Chapter 12:

Ratio and Proportion

NOTES:

Exercise 12.1

1. There are 20 girls and 15 boys in a class.

a) **What is the ratio of number of girls to the number boys?**
b) **What is the ratio of number of girls to the total number of students in the class?**

Solutions:

Number of girls in the class = 20

Number of boys in the class = 15

∴ Total number of students in the class = 20 + 15 = 35.

Now,

a) Ratio = $\frac{Number\ of\ girls}{Number\ of\ boys}$

$= \frac{20}{15}$

We have,

20 = 2 x 2 x ❺

15 = 3 x ❺

∴ HCF of 20 and 15 is 5.

We get,

$\frac{20 \div 5}{15 \div 5}$ [Dividing both numerator and denominator by HCF]

$= \frac{4}{3}$

= 4 : 3

b) Ratio = $\frac{Number\ of\ girls}{Total\ number\ of\ Students}$

$= \frac{20}{35}$

We have,

20 = 2 x 2 x 5

35 = 7 x 5

∴ HCF of 20 and 35 is 5.

We get,

$\frac{20 \div 5}{35 \div 5}$ [Dividing both numerator and denominator by HCF]

$= \frac{4}{7}$

= 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 number of students liking tennis.**
b) **Number of students liking cricket to total number of students.**

Solutions:

a) Here, Total number of students = 30

Number of students liking football = 6

Number of students liking cricket = 12

And remaining number of students liking tennis = 30 – (12 + 6)

= 30 – 18 = 12

Ratio = $\frac{Number\ of\ students\ liking\ football}{Number\ of\ students\ liking\ tennis}$

$= \frac{6}{12}$

We have,

6 = 2 x 3

12 = 2 x 2 x 3

∴ HCF of 6 and 12 is 6.

b) We get,

$= \frac{6 \div 6}{12 \div 6}$ [Dividing both numerator and denominator by HCF of 6 and 12]

$= \frac{1}{2}$

= 1 : 2

Ratio = $\frac{Number\ of\ students\ liking\ cricket}{Total\ number\ of\ students}$

$= \frac{12}{30}$

We have,

12 = 2 x ❷ x ❸

30 = ❷ x ❸ x 5

∴ HCF = 3 x 2 = 6

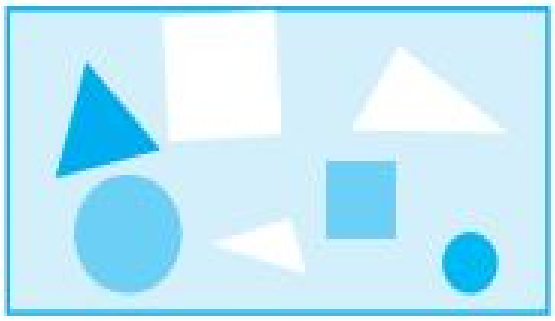
We get,

$= \frac{12 \div 6}{30 \div 6}$ [Dividing both numerator and denominator by HCF]

$= \frac{2}{5}$

= 2 : 5

3. See the figure and find the ratio of



a) **Number of triangles to the number of circles inside the rectangle.**
b) **Number of squares to all the figures inside the rectangle.**
c) **Number of circles to all the figures inside the rectangle.**

Solutions:

Number of triangles = 3

Number of circles = 2

Number of square = 2

∴ Total number of figures = 3 + 2 + 2 = 7

Now

a) Ratio of triangles to circles

$= \frac{Number\ of\ triangles}{Number\ of\ Circles}$

$= \frac{3}{2}$

= 3 : 2

b) Ratio of Squares to all figures

$= \frac{Number\ of\ Squares}{Number\ of\ all\ figures}$

$= \frac{2}{7}$

= 2 : 7

c) Ratio of circles to all figures

$= \frac{Number\ of\ Circles}{Number\ of\ Figures}$

$= \frac{2}{7}$

= 2 : 7

4. Distance travelled by Hamid and Akhtar in an hour are 9 km and 12 km. Find the ratio of speed of Hamid to the speed of Akhtar.

Solution:

We have,

Speed of Hamid = 9 km /hr

Speed of Akhtar= 12 km / hr

∴ **Ratio =** $\frac{speed\ of\ Hamid}{speed\ of\ AKhtar}$

$= \frac{9}{12}$

We have,

9 = 3 x ❸

12 = 2 x 2 x ❸

∴ HCF of 9 and 12 is 3.

We get,

$\frac{9 \div 3}{12 \div 3}$ **[**Dividing both numerator and denominator by HCF]

$= \frac{3}{4}$

= 3 : 4

5. Fill in the following blanks:

$\frac{15}{18} = \frac{\square}{6} = \frac{10}{\square} = \frac{\square}{30}$ **[Are these equivalent ratios]**

Solution:

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

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

$\frac{15}{18} = \frac{\square}{30}$

By cross multiplication, we get

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

$\square$ **x 18 = 15 x 6**

$\square = \frac{15 \times 6}{18} = 5$

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

$\square \times 15 = 10 \times 18$

$\square = \frac{10 \times 18}{15} = 12$

$\frac{15}{18} = \frac{\square}{30}$

$\square \times 18 = 15 \times 30$

$\square = \frac{15 \times 30}{18} = 25$

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

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

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

$\therefore \frac{15}{18} = \frac{5}{6} = \frac{10}{12} = \frac{25}{30}$ [each = 5 / 6]

Thus ratios are equivalent.

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**

Solutions:

a) **Ratio = $\frac{81}{108}$**

We have,

81 = 9 x ❸ x ❸

108 = 2 x 2 x 3 x ❸ x ❸

∴ HCF of 81 and 108 = 3 x 3 = 9

We get,

$\frac{81 \div 9}{108 \div 9} = \frac{9}{12} = \frac{3}{4}$ = 3: 4

b) **Ratio =** $\frac{98}{63}$

We have,

98 = 2 x 7 x 7

63 = 7 x 3 x 3

∴ HCF of 98 and 63 is 7

We get,

$\frac{98 \div 7}{63 \div 7}$ **[dividing both the numerator and denominator by HCF]**

$= \frac{14}{9}$ **= 14 : 9**

c) **Ratio =** $\frac{33\ km}{121\ km}$

We have

33 = 3 x 11

121 = 11 x 11

∴ HCF of 33 and 121 is 11

We get,

$\frac{33 \div 11}{121 \div 11}$ **[dividing both the numerator and denominator by HCF]**

$= \frac{3}{11}$ **= 3 : 11**

d) **Ratio =** $\frac{30\ minutes}{45\ minutes}$

We have,

30 = 2 x 3 x 5

45 = 5 x 3 x 3

∴ HCF of 30 and 45 is 15

We get,

$\frac{30 \div 15}{45 \div 15}$ **[dividing both the numerator and denominator by HCF]**

$= \frac{2}{3}$ **= 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**

Solutions:

a) **Ratio of 30 minutes to 1.5 hours**

$= \frac{30\ minutes}{1.5\ hour}$

$= \frac{30\ minutes}{90\ minutes}$ **[since 1.5 hours =** $\frac{15}{10}$ **x 60 minutes = 15 x 6 = 90 minutes]**

$= \frac{30}{90} = \frac{30 \div 30}{90 \div 30}$ **[Since HCF of 30 and 90 is 30]**

$= \frac{1}{3}$ **= 1 : 3**

b) **Ratio of 40 cm to 1.5 m**

$= \frac{40\ cm}{1.5\ m}$

$= \frac{40\ cm}{150\ cm}$ **[1.5m =** $\frac{15}{10}$ **x 100 cm = 150cm since 1m = 100cm]**

$= \frac{40 \div 10}{150 \div 10}$ **[since HCF of 40 and 150 is 10]**

$= \frac{4}{15}$

= 4 : 15

c) **Ratio of 55 paise to ₹1**

$= \frac{55\ paise}{₹1}$ **[since ₹1 =100 paise]**

$= \frac{55}{100}$

$= \frac{(55 \div 5)}{(100 \div 5)}$ **[since HCF of55 and 100 is 5]**

$= \frac{11}{20}$

= 11 : 20

d) **Ratio of 500ml to 2 litres**

$= \frac{500ml}{2\ litres}$

$= \frac{500ml}{2000ml}$ **[Since 1 litre = 1000ml]**

$= \frac{500}{2000}$

$= \frac{500 \div 500}{2000 \div 500}$ **[since HCF of 500 and 2000 is 500]**

$= \frac{1}{4}$

= 1 : 4

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.**

Solutions:

Total Earning = ₹ 1,50,000

Saving = ₹ 50,000

a) **Ratio of earning to saving**

$= \frac{₹1,50,000}{₹\ 50,000}$

$= \frac{1,50,000}{50,000}$

$= \frac{15}{5}$ **[Since HCF of 15 and 5 is 5]**

$= \frac{3}{1}$

= 3 : 1

b) **Money, she spends = ₹ 1,50,000 - ₹ 50,000**

= ₹ 1,00,000

∴ Ratio of Saving to expenditure $= \frac{₹\ 50,000}{₹\ 1,00,000}$

$= \frac{5 \div 5}{10 \div 5}$ **[Since HCF of 10 and 5 is 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.

Solutions:

Number of teachers = 102

Number of students = 3300

∴ Ratio of teachers to students = $\frac{102}{3300}$

$= \frac{102 \div 6}{3300 \div 6}$ **[Since HCF of 102 and 3300 is 6]**

$= \frac{17}{550}$

= 17 : 550

10. In a college, out of 4320 students, 2300 are girls. Find the ratio of

a) **Number of girls to the total number of students.**
b) **Number of boys to the number of girls.**
c) **Number of boys to the total number of students.**

Solutions:

Total number of students = 4320

Number of girls = 2300

∴ Number of boys = 4320 – 2300 = 2020

a) **Ratio of number of girls to total number of students**

$= \frac{2300}{4320}$

$= \frac{2300 \div 20}{4320 \div 20}$ **[Since HCF of 2300 and 4320 is 20]**

$= \frac{115}{216}$

= 115 : 216

b) **Ratio of number of boys to number of girls**

$= \frac{2020}{2300}$

$= \frac{2020 \div 20}{2300 \div 20}$ **[Since HCF of 2020 and 2300 is 20]**

$= \frac{101}{115}$

101 : 115

c) **Ratio of number of boys to total number of students**

$= \frac{2020}{4320}$

$= \frac{2020 \div 20}{4320 \div 20}$ **[Since HCF of 2020 and 4320 is 20]**

$= \frac{101}{216}$

= 101 : 216

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

a) **Number of students who opted basketball to the number of students who opted table tennis.**
b) **Number of students who opted cricket to the number of students opting basketball.**
c) **Number of students who opted basketball to the total number of students.**

Solutions:

Total number of students = 1800

Number of students who opted basketball = 750

Number of students who opted Cricket = 800

Number of students who opted table tennis

= 1800 – (750 + 800)

= 1800 – 1550 = 250

Now,

a) **Ratio of number of students who opted basketball to the number of student who opted table tennis.**

$= \frac{750}{250}$

We have,

750 = 3 x❺x ❷ x❺x ❺

250 = ❺ x❷x ❺ x ❺

i.e. HCF of 750 and 250 = 5 x 5 x 5 x 2 = 250

We get,

$\frac{750 \div 250}{250 \div 250}$ **[since dividing both numerator and denominator by HCF]**

$= \frac{3}{1}$

= 3 : 1

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

$= \frac{800}{750}$

We have,

800 = 2 x 2 x 2 x 2 x ❷ x ❺ x❺

750 = 3 x 5 x ❷ x ❺ x ❺

i.e. HCF of 800 and 750 = 2 x 5 x 5 = 50

We get,

$\frac{800 \div 50}{750 \div 50}$ **[since dividing both numerator and denominator by HCF]**

$= \frac{16}{15}$

= 16 : 15

c) **Ratio of number of students who opted basketball to total number of students**

$= \frac{750}{1800}$

We have,

750 = ❸ x ❺ x ❷ x ❺ x 5

1800 = ❷x ❸x 2 x 3 x 2 x ❺ x❺

i.e. HCF of 750 and 1800

= 2 x 3 x 5 x 5 = 150

We get,

$\frac{750 \div 150}{1800 \div 150}$ **[since dividing both numerator and denominator by HCF]**

$= \frac{5}{12}$ **= 5 :12**

12. Cost of a dozen pens is ₹ 180 and cost of 8 ball pens is ₹ 56. Find the ratio of the cost of a pen to the cost of a ball pen.

Solution:

We have,

1 dozen pen = 12 pens

Cost of 12 pens = ₹ 180

∴ Cost of 1 pen = ₹ 180÷ 12 =₹ 15

Cost of 8 ball pens = ₹ 56

∴ Cost of 1 ball pen = ₹ 56÷8 = ₹ 7

Now,

Ratio of the cost of a pen to cost of a ball pen = $\frac{₹15}{₹7}$ **= 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 metres)	10		40
Length of the hall (in metres	25	50	

Solutions:

Since $\frac{10}{25} = \frac{\square}{50}$

$\square$ **x 25 = 10 x 50 [By using cross product of equivalent fraction]**

$\square = \frac{10 \times 50}{25} = 20$

Thus, the corresponding to the length of 50 m, the breadth is 20 m

Again, $\frac{10}{25} = \frac{40}{\square}$

10 X $\square$ = 40 X 25 **[By using cross product of equivalent fraction]**

$\square = \frac{40 \times 25}{10}$

= 100

Thus, the corresponding to the breadth of 40m, the length is 100m

Now the table is completed as given below:

Breadth of the hall (in metres)	10	20	40
Length of the hall (in metres	25	50	100

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

Solution:

Total number of pens = 20

Sheela's share : Sangeeta's share = 3 : 2

Sum of Ratios = 3 + 2 = 5

∴ share of Sheela in 5 pens is 3

Share of Sangeeta in 5 pen is 2

∴ Sheela's share in 20 pens = $\frac{3}{5}$ x 20 = 12

Sangeeta's share in 20 pens = $\frac{2}{5}$ x 20 = 8

Thus, Sheela and Sangeeta shares are 12 and 8 respectively.

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

Solution:

Age of Shreya = 15 years

Age of Bhoomika = 12 years

∴ Ratio of their ages = $\frac{15\ years}{12\ years}$

We have,

15 = 3 x 5

12 = 3 x 2 x 2

i.e. HCF of 15 and 12 is 3

Now, we get

$\frac{15 \div 3}{12 \div 3}$ **[Dividing both numerator and denominator by HCF]**

$= \frac{5}{4}$

Sum of the ratios = 5 + 4 = 9

Total amount to be divided = ₹ 36

∴ Shreya's share = ₹ $\frac{5}{9}$ **x 36 = ₹ 20**

Bhoomika's share = ₹ $\frac{4}{9}$ **x 36 = ₹ 16**

16. Present age of 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 son

a) **Age of the father to the age of son, when son was 12 years old.**
b) **Age of father after 10 years to the age of son after 10 years.**
c) **Age of father to the age of son when father was 30 years old.**

Solutions:

a) **Present age of father = 42 years**

Present age of son = 14 years

Ratio of their ages = $\frac{Age\ of\ father}{Age\ of\ son} = \frac{42 years}{14\ years}$

$= \frac{42 \div 14}{14 \div 14}$ **[Since HCF of 14 and 42 is 14]**

$= \frac{3}{1}$ **= 3 : 1**

b) **When Son's age was 12 years (i.e. 2 years ago) then father's age was (42 years – 2years)**

= 40 years

∴ Ratio of father's age to Son's age is

$\frac{40\ years}{12\ years} = \frac{(40 \div 4)}{(12 \div 4)}$

$= \frac{10}{3}$

= 10 : 3

c) **After 10 years**

Age of father = 42 years + 10 years = 52 years

Age of Son = 14 years + 10 years = 24 years.

∴ Ratio of father's age to son's age

$= \frac{52\ years}{24\ years}$

$= \frac{52 \div 4}{24 \div 4}$ **[since HCF of 52 and 24 is 4]**

$= \frac{13}{6}$

= 13 : 6

d) **12 years ago**

Age of father was 30 years

Age of son = 14 years – 12 years

= 2 years

∴ Ratio of father's age to son's age = $\frac{30\ years}{2\ years}$

$= \frac{(30 \div 2)}{(2 \div 2)}$ **[since HCF of 30 and 2 is 2]**

$= \frac{15}{1}$

= 15 : 1

EXERCISE 12.2

1. Determine if the following are in proportion.

a) **15, 45, 40, 120**
b) **33, 121, 9, 96**
c) **24, 28, 36, 48**
d) **32, 48, 70, 210**
e) **4, 6, 8, 12**
f) **33, 44, 75, 100**

Solutions:

a) 15, 45, 40, 120

Ratio of 15 and 45 = 15 : 45

$= \frac{15}{45}$

$= \frac{(15 \div 15)}{(45 \div 15)}$ **[since HCF of 15 and 45 is 15]**

$= \frac{1}{3}$

= 1 : 3

b) **Ratio of 40 and 120 = 40 : 120**

$= \frac{40}{120}$

$= \frac{40 \div 40}{120 \div 40}$ **[since HCF of 40 and 120 is 40]**

$= \frac{1}{3}$

= 1 : 3

∴ 15 : 45 : : 40 : 120

i.e. 15, 45, 40 and 120 are in proportion.

33, 121, 9, 96

Ratio of 33 and 121 = 33 : 121

$= \frac{33}{121}$

$= \frac{33 \div 11}{121 \div 11}$ **[since HCF of 33 and 121 is 11]**

$= \frac{3}{11}$

= 3 : 11

Ratio of 9 and 96 = 9 : 96

$= \frac{9}{96}$

$= \frac{(9 \div 3)}{(96 \div 3)}$ **[since HCF of 9 and 96 is 3]**

$= \frac{3}{32}$

= 3 : 32

Since 3 : 11 ≠ 3 : 32

∴ 33, 121, 9 and 96 are not in proportion.

c) **24, 28, 36, 48**

Ratio of 24 and 28 = 24: 28

$= \frac{24}{28}$

$= \frac{(24 \div 4)}{(28 \div 4)}$ **[since HCF of 24 and 28 is 4]**

$= \frac{6}{7}$

=6 : 7

Ratio of 36 and 48 = 36 : 48

$= \frac{36}{48}$

$= \frac{36 \div 12}{48 \div 12}$ **[since HCF of 36 and 48 is 12]**

$= \frac{3}{4}$

= 3 : 4

Since 6 : 7 ≠ 3 : 4

∴ 24, 28, 36 and 48 are not in proportion.

d) 32, 48, 70, 210

Ratio of 32 and 48 = 32: 48

$= \frac{32}{48}$

$= \frac{32 \div 16}{48 \div 16}$ **[since HCF of 32 and 48 is 16]**

$= \frac{2}{3}$

=2 : 3

Ratio of 70 and 210 = 70 : 210

$= \frac{70}{210}$

$= \frac{(70 \div 70)}{(210 \div 70)}$ **[since HCF of 70 and 210 is 70]**

$= \frac{1}{3}$

= 1 : 3

Since 2 : 3 $\neq$ 1 : 3

∴ 32, 48, 70 and 210 are not in proportion.

e) 4, 6, 8, 12

Ratio of 4 and 6 = 4 : 6

$= \frac{4}{6}$

$= \frac{(4 \div 2)}{(6 \div 2)}$ **[since HCF of 4 and 6 is 2]**

$= \frac{2}{3}$

=2 : 3

Ratio of 8 and 12 = 8 : 12

$= \frac{8}{12}$

$= \frac{8 \div 4}{12 \div 4)}$ **[since HCF of 8 and 12 is 4]**

$= \frac{2}{3}$

= 2 : 3

Since 2 : 3 = 2 : 3

i.e. 4 : 6 = 8 : 12

∴ 4, 6, 8, and 12 are in proportion.

f) **33, 44, 75, 100**

Ratio of 33 and 44 = 33 : 44

$= \frac{33}{44}$

$= \frac{33 \div 11}{44 \div 11}$ **[since HCF of 33 and 44 is 11]**

$= \frac{3}{4}$

=3 : 4

Ratio of 75 and 100 = 75 : 100

$= \frac{75}{100}$

$= \frac{(75 \div 25)}{(100 \div 25)}$ **[since HCF of 75 and 100 is 25]**

$= \frac{3}{4}$

= 3 : 4

Since 3 : 4 = 3 : 4

i.e. 33 : 44 = 75 : 100

∴ 33, 44, 75, and 100 are in proportion.

2. Write True (T) or False (F) against each of the following statements :

a) 16 : 24 : : 20 : 30
b) 21: 6 : : 35 : 10
c) 12 : 18 : :28 : 12
d) 8 : 9 : : 24 : 27
e) 5. 2 : 3.9 : : 3 : 4
f) 0.9 : 0.36 : : 10 : 4

Solutions:

a) 16 : 24 :: 20 : 30

We have,16 : 24

$= \frac{16}{24}$

$= \frac{16 \div 8}{24 \div 8}$ **[Since HCF of 16 and 24 is 8]**

$= \mathbf{\frac{2}{3}}$

=2 : 3

And 20 : 30

$= \mathbf{\frac{20}{30}}$

$= \mathbf{\frac{20 \div 10}{30 \div 10}}$ **[Since HCF 20 and 30 is 10]**

$= \mathbf{\frac{2}{3}}$

= 2 : 3

Since 16 : 24 = 30 : 30

∴ 16 : 24 :: 20 : 30 is true.

b) 21: 6 :: 35 : 10

We have, 21 : 6

$= \frac{21}{6}$

$= \frac{(21 \div 3)}{(6 \div 3)}$ **[Since HCF of 21 and 6 is 3]**

$= \mathbf{\frac{7}{2}}$

=7 : 2

And 35 : 10

$= \mathbf{\frac{35}{10}}$

$= \mathbf{\frac{35 \div 5}{10 \div 5}}$ **[SinceHCF 35 and 10 is 5]**

$= \mathbf{\frac{7}{2}}$

= 7 : 2

Since 16 : 6 = 35 : 10

∴ 21: 6 :: 35 : 10 is true.

c) 12 : 18 :: 28 : 12

We have, 12 : 18

$= \frac{12}{18}$

$= \frac{(12 \div 6)}{(18 \div 6)}$ **[Since HCF of 12 and 18 is 6]**

$= \frac{2}{3}$

=2 : 3

And 28 : 12

$= \frac{28}{12}$

$= \frac{(28 \div 4)}{(12 \div 4)}$ **[SinceHCF 28 and 12 is 4]**

$= \frac{7}{3}$

= 7 : 3

Since $\frac{2}{3} \neq \frac{7}{3}$

∴ 12 : 18 ≠ 28 : 12

d) ∴ 12: 18 :: 28 : 12 is false.

8 : 9 :: 24 : 27

We have,

24 : 27

$= \frac{24}{27}$

$= \frac{(24 \div 3)}{(27 \div 3)}$ **[since HCF of 24 and 27 is 3]**

$= \frac{8}{9}$

Since 8 : 9 = 24 : 27

∴ 8 : 9 : : 24 : 27 is true.

e) **5.2 : 3.9 : : 3 : 4**

We have,

5.2 : 3.9

$= \frac{5.2}{3.9}$

$= \frac{52}{10} \div \frac{39}{10}$

$= \frac{52}{39}$

$= \frac{52 \div 13}{39 \div 13}$ **[Since HCF of 52 and 39 is 13]**

$= \frac{4}{3}$

= 4 : 3

Which is not equal to 3 : 4

∴ 5.2 : 3.9 ≠ 3 : 4

Thus, 5.2 : 3.9 : : 3 : 4 is false.

f) **0.9 : 0.36 : : 10 : 4**

We have,

0.9 : 0.36

$= \frac{9}{10} \div \frac{36}{100}$

$= \frac{90}{36}$

$= \frac{90 \div 18}{36 \div 18}$ **[Since HCF of 90 and 36 is 18]**

$= \frac{5}{2}$

= 5 : 2

Since 0.9 : 0.36 = 10 : 4

10 : 4

$= \frac{10}{4}$

$= \frac{10 \div 2}{4 \div 2}$ **[Since HCF of 10 and 4 is 2]**

$= \frac{5}{2}$

= 5 : 2

Since 0.9 : 0.36 = 10 : 4

∴ 0.9 : 0.36 : : 10 : 4 is true.

3. Are the following statements true?

a) 40 persons : 200 persons = ₹ 15 : ₹ 75
b) 7.5 litres : 15 litres = 5 kg : 10 kg
c) 99 kg : 45 kg = ₹ 44 : ₹ 20
d) 32 m : 64 m = 6 sec : 12 sec
e) 45 km : 60 km = 12 hours : 15 hours

Solutions:

a) 40 persons : 200 persons = ₹ 15 : ₹ 75

Since 40 persons : 200 persons

$= \frac{40}{200}$

$= \frac{(40 \div 40)}{(200 \div 40)}$ **[Since HCF of 40 and 200 is 40]**

$= \frac{1}{5}$

= 1 : 5

₹ 15 : ₹ 75

$= \frac{15}{75}$

$= \frac{(15 \div 15)}{(75 \div 15)}$ **[Since HCF of 15 and 75 is 15]**

$= \frac{1}{5}$

= 1: 5

The given ratios are equal.

∴ **40 persons : 200 persons** = ₹ 15 : ₹ 75 is true.

b) 7.5 litres : 15 litres = 5 kg : 10 kg

We have,

7.5 litres : 15 litres

$= \frac{7.5}{15}$

$= \frac{75}{150}$

$= \frac{75 \div 75}{150 \div 75}$ **[Since HCF of 75 and 150 is 75]**

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

= 1 : 2

And 5 kg : 10 kg

$= \mathbf{\frac{5}{10}}$

$= \frac{(5 \div 5)}{(10 \div 5)}$ **[Since HCF of 5 and 10 is 5]**

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

= 1 : 2

Since the two ratios are equal

∴ **7.5 litres : 15 litres = 5 kg : 10 kg is true**

c) 99 kg : 45 kg = ₹ 44 : ₹ 20

We have,

99 kg : 45 kg

$= \frac{99\ kg}{45\ kg}$

$= \frac{99 \div 9}{49 \div 9}$ **[Since HCF of 99 and 45 is 9]**

$= \mathbf{\frac{11}{5}}$

= 11 : 5

And ₹ 44 : ₹ 20

$= \frac{44}{20}$

$= \frac{44 \div 4}{20 \div 4}$ **[Since HCF of 44 and 20 is 4]**

$= \mathbf{\frac{11}{5}}$

= 11 : 5

Since two ratios are equal

∴ **99 kg : 44 kg =** ₹ 44 : ₹ 20 is true.

d) 32 m: 64 m = 6 sec : 12 sec

We have,

32 m : 64 m

$= \frac{32}{64}$

$= \frac{(32 \div 32)}{(64 \div 32)}$ **[Since HCF of 32 and 64 is 32]**

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

= 1 : 2

And 6 sec : 12 sec

$= \mathbf{\frac{6}{12}}$

$= \mathbf{\frac{6 \div 6}{12 \div 6}}$

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

= 1 : 2

Since the two ratios are equal

∴ 32m : 64m = 6 sec : 12 sec is true.

45km : 60 km = 12 hours : 15 hours

45 km : 60 km

$= \frac{45}{60}$

$= \frac{45 \div 15}{60 \div 15}$ **[Since HCF of 45 and 60 is 15]**

$= \frac{3}{4}$

= 3 : 4

And 12 hours : 15 hours

$= \frac{12}{15}$

$= \frac{12 \div 3}{15 \div 3}$ **[Since HCF of 12 and 15 is 3]**

$= \frac{4}{5}$

= 4 : 5

Since 3 : 4 ≠ 4 : 5

∴ 45 km : 60 km = 12 hours : 15 hours is false.

4. Determine if the following ratios form a proportion. Also, write the middle terms and extreme terms where the ratios form a proportion.

a) 25 cm : 1 m and ₹ 40 : ₹ 160
b) 39 litres : 65 litres and 6 bottles : 10 bottles
c) 2 kg : 80 kg and 25 g : 625 g
d) 200 mL : 2.5 litre and ₹ 4 : ₹ 50

Solutions:

a) 25 cm : 1 m and ₹ 40 : ₹ 160

Here, $\frac{25\ cm}{1\ m}$

$= \frac{25\ cm}{100\ cm}$ [Since 1 m = 100 cm]

$= \frac{25 \div 25}{100 \div 25}$ **[Dividing both numerator and denominator by HCF of 25 and 100]**

$= \frac{1}{4}$

= 1: 4

And ₹ 40 : ₹ 160

$= \frac{40}{160}$

$= \frac{40 \div 40}{160 \div 40}$ **[Dividing both numerator and denominator by HCF of 40 and 160]**

$= \frac{1}{4}$

= 1 : 4

Since 25cm : 1 m = ₹ 40 : ₹ 160

∴ Middle terms are 1m and ₹ 40 and extreme terms are 25 cm and ₹ 160.

b) 39 litres : 65 litres and 6 bottles : 10 bottles

Here,

39 litres : 65 litres

$= \frac{39}{65}$

$= \frac{39 \div 13}{65 \div 13}$ **[Dividing both numerator and denominator by HCF of 39 and 65]**

$= \frac{3}{5}$

= 3 : 5

And 6 bottles : 10 bottles

$= \frac{6}{10}$

$= \frac{(6 \div 2)}{(10 \div 2)}$ **[Dividing both numerator and denominator by HCF of 6 and 10]**

$= \frac{3}{5}$

= 3 : 5

Since 39 litres : 65 litres = 6 bottles : 10 bottles

∴ Middle terms are 65 litres and 10 bottles and extreme terms are 39 litres and 6 bottles.

c) **2kg : 80kg and 25g : 625g**

Here,

2kg : 80 kg

$= \frac{2}{80}$

$= \frac{2 \div 2}{80 \div 2}$ **[Dividing both numerator and denominator by HCF of 2 and 80]**

$= \frac{1}{40}$

= 1 : 40

And 25g : 625 g

$= \frac{25}{625}$

$= \frac{(25 \div 25)}{(625 \div 25)}$ **[Dividing both numerator and denominator by HCF of 25 and 625]**

$= \frac{1}{25}$

= 1 : 25

Since 1 : 40 ≠ 1 : 25

∴ The given ratios do not form a proportion.

d) **200 ml : 2.5 litres and** ₹ 4 : ₹ 50

Here,

200 ml: 2.5 litres

$= \frac{200}{2500}$ **[Since 1 litre = 1000ml]**

$= \frac{200 \div 100}{2500 \div 100}$

[Since dividing both numerator and denominator by HCF of 200 and 2500]

$= \frac{2}{25}$

= 2 : 25

And ₹ 4 : ₹ 50

$= \frac{4}{50}$

$= \frac{(4 \div 2)}{(50 \div 2)}$ **[Since dividing both numerator and denominator by HCF of 4 and 50]**

$= \frac{2}{25}$

= 2: 25

Since the two ratios are equal, they form a proportion

∴ **Middle terms are 2.5 litres and** ₹ 4 and its extreme terms are 200 ml and ₹ 50.

Exercise 12.3

1. If the cost of 7 m of cloth is ₹ 1470, find the cost of 5 m of cloth.

Solution:

Cost of 7 m of cloth = ₹ 1470

i. e. Cost of 1 m of cloth = ₹ $\frac{1470}{7}$

= ₹ 210

∴Cost of 5 m cloth = ₹ (210 x 5) = ₹1050

2. Ekta earns ₹ 3000 in 10 days. How much will she earn in 30 days?

Solution:

Ekta's earning in 10 days = ₹3000

i. e. Ekta's earning in 1 day = ∴₹$\frac{3000}{10}$

= ₹ 300

∴Ekta's earning in 30 days = ₹ (300 x 30)

= ₹ 9000

3. If it has rained 276 mm in the last 3 days, how many cm of rain will fall in one full week (7 days)? Assume that the rain continues to fall at the same rate.

Solutions:

Since, measure of rainfall in 3 days = 276 mm

i. e. Measure of rainfall in 1 day = $\frac{276}{3}$**mm**

= 93 mm

Therefore measure of rainfall in 7 days = (92 x 7) mm

= 644 mm

4. Cost of 5 kg of wheat is ₹ 91.50.

a) What will be the cost of 8 kg of wheat?
b) What quantity of wheat can be purchased in ₹ 183?

Solutions:

a) Cost of 5 kg of wheat = ₹ 91.50

i.e. Cost of 1 kg of wheat = $₹\frac{\mathbf{91.50}}{\mathbf{5}}$

= ₹18.30

∴ **cost of 8 kg of wheat =** ₹ (18.30 x 8)

= ₹ 146.40

b) Quantity of wheat that can be purchased for ₹ 18.30 = 1 kg

Quantity of wheat that can be purchased for ₹ 1 = $\frac{1}{18.30}$kg of wheat.

∴ $Quantity\ of\ wheat\ that\ can\ be\ purchased\ for$ ₹ 183 = $\frac{1}{18.30}$ x 183 = 10 kg of wheat.

5. The temperature dropped 15 degree celsius in the last 30 days. If the rate of temperature drop remains the same, how many degrees will the temperature drop in the next ten days?

Solution:

Here,

Drop in temperature in 30 days = 15 degree

∴ Drop in temperature in one day = $\frac{15}{30}$ degree

So, drop in temperature in 10 days

= 10 x $\frac{15}{30}$ degrees

= 5 degrees.

Thus, 5 degree temperature will drop in next 10 days.

6. Shaina pays ₹ 15000 as rent for 3 months. How much does she has to pay for a whole year, if the rent per month remains same?

Solutions:

Here,

Rent for 3 months = ₹ 15000

Rent for 1 month = ₹$\frac{15000}{3}$

= ₹5000

∴ Rent for a whole year (i.e. 12 months)

= ₹ (12 x 5000)

= ₹ 60,000

Therefore, Shaina will have to pay ₹ 60,000 for a whole year.

7. Cost of 4 dozen bananas is ₹ 180. How many bananas can be purchased for ₹ 90?

Solutions:

Since, 1 dozen of bananas = 12 bananas

∴ 4 dozen of bananas = (12 x 4) = 48 bananas

Now, number of bananas that can be purchased for ₹ 180 = 48

Number of bananas that can be purchased for ₹ 1 = $\frac{48}{180}$

= $\frac{48 \div 12}{180 \div 12}$[dividing both numerator and denominator by HCF of 48 and 180]

= $\frac{4}{15}$

∴ Number of bananas that can be purchased for ₹ 90

= $\frac{4}{15}$ x 90

= $\frac{360}{15}$

= 24

Thus, 24 bananas can be purchased for ₹ 90.

8. The weight of 72 books is 9 kg. What is the weight of 40 such books?

Solution:

Since, weight of 72 books = 9kg

Weight of 1 book = $\frac{9}{72}$kg

∴ Weight of 40 books = 40 x $\frac{9}{72}$kg

= $\frac{360}{72}$kg

= 5 kg

∴ The weight of books is 5 kg.

9. A truck requires 108 litres of diesel for covering a distance of 594 km. How much diesel will be required by the truck to cover a distance of 1650 km?

Solution:

Here,

Quantity of diesel required for 594 km = 108 litres

i.e. Quantity of diesel required for 1 km = 108 / 594 litres

= $\frac{108 \div 54}{594 \div 54}$ litres [Since HCF of 108 and 594 is 54]

= $\frac{2}{11}$ litres

∴ Quantity of diesel required for 1650 km

= $\frac{2}{11}$ x 1650 litres

= 2 x 150 litres

= 300 litres

Therefore, 300 litres of diesel will be required to cover 1650 km.

10. Raju purchases 10 pens for ₹ 150 and Manish buys 7 pens for ₹ 84. Can you say who got the pens cheaper?

Solution:

Cost of 10 pens for Raju = ₹150

i.e. Cost of 1 pen = ₹$\frac{150}{10}$ = ₹15

And Cost of 7 pens for Manish = ₹84

i.e. Cost of 1 pen = ₹$\frac{84}{7}$ = ₹12

Since ₹12 < ₹ 15

Thus, Manish got the pens cheaper.

11.Anish made 42 runs in 6 overs and Anup made 63 runs in 7 overs. Who made more runs per over?

Solution:

Number of runs Anish made in 6 overs = 42 runs.

i.e. Number of runs made in 1 over = $\frac{42}{6}$ = 7 runs

Number of runs Anup made in 7 overs = 63 runs

$i.e.$Number of runs made in 1 over = $\frac{63}{7}$ = 9 runs.

Therefore, Anup made more runs per over.