

**EXERCISE 13.1**

- Following are the car parking charges near a railway station upto
 

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

Check if the parking charges are in direct proportion to the parking time.

- A mixture of paint is prepared by mixing 1 part of red pigments with 8 parts of base. In the following table, find the parts of base that need to be added.

Parts of red pigment	1	4	7	12	20
Parts of base	8	-	-	-	-

- In question 2 above, if 1 part of red pigment requires 75ml of base, how much red pigment should we mix with 1800 ml of base.
- A machine in a soft drink factory fills 840 bottles in six hours. How many bottles will it fill in five hours?
- A photograph of a bacteria enlarged 50,000 times attains a length of 5 cm as shown in the diagram. What is the actual length of the bacteria? If the photograph is enlarged 20,000 times only, what would be its enlarged length?
- In a model of a ship, the mast is 9cm high, while the mast of the actual ship is 12 m high. If the length of the ship is 28 m, how long is the model ship?
- Suppose 2 kg of sugar contains  $9 \times 10^6$  crystals. How many sugar crystals are there in (i) 5 kg of sugar? (ii) 1.2 kg of sugar?
- Rashmi has a road map with a scale of 1 cm representing 18 km. She drives on a road for 72 km. What would be her distance covered in the map?
- A 5 m 60 cm high vertical pole casts a shadow 3 m 20 cm long. Find at the same time (i) the length of the shadow cast by another pole 10m 50 cm high (ii) the height of a pole which casts a shadow 5 m long.
- A loaded truck travels 14 km in 25 minutes. If the speed remains the same, how far can it travel in 5 hours?

**TEST YOURSELF (DIP-1)**

- Check whether  $a$  and  $b$  are in direct proportion or not.

$a$	2	4	7	9	11
$b$	8	16	28	36	44

- If cost of 10 chocolates is ₹485, then how many chocolates can be purchased for ₹1940.
- If  $a$  and  $b$  are directly proportional, then find the missing values.

$a$	$a_1$	4	$a_2$	2
$b$	18	72	126	$b_2$

- A TV tower, 25 meters high, casts a shadow of 10 meters. What will be the height of a pole that casts a shadow of 20 meters under similar conditions.
- If a train is travelling at a uniform speed of 55 km/hr. Then how far will it travel in 72 minutes?
- Atul has a graph with scale 1cm representing 50 units. If he wants to represent 800 units, then what would be the measurement in cms.
- A car is travelling at the speed of 60 km/hr. How much distance would it travel in 1 hr 15 minutes.
- The bus fare for 72 km is ₹576. Find the fare for 35 km.

### EXERCISE 13.2

- Which of the following are in inverse proportion ?
  - The number of workers on a job and the time to complete the job
  - The time taken for a journey and the distance travelled in a uniform speed
  - Area of cultivated land and the crop harvested.
  - The time taken for a fixed journey and the speed of the vehicle.
  - The population of a country and the area of land per person.
- In a television game show, the prize money of ₹1,00,000 is to be divided equally amongst the winners. Complete the following table and find whether the prize money given to an individual winner is directly or inversely proportional to the number of winners?

No. of winners	1	2	4	5	8	10	20
Prize for each winners (in ₹)	1,00,000	50,000	-	-	-	-	-

- Rehman is making a wheel using spokes. He wants to fix equal spokes in such a way that the angles between any pair of consecutive spokes are equal. Help him by completing the following table.

Number of spokes	4	6	8	10	12
Angle between a pair of consecutive spokes	$90^\circ$	$60^\circ$	-	-	-

- (i) Are the number of spokes and the angles formed between the pairs of consecutive spokes in inverse proportion?
  - (ii) Calculate the angle between a pair of consecutive spokes on a wheel with 15 spokes.
  - (iii) How many spokes would be needed, if the angle between a pair of consecutive spokes in  $40^\circ$ ?
4. If a box of sweets is divided among 24 children, they will get 5 sweets each. How many would each get, if the number of the children is reduced by 4?
  5. 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?
  6. A contractor estimates that 3 persons could rewire Jasminder's house in 4 days. If he uses 4 persons instead of three, how long should they take to complete the job?
  7. A batch of bottles were packed in 25 boxes with 12 bottles in each box. If the same batch is packed using 20 bottles in each box, how many boxes would be filled?
  8. A factory requires 42 machines to produce a given number of articles in 63 days. How many machines would be required to produce the same number of articles in 54 days.
  9. A car takes 2 hours to reach a destination by travelling at the speed of 60 km/hr. How long will it take when the car travels at the speed of 80 km/hr.?
  10. Two persons could fit new windows in a house in 3 days.
    - (i) One of the persons fell ill before the whole started. How long would the job take now?
    - (ii) How many persons would be needed to fit the windows in one day?
  11. 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?

**TEST YOURSELF (DIP-2)**

1. Observes the table and identify whether 'a' and 'b' are inversely proportional

<i>a</i>	12	4	36	54
<i>b</i>	9	27	3	2

2. If a and b are inversely proportional, find the values of  $a_1$  and  $b_1$  in the table given below:

<i>a</i>	12	4	36	$a_1$
<i>b</i>	3	9	$b_1$	6

3. If 40 men can sow seeds in a field in 9 days, then in how many days can 60 men sow seeds in the same field?
4. 8 pipes are required to fill a tank in 1 hour 15 minutes. How long will it take if only 4 pipes of the same type are used.
5. A person has enough food to feed 45 animals for 12 days. If there were 9 animals less, then for how long would the food last?
6. If 25 workers can build a house in 63 days, then how many workers can do the same work in 45 days?
7. A bus takes 2 hours to reach a destination by travelling at the rate of 80 km/hr. How long will it take while travelling at the rate of 120 km/hr.
8. A can do a work in 10 days and B can do it in 15 days. Then in how many days both A and B can do the work?
9. A can do a piece of work in 10 days and B can finish it in 15 days. They work together for 5 days and then A leaves. In how many days will B finish the remaining work?
10. Three pipes A, B and C can fill a tank in 5 hrs, 10 hrs and 15 hrs. respectively. In how many hours all three pipes will fill the tank together.



## NCERT Textual Exercises and Assignments

### Exercise – 13.1

1. Charge per hour :

$$C_1 = \frac{60}{4} = ₹15$$

$$C_2 = \frac{100}{8} = ₹12.50$$

$$C_3 = \frac{140}{12} = ₹11.67$$

$$C_4 = \frac{180}{24} = ₹7.50$$

Here, the charges per hour are not same, i.e.,  $C_1 \neq C_2 \neq C_3 \neq C_4$

Therefore, the parking charges are not in direct proportion to the parking time.

2. Let the ratio of parts of red pigment and parts of base be  $a/b$ .

Here  $a_1 = 1, b_1 = 8 \Rightarrow \frac{a_1}{b_1} = \frac{1}{8} = k$  (say)

When  $a_2 = 4, b_2 = ? \Rightarrow b_2 = \frac{a_2}{k} = \frac{4}{\frac{1}{8}} = 4 \times 8 = 32$

When  $a_3 = 7, b_3 = ?$

$$k = \frac{a_3}{b_3} \Rightarrow b_3 = \frac{a_3}{k} = \frac{7}{\frac{1}{8}} = 7 \times 8 = 56$$

When  $a_4 = 12, b_4 = ?$

$$k = \frac{a_4}{b_4} \Rightarrow b_4 = \frac{a_4}{k} = \frac{12}{\frac{1}{8}} = 12 \times 8 = 96$$

When  $a_5 = 20, b_5 = ?$

$$k = \frac{a_5}{b_5} \Rightarrow b_5 = \frac{a_5}{k} = \frac{20}{\frac{1}{8}} = 20 \times 8 = 160$$

Parts of red pigment	1	4	7	12	20
Parts of base	8	32	56	96	160

3. Let the parts of red pigment mix with 1800 mL base be  $x$ .

Parts of red pigment	1	$x$
Parts of base	75	1800

Since it is in direct proportion.

$$\therefore \frac{1}{75} = \frac{x}{1800} \Rightarrow 75 \times x = 1 \times 1800$$

$$\Rightarrow x = \frac{1 \times 1800}{75} = 24 \text{ parts}$$

Hence with base 1800 mL, 24 parts red pigment should be mixed.

4. Let the number of bottles filled in five hours be  $x$ .

Hours	6	5
Bottles	840	$x$

Here ratio of hours and bottles are in direct proportion.

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

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

Hence machine will fill 700 bottles in five hours.

5. Let enlarged length of bacteria be  $x$ .

$$\text{Actual length of bacteria} = \frac{5}{50000} = \frac{1}{10000} \text{ cm} = 10^{-4} \text{ cm}$$

Length	5	$x$
Enlarged length	50,000	20,000

Here length and enlarged length of bacteria are in direct proportion.

$$\therefore \frac{5}{50000} = \frac{x}{20000} \Rightarrow x \times 50000 = 5 \times 20000$$

$$\Rightarrow x = \frac{5 \times 20000}{50000} = 2 \text{ cm}$$

Hence the enlarged length of bacteria is 2cm.

6. Let the length of model ship be  $x$ .

Length of actual ship (in m)	12	28
Length of model ship (incm)	9	$x$

Here length of mast and actual length of ship are in direct proportion.

$$\therefore \frac{12}{9} = \frac{28}{x} \Rightarrow x \times 12 = 28 \times 9$$

$$\Rightarrow x = \frac{28 \times 9}{12} = 21 \text{ cm}$$

Hence length of the model ship is 21cm

7. (i) Let sugar crystals be  $x$ .

Weight of sugar (in kg)	2	5
No. of crystals	$9 \times 10^6$	$x$

Here weight of sugar and number of crystals are in direct proportion.

$$\therefore \frac{2}{9 \times 10^6} = \frac{5}{x} \Rightarrow x \times 2 = 5 \times 9 \times 10^6$$

$$\Rightarrow x = \frac{5 \times 9 \times 10^6}{2} = 22.5 \times 10^6 = 2.25 \times 10^7$$

Hence the number of sugar crystals is  $2.25 \times 10^7$ .

- (ii) Let sugar crystals be  $x$ .

Weight of sugar (in kg)	2	1.2
No. of crystals	$9 \times 10^6$	$x$

Here weight of sugar and number of crystals are in direct proportion.

$$\therefore \frac{2}{9 \times 10^6} = \frac{1.2}{x} \Rightarrow x \times 2 = 1.2 \times 9 \times 10^6$$

$$\Rightarrow x = \frac{1.2 \times 9 \times 10^6}{2} = 0.6 \times 9 \times 10^6 = 5.4 \times 10^6$$

Hence the number of sugar crystals is  $5.4 \times 10^6$ .

8. Let distance covered in the map be  $x$ .

Actual distance (in km)	18	72
Distance covered in map (in cm)	1	$x$

Here actual distance and distance covered in the map are in direct proportion.

$$\therefore \frac{18}{1} = \frac{72}{x} \Rightarrow x \times 18 = 72 \times 1$$

$$\Rightarrow x = \frac{72 \times 1}{18} = 4 \text{ cm}$$

Hence distance covered in the map is 4 cm.

9. Here height of the pole and length of the shadow are in direct proportion.

and  $1 \text{ m} = 100 \text{ cm}$

$$5 \text{ m } 60 \text{ cm} = 5 \times 100 + 60 = 560 \text{ cm}$$

$$3 \text{ m } 20 \text{ cm} = 3 \times 100 + 20 = 320 \text{ cm}$$

$$5 \text{ m} = 5 \times 100 = 500 \text{ cm}$$

$$10 \text{ m } 50 \text{ cm} = 10 \times 100 + 50 = 1050 \text{ cm}$$

(i) Let the length of the shadow of another pole be  $x$ .

Height of pole (in cm)	560	1050
Length of shadow (in cm)	320	$x$

$$\therefore \frac{560}{320} = \frac{1050}{x}$$

$$\Rightarrow x = \frac{1050 \times 320}{560} = 600\text{cm} = 6\text{m}$$

Hence length of the shadow of another pole is 6m.

(ii) Let the height of the pole be  $x$ .

Height of pole (in cm)	560	$x$
Length of shadow	320	500

$$\therefore \frac{560}{320} = \frac{x}{500} \Rightarrow x \times 320 = 560 \times 500$$

$$\Rightarrow x = \frac{560 \times 500}{320} = 875\text{cm} = 8\text{m } 75\text{cm}$$

Hence height of the pole is 8m 75 cm.

10. Let distance covered in 5 hours be  $x$  km.

$$\therefore 1 \text{ hour} = 60 \text{ minutes}$$

$$\therefore 5 \text{ hours} = 5 \times 60 = 300 \text{ minutes}$$

Distance (in km)	14	$x$
Time (in minutes)	25	300

Here distance covered and time in direct proportion.

$$\therefore \frac{14}{25} = \frac{x}{300} \Rightarrow x \times 25 = 14 \times 300$$

$$\Rightarrow x = \frac{14 \times 300}{25} = 168\text{km}$$

Hence the distance covered in 5 hours is 168 km.

### Test Yourself (DIP-1)

- yes direct proportion
- 40 chocolates
- $a_1 = 1, a_2 = 7, b_2 = 36$ .
- 50 meters
- 66 km.
- 160 cm
- 75 km
- ₹280.



## Exercise – 13.2

1. (i) The number of workers and the time to complete the job is in inverse proportion because less workers will take more time to complete a work and more workers will take less time to complete the same work.
  - (ii) Time and distance covered is in direct proportion.
  - (iii) It is a direct proportion because more of cultivated land will yield more crops.
  - (iv) Time and speed are inverse proportion because if time is less, speed is more
  - (v) It is a inverse proportion. If the population of a country increase, the area of land per person decreases.
2. Here number of winners and prize money are in inverse proportion because winners are increasing, prize money is decreasing.

When the number of winners are 4, each winner will get  $= \frac{100000}{4} = ₹25,000$

When the number of winners are 5, each winner will get  $= \frac{100000}{5} = ₹20,000$

When the number of winners are 8, each winner will get  $= \frac{100000}{8} = ₹12,500$

When the number of winners are 10, each winner will get  $= \frac{100000}{10} = ₹10,000$

When the number of winners are 20, each winner will get  $= \frac{100000}{20} = ₹5,000$

3.

No. of spokes	4	6	8	10	12
Angle between a pair of consecutive spokes	90°	60°	45°	36°	30°

- (i) Yes, the number of spokes and the angles formed between a pair of consecutive spokes is in inverse proportion.
  - (ii) When the number of spokes is 15, the angle between a pair of consecutive spokes =  $\frac{360^\circ}{15} = 24^\circ$ .
  - (iii) The number of spokes would be needed  $= \frac{360^\circ}{40^\circ} = 9$
4.  $\therefore$  Each child gets = 5 sweets  
 $\therefore$  24 children will get  $24 \times 5 = 120$  sweets  
 Total number of sweets = 120  
 If the number of children is reduced by 4, then children left =  $24 - 4 = 20$   
 Now each child will get sweets =  $\frac{120}{20} = 6$  sweets
  5. Let the number of days be  $x$ .

Total number of animals =  $20 + 10 = 30$

Animals	20	30
Days	6	$x$

Here the number of animals and the number of days are in inverse proportion.

$$\Rightarrow \frac{20}{30} = \frac{x}{6} \Rightarrow 30 \times x = 20 \times 6$$

$$\Rightarrow x = \frac{20 \times 6}{30} = 4$$

Hence the food will last for four days.

6. Let time taken to complete the job be  $x$ .

Persons	3	4
Days	4	$x$

Here the number of persons and the number of days are in inverse proportion.

$$\therefore \frac{3}{4} = \frac{x}{4} \quad 4 \times x = 3 \times 4$$

$$\Rightarrow x = \frac{3 \times 4}{4} = 3 \text{ days}$$

Hence they will complete the job in 3 days.

7. Let the number of boxes be  $x$ .

No. of bottles in each box	12	20
Boxes	25	$x$

Here the number of boxes are in inverse proportion.

$$\therefore \frac{12}{20} = \frac{x}{25} \Rightarrow x \times 20 = 120 \times 25$$

$$\Rightarrow x = \frac{12 \times 25}{20} = 15$$

Hence 15 boxes would be filled.

8. Let the number of machines required be  $x$ .

Days	63	54
Machines	42	$x$

Here the number of machines and the number of days are in inverse proportion.

$$\therefore \frac{63}{54} = \frac{x}{42} \Rightarrow x \times 54 = 63 \times 42$$

$$\Rightarrow x = \frac{63 \times 42}{54} = 49$$

Hence 49 machines would be required.

9. Let the number of hours be  $x$ .

Speed (in km/hr)	60	80
Time (in hours)	2	$x$

Here the speed of car and time are in inverse proportion.

$$\therefore \frac{60}{80} = \frac{x}{2} \Rightarrow x \times 80 = 60 \times 2$$

$$\Rightarrow x = \frac{60 \times 2}{80} = \frac{3}{2} = 1\frac{1}{2} \text{ hrs.}$$

Hence the car will take  $1\frac{1}{2}$  hours to reach its destination.

10. (i) Let the number of days be  $x$ .

Persons	2	1
Days	3	$x$

Here the speed of persons and the number of days are in inverse proportion

$$\frac{2}{1} = \frac{x}{3} \Rightarrow x \times 1 = 2 \times 3$$

$$\Rightarrow x = \frac{2 \times 3}{1} = 6 \text{ days}$$

- (ii) Let the number of persons be  $x$ .

Persons	2	$x$
Days	3	1

Here the number of persons and the number of days are in inverse proportion

$$\therefore \frac{2}{x} = \frac{1}{3} \Rightarrow x \times 1 = 2 \times 3$$

$$\Rightarrow x = \frac{2 \times 3}{1} = 6 \text{ persons}$$

11. Let the duration of each period be  $x$ .

Period	8	9
Duration of period (in minutes)	45	$x$

Here the number of periods and the duration of periods are in inverse proportion.

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

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

Hence duration of each period would be 40 minutes.

**Test Yourself (DIP–2)**

1.  $a \times b = 12 \times 9 = 4 \times 27 = 36 \times 3 = 24 \times 2 = 108$

2.  $a_1 = 6, b_1 = 1.$

3.

No. of man	40	60
No. of days	9	$x.$

$$40 \times 9 = 60 \times x \Rightarrow x = \frac{40 \times 9}{60} = 6.$$

4. 150 minutes

6. 35 workers

8. 6 days


10.  $2\frac{8}{11}$  hrs.

5. 15days

7. 1 hrs. 20 min.

9.  $3\frac{1}{3}$  days



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