Chapter 6 Ratio and Proportion Ex 6.2

Question 1.
Which of the following statements are true?
(i) 2.5 : 1.5 :: 7.0 : 4.2
(ii) $12:13=13:14$
(iii) 24 men : 16 men = 33 horses : 22 horses.
Solution:

(i) 2.5 : 1.5 :: 7.0 : 4.2

Product of extremes = 2.5 × 4.2 = 10.50

Product of means = 1.5 × 7.0 = 10.50

By cross product rule

Product of extremes = Product of means

2.5 : 1.5 :: 7.0 : 4.2 is true statement

(ii) $\frac{1}{2} : \frac{1}{3} = \frac{1}{3} : \frac{1}{4}$

Product of extremes = $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

Product of means = $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

By cross product rule

Product of extremes ≠ Product of means

$\frac{1}{2} : \frac{1}{3} = \frac{1}{3} : \frac{1}{4}$ is not a true statement.

(in) 24 men : 16 men = 33 horses : 22 horses

Product of extremes = 24 × 22 = 528

Product of means = 16 × 33 = 528

By cross product rule

Product of extremes = Product of means

24 men : 16 men = 33 horses : 22 horses is a true statement.

Question 2.
Check whether the following numbers are in proportion or not:
(i) 18, 10, 9, 5
(ii) 3, 3$\frac{1}{2}$, 4, 4$\frac{1}{2}$
(iii) 0.1, 0.2, 0.3, 0.6
Solution:

(i) 18, 10, 9, 5

Product of extremes = 18 × 5 = 90

Product of means = 10 × 9 = 90

By cross product rule

Product of extremes = Product of means

The numbers 18, 10, 9, 5 are in proportion.

(ii) $3, 3\frac{1}{2}, 4, 4\frac{1}{2}$

Product of extremes

$$= 3 \times 4\frac{1}{2} = 3 \times \frac{9}{2} = \frac{27}{2}$$

Product of means

$$= 3\frac{1}{2} \times 4 = \frac{7}{2} \times 4 = \frac{28}{2} = 14$$

By cross product rule

Product of extremes ≠ Product of means

The numbers $3, 3\frac{1}{2}, 4, 4\frac{1}{2}$ are not in proportion.

(iii) 0.1, 0.2, 0.3, 0.6

Product of extremes = 0.1 × 0.6 = 0.06

Product of means = 0.2 × 0.3 = 0.06

By cross product rule

Product of extremes = Product of means

The numbers 0.1, 0.2, 0.3, 0.6 are in proportion.

Question 3.
Find x in the following proportions:
(i) x : 4 = 9 : 12
(ii) 113 : x :: 12 : 15
(iii) 3.6 : 0.4 = x : 0.5
Solution:

(i) x : 4 = 9 : 12

By cross product rule

Product of extremes = Product of means

$x \times 12 = 4 \times 9$

$$x = \frac{4 \times 9}{12}$$

$$x = \frac{36}{12}$$

$$x = 3$$

(ii) $\frac{1}{13} : x :: \frac{1}{2} : \frac{1}{5}$

By cross product rule

Product of means = Product of extremes

$$x \times \frac{1}{2} = \frac{1}{13} \times \frac{1}{5}$$

$$x \times \frac{1}{2} = \frac{1}{65}$$

$$x = \frac{1}{65} \div \frac{1}{2}$$

$$x = \frac{1}{65} \times 2$$

$$x = \frac{2}{65}$$

(*iii*) 3.6 : 0.4 = x : 0.5

By cross product rule

Product of means = Product of extremes

0.4 × x = 3.6 × 0.5

$$x = \frac{3.6 \times 0.5}{0.4}$$

$$x = \frac{1.80}{0.4}$$

x = 4.5

Question 4.
Find the fourth proportional to
(i) 42, 12, 7
(ii) 13, 14, 15
(iii) 3 kg, 12 kg, 15 kg
Solution:

(i) 42, 12, 7

Let the fourth proportional be x.

Then 42, 12, 7, x are in proportion

Using the cross product rule

Product of extremes = Product of means

$42 \times x = 12 \times 7$

$$x = \frac{12 \times 7}{42}$$

$$x = \frac{84}{42}$$

$$x = 2$$

(ii) $\dfrac{1}{3}, \dfrac{1}{4}, \dfrac{1}{5}$

Let x be the fourth proportional, then

$\dfrac{1}{3}, \dfrac{1}{4}, \dfrac{1}{5}, x$ are in proportion

Using cross product rule

Product of extremes = Product of means

$$\frac{1}{3} \times x = \frac{1}{4} \times \frac{1}{5}$$

$$\frac{1}{3} \times x = \frac{1}{20}$$

$$x = \frac{1}{20} \div \frac{1}{3}$$

$$x = \frac{1}{20} \times 3$$

$$x = \frac{3}{20}$$

(iii) 3 kg, 12 kg, 15 kg

Let the fourth proportional be x kg, then

3 kg, 12 kg, 15 kg, x kg are in proportion

Using cross product rule

Product of extremes = Product of means

3 × x = (12 × 15) kg

3x = 180 kg

x = 60 kg

Question 5.
Check whether 7, 49, 343 are in continued proportion or not.
Solution:

Three quantities are said to be in continued proportion if a : b = b : c i.e., if

$\frac{a}{b} = \frac{b}{c}$ i.e., if $b^2 = ac$

Here, a = 7, b = 49, c = 343

$b^2 = ac$

$(49)^2 = 7 \times 343$

49 × 49 = 7 × 343

2401 = 2401

Yes, the number 7,49, 343 are in continued proportion.

Question 6.
Find the third proportional to
(i) 36, 18
(ii) 5$\frac{1}{4}$, 7

Solution:

(i) 36, 18

Let the third proportional to 36, 18 be x.

Then 36, 18 and x are in continued proportion

36 : 18 :: 18 : x

Using the cross product rule

Product of extremes = Product of means

36 × x = 18 × 18

x = 9

Hence, the third proportion is 9

(ii) $5\frac{1}{4}, 7$

Let the third proportional to $5\frac{1}{4}$, 7 be x

Then $5\frac{1}{4}$, 7 and x are in continued proportion

i.e. $5\frac{1}{4} : 7 :: 7 : x$

$\frac{21}{4} : 7 :: 7 : x$

Using cross product rule

Product of extremes = Product of means

$$\frac{21}{4} \times x = 7 \times 7$$

$$\frac{21}{4} \times x = 49$$

$$x = 49 \div \frac{21}{4}$$

$$x = 49 \times \frac{4}{21}$$

$$x = \frac{196}{21} = \frac{28}{3}$$

$$x = 9\frac{1}{3}$$

Hence, third proportion is $9\frac{1}{3}$

(iii) 3.2, 0.8

Let the third proportional to 3.2, 0.8 be x.

Then 3.2, 0.8 and x are in continued proportion

i.e., 3.2 : 0.8 :: 0.8 : x

Products of extremes = 3.2 × x

Product of means = 0.8 × 0.8

3.2 × x = 0.8 × 8

x = 0.2

Hence, third proportion is 0.2

Question 7.
The ratio between the length and width of a rectangular sheet of paper is 7 : 5. If the width of the sheet is 20.5 cm, find its length.

Solution:

Let the length of the sheet be x.

Then the ratio of length to width is x : 20.5 cm.

According to given statement,

x : 20.5 cm = 7 : 5

Using cross product rule

Product of extremes = Product of means

x × 5 = 20.5 cm × 7

x × 5 = 143.5 cm

x = 28.7 cm

Hence, length of the sheet = 28.7 cm

Question 8.
The ages of Amit and Archana are in the ratio 4 : 5. If Amit is 4 years 8 months old, find the age of Archana.
Solution:

Let the age of Archana be x.

Then the ratio of ages of Amit and Archana be 4 years 8 months : x.

1 year = 12 months

4 years = 4 × 12 months = 48 months

4 years 8 months = (48 + 8) months = 56 months

According to given statement,

56 months : x :: 4 : 5

Using cross product rule

Product of means = Product of extremes

x × 4 = 56 months × 5

x = 70 months

Converting months in years

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  12)70(5  years
     60
     10  months
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70 months = 5 years 10 months

Hence, the age of Archana is 5 years 10 months.