Chapter 7: Direct and Inverse Variations

Exercise 7.1

1. (a) From the table we see that—

$$\frac{a}{b} = \frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$$

Here we see that the ratio of a and b remains same for all the values, hence a and b are in direct proportion.

(b) From the table we see that—

$$\frac{a}{b} = \frac{75}{15} \neq \frac{85}{10} \neq \frac{90}{5}$$

Here we see that the ratio of a and b does not remain same for all the values, hence a and b are not in direct proportion.

(c) From the table we see that—

$$\frac{a}{b} = \frac{15}{2} = \frac{30}{4} = \frac{45}{6}$$

Here we see that the ratio of a and b remains same for all the values, hence a and b are in direct proportion.

2. Let us assume that x m cloth can be purchased.

Cost of cloth (₹)	1552	679
Length of cloth (m)	32	x

If the cost of the cloth decreases, the length of the cloth will also decrease. So this is the case of direct proportion. Thus the ratio cost of the cloth and length of the cloth will remain constant.

$$\Rightarrow \frac{1552}{32} = \frac{679}{x}$$

$$\Rightarrow 1552 \times x = 679 \times 32$$

$$\Rightarrow x = \frac{679 \times 32}{1552} = 14$$

Hence 14 m cloth can be purchased with ₹679.

3. Let us assume that x km will be covered.

Fuel consumed (L)	5.6	25.2
Distanced covered (km)	100	x

If the fuel consumption increases, then the distanced covered will also increase. So this is the case of direct proportion. Thus the ratio of fuel consumed to distance covered will remain constant.

$$\Rightarrow \frac{5.6}{100} = \frac{25.2}{x}$$

$$\Rightarrow 5.6 \times x = 25.2 \times 100$$

$$\Rightarrow x = \frac{25.2 \times 100}{5.6} = 450$$

Hence 450 km can be covered with 25.2 L of diesel.

4. Let us assume that ₹x is the cost.

Quantity of banana (dozen)	30	7
Cost of banana (₹)	1350	x

If the quantity of banana decreases, the cost of banana will also decrease. So this is the case of direct proportion. Thus the ratio quantity of banana and the cost of banana will remain constant.

$$\Rightarrow \frac{30}{1350} = \frac{7}{x}$$

$$\Rightarrow 30 \times x = 7 \times 1350$$

$$\Rightarrow x = \frac{7 \times 1350}{30} = 315$$

Hence 7 dozen of banana can be purchased with ₹315.

5. Let us assume that x trees can be planted.

Number of rows	18	30
Number of trees	450	x

As the number of rows increases, the number of trees will also increase. So this is the case of direct proportion. Thus the ratio number of rows and the number of trees will remain constant.

$$\Rightarrow \frac{18}{450} = \frac{30}{x}$$

$$\Rightarrow 18 \times x = 30 \times 450$$

$$x = \frac{30 \times 450}{18} = 750$$

nce 750 trees can be planted in 30 rows.

6. Let us assume that Rakesh will earn ₹2520 in x days.

Amount earned (₹)	840	2520
Number of days	7	x

As the number of days increases, the amount earned will also increase. So this is the case of direct proportion. Thus the ratio of amount earned and the number of days will remain constant.

$$\Rightarrow \frac{840}{7} = \frac{2520}{x}$$

$$\Rightarrow 840 \times x = 2520 \times 7$$

$$\Rightarrow x = \frac{2520 \times 7}{840} = 21$$

Hence Rakesh will earn ₹2520 in 21 days.

7. Let us assume that x kg apples can be bought.

Cost of apples (₹)	416	780
Quantity of apples (kg)	8	x

As the quantity of apples increases, the cost of apples will also increase. So this is the case of direct proportion. Thus the ratio of cost of apples and the quantity of apples will remain constant.

$$\Rightarrow \frac{416}{8} = \frac{780}{x}$$

$$\Rightarrow 416 \times x = 780 \times 8$$

$$\Rightarrow x = \frac{780 \times 8}{416} = 15$$

Hence 15 kg can be bought for ₹780.

8. Let us assume that 25 bags can be purchased in ₹x.

Number of bags	28	25
Price of bags (₹)	8092	x

As the number of bags decreases, the price of bags will also decrease. So this is the case of direct proportion. Thus the ratio number of bags and the price of bags will remain constant.

$$\Rightarrow \frac{28}{8092} = \frac{25}{x}$$

$$\Rightarrow 28 \times x = 8092 \times 25$$

$$\Rightarrow x = \frac{8092 \times 25}{28} = 7225$$

Hence the cost of 25 bags is ₹7225.

9. Let us assume that x km can be covered in 210 minutes.

Time (minutes)	60	210
Distance covered (km)	30	x

As the time increases, the distance covered will also increase. So this is the case of direct proportion. Thus the ratio of time and the distance covered will remain constant.

$$\Rightarrow \frac{60}{30} = \frac{210}{x}$$

$$\Rightarrow 60 \times x = 210 \times 30$$

$$\Rightarrow x = \frac{210 \times 30}{60} = 105$$

Hence Deepak will reach 105 km in 210 minutes.

10. Let us assume that x dollars can be exchanged.

Amount in Rupees	6765	13837.50
Amount in Dollars	110	x

The above quantities are in direct proportion.

$$\Rightarrow \frac{6765}{110} = \frac{13837.50}{x}$$

$$\Rightarrow 6765 \times x = 13837.50 \times 110$$

$$\Rightarrow x = \frac{13837.50 \times 110}{6765} = 225$$

Thus $225 can be exchanged for ₹13837.50.

Exercise 7.2

1. (a) From the given table, product of both the variables remains constant. Hence variable x and y are in inverse proportion.

   (b) From the given table, product of both the variables does not remain constant. Hence variable x and y are not in inverse proportion.

2. From the given table, $a_1 \times 15 = 10 \times 12 \Rightarrow a_1 = \dfrac{10 \times 12}{15} = 8$

   Similarly $b_1 \times 20 = 10 \times 12 \Rightarrow b_1 = \dfrac{10 \times 12}{20} = 6$

   Similarly $a_2 \times 12 = 10 \times 12 \Rightarrow a_2 = \dfrac{10 \times 12}{12} = 10$

   Similarly $b_2 \times 5 = 10 \times 12 \Rightarrow b_2 = \dfrac{10 \times 12}{5} = 24$

3. 1 hour = 60 minutes

   Distance covered by train in 60 minutes = 60 km

   Distance covered by train in 1 minutes $= \dfrac{60}{60} = 1$ km

   Distance covered by train in 20 minutes $= 1 \times 20 = 20$ km

4. Let us assume that the 14 men will complete the piece of work in x days.

Number of days	16	x
Number of men	42	14

   The above quantities are in inverse proportion.

   $\therefore$ $16 \times 42 = 14 \times x$

   $\Rightarrow x = \dfrac{16 \times 42}{14} = 48$ days

   Thus 14 men will complete the piece of work in 48 days.

5.

Price of 1 box of sweet = ₹200

Price of 13 boxes of sweet = 200 × 13 = ₹2600

Thus Raj has ₹2600 with him.

Increase in the price of sweet box = 30%

Increased price of the sweet box = 200 + 30% of 200

= 200 + 60 = ₹260

Let us assume that Raj can purchase x boxes of sweet with increased price.

Price	200	260
Number of boxes	13	x

The above quantities are in inverse proportion.

$\therefore$ 200 × 13 = 260 × x

$\Rightarrow x = \dfrac{13 \times 200}{260} = 10$ boxes

Thus now Raj can purchase 10 boxes of sweet with the increased price.

6.

Number of days taken by 9 women to weave 9 sweaters
= 18 days

Number of days taken by 9 women to weave 1 sweater

$= \dfrac{18}{9} = 10 = 2$ days

Number of days taken by 1 woman to weave 1 sweater

= 2 × 9 days = 18 days

7.

Let us assume that the train will take x hours with enhanced speed.

Speed of the train	35	70
Time taken to cover the distance	5	x

The above quantities are in inverse proportion.

5 × 35 = 70 × x

$x = \dfrac{35 \times 5}{70}$ hours

Thus the train will take 2.5 hours to cover the distance with the speed of 70 km per hour.

8.

Initial number of students = 150

Number of days for which rice is sufficient = 45 days

Days left when additional students left = 45 − 10 = 35 days

Number of students left = 25 students

Total number of students = 150 − 25 = 125

Let us assume that the rice will be sufficient for x days.

Number of students	150	125
Days for which rice is sufficient	18	x

The above quantities are in inverse proportion.

∴ $150 \times 35 = 125 \times x$

$\Rightarrow x = \dfrac{150 \times 35}{125} = 42 \text{days}$

Rice will be sufficient for remaining students for 42 days.

14.

Let us assume that there were x number of women initially.

Number of days to complete the work = 200 days

Number of women left = 20

Remaining women = $x - 20$

Number of days to complete the work with the remaining number of women = 200 + 20 = 220 days

Number of women	x	$x - 20$
Days to complete the work	200	220

The above quantities are in inverse proportion.

$\therefore x \times 200 = x - 20 \times 220$

$\Rightarrow 200x = 220x - 4400 \Rightarrow 220x - 200x = 4400$

$\Rightarrow x = \dfrac{4400}{20} = 220$ women

Thus initially there was 220 women.

15. Given x varies inversely with y and y varies inversely with z.

So, $x \propto \dfrac{1}{y}$ and $y \propto \dfrac{1}{z}$.

We remove proportionality sign and add proportionality constant.

$x = \dfrac{k}{y}$ and $y = \dfrac{k}{z}$ $\Rightarrow$ $k = yz$

$\Rightarrow x = \dfrac{yz}{y}$ $\Rightarrow$ $x = z$

So, $x = z$.

16. Sumit is right because Sumit used correct method of indirect variation.