

CLASS 6 | LESSON 12 | RATIO AND PROPORTION

Proportion:

If two ratios are equal, we say that they are in proportion and use the symbol ‘ $::$ ’ or ‘ $=$ ’ to equate the two ratios.

If two ratios are not equal, then we say that they are not in proportion.

In a statement of proportion, the four quantities involved when taken in order are known as respective terms.

First and fourth terms are known as extreme terms.

Second and third terms are known as middle terms.

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

Answer;

$$\text{a) } \frac{15}{45} \div \frac{15}{120} = \frac{1}{3}$$

$$\frac{40}{120} \div \frac{40}{96} = \frac{1}{3}$$

$$\text{Therefore, } \frac{15}{45} = \frac{40}{120}$$

So these are in proportion.

$$\text{b) } \frac{33}{121} \div \frac{11}{96} = \frac{3}{11}$$

$$\frac{9}{96} \div \frac{3}{32} = \frac{3}{32}$$

$$\text{Here } \frac{33}{121} \neq \frac{9}{96}$$

So these are not in proportion.

$$c) \frac{24}{28} \div \frac{4}{4} = \frac{6}{7}$$

$$\frac{36}{48} \div \frac{12}{12} = \frac{3}{4}$$

$$\text{Here } \frac{24}{28} \neq \frac{36}{48}$$

So these are not in proportion.

$$d) \frac{32}{48} \div \frac{16}{16} = \frac{2}{3}$$

$$\frac{70}{210} \div \frac{70}{70} = \frac{1}{3}$$

$$\text{Here } \frac{32}{48} \neq \frac{70}{210}$$

So these are not in proportion.

$$e) \frac{4}{6} \div \frac{2}{2} = \frac{2}{3}$$

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

$$\text{Therefore, } \frac{4}{6} = \frac{8}{12}$$

So these are in proportion.

$$f) \frac{33}{44} \div \frac{11}{11} = \frac{3}{4}$$

$$\frac{75}{100} \div \frac{25}{25} = \frac{3}{4}$$

$$\text{Therefore, } \frac{33}{44} = \frac{75}{100}$$

So these 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

Answer:

$$a) \frac{16}{24} \div \frac{8}{8} = \frac{2}{3}$$

$$\frac{20}{30} \div \frac{10}{10} = \frac{2}{3}$$

Since 16:24:: 20:30, it is true.

$$b) \frac{21}{6} \div \frac{3}{3} = \frac{7}{2}$$

$$\frac{35}{10} \div \frac{5}{5} = \frac{7}{2}$$

Since 21:6:: 35:10, it is true.

$$c) \frac{12}{18} \div \frac{6}{6} = \frac{2}{3}$$

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

Since the above two ratios are not equal, it is false.

$$d) 8:9 = \frac{8}{9}$$

$$24:27 = \frac{24}{27} \div \frac{3}{3} = \frac{8}{9}$$

Since 8:9:: 24:27, it is true.

e) Since the given ratios are not equal, it is false.

$$f) 0.9:0.36 = \frac{0.9}{0.36} \times \frac{100}{100} = \frac{90}{36} \div \frac{18}{18} = \frac{5}{2}$$

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

Since 0.9:0.36:: 10:4, it is true.

3. Are the following statements true?

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

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

c) 99 kg: 45 kg = Rs 44: Rs 20

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

e) 45 km: 60 km = 12 hours: 15 hours

Answer:

$$\text{a) } 40 \text{ persons: } 200 \text{ persons} = \frac{40}{200} \div \frac{40}{40} = \frac{1}{5}$$

$$\text{Rs } 15:\text{Rs } 75 = \frac{15}{75} \div \frac{15}{15} = \frac{1}{5}$$

Since 40:200:15:75, it is true.

$$\text{b) } 7.5 \text{ litres: } 15 \text{ litres} = \frac{7.5}{15} \times \frac{10}{10} = \frac{7.5}{150} \div \frac{7.5}{75} = \frac{1}{2}$$

$$5 \text{ kg: } 10 \text{ kg} = \frac{5}{10} \div \frac{5}{5} = \frac{1}{2}$$

Since 7.5:15:: 5:10, it is true.

$$\text{c) } 99 \text{ kg : } 45 \text{ kg} = \frac{99}{45} \div \frac{9}{9} = \frac{11}{5}$$

$$\text{Rs } 44: \text{Rs } 20 = \frac{44}{20} \div \frac{4}{4} = \frac{11}{5}$$

Since 99:45:: 44:20, it is true.

$$\text{d) } 32\text{m:}64 \text{ m} = \frac{32}{64} \div \frac{32}{32} = \frac{1}{2}$$

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

Since 32:64:: 6:12, it is true.

$$\text{e) } 45 \text{ km: } 60\text{km} = \frac{45}{60} \div \frac{15}{15} = \frac{3}{4}$$

$$12 \text{ hours: } 15 \text{ hours} = \frac{12}{15} \div \frac{3}{3} = \frac{4}{5}$$

Since the ratios are not equal, it 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: 1m and Rs 40: Rs 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 Rs 4: Rs50

Answer:

$$\text{a) } 25 \text{ cm: } 1\text{m} = 25 \text{ cm: } 100\text{cm} = \frac{25}{100} \div \frac{25}{25} = \frac{1}{4}$$

$$\text{Rs } 40: \text{Rs } 160 = \frac{40}{160} \div \frac{40}{40} = \frac{1}{4}$$

Since the two ratios are equal, it forms a proportion.

Middle terms are 1m & Rs 40

Extreme terms are 25 cm & Rs 160

$$\text{b) } 39 \text{ litres : } 65 \text{ litres} = \frac{39}{65} \div \frac{13}{13} = \frac{3}{5}$$

$$6 \text{ bottles: } 10 \text{ bottles} = \frac{6}{10} \div \frac{2}{2} = \frac{3}{5}$$

Since the two ratios are equal, it forms a proportion.

Middle terms are 65 litres and 6 bottles

Extreme terms are 39 litres and 10 bottles

$$\text{c) } 2 \text{ kg: } 80 \text{ kg} = \frac{2}{80} \div \frac{2}{2} = \frac{1}{40}$$

$$25 \text{ g: } 625 \text{ g} = \frac{25}{625} \div \frac{25}{25} = \frac{1}{25}$$

Since the two ratios are not equal, it is not in proportion.

$$\text{d) } 200 \text{ ml: } 2.5 \text{ litre} = 200 \text{ ml: } 2500 \text{ ml} = \frac{200}{2500} \div \frac{100}{100} = \frac{2}{25}$$

$$\text{Rs } 4: \text{Rs } 50 = \frac{4}{50} \div \frac{2}{2} = \frac{2}{25}$$

Since the two ratios are equal, it forms a proportion.

Middle terms are 2.5 litre & 200 ml

Extreme terms are 200 ml & 2500 ml

UNITARY METHOD

The method in which first we find the value of one unit and then the value of required number of units is known as Unitary Method.

EXERCISE 12.3

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

Answer:

Cost of 7m of cloth = Rs 1470

Cost of one metre of cloth = $1470 \div 7 = 210$

Therefore cost of 5m of cloth = $210 \times 5 = \text{Rs } 1050$

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

Answer:

Money earned in 10 days = Rs 3000

Money earned in one day = $3000 \div 10 = \text{Rs } 300$

Money earned in 30 days = $300 \times 30 = \text{Rs } 9000$

3. If it has rained 276 mm in the last 3 days, how many cm of rain will fall in one full week (7days)?

Assume that the rain continues to fall at the same rate.

Answer:

Measure of rain in 3days = 276 mm

Measure of rain in 1 day = $276 \div 3 = 92$ mm

Measure of rain in one full week = $92 \times 7 = 644$ mm

4. Cost of 5 kg of wheat is Rs 91.50

a) What will be the cost of 8 kg of wheat?

b) What quantity of wheat can be purchased in Rs 183?

Answer:

a) Cost of 5 kg of wheat = 91.50

Cost of 1 kg of wheat = $91.50 \div 5 = 18.30$

Cost of 8 kg of wheat = $18.30 \times 8 = \text{Rs } 146.40$

b) Wheat can be purchased in Rs 183 = 10 kg

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?

Answer:

The temperature dropped in the last 30 days = 15 degree Celsius

The temperature dropped in 1 day = $15 \div 30 = \frac{1}{2}$ degree celcius

The temperature dropped in the next 10 days = $\frac{1}{2} \times 10 = 5$ Degree Celsius

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

Answer:

The amount that Shaina paid as rent for 3 months = Rs 15000

The amount that Shaina paid for 1 month = $15000 \div 3 =$ Rs 5000

The amount she has to pay for a whole year = $5000 \times 12 =$ Rs 60,000

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

Answer:

1 dozen = 12

Cost of 4 dozen bananas = Rs 180

Cost of 1 dozen bananas = $180 \div 4 =$ Rs 45

The number of bananas can be purchased for Rs 90 = 2 dozen = 24 bananas.

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

Answer:

The weight of 72 books = 9 kg

The weight of 1 book = $9 \div 72 = \frac{1}{8}$ kg

The weight of 40 such books = $\frac{1}{8} \times 40 = 5$ kg

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

Answer:

The amount of diesel required for covering a distance of 594 km = 108 litres

The amount of diesel required for covering a distance of 1 km = $108 \div 594 = \frac{2}{11}$ litres

The amount of diesel required for covering a distance of 1650 km = $\frac{2}{11} \times 1650 = 300$ litres

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

Answer:

Raju purchased 10 pens for Rs 150.

Cost of 10 pens = Rs 150

Cost of 1 pen = $150 \div 10 = \text{Rs } 15$

Manish purchased 7 pens for Rs 84.

Cost of 7 pens = Rs 84

Cost of 1 pen = $84 \div 7 = \text{Rs } 12$

So 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?

Answer:

Anish made 42 runs in 6 overs.

The runs made in 6 over = 42 runs

The runs made in 1 over = $42 \div 6 = 7$ runs

Anup made 63 runs in 7 overs.

The runs made in 7 over = 63 runs

The runs made in 1 over = $63 \div 7 = 9$ runs

So Anup made more runs per over.

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