



ST. MARY'S CO-ED SCHOOL, HARDA

[2020-21]

CLASS- VI

SUBJECT- MATHS

CHAPTER- 10

Ratio, Proportion and Unitary Method

Exercise 10 A

Q.1. Find each of the following ratios in the simplest form:

$$(i) 24:56 = \frac{24}{56} = \frac{24 \div 8}{56 \div 8} = \frac{3}{7}$$

As the H.C.F. of 3 and 7 is 1, the simplest form of 24:56 is 3:7.

(ii) 84 paise to Rupees 3

$$= 0.84: 3$$

$$= 0.84 / 3$$

$$= 0.84 \div 3 / 3 \div 3$$

$$= 0.28 / 1$$

$$= 28 / 100$$

$$= 28 \div 4 / 100 \div 4$$

$$= 7 / 25$$

Since the HCF of 7 and 25 is 1

$\therefore$ The simplest form of 0.84: 3 is 7: 25

(iii) To convert given ratio a: b to its simplest form, we divide each term by the HCF of a and b

$$4 \text{ kg to } 750 \text{ g} = 4000 \text{ g to } 750 \text{ g}$$

$$= 4000: 750$$

$$= 4000 \div 250 / 750 \div 250$$

$$= 16 / 3$$

Since the HCF of 16 and 3 is 1

$\therefore$ The simplest form of 4000: 750 is 16: 3

(iv) To convert given ratio a: b to its simplest form, we divide each term by the HCF of a and b

$$1.8 \text{ kg to } 6 \text{ kg} = 1.8: 6$$

$$= 1.8 / 6$$

$$= 18 / 60$$

$$= 18 \div 6 / 60 \div 6$$

$$= 3 / 10$$

Since the HCF of 3 and 10 is 1

$\therefore$ The simplest form of 1.8: 6 is 3: 10

(v) To convert given ratio a: b to its simplest form, we divide each term by the HCF of a and b

$$48 \text{ minutes to } 1 \text{ hour} = 48 \text{ min} : 60 \text{ min}$$

$$= 48: 60$$

$$= 48 \div 12 / 60 \div 12$$

$$= 4 / 5$$

Since the HCF of 4 and 5 is 1

$\therefore$ The simplest form of 48: 60 is 4:5

(vi) To convert given ratio a: b to its simplest form, we divide each term by the HCF of a and b

$$2.4 \text{ Km to } 900 \text{ m} = 2400 \text{ m} : 900 \text{ m}$$

$$= 2400 / 900$$

$$= 24 / 9$$

$$= 24 \div 3 / 9 \div 3$$

$$= 8 / 3$$

Since the HCF of 8 and 3 is 1

$\therefore$ The simplest form of 2400: 900 is 8: 3.

2. Express each of the following ratios in the simplest form:

Solution

(i) HCF of 36 and 90 is 18

$$\therefore 36: 90 = 36 / 90$$

$$= 36 \div 18 / 90 \div 18$$

$$= 2 / 5$$

$$= 2: 5$$

Hence, the simplest form of 36: 90 is 2: 5

(ii) HCF of 324 and 144 is 36

$$\therefore 324: 144 = 324 / 144$$

$$= 324 \div 36 / 144 \div 36$$

$$= 9 / 4$$

Hence, the simplest form of 324: 144 is 9: 4

(iii) HCF of 85 and 561 is 17

$$\therefore 85: 561 = 85 / 561$$

$$= 85 \div 17 / 561 \div 17$$

$$= 5 / 33$$

Hence, the simplest form of 85: 561 is 5: 33

(iv) HCF of 480 and 384 is 96

$$\therefore 480: 384 = 480 / 384$$

$$= 480 \div 96 / 384 \div 96$$

$$= 5 / 4$$

Hence, the simplest form of 480: 384 is 5: 4

(v) HCF of 186 and 403 is 31

$$\therefore 186: 403 = 186 / 403$$

$$= 186 \div 31 / 403 \div 31$$

$$= 6 / 13$$

Hence, the simplest form of 186: 403 is 6: 13

(vi) HCF of 777 and 1147 is 37

$$\therefore 777: 1147 = 777 / 1147$$

$$= 777 \div 37 / 1147 \div 37$$

$$= 21 / 31$$

Hence, the simplest form of 777: 1147 is 21: 31

3. Write the each of the following ratios in the simplest form:

(i) Rupees 6.30: Rupees 16.80

$$= 6.30 / 16.80$$

$$= 63 / 168$$

Since HCF of 63 and 168 is 21

$$= 63 \div 21 / 168 \div 21$$

$$= 3 / 8$$

$\therefore$ Simplest form of Rupees 6.30: Rupees 16.80 is 3: 8

(ii) 3 weeks : 30 days = 21 days: 30 days

$$= 21: 30$$

$$= 21 / 30$$

Since HCF of 21 and 30 is 3

$$= 21 \div 3 / 30 \div 3$$

$$= 7 / 10$$

$\therefore$ Simplest form of 21: 30 is 7:10

(iii) 3 m 5 cm : 35 cm = 300 cm 5 cm : 35 cm [1m = 100 cm]

$$= 305 \text{ cm}: 35 \text{ cm}$$

$$= 305: 35$$

$$= 305 / 35$$

Since, HCF of 305 and 35 is 5

$$= 305 \div 5 / 35 \div 5$$

$$= 61 / 7$$

$\therefore$ Simplest form of 305: 35 is 61: 7

(iv) 48 min : 2 hrs 40 min = 48 min : 120 min 40 min [1 hour = 60 minutes]

= 48 min : 160 min

= 48: 160

= 48 / 160

Since, HCF of 48 and 160 is 16

= $48 \div 16 / 160 \div 16$

= 3 / 10

∴ Simplest form of 48:160 is 3: 10

(v) 1 L 35 ml: 270 ml = 1035 ml: 270 ml [1 L = 1000 ml]

= 1035: 270

= 1035 / 270

Since, HCF of 1035 and 270 is 45

= $1035 \div 45 / 270 \div 45$

= 23 / 6

∴ Simplest form of 1035: 270 is 23: 6

(vi) 4 kg: 2 kg 500g = 4000g: 2500 g [1 kg = 1000 g]

= 4000 / 2500

= 40 / 25

Since, HCF of 40 and 25 is 5

= $40 \div 5 / 25 \div 5$

= 8 / 5

∴ Simplest form of 4000:2500 is 8: 5

4. Mr Sahai and his wife are both school teachers and earn Rs 16800 and Rs 10500 per month respectively. Find the ratio of:

(1) Mr. Sahai 's income to his wife's income:

(2) Mrs. Sahai's income to her Husband's income:

(3) Mr. Sahai 's income to the total income of the two.

Solution

Mr Sahai's earning = 16,800

And, Mrs Sahai's earning = 10,500

(i) $16,800 : 10,500 = 168 : 105$

$= 168 / 105$

Since, HCF of 168 and 105 is 21

$= 168 \div 21 / 105 \div 21$

$= 8 / 5$

$= 8 : 5$

(ii) $10,500 : 16,800 = 105 : 168$

$= 105 / 168$

Since, HCF of 105 and 168 is 21

$= 105 \div 21 / 168 \div 21$

$= 5 / 8$

$= 5 : 8$

(iii) Total income of the two = $16,800 + 10,500$

$= 27,300$

$16,800 : 27,300 = 168 : 273$

$= 168 / 273$

Since, HCF of 168 and 273 is 21

$= 168 \div 21 / 273 \div 21$

$= 8 / 13$

$= 8 : 13$

5. Rohit earns Rs 15300 and saves Rs 1224 per month. Find the ratio of:

(1) His income and saving:

(2) His income and expenditure:

(3) His expenditure and saving:

Solution:-

Rohit's income = 15,300

Rohit's saving = 1,224

(i) 15,300: 1,224 = 15,300 / 1,224

HCF of 15,300 and 1,224 is 612

= 15,300 ÷ 612 / 1,224 ÷ 612

= 25 / 2

Income: saving = 25: 2

Monthly expenditure = (15300 – 1224)

= 14076

(ii) 15,300: 14076 = 15,300 / 14076

HCF of 15,300 and 14076 is 612

= 15,300 ÷ 612 / 14076 ÷ 612

= 25 / 23

= 25: 23

Income: Expenditure = 25: 23

(iii) 14,076: 1,224 = 14,076 / 1,224

HCF of 14,076 and 1,224 is 612

= 14,076 ÷ 612 / 1,224 ÷ 612

= 23 / 2

Expenditure: Saving = 23: 2

6. The ratio of the number of male and female workers in a textile mill is 5 : 3. If there are 115 male workers, what is the number of female workers in the mill?

Solution:-

Number of male: Number of female = 5: 3

Let x be the number

Number of male = 5x

Number of female = $3x$

Given number of male = 115

$$5x = 115$$

$$x = 115 / 5$$

$$x = 23$$

Number of female workers = $3x$

$$= 3 \times 23$$

$$= 69$$

$\therefore$ there are 69 female workers in the mil

7. The boys and the girls in a school are in the ratio 9:5. If the total strength of the school is 448. Find the number of girls.

Solution:-

Number of boys: number of girls = 9: 5

Let number of boys be $9x$

Number of girls be $5x$

Total strength = 448

According to the question we have,

$$9x + 5x = 448$$

$$14x = 448$$

$$x = 448 / 14$$

$$= 32$$

$$\text{Number of boys} = 9x = 9 \times 32$$

$$= 288$$

$$\text{Number of girls} = 5x = 5 \times 32$$

$$= 160$$

$\therefore$ Number of girls are 160

8. Divide Rs. 1575 between Kamal and Madhu in the ratio 7:2.

Solution:-

Kamal: Madhu = 7: 2

Sum of ratios = $7 + 2 = 9$

Kamal's share = $7 / 9 \times 1,575 = 11025 / 9$

= Rupees 1,225

Madhu's share = $2 / 9 \times 1,575 = 3150 / 9$

= Rupees 350

9. Divide Rs. 3450 among A , B and C in the ratio 3 : 5 : 7.

Solution:-

Given A: B: C = 3: 5: 7

Sum of the ratios = $3 + 5 + 7$

= 15

Share of A = $3 / 15 \times 3,450$

= $10,350 / 15$

= Rupees 690

Share of B = $5 / 15 \times 3,450$

= $17,250 / 15$

= Rupees 1,150

Share of C = $7 / 15 \times 3,450$

= $24,150 / 15$

= Rupees 1,610

10. Two numbers are in the ratio 11 : 12 and their sum is 460. Find the numbers.

Solution:-

Two numbers are in the ratio = 11: 12

Let x be the number

According to the question = $11x + 12x = 460$

$23x = 460$

$x = 460 / 23$

$$x = 20$$

$$11x = 11 \times 20 = 220$$

$$12x = 12 \times 20 = 240$$

Hence, 220 and 240 are the numbers in the ratio 11: 12 and their sum is 460

EXERCISE – 10 B

Q.1 Determine if the following numbers are in proportion:

(i) 4, 6, 8, 12

(ii) 7, 42, 13, 78

(iii) 33, 121, 9, 96

(iv) 22, 33, 42, 63

(v) 32, 48, 70, 210

(vi) 150, 200, 250, 300

SOLUTION

(i) 4, 6, 8, 12

$$\frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{2}{3}; \quad \frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

Hence, 4:6::8:12 are in proportion.

(ii) 7, 42, 13, 78

$$\frac{7}{42} = \frac{7 \div 7}{42 \div 7} = \frac{1}{6}; \quad \frac{13}{78} = \frac{13 \div 13}{78 \div 13} = \frac{1}{6}$$

Hence, 7:42::13:78 are in proportion.

(iii) 33, 121, 9, 96

$$\frac{33}{121} = \frac{33 \div 11}{121 \div 11} = \frac{3}{11}; \quad \frac{9}{96} = \frac{9 \div 3}{96 \div 3} = \frac{3}{32}$$

Hence, 33:121::9:96 are not in proportion.

(iv) 22, 33, 42, 63

$$2233=22 \div 11 \quad 33 \div 11=3 \quad \text{and} \quad 4263=42 \div 21 \quad 63 \div 21=3 \quad 2233=22 \div 11 \quad 33 \div 11=3 \quad \text{and} \quad 4263=42 \div 21 \quad 63 \div 21=3$$

Hence, 22:33 :: 42 : 63 are not in proportion.

(v) 32, 48, 70, 210

$$\frac{32}{48} = \frac{32 \div 6}{48 \div 6} = \frac{7}{8}; \quad \frac{70}{210} = \frac{70 \div 70}{210 \div 70} = \frac{1}{3}$$

Hence, 32:48::70:210 are not in proportion.

(vi) 150, 200, 250, 300

$$\frac{150}{200} = \frac{150 \div 50}{200 \div 50} = \frac{3}{4}; \quad \frac{250}{300} = \frac{250 \div 50}{300 \div 50} = \frac{5}{6}$$

Hence, 150:200::250:300 are not in proportion

Q.2 Verify the following:

(i) 60 : 105 :: 84 : 147

(ii) 91 : 104 :: 119 : 136

(iii) 108 : 72 :: 129 : 86

(iv) 39 : 65 :: 141 : 235

SOLUTION

(i) 60:105::84:147

$$\frac{60}{105} = \frac{60 \div 15}{105 \div 15} = \frac{4}{7} \quad (\text{H.C.F. of 60 and 105 is 15.})$$

$$\frac{84}{147} = \frac{84 \div 21}{147 \div 21} = \frac{4}{7} \quad (\text{H.C.F. of 84 and 147 is 21.})$$

Hence, 60:105::84:147 are in proportion.

(ii) 91:104::119:136

$$\frac{91}{104} = \frac{91 \div 13}{104 \div 13} = \frac{7}{8} \quad (\text{H.C.F. of 91 and 104 is 13.})$$

$$\frac{119}{136} = \frac{119 \div 17}{136 \div 17} = \frac{7}{8} \quad (\text{H.C.F. of 11 and 136 is 17.})$$

Hence, 91:104::119:136 are in proportion.

(iii) 108:72::129:86

$$\frac{108}{72} = \frac{108 \div 36}{72 \div 36} = \frac{3}{2} \quad (\text{H.C.F. of 108 and 72 is 36.})$$

$$\frac{129}{86} = \frac{129 \div 43}{86 \div 43} = \frac{3}{2} \quad (\text{H.C.F. of 129 and 86 is 43.})$$

Hence, 108:72::129:86 are in proportion.

(iv) $39:65::141:235$

$$\frac{39}{65} = \frac{39 \div 13}{65 \div 13} = \frac{3}{5} \quad (\text{H.C.F. of 39 and 65 is 13.})$$

$$\frac{141}{235} = \frac{141 \div 47}{235 \div 47} = \frac{3}{5} \quad (\text{H.C.F. of 141 and 235 is 47.})$$

Hence, $39:65::141:235$ are in proportion

Q.3. Find the value of x in each of the following proportions:

(i) $55 : 11 :: x : 6$

(ii) $27 : x :: 63 : 84$

(iii) $51 : 85 :: 57 : x$

(iv) $x : 92 :: 87 : 116$

SOLUTION

(i) $55:11::x:6$

Product of extremes = Product of means

$$55 \times 6 = 11 \times x$$

$$\Rightarrow 11x = 330$$

$$\Rightarrow x = \frac{330}{11} = 30$$

(ii) $27:x::63:84$

Product of extremes = Product of means

$$27 \times 84 = x \times 63$$

$$\Rightarrow 63x = 2268$$

$$\Rightarrow x = \frac{2268}{63} = 36$$

(iii) $51:85::57:x$

Product of extremes = Product of means

$$51 \times x = 85 \times 57$$

$$\Rightarrow 51x = 4845$$

$$\Rightarrow x = \frac{4845}{51} = 95$$

(iv) $x:92::87:116$

Product of extremes = Product of means

$$x \times 116 = 92 \times 87$$

$$\Rightarrow 116x = 8004$$

$$\Rightarrow x = \frac{8004}{116} = 69$$

Q.4. Write (T) for true and (F) for false in case of each of the following:

- (i) $51 : 68 :: 85 : 102$
- (ii) $36 : 45 :: 80 : 100$
- (iii) $30 \text{ bags} : 18 \text{ bags} :: \text{Rs } 450 : \text{Rs } 270$
- (iv) $81 \text{ kg} : 45 \text{ kg} :: 18 \text{ men} : 10 \text{ men}$
- (v) $45 \text{ km} : 60 \text{ km} :: 12 \text{ h} : 15 \text{ h}$
- (vi) $32 \text{ kg} : \text{Rs } 36 :: 8 \text{ kg} : \text{Rs } 9$

SOLUTION

- (i) $51:68::85:102$

Product of means = $68 \times 85 = 5780$

Product of extremes = $51 \times 102 = 5202$

Product of means $\neq$ Product of extremes

Hence, (F).

- (ii) $36:45::80:100$

Product of means = $45 \times 80 = 3600$

Product of extremes = $36 \times 100 = 3600$

Product of means = Product of extremes

Hence, (T).

- (iii) $30 \text{ bags}:18 \text{ bags}::\text{Rs } 450:\text{Rs } 270$

or $30:18::450:270$

Product of means = $18 \times 450 = 8100$

Product of extremes = $30 \times 270 = 8100$

Product of means = Product of extremes

Hence, (T).

- (iv) $81 \text{ kg}:45 \text{ kg}::18 \text{ men}:10 \text{ men}$

or $81:45::18:10$

Product of means = $45 \times 18 = 810$

Product of extremes = $81 \times 10 = 810$

Product of means = Product of extremes

Hence, (T).

- (v) $45 \text{ km}:60 \text{ km}::12 \text{ h}:15 \text{ h}$

or, $45:60::12:15$

Product of means = $60 \times 12 = 720$

Product of extremes = $45 \times 15 = 675$

Product of means $\neq$ Product of extremes

Hence, (F).

(vi) 32 kg:Rs 36::8 kg:Rs 9

$$\text{Product of means} = 36 \times 8 = 288$$

$$\text{Product of extremes} = 32 \times 9 = 288$$

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

Hence, (T).

Q.5 Determine if the following ratios form a proportion:

(i) 25 cm : 1 m and Rs 40 : Rs 160

(ii) 39 litres : 65 litres and 6 bottles : 10 bottles

(iii) 200 mL : 2.5 L and Rs 4 : Rs 50

(iv) 2 kg : 80 kg and 25 g : 625 kg

SOLUTION

(i) 25 cm:1 m and Rs 40:Rs 160 (or) 25 cm:100 cm and Rs 40:Rs 160

$$\frac{25}{100} = \frac{25 \div 25}{100 \div 25} = \frac{1}{4} \quad \text{and} \quad \frac{40}{160} = \frac{40 \div 40}{160 \div 40} = \frac{1}{4}$$

Hence, they are in proportion.

(ii) 39 litres:65 litres and 6 bottles:10 bottles

$$\frac{39}{65} = \frac{39 \div 13}{65 \div 13} = \frac{3}{5} \quad \text{and} \quad \frac{6}{10} = \frac{6 \div 2}{10 \div 2} = \frac{3}{5}$$

Hence they are in proportion.

(iii) 200 mL:2.5 L and Rs 4:Rs 50 (or) 200 mL:2500 mL and Rs 4:Rs 50

$$\frac{200}{2500} = \frac{2}{25} \quad \text{and} \quad \frac{4}{50} = \frac{4 \div 2}{50 \div 2} = \frac{2}{25}$$

Hence, they are in proportion.

(iv) 2 kg:80 kg and 25 g:625 kg (or) 2 kg:80 kg and 25 g:625000 g

$$\frac{2}{80} = \frac{2 \div 2}{80 \div 2} = \frac{1}{40} \quad \text{and} \quad \frac{25}{625000} = \frac{25 \div 25}{625000 \div 25} = \frac{1}{25000}$$

Hence, they are not in proportion.

Q.6. In a proportion, the 1st, 2nd and 4th terms are 51, 68 and 108 respectively. Find the 3rd term.

SOLUTION

Let the 3rd term be x .

Thus, $51:68::x:108$

We know:

Product of extremes = Product of means

$$51 \times 108 = 68 \times x$$

$$\Rightarrow 5508 = 68x$$

$$\Rightarrow x = \frac{5508}{68} = 81$$

Hence, the third term is 81.

Q.7 The 1st, 3rd and 4th terms of a proportion are 12, 8 and 14 respectively. Find the 2nd term.

SOLUTION

Let the second term be x .

Then, $12:x::8:14$

We know:

Product of extremes = Product of means

$$12 \times 14 = 8x$$

$$\Rightarrow 168 = 8x$$

$$\Rightarrow x = \frac{168}{8} = 21$$

Hence, the second term is 21.

Q.8. Show that the following numbers are in continued proportion:

(i) 48, 60, 75

(ii) 36, 90, 225

(iii) 16, 84, 441

SOLUTION

(i) 48:60, 60:75

$$\text{Product of means} = 60 \times 60 = 3600$$

$$\text{Product of extremes} = 48 \times 75 = 3600$$

Product of means = Product of extremes

Hence, 48:60::60:75 are in continued proportion.

(ii) 36:90, 90:225

$$\text{Product of means} = 90 \times 90 = 8100$$

$$\text{Product of extremes} = 36 \times 225 = 8100$$

Product of means = Product of extremes

Hence, 36:90::90:225 are in continued proportion.

(iii) 16:84, 84:441

$$\text{Product of means} = 84 \times 84 = 7056$$

$$\text{Product of extremes} = 16 \times 441 = 7056$$

Product of means = Product of extremes

Hence, 16:84::84:441 are in continued proportion.

Q.9. If 9, x , x 49 are in proportion, find the value of x .

SOLUTION

Given: 9: x :: x :49

We know:

Product of means = Product of extremes

$$x \times x = 9 \times 49$$

$$\Rightarrow x^2 = 441$$

$$\Rightarrow x^2 = (21)^2$$

$$\Rightarrow x = 21$$

Q.10. An electric pole casts a shadow of length 20 m at a time when a tree 6 m high casts a shadow of length 8 m. Find the height of the pole.

SOLUTION

Let the height of the pole = x m

Then, we have:

$$x:20::6:8$$

Now, we know:

Product of extremes = Product of means

$$8x = 20 \times 6$$

$$x = \frac{120}{8} = 15$$

Hence, the height of the pole is 15 m.

Q.11. Find the value of x if $5 : 3 :: x : 6$.

$5:3::x:6$

We know:

Product of means = Product of extremes

$$3x = 5 \times 6$$
$$\Rightarrow x = \frac{30}{3} = 10$$

$\therefore x = 10$

