CHAPTER 11

Direct and Inverse Proportions

Learning Objectives

In this chapter you will learn:

- *About direct and inverse proportions.*
- *About various terms like demand and supply.*
- *About Growth in population and land available and other daily life problems.*

11.1 Introduction:-

In our day to day life, we come across many such situations where variation in one quantity brings variation in other quantity. For example,

1. If the number of articles (of same kind) purchased increases, the total cost also increases.
2. More the money deposited in a bank, more will be the interest.
3. With increase in speed of a vehicle, the time taken to cover the same distance will decrease.
4. More the number of workers, less time will be taken to complete the same work.

Observe that change in one quantity leads to change in other quantity. Consider an example, Aman prepares tea for herself. She uses 200 m*l* of water, 1 spoon of sugar, half spoon of tea leaves and 30m*l* of milk. How much quantity of each item will she need to make tea for five persons?

To answer such type of questions,we now study concept of variation in which we shall discuss two types of variation or proportion i.e. direct and inverse.

11.2 Direct Proportion

Two quantities are said to be in direct proportion when increase in one quantity (variable) leads to increase in other quantity (variable) in same ratio or when decrease in one quantity leads to decrease in other quantity in same ratio. Consider if cost of 1kg of sugar is ₹20 then what would be the cost of 4kg sugar?

We see that cost of 4 kg sugar is 4 times cost of 1kg of sugar. The cost will be $4 \times 20 =$ ₹80.

$\therefore$ Increase in quantity of sugar (i.e. 1 kg to 4kg) leads to increase in the cost of sugar (i.e. ₹20 to ₹80). So these quantities (variables) are in direct proportion.

Similarly cost of 6kg sugar will be ₹120 and 10 kg of sugar wil be ₹200.

Study the following table

Weight of sugar (in kg)	1	2	3	4	--
Cost in ₹	20	2×20=40	3×20=60	4×20=80	---

Observe that as weight of sugar increases its cost also increases in such a manner that their ratio remains same.

In above example, Ratio $= \dfrac{\text{weight of sugar}}{\text{cost}} = \dfrac{1}{20}$ (in all cases)

Consider one more example. Let the mileage of a car is 21km/litre. How far will it travel in 10 litres? The answer is 210km. How did we calculate it? Since in one litre it travel 21kms. So in 10 litres, it will travel $(21 \times 10) = 210$ kms. Similarly in 20 litres it will travel (21×20) kms $= 420$ kms. Let the consumption of petrol be x litres and corresponding distance travelled is y km then complete the following table.

Petrol in litres (x)	1	10	20	25	30	45	50
Distance in km (y)	21	210	420	--	--	--	--

As the value of x increases, the value of y also increases. In such a way that the ratio $\dfrac{x}{y}$ does not change; it remains constant (say k). In this case, it is $\dfrac{1}{21}$.

We say x and y are in direct proportion if $\dfrac{x}{y} = k$ i.e $x = ky$

In this example, $\dfrac{1}{21} = \dfrac{10}{210} = \dfrac{20}{420} =$ ------

Where in numerator 1, 10, 20.... is the petrol consumed in litres (x) and in denominator 21, 210, 420, ... is the corresponding distance travelled in kms (y). So when x and y are **in direct proportion** we can write $\dfrac{x_1}{y_1} = \dfrac{x_2}{y_2}$ where y_1 and y_2 are the values of y corresponding to the values x_1 and x_2 of x respectively.

The consumption of petrol and the distance travelled by a car is a case of **direct proportion**. Similarly the total amount spent and the number of articles purchased of same kind is also an example of **direct proportion.**

Now observe the following example. Let the present age of a boy, his father and mother are 15years, 45 years and 40 years respectively. Make the following table

	Present Age	**Age after Five years**	**Age after ten years**
Boy's age (B)	15	20	25
Father's age (F)	45	50	55
$\dfrac{B}{F}$	$\dfrac{15}{45} = \dfrac{1}{3}$	$\dfrac{20}{50} = \dfrac{2}{5}$	$\dfrac{25}{55} = \dfrac{5}{11}$

Similarly you can make a table to find the ratio of his age to the corresponding age of his mother.

Now what do you observe? Do B and F increases (or decreases) together? The answer will be yes.

Now Is $\frac{B}{F}$ (ratio) same everytime? The answer is **No.** So they are not in direct proportion. You can repeat this activity with other friends and write down the observations.

Note : Variables increasing (or decreasing) together need not always be in direct proportion.

Let us consider some examples where we would use the concept of direct proportion.

Example 11.1 Which of the following quantities x and y are in the direct proportion?

(i)

x	8	15
y	40	75

(ii)

x	15	35
y	25	45

(iii)

x	8	9
y	6	12

Sol. As we know that two quantities x and y are in direct proportion if $\frac{x_1}{y_1} = \frac{x_2}{y_2}$ or $\frac{x}{y} = k$ constant.

(i) Here $x_1 = 8$, $x_2 = 15$, $y_1 = 40$, $y_2 = 75$

Now, $\frac{x_1}{y_1} = \frac{8}{40} = \frac{1}{5}$ and $\frac{x_2}{y_2} = \frac{15}{75} = \frac{1}{5}$

$\Rightarrow \quad \frac{x_1}{y_1} = \frac{x_2}{y_2} = \frac{1}{5}$

Thus, x and y are in direct proportion.

(ii) Here $x_1 = 15$, $x_2 = 35$, $y_1 = 25$, $y_2 = 45$

Now, $\frac{x_1}{y_1} = \frac{15}{25} = \frac{3}{5}$ and $\frac{x_2}{y_2} = \frac{35}{45} = \frac{7}{9}$

$\Rightarrow \quad \frac{x_1}{y_1} \neq \frac{x_2}{y_2}$

Thus, x and y are not in direct proportion.

(iii) Here $x_1 = 8$, $x_2 = 9$, $y_1 = 6$, $y_2 = 12$

Now, $\frac{x_1}{y_1} = \frac{8}{6} = \frac{4}{3}$ and $\frac{x_2}{y_2} = \frac{9}{12} = \frac{3}{4}$

$\Rightarrow \quad \frac{x_1}{y_1} \neq \frac{x_2}{y_2}$

Thus, x and y are not in direct proportion.

Example 11.2 **Find value of a in the following parts, if x and y are in direct proportion:**

(i)

x	8	13
y	48	a

(ii)

x	a	12
y	45	60

Sol. (i) Given x and y are in direct proportion.

$$\therefore \quad \frac{x_1}{y_1} = \frac{x_2}{y_2} \quad \Rightarrow \quad \frac{8}{48} = \frac{13}{a}$$

$$\Rightarrow \quad 8 \times a = 13 \times 48 \Rightarrow a = \frac{13 \times \cancel{48}^{6}}{\cancel{8}_1} = 78$$

(ii) Given x and y are in direct proportion.

$$\therefore \quad \frac{x_1}{y_1} = \frac{x_2}{y_2} \quad \Rightarrow \quad \frac{a}{45} = \frac{12}{60}$$

$$\Rightarrow \quad a \times 60 = 12 \times 45$$

$$\Rightarrow \quad a = \frac{\cancel{12}^{1} \times \cancel{45}^{9}}{\cancel{60}\,\cancel{5}_1} = 9$$

Example 11.3. **The cost of 3 metres cloth is ₹105. Tabulate the cost of 5 metres, 7 metres, 10 metres and 13 metres of cloth of the same type.**

Sol. Suppose the length of cloth is x metres and its cost is ₹ y.

As the length of cloth increases, cost of the cloth also increases in the same ratio. It is a case of direct proportion.

x	3	5	7	10	13
y	105	y_2	y_3	y_4	y_5

So we will use the relationship $\frac{x_1}{y_1} = \frac{x_2}{y_2}$

(i) Here $x_1 = 3$, $y_1 = 105$, $x_2 = 5$ is $y_2 = ?$

So using $\frac{x_1}{y_1} = \frac{x_2}{y_2}$

We get $\frac{3}{105} = \frac{5}{y_2}$ or $3y_2 = 5 \times 105$ or $y_2 = \frac{5 \times \cancel{105}^{35}}{\cancel{3}_1} = 175$

(ii) Here $x_3 = 7$ so $\frac{3}{105} = \frac{7}{y_3}$ or $3y_3 = 7 \times 105$ or $y_3 = \frac{7 \times \cancel{105}^{35}}{\cancel{3}_1} = 245$

(iii) Here $x_4 = 10$ so $\frac{3}{105} = \frac{10}{y_4}$ or $3y_4 = 10 \times 105$ or $y_4 = \frac{10 \times \cancel{105}^{35}}{\cancel{3}_1} = 350$

(iv) Here $x_5 = 13$ so $\frac{3}{105} = \frac{13}{y_5}$ or $3y_5 = 13 \times 105$ or $y_5 = \frac{13 \times \cancel{105}^{35}}{\cancel{3}_1} = 455$

Here, Note that after finding y_2 we can also use $\frac{x_2}{y_2} = \frac{x_3}{y_3}$

i.e $\frac{5}{175} = \frac{7}{y_3}$ in place of $\frac{x_1}{y_1} = \frac{x_3}{y_3}$ to find the value of y_3 and so on, as ratio will remain constant.

Example 11.4 **Following are the car parking charges near a bus stop**

Upto 4 hours	**₹60**
Upto 8 hours	**₹100**
Upto 12 hours	**₹140**
Upto 24 hours	**₹180**

Check if the parking charges are in direct proportion.

Sol. Let us make the table from the given data, taking time upto hours as x and corresponding parking charges as ₹ y

Time in hours (x)	4	8	12	24
Charges in ₹ (y)	60	100	140	180

Now $\frac{x_1}{y_1} = \frac{1}{15}$; $\frac{x_2}{y_2} = \frac{8}{100} = \frac{2}{25}$; $\frac{x_3}{y_3} = \frac{12}{140} = \frac{3}{35}$; $\frac{x_4}{y_4} = \frac{24}{180} = \frac{2}{15}$

Here, we observe that although charges of parking increases with hours of parking, but their ratio is not same. So parking charges are not in direct proportion.

Example 11.5 **Complete the table if x and y are in direct proportion.**

x	2	4	x_3	24	x_5	x_6	50
y	7	y_2	28	y_4	98	112	y_7

Sol. As x and y are in direct proportion, So $\frac{x_1}{y_1} = \frac{x_2}{y_2} = \frac{x_3}{y_3} = \ldots\ldots\ldots\ldots$

(i) $\frac{2}{7} = \frac{4}{y_2}$ so $2y_2 = 4 \times 7$ or $y_2 = \frac{4 \times 7}{2} = 14$

(ii) $\frac{2}{7} = \frac{x_3}{28}$ or $7x_3 = 28 \times 2$ or $x_3 = \frac{28 \times 2}{7} = 8$

(iii) $\frac{2}{7} = \frac{24}{y_4}$ or $2y_4 = 24 \times 7$ or $y_4 = \frac{24 \times 7}{2} = 84$

(iv) $\frac{2}{7} = \frac{x_5}{98}$ or $7x_5 = 2 \times 98$ or $x_5 = \frac{2 \times 98}{7} = 28$

(v) $\frac{2}{7} = \frac{x_6}{112}$ or $7x_6 = 2 \times 112$ or $x_6 = \frac{2 \times 112}{7} = 32$

(vi) $\frac{2}{7} = \frac{50}{y_7}$ or $2y_7 = 50 \times 7$ or $y_7 = \frac{50 \times 7}{2} = 175$

Example 11.6 A machine in a soft drink factory fills 840 bottles in 6 hours. How many bottles will it fill in 5 hours?

Sol. Let the number of bottles that will be filled in 5 hours be x.

Now we put the given information in the form of a table as shown below:

Number of Bottles	840	x
Time Taken (hours)	6	5

More the number of bottles, more time will be taken. So both terms are in direct proportion.

$$\therefore \quad \frac{840}{6} = \frac{x}{5} \quad \Rightarrow \quad x \times 6 = 840 \times 5$$

$$\Rightarrow \quad x = \frac{840 \times 5}{6} = 700$$

Thus, 700 bottles will be filled in 5 hours.

Example 11.7 Parveen has a road map with a scale of 1cm representing 22km. He drives on a road for 88km. What would be corresponding distance shown on the map?

Sol. Let the required distance be x cm.

Scale (in cm)	1	x
Distance (in km)	22	88

More the scale on the map, more the distance will be there. So both terms are in direct proportion.

$$\therefore \frac{1}{22} - \frac{x}{88} \Rightarrow x - \frac{88}{22} - 4$$

So, the distance shown on map will be 4 cm.

Example 11.8 If the weight of 12 sheets of a paper is 36 grams, how many sheets of the same paper will weight 300 grams?

Sol. Let the number of sheets with weight 300 gram be x. We put above information in the form of table as shown below.

Number of sheets	12	x
Weight of sheets (in grams)	36	300

As more the number of sheets of same type, more will be weight. So number of sheets and their weights are directly proportional to each other

So $\frac{12}{36} = \frac{x}{300}$ or $x = \frac{12 \times 300}{36} = 100$

Thus, the number of sheets of papers weighing 300 grams be 100.

Example 11.9 A truck is moving with a uniform speed of 45 km/hour.

(i) How far will it travel in one and half hour?

(ii) How much time truck will take to cover a distance of 495 km?

Sol. Let the distance travelled (in km) in one and half hour be x and time taken to travel 495 km is y mintues.

Distance travelled (in km)	45	x	495
Time taken(in minutes)	60	90	y

$$\left[\begin{array}{l} \because 1 \text{ hour} = 60 \text{ min} \\ \therefore 1\frac{1}{2} \text{ hours} = 90 \text{ min} \end{array}\right]$$

As speed of truck is uniform, so the distance covered would be directly proportional to time

(i) So we have $\frac{45}{60} = \frac{x}{90}$ or $x = \frac{45 \times 90}{60} = 67.5$

So truck will cover 67.5 km in one and half hour

(ii) Also $\frac{45}{60} = \frac{495}{y}$ or $y = \frac{495 \times 60}{45} = 660$

So time taken to cover 495 km is 660 minute = 11hours

Example 11.10 A 5m 60cm high vertical pole casts a shadow 3m 20cm long. Find at the same time

(i) The length of the shadow by another pole of height 10m 50cm.

(ii) The height of the pole whose shadow is 5m long.

Sol. Let the height of pole be x metres and length of shadow is y metres, from the given question we can form the table shown below. We know that 1m = 100cm

Height of pole (in metres)	5.6	10.5	x
Length of shadow (in metres)	3.2	y	5.0

$$\left[\begin{array}{lcl} \because \text{5m 60cm} & = & \text{5.6m} \\ \text{3m 20cm} & = & \text{3.2m} \\ \text{10m 50cm} & = & \text{10.5m} \end{array}\right]$$

The case is of direct proportion, so $\frac{x_1}{y_1} = \frac{x_2}{y_2}$

(i) Here, $\frac{5.6}{3.2} = \frac{10.5}{y} \Rightarrow 5.6 \times y = 3.2 \times 10.5$ so $y = \frac{3.2 \times 10.5}{5.6} = 6$

So length of shadow of pole having height 10.5m is 6m

(ii) $\frac{5.6}{3.2} = \frac{x}{5} \Rightarrow x \times 3.2 = 5.6 \times 5$ so $x = \frac{5.6 \times 5}{3.2} = 8.75$

So Height of pole having shadow 5 m is 8.75 m.

Note: This Question can be solved by converting units in centimetres also.

Exercise 11.1

1. Which of the following quantities x and y are in direct variation?

(i)

x	9	12
y	54	72

(ii)

x	18	24
y	27	36

(iii)

x	12	14
y	20	24

(iv)

x	15	9
y	18	15

(v)

x	6	13
y	9	19.5

2. Find the value of missing quantity if x and y are in direct variation.

(i)

x	12	–
y	48	88

(ii)

x	13	7
y	–	56

(iii)

x	–	17
y	84	102

3. Complete the table if x and y are in direct proportion.

x	2	a	8	c	15	e
y	8	20	b	52	d	80

4. A machine in a factory fills 680 bottles in 5 hours. How many bottles will it fill in 3 hours?
5. Picture of Bacteria enlarged 60000 times attains a length of 3cm. What is the length of bacteria if it is enlarged 10000 times only.
6. A bus travels 40km in 30 minutes. If the speed of the bus remain same, how far can it travel in 3 hours?
7. If the weight of 25 precious stones is 50 grams. How many precious stones of the same type would weigh 4500 grams?
8. A 15 metres high pole casts a shadow of 10 metres. Find the height of a tree that casts a shadow of 15 metres under similar conditions.
9. If the weight of 12 sheets of a thick paper is 40gm, how many sheets of the same paper would weigh $2\frac{1}{2}$ kg?
10. In a library, 126 copies of a certain book requires a shelf-length of 3.4 metres. How many copies of the same book would occupy a shelf length of 5.1 metres?
11. A mixture of paint is prepared by mixing 1 part of blue pigment with 5 parts of base. In the following table, find the parts of base that need to be added.

Parts of blue pigment	1	4	9	12
Parts of base	5	–	–	–

12. The cost of one litre of milk is ₹55. Tabulate the cost of 2, 4 and 10 litres of milk.

13. A train is running at the uniform speed of 75km/h.

 (i) How much distance will be covered in 20 minutes?

 (ii) How much time it will take to cover 250 km?

14. The cost of 12 chocolates is ₹180.

 (i) What is the cost of 18 such chocolates?

 (ii) How many such chocolates will be there in ₹330?

15. **Multiple Choice Questions :**

 (i) Find 'a' if the given quantities are in direct variation.

x	12	18
y	a	30

 (a) 15 (b) 20 (c) 18 (d) 16

 (ii) If x and y are in direct variation then which of the following is true?

 (a) $xy = k$ (b) $x + y = k$ (c) $x - y = k$ (d) $\frac{x}{y} = k$

 (iii) If the cost of 5 pencils is ₹15. Find the cost of 12 such pencils.

 (a) ₹15 (b) ₹18 (c) ₹36 (d) ₹24

 (iv) A car is moving at a uniform speed of 75km/h. How for it will travel in 3 hours?

 (a) 300 km (b) 225 km (c) 275 km (d) 150 km

11.3 Inverse proportion:-

Two quantities (variables) are said to be in inverse proportion if increase in one quantity leads to decrease in other quantity in same ratio or vice-versa. For example, (i) If the number of workers increases, time taken to finish the same work decreases. (ii) if the speed of a vehicle increases, the time taken to cover the same distance decreases.

Let us consider an example. A school wants to spend ₹6000 on mathematics books. If the rate of one book is ₹40, then how many books could be bought? Clearly 150 books can be bought. If the price of book is more than ₹40, then the number of books which could be purchased with the same amount of money will be less than 150. Observe the following table.

Price of books (in ₹)	**40**	**80**	**120**	**200**
Number of books that can be purchased	**150**	**75**	**50**	**30**

If we double the price of book i.e. $40\times2=80$, the number of books that can be purchased by same amount will be $150\times\frac{1}{2}=75$ (*i.e* halved). if we increase the price by three times i.e. $40\times3=120$, the number of books can be purchased with same amount will be $150 \times \frac{1}{3} = 50$ (*i.e* one third). We observe that price of book increases and number of books purchased by same amount decreases.

Note: The product of the corresponding values of two quantities is fixed constant i.e.

$40 \times 150 = 80 \times 75 = 120 \times 50 = 200 \times 30 = 6000$

If we represent the price of one book as x and number of books purchased as y, then as x increases, y decreases in same ratio and vice versa. It is important to note that the product xy remains fixed constant.

Note: So two quantities x and y are said to vary inversely, If there exist a relation of the type $xy = k$, between them, where k is a constant.

If for x_1, x_2 values of x there are corresponding y_1 and y_2 values of y then $x_1y_1 = x_2y_2 = k$ (say) or $\frac{x_1}{x_2} - \frac{y_1}{y_2}$ we say that x and y are in inverse proportion.

When two quantities x and y are in direct proportion (or vary directly) they are also written as $x \propto y$ or $x = ky$ (where k is a constant of proportionality) and when two quantities x and y are in inverse proportion (or vary inversely) they are also written as $x \propto \frac{1}{y}$ or $x = \frac{k}{y}$ (where k is a constant of proportionality)

Let us consider some examples where we use the concept of inverse proportion.

Example 11.11. Which of the following quantities are in inverse proportion?

(i)

x	**12**	**36**
y	**15**	**5**

(ii)

x	**18**	**54**
y	**27**	**12**

(iii)

x	**24**	**8**
y	**12**	**36**

Sol. We know, if x and y are in inverse proportion then $x_1y_1 = x_2y_2$

(i) Here $x_1 = 12, x_2 = 36, y_1 = 15, y_2 = 5$

$\therefore \quad x_1 y_1 = 12 \times 15 = 180$ and $x_2 y_2 = 36 \times 5 = 180$

$\Rightarrow \quad x_1 y_1 = x_2 y_2 = 180$

Thus x and y are in inverse proportion.

(ii) Here $x_1 = 18, x_2 = 54, y_1 = 27, y_2 = 12$

$\therefore \quad x_1 y_1 = 18 \times 27 = 486$ and $x_2 y_2 = 54 \times 12 = 648$

$\Rightarrow \quad x_1 y_1 \neq x_2 y_2$

Thus x and y are not in inverse proportion.

(iii) Here $x_1 = 24, x_2 = 8, y_1 = 12, y_2 = 36$

$\therefore \quad x_1 y_1 = 24 \times 12 = 288$ and $x_2 y_2 = 8 \times 36 = 288$

$\Rightarrow \quad x_1 y_1 = x_2 y_2 = 288$

Thus x and y are in inverse proportion.

Example 11.12. **Find the value of 'a' if x varies inversely to y.**

(i)

x	9	36
y	a	6

(ii)

x	15	a
y	24	18

Sol. (i) Given x and y are in inverse proportion.

$\therefore \quad x_1 y_1 = x_2 y_2$

$\Rightarrow \quad 9 \times a = 36 \times 6 \quad \Rightarrow \quad a = \dfrac{36 \times 6}{9} = 24$

(i) Given x and y are in inverse proportion.

$\therefore \quad x_1 y_1 = x_2 y_2$

$\Rightarrow \quad 15 \times 24 = a \times 18 \quad \Rightarrow \quad a = \dfrac{15 \times 24}{18} = 20$

Example 11.13. **If 15 men can build a wall in 24 hours, how many men will be required to do the same work in 30 hours?**

Sol. Let the number of men required to build the wall in 30 hours be 'a'.

We have the following table:

Number of men	15	a
Number of hours	24	30

Obviously, more the number of men, less the number of hours required to build the wall. So, both quantities are in inverse proportion.

$\therefore \quad 15 \times 24 = a \times 30$

$\Rightarrow \quad a = \dfrac{15 \times 24}{30} = 12$

Thus, 12 men will be required to finish the work in 30 hours.

Example 11.14. **A School has 8 periods a day each of 45 minutes duration. How long would each period be, if the school has 9 periods a day, assuming the number of school hours to be the same?**

Sol. Let timing of each period be x minutes if 9 periods are there.

We have the following table:

Number of Periods	8	9
Timing (in min)	45	x

Obviously, more the number of periods less the timing of periods. So, both quantities are in inverse proportion.

$$\Rightarrow \qquad 8 \times 45 = 9 \times x$$

$$\Rightarrow \qquad x = \frac{8 \times 45}{9} = 40$$

Thus, each period will be of 40 minutes, if 9 periods are there.

Example 11.15. 8 pipes are required to fill a tank in 2 hours. How long will it take if (i) 6 pipes (ii) 12 pipes of same type are used to fill the tank.

Sol. Let the required time to fill the tank be x_1 and x_2 minutes corresponding to 6 pipes and 12 pipes.

Thus we have the following table

Number of pipes	8	6	12
Time taken to fill tank (in minute)	120	x_1	x_2

1 hour = 60 min
2 hours = 60×2
= 120 min

As number of pipes decreases, time taken will increases and as the number of pipes increases, the time taken will decreases, so this is case of inverse proportion.

(i) $\therefore \quad 8 \times 120 = 6 \times x_1$ (As in inverse porportion $x_1y_1 = x_2\,y_2$)

$$\Rightarrow \quad x_1 = \frac{8 \times 120}{6} = 160$$

Thus, time taken by 6 pipes to fill the tank will be 160 minutes i.e. 2 hours 40 minutes.

(ii) $\quad 8 \times 120 = 12 \times x_2$

$$\Rightarrow \quad x_2 = \frac{8 \times 120}{12} = 80$$

Thus, time taken by 12 pipes to fill the tank is 80 minutes i.e. 1 hour and 20 minutes.

Example 11.16. There are 100 students in a hostel. Food provision for them is for 21 days. Out of 100, 25 students have gone to their home for one month. How long will the provision of food last for the remaining students?

Sol. Suppose the provision last for y days when the number of students remains 100 – 25 = 75. we have the following table.

Number of students	100	75
Number of days	21	y

Notice that it is a case of inverse proportion

So $\quad 100 \times 21 = 75 \times y$

hence $y = \dfrac{100 \times 21}{75} = 28$

Thus, the provision will last for 28 days.

Exercise 11.2

1. Which of the following are in inverse proportion?

(i)

x	8	6
y	9	12

(ii)

x	15	5
y	18	56

(iii)

x	24	8
y	20	60

(iv)

x	12	18
y	24	20

(v)

x	25	10
y	20	50

2. Find the value of 'a' if x and y are in inverse proportion.

(i)

x	16	8
y	9	a

(ii)

x	12	27
y	a	4

(iii)

x	25	a
y	8	20

3. If a box of pens is given to 25 children, they will get 3 pens each. How many pens would each child get, if the number of children is reduced by 10?
4. A batch of tablets were packed in 10 boxes with 6 tablets in each box. If the same batch is packed using 12 tablets in each box. How many boxes would be needed?
5. A company requires 36 machines to make a product in 54 days. How many machines would be required to make the same product in 81 days?
6. 6 pipes are required to fill a tank is 1h 20 min. How long will it take if only 5 pipes of the same type are used?
7. A train takes 2 hours to reach a destination at speed of 60km/h. How long will it take to reach the destination at 80km/h?
8. A car can finish a certain journey in 10 hours at the speed of 32km/h. By how much should its speed be increased so that it may take only 8 hours to cover the same distance?
9. Two persons could fit the AC unit in a house in 2 hours. One person fell ill before the work started, how long would the job take now?
10. Arrangement of tables & chairs in an exam hall is done by 10 workers in 2 hours. How many workers will be required to do the same work in 4 hours?
11. A factory requires 42 machines to produce a given number of articles in 63 days? How many more machines would be required to produce the same number of articles in 54 days?
12. There are 200 students in a hostel. Food provision for them lasts for 10 days. How long will these provision last, if 50 more students join the hostel?
13. If a box of sweets is divided among 24 children, they will get 4 sweets each. How many would each get, if the number of children is reduced by 8.
14. In a television game show, the prize money of ₹1,00,000 is to be divided equally among winners. Complete the following table and find whether the prize money given to an individual winner is directly or inversely proportion to the numbers of winners.

No. of winners	1	2	4	5	8	10
Prize money of each winner	100000	50000	-	-		-

15. Multiple Choice Questions :

(i) If x and y are in inverse proportion then which of the following is true?

(a) $xy = k$ (b) $\frac{x}{y} = k$ (c) $x + y = k$ (d) $x - y = k$

(ii) Find a if x and y are in inverse proportion:

x	30	24
y	12	a

(a) 18 (b) 20 (c) 15 (d) 16

(iii) 10 men complete a work in 20 days. In how many days 25 men will complete the work?

(a) 4 (b) 16 (c) 12 (d) 8

(iv) A farmer has enough food to feed 20 animals in his cattle for 6 days? How long would the food last if there were 10 more animals in his cattle?

(a) 3 (b) 8 (c) 4 (d) 10

Learning Outcome

After completion of the chapter, the students are now able to:

- *Understand direct and inverse porportion.*
- *Understand various terms like demand and supply.*
- *Understand about growth in population and land available and their use in daily life.*

Answers

Exercise 11.1

1. (i), (ii) **2.** (i) 22 (ii) 104 (iii) 14 **3.** a = 5, b = 32, c = 13, d = 60, e = 20

4. 408 bottles **5.** 0.5cm **6.** 240km **7.** 2250 stones

8. 22.5m **9.** 750 sheets **10.** 189 copies

11. 20, 45, 60 **12.** ₹110, ₹220, ₹550 **13.** (i) 25km (ii) 3hr 20 min

14. (i) ₹270 (ii) 22 **15.** (i) b (ii) d (iii) c (iv) b

Exercise 11.2

1 (i), (iii), (v) **2.** (i) 18 (ii) 9 (iii) 10 **3.** 5pen **4.** 5 boxes **5.** 24 machines

6. 1 hour 48 min **7.** 1 hour 30 min **8.** 8km/h **9.** 4 hours **10.** 5 workers

11. 49 machines **12.** 8 days **13.** 6 sweets

14. 25,000; 20,000; 12,500; 10,000 **15.** (i) a (ii) c (iii) d (iv) c