

# DIRECT AND INVERSE PROPORTIONS

## TEXT BOOK EXERCISE 11.1

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

$x$	9	12
$y$	54	72

(i)

$x$	18	24
$y$	27	36

(ii)

$x$	12	14
$y$	20	24

(iii)

$x$	15	9
$y$	18	15

(iv)

$x$	6	13
$y$	9	19.5

(v)

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

$$\frac{x}{y} = k \text{ (constant)}$$

(i) Here,  $x_1 = 9, x_2 = 12, y_1 = 54, y_2 = 72$

Now,  $\frac{x_1}{y_1} = \frac{9}{54} = \frac{1}{6}$

and  $\frac{x_2}{y_2} = \frac{12}{72} = \frac{1}{6}$

$$\Rightarrow \frac{x_1}{y_1} = \frac{x_2}{y_2} = \frac{1}{6}$$

Thus,  $x$  and  $y$  are in direct proportion.

(ii) Here,  $x_1 = 18, x_2 = 24, y_1 = 27, y_2 = 36$

Now,  $\frac{x_1}{y_1} = \frac{18}{27} = \frac{2}{3}$

and  $\frac{x_2}{y_2} = \frac{24}{36} = \frac{2}{3}$

$$\Rightarrow \frac{x_1}{y_1} = \frac{x_2}{y_2}$$

Thus,  $x$  and  $y$  are in direct proportion.

(iii) Here,  $x_1 = 12, x_2 = 14, y_1 = 20, y_2 = 24$

Now,  $\frac{x_1}{y_1} = \frac{12}{24} = \frac{1}{2}$

and  $\frac{x_2}{y_2} = \frac{14}{24} = \frac{7}{12}$

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

Thus,  $x$  and  $y$  are not in direct proportion.

(iv) Here,  $x_1 = 15, x_2 = 9, y_1 = 18, y_2 = 15$

Now,  $\frac{x_1}{y_1} = \frac{15}{18} = \frac{5}{6}$

and  $\frac{x_2}{y_2} = \frac{9}{15} = \frac{3}{5}$

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

Thus,  $x$  and  $y$  are not in direct proportion.

(v) Here,  $x_1 = 6, x_2 = 13, y_1 = 9, y_2 = 19.5$

Now,  $\frac{x_1}{y_1} = \frac{6}{9} = \frac{2}{3}$

and  $\frac{x_2}{y_2} = \frac{13}{19.5} = \frac{130}{195} = \frac{2}{3}$

$$\Rightarrow \frac{x_1}{y_1} = \frac{x_2}{y_2}$$

Thus,  $x$  and  $y$  are in direct proportion.

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

$x$	12	-
$y$	48	88

(i)

$x$	13	7
$y$	-	56

(ii)

$x$	-	17
$y$	84	102

(iii)



**Solution.** (i) Given  $x$  and  $y$  are in direct proportion.

$$\therefore \frac{x_1}{y_1} = \frac{x_2}{y_2} \Rightarrow \frac{12}{48} = \frac{x_2}{88}$$

$$\Rightarrow x_2 = \frac{12 \times 88}{48} = 22 \text{ Ans.}$$

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

$$\therefore \frac{x_1}{y_1} = \frac{x_2}{y_2} \Rightarrow \frac{13}{y_1} = \frac{7}{56}$$

$$\Rightarrow y_1 = \frac{13 \times 56}{7} = 104 \text{ Ans.}$$

(iii) Given  $x$  and  $y$  are in direct proportion

$$\therefore \frac{x_1}{y_1} = \frac{x_2}{y_2} \Rightarrow \frac{x_1}{84} = \frac{17}{102}$$

$$\Rightarrow x_1 = \frac{17 \times 84}{102} = 14 \text{ Ans.}$$

**Q. 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

**Solution.** Given  $x$  and  $y$  are in direct proportion.

$$\therefore \frac{x_1}{y_1} = \frac{x_2}{y_2} \Rightarrow \frac{2}{8} = \frac{a}{20}$$

$$\Rightarrow a = \frac{2 \times 20}{8} \Rightarrow a = 5$$

Also,  $\frac{x_1}{y_1} = \frac{x_3}{y_3} \Rightarrow \frac{2}{8} = \frac{8}{b}$

$$\Rightarrow b = \frac{8 \times 8}{2} \Rightarrow b = 32$$

$$\frac{x_1}{y_1} = \frac{x_4}{y_4} \Rightarrow \frac{2}{8} = \frac{c}{52}$$

$$\Rightarrow c = \frac{2 \times 52}{8} \Rightarrow c = 13$$

$$\frac{x_1}{y_1} = \frac{x_5}{y_5} \Rightarrow \frac{2}{8} = \frac{15}{d}$$

$$\Rightarrow d = \frac{8 \times 15}{2} \Rightarrow d = 60$$

$$\frac{x_1}{y_1} = \frac{x_6}{y_6} \Rightarrow \frac{2}{8} = \frac{e}{80}$$

$$\Rightarrow e = \frac{2 \times 80}{8} \Rightarrow e = 20$$

**Q. 4.** A machine in a factory fills 680 bottles in 5 hours. How many bottles will it fill in 3 hours ?

**Solution.** Let the number of bottles that will be filled in 3 hours be  $x$ .

Now, we form a table as shown below :

Number of Bottles	680	$x$
Time taken (in hours)	5	3

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

$$\therefore \frac{680}{5} = \frac{x}{3} \Rightarrow x = \frac{680 \times 3}{5}$$

$$\Rightarrow x = 408$$

Thus, 408 bottles will be filled in 3 hours.

**Ans.**

**Q. 5.** Picture of Bacteria enlarged 60000 times attains a length of 3 cm. What is the length of bacteria if it is enlarged 10000 times only.

**Solution.** Let the enlarged length of 10000 times enlarged bacteria be  $x$ . We form a table as shown below :

Enlarged length (in cm)	3	$x$
Enlarged picture	60000	10000

More is the enlarged picture, the enlarged length will also be more

So, both terms are in direct proportion.

$$\therefore \frac{3}{60000} = \frac{x}{10000}$$

$$\Rightarrow x = \frac{3 \times 10000}{60000} = \frac{1}{2} = 0.5$$

Thus, the enlarged length will be 0.5 cm.

**Ans.**



**Q. 6.** A bus travels 40 km in 30 minutes. If the speed of the bus remain same, how far can it travel in 3 hours ?

**Solution.** Let distance travelled (in km) in 3 hours (180 minutes) be  $x$  km. We form a table as shown below :

Distance travelled (in km)	40	$x$
Time taken (in minutes)	30	180

As the speed of the bus is constant. So, the distance covered would be directly proportional to time.

$$\therefore \frac{40}{30} = \frac{x}{180}$$

$$\Rightarrow x = \frac{40 \times 180}{30} = 240$$

Thus, bus will travel 240 km in 3 hours. **Ans.**

**Q. 7.** If the weight of 25 precious stones is 50 grams. How many precious stones of the same type would weigh 4500 grams ?

**Ans.** Let the number of stones be  $x$ . We form a table as shown below :

Number of stones	25	$x$
Weight of stones (in figure)	50	4500

More is the number of stones, more would be their weight.

So, both terms are in direct proportion.

$$\therefore \frac{25}{50} = \frac{x}{4500}$$

$$\Rightarrow x = \frac{25 \times 4500}{50} = 2250$$

Thus, the number of stones is 2250. **Ans.**

**Q. 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.

**Solution.** Let the height of tree be  $x$  metres. We form a table as shown below :

Height of the object (in metres)	15	$x$
Length of the shadow (in metres)	10	15

As more the height of an object, the more would be the length of its shadow.

So, this is a case of direct proportion.

$$\therefore \frac{15}{10} = \frac{x}{15}$$

$$\Rightarrow x = \frac{15 \times 15}{10} = \frac{225}{10} = 22.5$$

Thus, the height of the tree is 22.5 metres.

**Ans.**

**Q. 9.** If the weight of 12 sheets of a thick paper is 40 gm, how many sheets of the same

paper would weigh  $2\frac{1}{2}$  kg ?

**Solution.** Let the number of sheets which weigh  $2\frac{1}{2}$  kg be  $x$ .

We form a table as shown below :

Number of sheets	12	$x$
Weight of sheets (in grams)	40	2500

More the number of sheets, the more would be their weights.

So, the number of sheets and their weights are directly proportional to each other.

$$\therefore \frac{12}{40} = \frac{x}{2500} \Rightarrow x = \frac{12 \times 2500}{40}$$

$$\Rightarrow x = 750$$

Thus, the required number of sheets of paper = 750. **Ans.**

**Q. 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 ?

**Solution.** Let the number of copies of the same book be  $x$ .

We form a table as shown below :

Number of copies of a certain book	126	$x$
Length of the shelf (in metres)	3.4	5.1

More the number of copies of a book, the more would be the length of the shelf.

So, both are in direct proportion.



$$\therefore \frac{126}{3.4} = \frac{x}{5.1} \Rightarrow \frac{126 \times 5.1}{3.4} = x$$

$$\Rightarrow x = \frac{126 \times 51}{34} \Rightarrow x = 189$$

Thus, number of copies of the book = 189.

**Ans.**

**Q. 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	-	-	-

**Solution.** Let  $x$  parts of blue pigment is mixed with  $y$  parts of base.

Parts of blue pigment	$x$	1	4	9	12
Parts of base	$y$	5	$y_2$	$y_3$	$y_4$

As the parts of blue pigment increases, the parts of base also increases in the same ratio.

It is a case of direct proportion.

$$\therefore \frac{x_1}{y_1} = \frac{x_2}{y_2}$$

$$(i) \quad \frac{1}{5} = \frac{4}{y_2} \Rightarrow y_2 = 20$$

$$(ii) \quad \frac{1}{5} = \frac{9}{y_3} \Rightarrow y_3 = 45$$

$$(iii) \quad \frac{1}{5} = \frac{12}{y_4} \Rightarrow y_4 = 60$$

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

**Solution.** Suppose the cost of  $x$  litres of milk is ₹  $y$

$x$	1	2	4	10
$y$	55	$y_2$	$y_3$	$y_4$

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

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

$$(i) \text{ Here, } x_1 = 1, y_1 = 55, x_2 = 2, y_2 = ?$$

$$\therefore \frac{1}{55} = \frac{2}{y_2} \Rightarrow y_2 = 2 \times 55 = 110$$

$$(ii) \text{ Here, } x_1 = 1, y_1 = 55, x_3 = 4, y_3 = ?$$

$$\therefore \frac{1}{55} = \frac{4}{y_3}$$

$$\Rightarrow y_3 = 4 \times 55 = 220$$

$$(iii) \text{ Here, } x_1 = 1, y_1 = 55, x_4 = 10, y_4 = ?$$

$$\therefore \frac{1}{55} = \frac{10}{y_4}$$

$$\Rightarrow y_4 = 10 \times 55 = 550$$

Hence, costs are ₹ 110, ₹ 220 and ₹ 550. **Ans.**

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

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

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

**Solution.** Let the distance covered in 20 minutes be  $x$  and time taken (in minutes) to cover 250 km be  $y$ .

Distance covered (in km)	75	$x$	250
Time taken (in minutes)	60	20	$y$

Since, the speed is uniform. Therefore, the distance covered would be directly proportional to time

(i) We have :

$$\frac{75}{60} = \frac{x}{20}$$

$$x = \frac{75 \times 20}{60}$$

$$\Rightarrow x = 25$$

So, the train will cover 25 km in 20 minutes.

**Ans.**

$$(ii) \text{ Also, } \frac{75}{60} = \frac{250}{y}$$

$$\Rightarrow y = \frac{250 \times 60}{75} = 200$$

Hence, 200 minutes i.e. 3 hours 20 minutes will be required to cover a distance of 250 km. **Ans.**

**Q. 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 ?

**Solution.** Let cost of 18 chocolates be  $y$  and number of chocolate in ₹ 330 be  $x$ .

Number of chocolates	12	18	$x$
Cost of chocolate (in ₹)	180	$y$	330

As the number of chocolates increases, the cost would also increases. So, it is a case of direct proportion.

$$(i) \therefore \frac{12}{180} = \frac{18}{y} \Rightarrow y = \frac{18 \times 180}{12}$$

$$\Rightarrow y = 270$$

Thus, cost of 18 chocolates is ₹ 270 **Ans.**

$$(ii) \text{ Also } \frac{12}{180} = \frac{x}{330} \Rightarrow x = \frac{12 \times 330}{180} = 22$$

Thus, the number of chocolates in ₹ 330 is 22.

**Q. 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 75 km/h. How far it will travel in 3 hours ?

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

**Ans.** (i) (b) 20 (ii) (d)  $\frac{x}{y} = k$

(iii) (c) ₹ 36 (iv) (b) 225 km.