CHAPTER 10-DIRECT AND INVERSE VARIATIONS

Question 1.

In which of the following tables, x and y vary directly:

(i)

x	3	5	8	11
y	4.5	7.5	12	16.5

Solution:

$\frac{x_1}{y_1} = \frac{3}{4.5} = \frac{1}{1.5}$

$\frac{x_2}{y_2} = \frac{5}{7.5} = \frac{1}{1.5}$

$\frac{x_3}{y_3} = \frac{8}{12} = \frac{1}{1.5}$(Forming the given data in fractional form)

$\frac{x_4}{y_4} = \frac{11}{16.5} = \frac{1}{1.5}$

$\Rightarrow \frac{x_1}{y_1} = \frac{x_2}{y_2} = \frac{x_3}{y_3} = \frac{x_4}{y_4}$

Yes, x and y vary directly.

(ii)

x	16	30	40	56
y	32	60	80	84

Solution:

$\frac{x_1}{y_1} = \frac{16}{32} = \frac{1}{2}$ (Forming the given data in fractional form)

$\frac{x_2}{y_2} = \frac{30}{60} = \frac{1}{2}$

$\frac{x_3}{y_3} = \frac{40}{80} = \frac{1}{2}$

$\frac{x_4}{y_4} = \frac{56}{84} = \frac{28}{42} = \frac{14}{21} = \frac{7}{3}$

$\Rightarrow \frac{x_1}{y_1} = \frac{x_2}{y_2} = \frac{x_3}{y_3} \neq \frac{x_4}{y_4}$

x and y are not in direct variation.

(iii)

x	27	45	54	75
y	81	180	216	225

Solution:

$\frac{x_1}{y_1} = \frac{27}{81} = \frac{3}{9} = \frac{1}{3}$ (Forming the given data in fractional form)

$\frac{x_2}{y_2} = \frac{45}{180} = \frac{15}{60} = \frac{3}{12}$

$\frac{x_3}{y_3} = \frac{54}{216} = \frac{18}{72} = \frac{1}{4}$

$\frac{x_4}{y_4} = \frac{75}{225} = \frac{25}{45} = \frac{5}{9}$

$\Rightarrow \frac{x_1}{y_1} \neq \frac{x_2}{y_2} \neq \frac{x_3}{y_3} \neq \frac{x_4}{y_4}$

x and y are not in direct variation.

Question 2.

If x and y vary directly, find the values of x,y and z.

X	3	x	y	10
Y	36	60	96	Z

Solution:

X and y are in direct variation

$\therefore \frac{3}{36} = \frac{x}{60} = \frac{y}{96} = \frac{10}{z}$ (Forming the given data in fractional form)

$\Rightarrow \frac{3}{36} = \frac{x}{60}, \frac{3}{36} = \frac{y}{96}, \frac{3}{36} = \frac{10}{z}$

$x = \frac{3}{36} \times 60, y = \frac{3}{36} \times 96$

$z = 10 \times \frac{36}{3}$

$\Rightarrow x = 5, y = 8, z = 120$

X	3	5	8	10
Y	36	60	96	120

Question 3.

A truck consumes 28 liters of diesel for moving through a distance of 448km. How much distance will it cover in 64 liters of diesel?

Solution:

Let the truck cover x km in 64 liters of diesel.

Diesel (in liters)	28	64
Distance (in km)	448	x

It is the case of direct variation

(Forming the given data in fractional form)

$\Rightarrow \quad \frac{x_1}{y_1} = \frac{x_2}{y_2} \Rightarrow \frac{28}{448} = \frac{64}{x}$

$\text{i.e.,}\ 28x = 64 \times 448$

$x = \frac{64 \times 448}{28} = 1024\text{km}$

Question 4.

For 100km, a taxi charges ₹ 1,800. How much will it charge for a journey of 120 km?

Solution:

Let a charges of car is ₹ x in 120km

Distance in (km)	1800	x
Taxi charges (₹)	100	120

Since it is the case of direct variation

$\Rightarrow \frac{x_1}{y_1} = \frac{x_2}{y_2} \Rightarrow \frac{1800}{100} \times \frac{x}{120}$

$\Rightarrow 100x = 1800 \times 120$

$x = \frac{1800 \times 120}{100} = 2160 \text{ km}$

Question 5.

If 27 identical articles cost ₹ 1,890, how many articles can be bought for ₹ 1,750?

Solution:

Let x number of articles be purchased in ₹ 1750

Cost (₹)	1890	1750
No. of articles	27	X

Since, it is a case of direct variation

$\Rightarrow \frac{1890}{27} = \frac{1750}{x}$

$\Rightarrow x = \frac{1750 \times 27}{1890}$

$= 25 \text{ articles}$

Question 6.

7kg of rice costs Rs.1,120. How much rice can be bought for Rs.3,680?

Solution:

Rice : Cost : Rice: Cost

7kg: 1120 :: x kg : 3680

$\therefore x = \frac{7 \times 3680}{1120} = 23\text{kg}$

Question 7.

6 note-books cost ₹ 156, find the cost of 54 such note-books.

Solution:

Notebooks: cost :: notebooks : cost

6 : Rs.156 :: 54 : Rs.x

$\therefore x = \frac{156 \times 54}{6} = Rs.1404$

Question 8.

22 men can dig a 27m long trench in one day. How many men should be employed for digging 135m long trench of the same type in one day?

Solution:

Men : length trench :: men : length of trench

22 : 27m :: x : 135m (Expressing in ratios)

$x = \frac{22 \times 135}{27} = 110\ men$

Question 9.

If the total weight of 11 identical articles is 77 kg, how many articles of the same type would weigh 224 kg?

Solution:

No. of : weight :: no. of articles : weight

Articles

11 : 77 kg :: x : 224kg

$x = \frac{11 \times 224}{77} = 32\ articles$

Question 10.

A train is moving with uniform speed of 120km per hour.

(i) How far will it travel in 36 minutes?

Solution:

Speed of train in 60 minutes $= 120\ \text{km}$

i.e. distance covered in 60 minutes $= \frac{120}{60}$

Distance covered in 36 minutes $= \frac{120 \times 36}{60}$

$= 2 \times 36 = 73\ \text{km}$

(ii) In how much time will it cover 210 km?

Solution:

If distance covered is 120 km then time taken = 60 minutes

If distance covered is 1 km then time taken $= \frac{60}{120}$

If distance covered is 210 km then time taken $= \frac{60}{120} \times 210 = 105$ minutes

$= 1$ hour 45 minutes

Question 1.

Check whether x and y vary inversely or not.

(i)

x	4	3	12	1
y	6	8	2	24

Solution:

x and y are inversely proportional

Then xy are equal.

(i) $xy = 4 \times 6 = 24$

$xy = 3 \times 8 = 24$

$xy = 12 \times 2 = 24$ (Using the data's in the table)

$xy = 1 \times 24 = 24$

xy in each case is equal

x and y are inversely proportional

(ii)

x	30	120	60	24
y	60	30	30	75

Solution:

$xy = 30 \times 60 = 1800$

$xy = 120 \times 30 = 3600$

$xy = 60 \times 30 = 1800$

$xy = 24 \times 75 = 1800$

xy in each case is not equal.

x and y are not inversely proportional

Question 2.

If x and y vary inversely, find the values of 1, m and n:

(i)

x	4	8	2	32
y	4	l	m	n

Solution:

$\because$ x and y are inversely proportional

$\therefore xy$ is equal

Now,

$xy = 4 \times 4 = 16$

$8 \times l = 16 \Rightarrow l = \frac{16}{8} = 2$

$2 \times m = 16 \Rightarrow m = \frac{16}{2} = 8$

$32 \times n = 16 \Rightarrow n = \frac{16}{32} = 0.5$

(ii)

x	24	32	m	16
y	l	12	8	n

Solution:

$\because$ x and y are inversely proportional

$\therefore xy$ is equal

Now,

(ii) $xy = 32 \times 12 = 384$

$24 \times l = 384 \Rightarrow l = \frac{384}{24} = 16$

$m \times 8 = 384 \Rightarrow m = \frac{384}{8} = 48$

$16 \times n = 384 \Rightarrow n = \frac{384}{16} = 24$

Question 3.

36 men can do a piece of work in 7 days. How many men will do the same work in 42 days?

Solution:

Men : Days :: Men : Days

36 : 7 : x : 42

∴By inverse proportional

$36 \times 7 = x \times 42$

$\Rightarrow x = \frac{36 \times 7}{42} = 6\text{men}$

Question 4.

12 pipes, all of the same size, fill a tank in 42 minutes. How long will it take to fill the same tank, if 21 pipes of the same size are used?

Solution:

Pipes : Time :: Pipes: Time

12 : 2x :: 21 : 42

∴ By inverse proportion

$12 \times 42 = 21 \times x$

$\Rightarrow x = \frac{12 \times 42}{21} = 24\text{ minutes}$

Question 5.

In a fort 150 men had provisions for 45 days. After 10 days, 25 men left the fort. How long would the food last at the same rate?

Solution:

After 10 days: For 150 men, provision will last (45-10) days =35 days

⇒For 1 man, the provisions will last=150×35 days

And for (150-25)=125 men, the provisions will last for $= \frac{150 \times 35}{125} = 42 \text{ days}$