Chapter 4

Direct and Inverse Proportion

Ex 4.1

Fill in the blanks.

(i) If the cost of 8 apples is 56 then the cost of 12 apples is _____.

(ii) If the weight of one fruit box is 312 kg, then the weight of 6 such boxes is

(iii) A car travels 60 km with 3 liters of petrol. If the car has to cover the distance of

200 km, it requires ____ liters of the petrol.

(iv) If 7 m cloth costs \gtrless 294, then the cost of 5m of cloth is ____.

(v) If a machine in a cool drinks factory fills 600 bottles in 5 hrs, then it will fill _____ bottles in 3 hours.

Solutions:

(i) 84
(ii) 21 kg
(iii) 10
(iv) ₹ 210
(v) 360

Question 2.

Say True or False

(i) Distance travelled by a bus and time taken are in direct proportion.

(ii) Expenditure of a family to number of members of the family are in direct proportion.

(iii) Number of students in a hostel and consumption of food are not in direct proportion.

(iv) If Mallika walks 1km in 20 minutes, then she can convert 3km in 1 hour.(v) If 12 men can dig a pond in 8 days, then 18 men can dig it in 6 days.

Solutions:

- (i) True
- (ii) True
- (iii) False
- (iv) True
- (v) False

Question 3. A dozen bananas costs ₹ 20. What is the price of 48 bananas ?

Solution:

Let the required price be \exists x. As the number of bananas increases price also increases

 \therefore Number of bananas and cost are in direct proportion.



Number of bananas	1 dozen = 12	48		
Cost in rupees	20	x		
$\frac{x_1}{x_2} = \frac{x_2}{x_2}$				
$ \begin{array}{ccc} $				
	$\frac{1}{20} = \frac{1}{x}$			
	$x = \frac{48 \times 12}{12}$	20		
	x = 80			
Price of 48 ba	nanas = ₹ 80.			

Question 4.

A group of 21 students paid ₹ 840 as the entry fee for a magic show. How many students entered the magic show if the total amount paid was ₹ 1680? Solution:

Let the required number of students be x.

Number of students	21	x
Entry fees in ₹	840	1680

As the number of students increases the entry fees also increases. ∴ They are in direct proportion .

$$\frac{x_{1}}{y_{1}} = \frac{x_{2}}{y_{2}}$$

$$\frac{21}{840} = \frac{x}{1680}$$

$$x = \frac{21 \times 1680}{840}$$

$$x = 42.$$

 \therefore The number of students entered magic show = 42

Question 5.

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A birthday party is arranged in third floor of a hotel. 120 people take 8 trips in a lift to go to the party hall. If 12 trips were made how many people would have attended the party?

Solution:

Let the number of people attended the party be x.

Number of people	120	x
Number of trips	8	12

As the number of trips increases, number of people also increases.

 \div They are in direct proportion.

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

$$\frac{120}{8} = \frac{x}{12}$$

$$x = \frac{120 \times 12}{8} = 180$$

180 people attend the party in 12 trips

Question 6.

The shadow of a pole with height of 8m is 6m. If the shadow of another pole measured at the same time is 30m, find the height of the pole?

Solution:

Let the required height of the pole be 'x' m.

Height of pole in m	8	x
Length of shadow in m	6	30

Height of the pole and its shadow are in direct proportion

$$\frac{x_1}{y_1} = \frac{x_2}{y_2}$$
$$\frac{8}{6} = \frac{x}{30}$$
$$x = \frac{8 \times 30}{6}$$

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x = 40 \therefore Height of the pole x = 40m.

Question 7.

A postman can sort out 738 letters in 6 hours. How many letters can be sorted in 9 hours?

Solution:

Let the required number of letters be x.

Number of letters	738	x
Required time to sort in hours	6	9

They are in direct proportion.

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

$$\frac{738}{6} = \frac{x}{9}$$

$$x = \frac{739 \times 9}{6}$$

$$x = 1107.$$

In 9 hours 1107 letters can be sorted.

Question 8.

If half a meter of cloth costs \gtrless 15. Find the cost of 813 meters of the same cloth.

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Solution:

Let the cost of cloth required be x.

Cost of cloth in ₹	15	x
Length of cloth in meters	1/2	$8\frac{1}{3} = \frac{25}{3}$

Cost and length are in direct proportion.

$$\therefore \frac{x_1}{y_1} = \frac{x_2}{y_2}; \quad \frac{15}{\frac{1}{2}} = \frac{x}{\frac{25}{3}}$$

$$15 \times \frac{25}{3} = x \times \frac{1}{2}$$

$$x \times \frac{1}{2} = 125$$

$$x = 125 \times 2$$

$$x = 250$$
Cost of $8\frac{1}{3}$ m of cloth $= ₹ 250$.

Question 9.

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The weight of 72 books is 9 kg. What is the weight of 40 such books (using unitary method)

Solution:

Weight of 72 books = 9 kg = 9000 g \therefore Weight of 1 book = 900072 = 125 g \therefore Weight of 40 books = 125 × 40 g = 5000 g = 5 kg. Weight of 40 books = 5 kg

Question 10.

Thamarai pages ₹ 7500 as rent for 3 months. With the same rate how much does she have to pay for 1 year (using unitary method).

Solution: Rent paid by Thamarai for 3 months = ₹7500 \therefore Rent paid for 1 month = 75003 = 2500Rent paid for 1 year or 12 moths = $2500 \times 12 = ₹30,000$ For 1 year rent to be paid = ₹30,000

Question 11. If 30 men can reap a field in 15 days, then in how many days can 20 men reap the same field? (using unitary method).

Solution:

30 men can reap a field in 15 days.

 \therefore 1 men can reap the field in $\frac{15}{30}$ days = $\frac{1}{2}$ days.

:.20 men can reap the field in = $\frac{1}{\cancel{2}} \times \cancel{20}^{10} = 10$ days

 \therefore 20 men can reap the field in 10 days.

Question 12.

Valli purchase 10 pens for ₹ 180 and Kamala boys 8 pens for ₹ 96. Can you say who bought the pen cheaper (using unitary method).

Solution:

Valli purchases 10 pens for ₹ 180 ∴ Valli purchase 1 pen for ₹ $\frac{180}{10} = ₹ 18$ Kamala buys 8 pens for ₹ 96 ∴ Kamala buys 1 pen for ₹ $\frac{96}{8} = ₹ 12$ ₹12 < ₹18

∴ Kamala bought the pen cheaper.

Question 13.

A motorbike requires 2 liters of petrol to cover 100 kilometres. How many liters of petrol will be required to cover 250 kilometers? (using unitary method).

Solution:

To cover 100 km quantity of petrol required = 2 litres

 $\therefore \qquad \text{To cover 1 km petrol required} = \frac{2}{100} = \frac{1}{50} \text{ litres}$ $\therefore \qquad \text{To cover 250 km petrol required} = \frac{1}{50} \times 250 = 5 \text{ litres.}$

 $5\ litres$ of petrol required to cover $250\ km$

Objective Type Questions

Question 14. If the cost of 3 books is ₹ 90, then find the cost of 12 books. (i) ₹ 300 (ii) ₹ 320 (iii) ₹ 360 (iv) ₹ 400

Hint:
$$\frac{3}{90} = \frac{12}{x} \Rightarrow x = \frac{\cancel{12} \times 90}{\cancel{5}} = 360$$

Solution:

(iii) ₹ 360

Question 15.

If Mani buys 5 kg of potatoes for ₹ 75 then he can buy ₹ 105.

(i) 6 (ii) 7 (iii) 8 (iv) 5

Hint:
$$\frac{5}{75} = \frac{x}{105} \Rightarrow x = \frac{\cancel{5} \times \cancel{105}}{\cancel{75}} = 7$$

Solution:

(ii) 7

Question 16.

35 cycles were produced in 5 days by a company then ___ cycles will be produced in 21 days.

(i) 150 (ii) 70 (iii) 100 (iv) 147

Hint :
$$\frac{35}{5} = \frac{x}{21} \Rightarrow x = \frac{\frac{7}{5} \times 21}{5} = 147$$

Solution:

(iv) 147

Question 17.

An aircraft can accommodate 280 people in 2 trips. It can take _____ trips to take 1400 people.

- (i) 8
- (ii) 10
- (iii) 9
- (iv) 12

Solution:

(ii) 10

Question 18.

Suppose 3 kg of sugar is used to prepare sweets for 50 members, then ___ kg of sugar is required for 150 members.

(i) 9 (ii) 10 (iii) 15 (iv) 6

Hint:
$$\frac{3}{50} = \frac{x}{150} \Rightarrow x = \frac{3 \times 150}{50} = 9$$

(i) 9

Ex 4.2

Question 1.

Fill in the blanks

(i) 16 taps can fill a petrol tank in 18 minutes. The time taken for 9 taps to fill the same tank will be ____ minutes.

(ii) If 40 workers can do a project work in 8 days, then ____ workers can do it in 4 days.

Solutions:

(i) 32 (ii) 80

Question 2.

6 pumps are required to fill a water sump in 1 hr 30 minutes. What will be the time taken to fill the sump if one pump is switched off? Solution:

Let x be the required time taken

Time taken in minutes	1hr. 30m = 90m	x
Number of pumps	6	6 - 1 = 5

As the number of pumps increases the time taken to fill the sump will be less \therefore They are in inverse proportion

$$x_{1}y_{1} = x_{2}y_{2}$$

$$90 \times 6 = x \times 5$$

$$x = \frac{90 \times 6}{5} = 108 \text{ minutes} = \frac{108}{60} = 1 \text{ hr } 48 \text{ min}$$

Time taken in minutes 1 hr. 48m

Question 3.

A farmer has enough food for 144 ducks for 28 days. If he sells 32 ducks how long will the food last?

Solution:

Let the required number of days be x.

Number of days	28	x
Number of ducks	144	144 - 32 = 112

As the number of ducks decreases the food will last for more days.

: They are in inverse proportion. $x_1y_1 = x_2y_2$

 $28 \times 144 = x \times 112$

$$x = \frac{28 \times 144}{142}$$
$$x = 36$$

The food lasts for 36 days

Question 4.

It takes 60 days for 10 machines to dig a hole. Assuming that all machines work at the same speed, how long will it take 30 machines to dig the same hole?

Solution:

Let the number of days required be x.

Number of machines	10	30
Number of days	60	x

As the number of machines increases it takes less days to complete the work \therefore They are in inverse proportion, $x_1y_1 = x_2y_2$

$$10 \times 60 = 30 \times x$$

 $x = \frac{10 \times 60}{30}; x = 20$

It takes 20 days to dig the hole

Question 5.

Forty students stay in a hostel. They had food stock for 30 days. If the students are doubled then for how many days the stock will last?

Solution:

Let the required number of days be x.

Number of days	30	<i>x</i> ·
Number of students	40	$Doubled = 2 \times 40 = 80$

As the number of students increases the food last for less number of days ∴ They are in inverse proportion.

$$x_{1}y_{1} = x_{2}y_{2}$$

$$30 \times 40 = x \times 80$$

$$x = \frac{\cancel{30} \times \cancel{40}}{\cancel{80}}$$

$$x = 15$$

The food stock lasts for 15 days

Question 6.

Meena had enough money to send 8 parcels each weighing 500 grams through a courier service. What would be the weight of each parcel, if she has to send 40 parcel for the same money?

Solution:

Let the required weight of the parcel be x grams.

Number of parcels	8	40
Weight of the parcels in grams	500	x

As the number of parcels increases weight of a parcel decreases.

 \therefore They are in inverse proportion.

$$x_1 y_1 = x_2 y_2$$

$$8 \times 500 = 40 \times x$$

$$x = \frac{\cancel{8} \times \cancel{500}}{\cancel{40}}$$

$$x = 100^{\cancel{8}}$$

Weight of each parcel = 100 grams

Question 7.

It takes 120 minutes to weed a garden with 6 gardeners. If the same work is to be done in 30minutes, how many more gardeners are needed?

Solution:

Let the, number of gardeners needed be x.

Number of gardeners	6	x
Time in minutes	120	30

As the number of gardeners increases the time decreases. They are in inverse proportion,

$$x_1y_1 = x_2y_2$$

$$6 \times 120 = x \times 30$$

$$x = \frac{6 \times 120}{30}$$

$$x = 24$$

 \therefore To complete the work in 30 min gardeners needed = 24

Already existing gardeners = 6

 \therefore More gardeners needed = 24 - 6 = 18

18 more gardeners are needed

Question 8.

Neelaveni goes by bicycle to her school every day. Her average speed is 12km/hr and she reaches school in 20 minutes. What is the increase in speed, If she reaches the school in 15 minutes?

Solution:

Let the speed to reach school in 15 min be x

Speed in km/hr	12	x
Time in min	20	15

: They are in inverse proportion $x_1y_1 = x_2 y_2$

 $12 \times 20 = x \times 15$ $x = \frac{\cancel{12} \times \cancel{20}}{\cancel{12}}$ x = 16

If she reaches in 15 min the speed = 16 km/hrAlready running with 12 km / hr \therefore Increased speed = 16 - 12 = 4km / hr Increase in speed = 4 km / hr

Question 9.

A toy company requires 36 machines to produce car toys in 54 days. How many machines would be required to produce the same number of car toys in 81 days?

Solution:

Let the required number of machines be x

Number of machines	36	x
Number of days	54	81

As the number of machines increases number of days required decreases. *.*..

They are in inverse proportion.
$$x_1 y_1 = x_2 y_2$$

$$36 \times 54 = x \times 81$$
$$x = \frac{36 \times 54}{81}$$
$$x = 24$$

 \therefore 24 machines would be required

Objective Type Questions

Question 10.

12 cows can graze a field for 10 days. 20 cows can graze the same field for _____ days

- (i) 15
- (ii) 18 (iii) 6
- (iv) 8

Solution:

(iii) 6

Hint:

Cows	Days	
12	10	
20	x	
$12 \times 10 = 20 \times x$; $x = \frac{12 \times 10}{20} = 6$		

Question 11.

4 typists are employed to complete a work in 12 days. If two more typists are added, they will finish the same work in days

(i) 7 (ii) 8

(iii) 9

(iv) 10

Solution:

(ii) 8

Hint :

Typist	Days
4	12
2 more added $4 + 2 = 6$	x
$4 \times 12 = 6 \times x;$ $x = 8$	$\frac{4\times \cancel{12}}{\cancel{6}} = x$

Ex 4.3

Miscellaneous Practice Problems

Question 1.
If the cost of 7 kg of onions is ₹ 84 find the following :
(i) Weight of the onions bought for ₹ 180
(ii) The cost of 3 kg of onions

Solution:

(i) For ₹ 84 weight of onion bought for ₹ 1 weight of onion bought
∴ For ₹ 180 weight of onion bought w
∴ For ₹ 180 weight of onion bought (ii) Cost of 7 kg of onions = 15 kg Cost of 1 kg of onions = $\frac{84}{7}$ Cost of 3 kg of onions = $\frac{\$4}{7} \times 3 = 36$ Cost of 3 kg onions = 36

Question 2. If C = kd (i) what is the relation between C and d? (ii) Find k when C = 30 and d = 6 (iii) Find C, when d = 10

Solution:

Given
$$C = kd \implies \frac{C}{d} = k$$

This is in the form $\frac{x}{y} = k$

As C increases d also increases ∴ It is direct proportion

(ii) When C = 30 and
$$d = 6$$
; $k = \frac{C}{d}$
$$= \frac{\frac{30}{6}}{\frac{1}{6}}$$

(ii)

When d = 6, C = 30 [from ii]

C

When
$$d = 10, C = ?$$

 $\frac{C_1}{d_1} = \frac{C_2}{d_2}$
 $\frac{30}{6} = \frac{C_2}{10}$
 $C_2 = \frac{30 \times 10}{6} = 50$, when $d = 10$
 $\boxed{C = 50}$

Question 3.

Every 3 months Tamilselvan deposits ₹ 5000 as savings in his bank account.

In how many years he can save ₹ 1,50,000.

Solution:

Let the number of years required be x.

Number of months	3 month = $\frac{\cancel{3}}{\cancel{12}} \times \underbrace{1.50,000}_{\cancel{3}}$ year	x
Deposit per month in ₹	₹ 5000	1,50,000

No. of years and deposit are direct proportion as they both increases simultaneously.

$$\frac{\frac{x_1}{y_1}}{\frac{y_1}{y_2}} = \frac{\frac{x_2}{y_2}}{\frac{x_2}{y_2}}$$
$$\frac{\frac{3}{12}}{\frac{12}{5000}} = \frac{x}{1,50,000}$$
$$\frac{\cancel{x}}{\cancel{x}} \times \underbrace{1,50,000}^{37,500} = x \times 5000$$
$$x = \frac{\cancel{x}}{\cancel{x}}$$
$$x = \frac{\cancel{x}}{\cancel{x}}$$
$$x = \frac{\cancel{x}}{\cancel{x}}$$

He can save ₹ 1,50,000 in 712 years.

Question 4.

A printer, prints a book of 300 pages at the rate of 30 pages per minute. Then, how long will it take to print the same book if the speed of the printer is 25 pages per minute?

Solution:

Let the required time taken to print be x As the speed increases time taken to print decreases \therefore They are in inverse proportion Time taken to print 30 pages = 1 min

$$\therefore \text{ Time taken to print 300 pages} = \frac{300}{30} = 10 \text{ min}$$

Time taken to print (in minutes)	10	x
Number of pages printed per minutes	30	25

$$x_{1}y_{1} = x_{2}y_{2}$$

10 × 30 = x × 25
$$x = \frac{\cancel{30} \times \cancel{10}}{\cancel{25}} = 12 \min$$

Time taken to print = 12 min

Question 5.

If the cost of 6 cans of juice in \gtrless 210, then what will be the cost of 4 cans of juice?

Solution:

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Let the cost required be x

Number of cans of juice	6	4
Cost in rupees	210	x

As number of cans increases cost also increases.

∴ They are in direct proportion

$$\frac{\frac{x_1}{y_1}}{\frac{y_1}{2}} = \frac{\frac{x_2}{y_2}}{\frac{6}{210}} = \frac{4}{x}$$

$$6 \times x = 4 \times 210$$

$$x = \frac{\cancel{4} \times \cancel{210}}{\cancel{6}}$$

x = 140Cost of 4 cans of juice = 140

Question 6.

x varies inversely as twice of y. Given that when y = 6, the value of x is 4. Find the value of x when y = 8.

Solution:

Given x varies inversely as twice of y.

x	4	x
у	6	8

$$x_{1}y_{1} = x_{2}y_{2}$$

$$4 \times 6 = x \times 8$$

$$x = \frac{\cancel{4 \times \cancel{6}}}{\cancel{5}}$$

$$x = 3$$
When $y = 8 \boxed{x=3}$

Question 7.

A truck requires 108 litres of diesel for covering a distance of 594 km. How much diesel will be required to cover a distance of 1650 km?

Solution:

Let the required distance be x

Quantity of diesel in liters	108	x
Distance covered (km)	594	1650

As the distance increases fuel quantity also increases.

 \therefore They are direct proportion.

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

$$\frac{108}{594} = \frac{x}{1650}$$

$$x = \frac{\frac{108}{108 \times 1650}}{\frac{108}{594}}$$

$$x = 300$$

 \therefore The diesel required = 300 liters

Challenge Problems

Question 8.

If the cost of a dozen soaps is \gtrless 396, what will be the cost of 35 such soaps?

Solution: 1 dozen = 12 Cost of 12 soaps = ₹ 396

- $\therefore \text{ Cost of 1 soaps } = \mathbf{\overline{\xi}} \ \frac{396}{12} = \mathbf{\overline{\xi}} \ 33$
- ∴ Cost of 35 soaps = ₹ 33 × 35 = ₹ 1155 Cost of 35 soaps = ₹ 1155

Question 9.

In a school there is 7 periods a day each of 45 minutes duration. How long each period is if the school has 9 periods a day assuming the number of hours to be the same?

Solution:

Number of periods increases as duration decreases, since the number of hours is same.

Let the duration of each period be x.

Number of periods	7	9
Duration of period (min)	45	x
$x_{1}y_{1}$	$= x_2 y_2$	
7 × 45	$= 9 \times x$	
	7×45	
x	$=\frac{1}{g}$	
x	= 35	
Duration of every period	= 35 min	

Question 10.

Cost of 105 note books is ₹ 2415. How many notebooks can be bought for ₹ 1863?

Solution:

For 2415 number of notebooks bought = 105

∴ For ₹ 1 number of note books bought = $\frac{105}{2415} = \frac{1}{23}$ ∴ For ₹ 1863 number of note books bought = $\frac{1}{23} \times 1863 = 81$ 81 Note books can be bought

Question 11.

10 farmers can plough a field in 21 days. Find the number of days reduced if 14 farmers ploughed the same field?

Solution:

Let the required number of days if 14 farmers ploughed = x

Number of days	21	x
Number of farmers	10	14

As number of farmers increases, number of days decreases. ∴ They are in inverse proportion

$$x_{1}y_{1} = x_{2}y_{2}$$

$$21 \times 10 = x \times 14$$

$$x = \frac{21 \times 10}{14}$$

$$x = 15$$

Initially the farmers worked for 21 days. Now they worked for 15 days. \therefore The number of days reduced = 21 – 15 = 6 days

Question 12.

A flood relief camp has food stock by which 80 people can be benefited for 60 days. After 10 days 20 more people have joined the camp. Calculate the number of days of food shortage due to the addition of 20 more people?

Solution:

	Number of people	Food stock for number of days
Initially	80	60
Available food after 10 days	80	60 - 10 = 50
If 20 people joined no. of days remaining food last	80 + 20 = 100	x

As number of people increases food last for less number of days.

 $80 \times 50 = 100 \times x$

$$x = \frac{\cancel{80} \times \cancel{50}}{\cancel{100}}$$
$$x = 40^{\circ} \cancel{2}$$

Remaining food is to be used for 50 days.

But it only last for 40 days.

No. of days shortage = 50 - 40 = 10 days.

 \therefore 10 days of food shortage due to the addition of 20 more people.

Question 13.

Six men can complete a work in 12 days. Two days later, 6 more men joined them. How many days will they take to complete the remaining work?

Solution:

	Number of men	No. of days
Initially	6	12
2 days later available work	6	12 - 2 = 10
Remaining work after 6 men joined	6 + 6 = 12	x

As the number of men increases number of days increases.

: They are inversely proportional

$$x_{1}y_{1} = x_{2}y_{2}$$

$$6 \times 10 = 12 \times x$$

$$x = \frac{\cancel{6} \times \cancel{10}}{\cancel{12}}$$

$$x = 5 \text{ days}$$

x = 5 days

∴ Remaining work will be complete in 5 days