled by Hamid = 9 km.

Distance traveled by Akhtar = 12 km.

Speed of Hamid = 9 km

per hour Speed of Akhtar = 12 km per hour

∴ The ratio of the speed of Hamid to the speed of Akhtar = Speed of Hamid/ Speed of Akhtar

$$\text{Ratio} = \frac{\text{Speed of Hamid}}{\text{Speed of Akhtar}}$$

$$= \frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4} \text{ or } 3 : 4$$

Thus, the required ratio is 3 : 4.

5. Fill in the following blanks:

$$\frac{15}{18} = \frac{\square}{6} = \frac{10}{\square} = \frac{\square}{36}$$

[Are these equivalent ratios?]

**Ans.**  $\frac{15}{18} = \frac{\square}{6}$

$$\Rightarrow \square \times 18 = 15 \times 6$$

$$\Rightarrow \square = \frac{15 \times 6}{18} = \frac{90}{18} = \frac{90 \div 18}{18 \div 18} = \frac{5}{1} = 5.$$

$$\therefore \square = 5.$$

$$\frac{5}{6} = \frac{10}{\square}$$

$$\Rightarrow 5 \times \square = 6 \times 10$$

$$\Rightarrow \square = \frac{6 \times 10}{5} = \frac{60}{5} = 12$$

$$\therefore \square = 12.$$

$$\frac{10}{12} = \frac{\square}{30}$$

$$\Rightarrow 12 \times \square = 10 \times 30$$

$$\Rightarrow \square = \frac{10 \times 30}{12} = \frac{300}{12} = 25$$

$$\therefore \square = 25$$

Now the fractions, we have

$$\frac{15}{18} = \frac{5}{6} = \frac{10}{12} = \frac{25}{30}$$

$$\frac{15}{18} = \frac{15 \div 3}{18 \div 3} = \frac{5}{6} \text{ [HCF of 15 and 18 is 3]}$$

$$\frac{10}{12} = \frac{10 \div 2}{12 \div 2} = \frac{5}{6} \text{ [HCF of 10 and 12 is 2]}$$

$$\frac{25}{30} = \frac{25 \div 5}{30 \div 5} = \frac{5}{6} \text{ [HCF of 25 and 30 is 5]}$$

Thus  $\frac{15}{18}$ ,  $\frac{5}{6}$ ,  $\frac{10}{12}$  and  $\frac{25}{30}$  are all equivalent ratios

6. Find the ratio of the following:

(a) 81 to 108

(b) 98 to 63

(c) 33 km to 121 km

(d) 30 minutes to 45 minutes

**Ans.** (a) 81 to 108 =  $\frac{81}{108} = \frac{81 \div 27}{108 \div 27} = \frac{3}{4}$

[HCF of 81 and 108 = 27]

Thus, the ratio = 3 : 4

(b) 98 to 63 =  $\frac{98}{63} = \frac{98 \div 7}{63 \div 7} = \frac{14}{9}$

[HCF of 98 and 63 = 7]

Thus, the ratio = 14 : 9

$$(c) 33 \text{ to } 121 \text{ km} = \frac{33}{121} = \frac{33 \div 11}{121 \div 11} = \frac{3}{11}$$

[HCF of 33 and 121 = 11]

Thus, the ratio = 3 : 11

(d) 30 minutes to 45 minutes

$$= \frac{30}{45} = \frac{30 \div 15}{45 \div 15} = \frac{2}{3}$$

[HCF of 30 and 45 = 15]

Thus, the ratio = 2 : 3

7. Find the ratio of the following:

(a) 30 minutes to 1.5 hours

(b) 40 cm to 1.5 m

(c) 55 paise to ₹ 1

(d) 500 mL to 2 litres

**Ans.** (a) 1 hour = 60 minutes

$$\therefore 1.5 \text{ hours} = 60 \times 1.5 \text{ minutes} = 90 \text{ minutes}$$

$\therefore$  The ratio of 30 minutes to 1.5 hours = Ratio of 30 minutes to 90 minutes

$$= \frac{30}{90} = \frac{30 \div 30}{90 \div 30} = \frac{1}{3} = 1 : 3$$

[HCF of 30 and 90 = 30]

(b) 1 m = 100 cm

$$\therefore 1.5 \text{ m} = 1.5 \times 100 \text{ cm} = 150 \text{ cm.}$$

$\therefore$  Ratio of 40 cm to 1.5 m = Ratio of 40 cm to 150 cm.

$$\frac{40}{150} = \frac{40 \div 10}{150 \div 10} = \frac{4}{15} = 4 : 15$$

[HCF of 40 and 150 = 10]

(c) ₹ 1 = 100 paise

$\therefore$  Ratio of 55 paise to ₹ 1 = Ratio of 55 paise to 100 paise

$$\frac{55}{100} = \frac{55 \div 5}{100 \div 5} = \frac{11}{20} = 11 : 20$$

[HCF of 55 and 100 = 5]

(d) 500 mL to 2 litres

1 litre = 1000 mL

∴ 2 litres =  $2 \times 1000$  mL = 2000 mL

∴ Ratio of 500 mL to 2 litres = Ratio of 500 mL to 2000 mL

$$= \frac{500}{2000} = \frac{500 \div 500}{2000 \div 500} = \frac{1}{4} = 1 : 4$$

[HCF of 500 and 2000 = 500]

8. In a year, Seema earns ₹ 1,50,000 and saves ₹ 50,000. Find the ratio of

(a) Money that Seema earns to the money she saves.

(b) Money that she saves to the money she spends.

**Ans.** (a) Money earned by Seema = ₹ 1,50,000

Money saved by her = ₹ 50,000

∴ Money spent by her = ₹ 1,50,000 – ₹ 50,000 = ₹ 1,00,000

∴ The ratio of money earned by Seema to the money saved by her

$$= \frac{\text{money earned}}{\text{Money saved}} = \frac{1,50,000}{50,000}$$

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

(b) Ratio of money saved by Seema to the money

$$\text{spent by her} = \frac{\text{money earned}}{\text{Money saved}}$$

$$= \frac{50,000}{1,00,000} = \frac{5}{10} = \frac{5 \div 5}{10 \div 5} = \frac{1}{2} = 1 : 2$$

9. There are 102 teachers in a school of 3300 students.

Find the ratio of the number of teachers to the number of students.

**Ans.** Number of teachers = 102

Number of students = 3300

∴ The ratio of the number of teachers to the number of students

$$= \frac{\text{Number of teachers}}{\text{Number of students}}$$

$$= \frac{102}{3300} = \frac{102 \div 6}{3300 \div 6} = \frac{17}{550} = 17 : 550$$

10. In a college, out of 4320 students, 2300 are girls, find the ratio of
- Number of girls to the total number of students.
  - Number of boys to the number of girls.
  - Number of boys to the total number of students.

**Ans.** Total number of students = 4320

Number of girls = 2300

$\therefore$  Number of boys =  $4320 - 2300 = 2020$

(a) Ratio of number of girls to the total number of students

$$\begin{aligned} &= \frac{\text{number of girls}}{\text{Total number of students}} \\ &= \frac{2300}{4320} = \frac{2300 \div 20}{4320 \div 20} = \frac{115}{216} = 115 : 216 \end{aligned}$$

[HCF of 2300 and 4320 = 20]

(b) Ratio of number of boys to the number of girls

$$\begin{aligned} &= \frac{\text{number of boys}}{\text{Total number girls}} \\ &= \frac{2020}{2300} = \frac{2020 \div 20}{2300 \div 20} = \frac{101}{115} = 101 : 115 \end{aligned}$$

[HCF of 2020 and 2300 = 20]

(c) Ratio of number of boys to the total number of students

$$\begin{aligned} &= \frac{\text{number of boys}}{\text{Total number students}} \\ &= \frac{2020}{4320} = \frac{2020 \div 20}{4320 \div 20} \\ &= \frac{101}{216} = 101 : 216 \end{aligned}$$

[HCF of 2020 and 4320 = 20]

11. Out of 1800 students in a school, 750 opted for basketball, 800 opted for cricket, and the remaining opted for table tennis. If a student can opt for only one game, find the ratio of

(a) The number of students who opted for basketball to the number of students who opted for table tennis.

(b) The number of students who opted for cricket to the number of students opting for basketball.

(c) The number of students who opted for basketball to the total number of students.

**Ans.** Total number of students = 1800

Number of students opting for basketball = 750

Number of students opting for cricket = 800

Number of remaining students who opted for table tennis =  $1800 - (750 + 800)$

=  $1800 - 1550 = 250$

(a) The ratio of number of students who opted for basketball to the number of students who opted for table tennis =

Number of students opting for basketball/ Number of students opting for table tennis

$$\frac{\text{Number of students opting basketball}}{\text{Number of students opting table tennis}}$$

$$= \frac{750}{250} = \frac{750 \div 250}{250 \div 250} = \frac{3}{1}$$

$$= 3 : 1 \quad [\text{HCF of 750 and 250} = 250]$$

(b) Ratio of the students who opted for cricket to the number of students opting for basketball

$$\frac{\text{Number of students opting cricket}}{\text{Number of students opting basketball}}$$

$$= \frac{800}{750} = \frac{800 \div 50}{750 \div 50} = \frac{16}{15}$$

$$= 16 : 15 \quad [\text{HCF of 800 and 750} = 50]$$

(c) Ratio of number of students who opted for basketball to the total number of students

$$\frac{\text{Number of students who opted basketball}}{\text{Total number of students}}$$

$$= \frac{750}{1800} = \frac{750 \div 150}{1800 \div 150} = \frac{5}{12}$$

$$= 5 : 12 \quad [\text{HCF of 750 and 1800} = 150]$$

**12.** Cost of a dozen pens is ₹ 180 and the cost of 8 ball pens is ₹ 56.

Find the ratio of the cost of a pen to the cost of a ball pen.

**Ans.** Cost of 1 dozen, i.e., 12 pens = ₹ 180

$$\therefore \text{Cost of 1 pen} = ₹ \frac{180}{12} = ₹ 15$$



Cost of 8 ball pens = ₹ 56

$$\therefore \text{Cost of 1 ball pen} = ₹ \frac{56}{8} = ₹ 7$$

The ratio of the cost of 1 pen to the cost of 1 ball pen

$$= \frac{\text{Cost of 1 pen}}{\text{Cost of 1 ball pen}} = \frac{15}{7} = 15:7$$

Thus the required ratio is 15 : 7.

13. Consider the statement: Ratio of breadth and length of a hall is 2 : 5. Complete the following table that shows some possible breadths and lengths of the hall.

Breadth of the hall (in meters)	2	X	40
Length of the hall (in meters)	5	50	X

Ans. We have  $2 : 5 :: X : 50 = \frac{2}{5} = \frac{X}{50}$

$$\Rightarrow X \times 5 = 2 \times 50$$

$$\Rightarrow X = \frac{2 \times \overset{10}{\cancel{50}}}{\cancel{5}} = 20$$

We also have  $2 : 5 :: 40 : X$

$$\therefore \frac{2}{5} = \frac{40}{X} \Rightarrow X \times 2 = 40 \times 5$$

$$\Rightarrow X = \frac{\overset{20}{\cancel{40}} \times 5}{\cancel{2}} = 100$$

Breadth of the hall (in meters)	2	20	40
Length of the hall (in meters)	5	50	100

14. Divide 20 pens between Sheela and Sangeeta in the ratio of 3 : 2.

Ans. We have  $3 + 2 = 5$

Total number of pen = 20

$$\therefore \text{Sheela's share} = \frac{3}{5} \times 20 = 3 \times 4 = 12 \text{ pens}$$

$$\text{Sangeeta's shares} = \frac{2}{5} \times 20 = 2 \times 4 = 8 \text{ pens.}$$

Thus Sheela gets 12 pens and Sangeeta gets 8 pens.

- 15.** Mother wants to divide ₹ 36 between her daughters Shreya and Bhoomika in the ratio of their ages. If the age of Shreya is 15 years and the age of Bhoomika is 12 years, find how much Shreya and Bhoomika will get?

**Ans.** Given that:

Money got by Shreya: Money got by Bhoomika = 15 : 12

$$\therefore \text{Sum} = 15 + 12 = 27$$

$$\text{Share of Shreya} = \frac{15 \times 36}{27} = \text{Rs } 20$$

$$\text{Share of Bhoomika} = \frac{12 \times 36}{27} = \text{Rs } 16$$

- 16.** Present age of the father is 42 years and that of his son is 14 years. Find the ratio of
- Present age of father to the present age of the son.
  - Age of the father to the age of the son, when the son was 12 years old.
  - Age of the father after 10 years to the age of the son after 10 years.
  - Age of the father to the age of the son when father was 30 years old.

**Ans.** The present age of the father = 42 years.

The present age of his son = 14 years.

(a) Ratio of the present age of father to the present age of the son

$$= \frac{42}{14} = \frac{42 \div 14}{14 \div 14} = \frac{3}{1} = 3 : 1$$

[HCF of 42 and 14 = 14]

(b) When the son was 12 years old, i.e.,  $14 - 12 = 2$  years ago father's age =  $42 - 2 = 40$  years.

The ratio of the father's age to the son's age

$$= \frac{40}{12} = \frac{40 \div 4}{12 \div 4} = \frac{10}{3} = 10 : 3$$

[HCF of 40 and 12 = 4]

(c) Ratio of father's age after 10 years, i.e.,  $42 + 10 = 52$  years

to the age of son after 10 years, i.e.,  $= 14 + 10 = 24$  years

$$= \frac{52}{24} = \frac{52 \div 4}{24 \div 4} = \frac{13}{6} = 13 : 6$$

(d) Ratio of the son's age to the age of father when he was only 30 years .

When father was 30 years,

i.e., before  $42 - 30 = 12$  years

Age of son was  $= 14 - 12 = 2$  years

∴ Required ratio

$$= \frac{30}{2} = \frac{30 \div 2}{2 \div 2} = \frac{15}{1} = 15 : 1$$