Chapter: Direct and inverse proportions
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Exercise: 12A

Question 1:
(i)

Solution: Clearly, $\frac{x}{y}=\frac{3}{9}=\frac{5}{15}=\frac{8}{24}=\frac{11}{33}=\frac{26}{78}=\frac{1}{3}$ (constant)
Therefore, x and y are proportional.
(ii)

Solution: Clearly, $\frac{x}{y}=\frac{2.5}{10}=\frac{4}{16}=\frac{7.5}{30}=\frac{10}{40}=\frac{1}{4}$, while $\frac{14}{42}=\frac{1}{3}$

i.e., $\frac{2.5}{10}=\frac{4}{16}=\frac{7.5}{30}=\frac{10}{40}$ is not equal to $\frac{14}{42}$ .Therefore, x and y are not proportional.

(iii)

Solution: Clearly, $\frac{x}{y}=\frac{5}{15}=\frac{7}{21}=\frac{9}{27}=\frac{25}{75}=\frac{1}{3}$, while $\frac{15}{60}=\frac{18}{72}=\frac{1}{4}$

i.e., $=\frac{5}{15}=\frac{7}{21}=\frac{9}{27}=\frac{25}{75}$ is not equal to $\frac{15}{60}$ and $\frac{18}{72}$ .Therefore, x and y are not proportional.

Question 2:

Solution: Since x and y are directly proportional, we have: $\frac{3}{72}=\frac{x_1}{120}=\frac{x_2}{192}=\frac{10}{y_1}$ Now, $\frac{3}{72}=\frac{x_1}{120}$

$x_1=\frac{120\times 3}{72}=5$ and, $\frac{3}{72}=\frac{x_2}{192}$

$x_2=\frac{3\times 192}{72}=8$

And, $\frac{3}{72}=\frac{10}{y_1}$

$y_1=\frac{72\times 10}{3}=240$

Therefore, $x_1 = 5$, $x_2 = 8$ and $y_1 = 240$

Question 3:
Solution:
Let the required distance be *x* km. Then, we have:

Quantity of diesel (in liters)	34	20
Distance (in km)	510	*x*

Clearly, the less the quantity of diesel consumed, the less is the distance covered.
So, this is a case of direct proportion.

Now, $\frac{34}{510}=\frac{20}{x}$

$\frac{1}{15}=\frac{20}{x}$

X × 1 = 20 × 15 = 300

therefore, the required distance is 300 km.

Question 4:

Solution:

Let the charge for a journey of 124 km be Rs. *x*.

Price(in Rs.)	2550	*x*
Distance(in km)	150	124

More is the distance travelled, more will be the price.
So, it is a case of direct proportion.

$\therefore \frac{2550\times124}{150}=\frac{x}{124}$

$x=\frac{2550\times124}{150}=2108$

Thus, the taxi charges Rs. 2,108 for the distance of 124 km.

Question 5:

Solution:

Let the required distance be *x* km. Then, we have: 1 h=60 minute. 5 h=5×60=300 min.

Distance (in km)	16	*x*
Time (in min)	25	300

Clearly, the more the time taken, the more will be the distance covered.
So, this is a case of direct proportion.

Now, $\frac{16}{25}=\frac{x}{300}$

$x=\frac{16\times300}{25}$

x = 192

Therefore, the required distance is 192 km.

Question 6:

Solution:

Let the required number of dolls be *x*. Then, we have:

No of dolls	18	*x*
Cost of dolls (in rupees)	630	455

Clearly, the less the amount of money, the less will be the number of dolls bought.
So, this is a case of direct proportion.

Now, $\frac{18}{630} = \frac{x}{455}$

$\frac{1}{35} = \frac{x}{455}$

$X = \frac{455}{35}$

x=13

Therefore, 13 dolls can be bought for Rs 455.

Question 7:
Solution:
Let the quantity of sugar bought for 371 be *x* kg.

Quantity(in kg)	9	*x*
Price	238.50	371

The price increases as the quantity increases. Thus, this is a case of direct proportion

$\therefore \frac{9}{238.50} = \frac{x}{371}$

$X = \frac{9 \times 371}{238.50} = 14$

Thus, the quantity of sugar bought for 371 is 14 kg.

Question 8:
Solution:
Let the length of cloth be *x* m. Then, we have:

Length of cloth (in meters)	15	*x*
Cost of cloth (in rupees)	981	1308

Clearly, more length of cloth can be bought by more amount of money.
So, this is a case of direct proportion.

Now, $\frac{15}{981} = \frac{x}{1308}$

$x = \frac{15 \times 1308}{981}$

x=20

Therefore, 20 m of cloth can be bought for Rs 1,308.

Question 9:
Solution:
Let *x* m be the length of the model of the ship. Then, we have:

1 m = 100 cm
Therefore, 15 m= 1500 cm
35 m= 3500 cm

	Length of the mast (in cm)	Length of the ship (in cm)
Actual ship	1500	3500
Model of the ship	9	x

Clearly, if the length of the actual ship is more, then the length of the model ship will also be more.
So, this is a case of direct proportion.

Now, $\frac{1500}{9} = \frac{3500}{x}$

$$X = \frac{3500 \times 9}{1500}$$

$$X = 21 \text{ cm}$$

Therefore, the length of the model of the ship is 21 cm.

Question 10:
Solution:
Let x kg be the required amount of dust. Then, we have:

No. of days	8	15
Dust (in kg)	6.4×107	X

Clearly, more amount of dust will be collected in more number of days.
So, this is a case of direct proportion.,

Now $\frac{8}{6.4 \times 10^7} = \frac{15}{x}$

$$X = \frac{15 \times 6.4 \times 10^7}{8}$$

$$X = 12 \times 10^7$$

Therefore, 12, 00, 00,000 kg of dust will be picked up in 15 days.

Question 11:
Solution:
Let x km be the required distance. Then, we have:
1 h=60 minute.
i.e. 1h 12 min= (60+12) min=72 min

Distance covered (in km)	50	x
Time (in min)	60	72

Clearly, more distance will be covered in more time.
So, this is a case of direct proportion

Now, $\frac{50}{60}=\frac{x}{72}$

$x=\frac{50\times 72}{60}$

$x=60$

Therefore, the distance travelled by the car in 1 h 12 min is 60 km.

Question 12:

Solution:

Let *x* km be the required distance covered by Ravi in 2 h 24 min.

Then, we have:

1 h=60 min

i.e., 2 h 24 min = (120+24) min=144 min

Distance covered (in km)	5	*x*
Time (in min)	60	144

Clearly, more distance will be covered in more time.

So, this is a case of direct proportion.

Now, $\frac{5}{60}=\frac{x}{144}$

$x=\frac{5\times 144}{60}$

x = 12

Therefore, the distance covered by Ravi in 2 h 24 min is 12 km.

Question 13:

Solution:

Let *x* mm be the required thickness. Then, we have:

Thickness of cardboard (in mm)	65	*x*
No. of cardboards	12	312

Clearly, when the number of cardboard is more, the thickness will also be more.

So, it is a case of direct proportion.

Now, $\frac{65}{12}=\frac{x}{312}$

$X=\frac{65\times 312}{12}$

$x=1690$

Therefore, the thickness of the pile of 312 cardboards is 1690 mm.

Question 14:
Solution:
Let x be the required number of men.
Now, $6\frac{3}{4}$ m$=\frac{27}{4}$ m

Then, we have:

Number of men	11	x
Length of trench (in meters)	$\frac{27}{4}$	27

Clearly, the longer the trench, the greater will be the number of men required.
So, it is a case of direct proportion.

$$\text{Now, } \frac{11}{27/4} = \frac{x}{27}$$
$$\frac{11\times 4}{27} = \frac{x}{27}$$
$$x=44$$

Therefore, 44 men should be employed to dig a trench of length 27 m.

Question 15:
Solution:
Let Reenu type x words in 8 minutes.

No. of words	540	x
Time taken (in min)	30	8

Clearly, less number of words will be typed in less time.
So, it is a case of direct proportion.

$$\text{Now, } \frac{540}{30}=\frac{x}{8}$$
$$x=\frac{540\times 8}{30}$$
$$x=144$$

Therefore, Reenu will type 144 words in 8 minutes.

Exercise: 12B
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Question 1:
(i)

Solution; Clearly, $6\times9\neq10\times15\neq14\times21\neq16\times24$
Therefore, x and y are not inversely proportional.

(ii)

Solution: Clearly, $5 \times 18 = 9 \times 10 = 15 \times 6 = 3 \times 30 = 45 \times 2 = 90$ = (constant)
Therefore, x and y are inversely proportional.

(iii)

Solution: Clearly, $9 \times 4 = 3 \times 12 = 36 \times 1 = 36$, while $6 \times 9 = 54$
i.e., $9 \times 4 = 3 \times 12 = 36 \times 1 \neq 6 \times 9$
Therefore, x and y are not inversely proportional.

Question 2:
Solution:
Since x and y are inversely proportional, xy must be a constant.
Therefore, $8\times y_1 = x_1 \times 4 = 16 \times 5 = x_2 \times 2 = 80 \times y_2$
Now, $16 \times 5 = 8 \times y_1$

$\frac{80}{8} = y_1$

$\therefore\ y_1 = 10$

$16 \times 5 = x_1 \times 4$

$\frac{80}{4} = x_1$

$\therefore\ x_1 = 20$

$16 \times 5 = x_2 \times 2$

$\frac{80}{2} = x_2$

$\therefore\ x_2 = 40$

$16 \times 5 = 80 \times y_2$

$\frac{80}{80} = y_2$

$\therefore\ y_2 = 1$

Hence, $y_1 = 10$, $x_1 = 20$, $x_2 = 40$ and $y_2 = 1$

Question 3:
Solution:
Let *x* be the required number of days. Then, we have:

No. of days	8	*x*
No. of men	35	20

Clearly, less men will take more days to reap the field.
So, it is a case of inverse proportion.
Now, $8 \times 35 = x \times 20$

$$\frac{8 \times 35}{20} = x$$

$$14 = x$$

Therefore, 20 men can reap the same field in 14 days.

Question 4:
Solution: Let *x* be the required number of men. Then, we have:

No. of days	8	6
No. of men	12	*x*

Clearly, more men will require less number of days to dig the pond.
So, it is a case of inverse proportion.
Now, $8 \times 12 = 6 \times x$

$$x = \frac{8 \times 12}{6}$$

$$x = 16$$

Therefore, 16 men can dig the pond in 6 days.

Question 5:
Solution:

Let *x* be the number of days. Then, we have:

No. of days	28	*x*
No. of cows	6	14

Clearly, more number of cows will take less number of days to graze the field.
So, it is a case of inverse proportion.
Now, $28 \times 6 = x \times 14$

$$X = \frac{28 \times 6}{14}$$

$$x = 12$$

Therefore, 14 cows will take 12 days to graze the field.

Question 6:
Solution:
Let *x* h be the required time taken. Then, we have:

Speed (in km/h)	60	75
Time (in h)	5	*x*

Clearly, the higher the speed, the lesser will be the the time taken.
So, it is a case of inverse proportion.
Now, $60\times5=75\times x$

$$x=\frac{60\times5}{75}$$

$$x=4$$

Therefore, the car will reach its destination in 4 h if it travels at a speed of 75 km/h.

Question 7:
Solution:
Let x be the number of machines required to produce same number of articles in 48.
Then, we have:

No. of machines	42	*x*
No. of days	56	48

Clearly, less number of days will require more number of machines.
So, it is a case of inverse proportion.
Now, $42\times56=x\times48$

$$\Rightarrow x=\frac{42\times56}{48}$$

$$\Rightarrow x=49$$

Therefore, 49 machines would be required to produce the same number of articles in 48 days.

Question 8:
Solution:
Let *x* be the required number of taps. Then, we have:
1 h = 60 min
i.e., 1 h 36 min = (60+36) min = 96 min

No. of taps	7	8
Time (in min)	96	*x*

Clearly, more number of taps will require less time to fill the tank.
So, it is a case of inverse proportion.
Now, $7\times96=8\times x$

$$X=\frac{7\times96}{8}$$

$x=84$

Therefore, 8 taps of the same size will take 84 min or 1 h 24 min to fill the tank.

Question 9:

Solution:

Let *x* min be the required number of time. Then, we have:

No. of taps	8	6
Time (in min)	27	x

Clearly, less number of taps will take more time to fill the tank .

So, it is a case of inverse proportion.

Now, $8\times27=6\times x$

$$x=\frac{8\times 27}{6}$$

$x=36$

Therefore, it will take 36 min to fill the tank.

Question 10:

Solution:

Let x be the required number of days. Then, we have:

No. of days	9	*X*
No. of animals	28	36

Clearly, more number of animals will take less number of days to finish the food.

So, it is a case of inverse proportion.

Now, $9\times28=x\times36$

$$x=\frac{9\times 28}{36}$$

$x=7$

Therefore, the food will last for 7 days.

Question 11:

Solution:

Let *x* be the required number of days. Then, we have:

No. of men	900	1400
No. of days	42	*x*

Clearly, more men will take less number of days to finish the food.

So, it is a case of inverse proportion.

Now, $900\times42=1400\times x$

$$x=\frac{900\times 42}{1400}$$

$x=27$

Therefore, the food will now last for 27 days.

Question 12:
Solution:
Let x be the required number of days. Then, we have:

No. of students	75	60
No. of days	24	x

Clearly, less number of students will take more days to finish the food.
So, it is a case of inverse proportion.
Now, $75\times24=60\times x$

$$x=\frac{75\times24}{60}$$

$x=30$

Therefore, the food will now last for 30 days.

Question 13:
Solution:
Let x min be the duration of each period when the school has 8 periods a day.

No. of periods	9	8
Time (in min)	40	x

Clearly, if the number of periods reduces, the duration of each period will increase.
So, it is a case of inverse proportion.
Now, $9\times40=8\times x$

$$x=\frac{9\times40}{8}$$

$x=45$

Therefore, the duration of each period will be 45 min if there were eight periods a day.

Question 14:
Solution:

x	15	9
y	6	y_1

x and y vary inversely.i.e. xy = constant
Now, $15\times6=9\times y_1$

$y_1=15\times69$

$y_1 = 10$

∴ Value of y=10, when x =9

Question 15:
Solution:

x	18	x_1
y	8	16

x and y vary inversely.i.e. xy = constant
Now, $18 \times 8 = x_1 \times 16$

$$\frac{18 \times 8}{16} = x_1$$

$$9 = x_1$$

∴ Value of x=9

Exercise: 12 C
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Question 1:
Solution: Let 22 kg of pulses cost x.

Quantity(in kg)	14	22
Price(in Rs)	882	x

As the quantity increases, the price also increases.
So, it is a case of direct proportion.

$$\therefore \frac{14}{882} = \frac{22}{x}$$

$$X = \frac{22 \times 882}{14} = 1386$$

Thus, the cost of 22 kg of pulses is Rs 1,386.

Hence, the correct Solution is option (d).

Question 2:
Solution: Let the number of oranges that can be bought for Rs. 169 be x.

Quantity	8	x
Price(in Rs.)	52	169

As the quantity increases the price also increases.
So, this is a case of direct proportion.

$$\therefore \frac{8}{52} = \frac{x}{169}$$

$$X = \frac{8 \times 169}{52} = 26$$

Thus, 26 oranges can be bought for Rs. 169.
Hence, the correct Solution is option (c).

Question 3:
Solution:
(b) 700

Let *x* be the number of bottles filled in 5 hours.

No. of bottles	420	x
Time (h)	3	5

More number of bottles will be filled in more time.

Now, $\frac{420}{3} = \frac{x}{5}$

$$x = \frac{420 \times 5}{3}$$

$$x = 700$$

Therefore, 700 bottles would be filled in 5 h.

Question 4:
Solution:
(a) 25 km

Let *x* km be the required distance.
Now, 1 h = 60 min

Distance (in km)	75	x
Time (in min)	60	20

Less distance will be covered in less time.

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

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

$$x = 25 \text{ km}$$

Question 5:
Solution:
(c) 300
Let x sheets weigh 1 kg.
Now, 1 kg = 1000 g

No. of sheets	12	X
Weight (in g)	40	1000

Now, $\frac{12}{40} = \frac{x}{1000}$

$x = \frac{12 \times 1000}{40}$

$x = 300$

Question 6:
Solution:
(b) 9.8 m
Let *x* m be the height of the tree.

Height of object	14	x
Length of shadow	10	7

The more the length of the shadow, the more will be the height of the tree.

Now, $\frac{14}{10} = \frac{x}{7}$

$x = \frac{14 \times 7}{10}$

$x = 9.8$

Therefore, a 9.8 m tall tree will cast a shadow of length 7 m.

Question 7:
Solution: (c) 10^{-4} cm
Let *x* cm be the actual length of the bacteria.
The larger the object, the larger its image will be.

Now, $\frac{x}{1}$ =550000=10-4 cm

Hence, the actual length of the bacteria is 10^{-4} cm.

Question 8:
Solution:
(b) 144 min
Let *x* min be the time taken by 5 pipes to fill the tank.

No. of pipes	6	5

Time (in min)	120	X

Now, 6×120=5×x

x=144

Therefore, 5 pipes will take 144 min to fill the tank.

Question 9:

Solution:

(b) 3 days

Let *x* be number of days taken by 4 persons to build the wall.

No. of persons	3	4
No. of days	4	x

More number of persons will take less time to build the wall.

So, it is a case of inverse proportion.

Now, 3×4=4×x⇒x=3

Therefore, 4 persons can build the wall in 3 days.

Question 10:

Solution:

(a) 1 h 30 min

Let *x* h be the time taken by the car travelling at 80 km/hr.

Speed (km/h)	60	80
Time (in h)	2	X

The greater the speed, the lesser will be the time taken.

So, it is a case of inverse proportion.

Now, 60×2= 80×x

$x = \frac{120}{80}$

x= 1.5Therefore, the car will take 1 h 30 min to reach its destination if it travels at a speed of 80 km/h.

Test paper

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A Question 1:

Solution:

Let *x* be the required number of boxes.

No. of boxes	350	x
No. of cartons	25	16

Less number of boxes will require less number of cartons.

So, it is a case of direct proportion.

Now, $\frac{350}{25} = \frac{x}{16}$

$x = \frac{350 \times 16}{25}$

$x = 224$

∴ 224 boxes can be placed in 16 cartoons.

Question 2:

Solution:

Let Rs *x* be the cost of 24 tennis balls.

No. of balls	140	24
Cost of balls	4900	x

More tennis balls will cost more.

Now, $\frac{140}{4900} = \frac{24}{x}$

$x = \frac{24 \times 4900}{140}$

$x = 840$

∴ The cost of 2 dozen tennis balls is Rs 840.

Question 3:

Solution:

Let Rs *x* be the railway fare for a journey of distance 53 km.

Distance (in km)	61	53
Railway fare (in rupees)	183	x

The lesser the distance, the lesser will be the fare.

So, it is a case of direct proportion.

Now, $\frac{61}{183} = \frac{53}{x}$

$X = \frac{53 \times 183}{61}$

$x = 159$

The railway fare for a journey of distance 53 km is Rs 159.

Question 4:

Solution:

Let *x* people dig the trench in 4 days.

No. of people	10	x
No. of days	6	4

More people will take less number of days to dig the trench.
Hence, this is a case of inverse proportion.

Now, $10 \times 6 = x \times 4$

$$X = \frac{60}{4}$$

$$x=15$$

∴ 15 people can dig the trench in 4 days.

Question 5:
Solution:
Let *x* be the number of days taken by 21 men to finish the piece of work.

No. of men	30	21
No. of days	28	x

More men will take less time to complete the work.
So, this is a case of inverse proportion.
Now, $30 \times 28 = 21 \times x$

$$x = \frac{30 \times 28}{21}$$

$$x=40$$

∴ 21 men will take 40 days to finish the piece of work.

Question 6:
Solution:
Clearly, the remaining food is sufficient for 200 men for (45 − 15), i.e., 30 days.
Total number of men = 200 + 40 = 240
Let the remaining food last for *x* days.

No. of men	200	240
No. of days	30	x

Clearly, more men will take less number of days to finish the food.
So, it is a case of inverse proportion.
Now, $200 \times 30 = 240 \times x$

$$x = \frac{200 \times 30}{240}$$

$$x=25$$

∴ The remaining food will last for 25 days.

B. mark () against the correct answer in each of the following:

Question 7:
Solution:

(d) 144 minutes

Let one pipe take *x* min to fill the tank.

No. of pipe	6	1
Time(in min)	24	x

Clearly, one pipe will take more time to fill the tank.
So, it is a case of inverse proportion.
Now, $6\times24=1\times x$
$x=6\times24$
$x=144$

∴ One pipe can fill the tank in 144 minutes.

Question 8:
Solution: (d) 588 days

Let one worker take *x* days to build the wall.

No. of workers	14	1
No. of days	42	x

Clearly, one worker will take more days to finish the work.
So, it is a case of inverse proportion.

Now, $14\times42=1\times x$
$x=14\times42$
$x=588$

∴ One worker can build the wall in 588 days.

Question 9:
Solution: (a) 14 days
Let 20 men take *x* days to reap the field.

No. of days	8	x
No. of men	35	20

Clearly, less number of men will take more days.
So, it is a case of inverse proportion.

Now, $8 \times 35 = x \times 20$

$$x = \frac{8 \times 35}{20}$$

$$x = 14$$

∴ 20 men can reap the field in 14 days.

Question 10:
Solution: (b) 72 km
Let *x* km be the distance covered in 1 h 12 min.
Now, 1 h 12 min = (60+12) min = 72 min

Distance(in km)	60	x
Time(in min)	60	72

More distance will be covered in more time.
So, it is a cas of direct proportion.

Now, $\frac{60}{60} = \frac{x}{72}$

$$x = 72 \text{ km}$$

∴ The car will cover a distance of 72 km in 1 h 12 min.

Question 11:
Solution: (c) 170 words
Let *x* be the number of words typed by Rashmi in 10 minutes.

No. of words	510	x
Time(in min)	30	10

Less time will be taken to type less number of words.
So, it is a case of direct variation.

Now, $\frac{510}{30} = \frac{x}{10}$

$$X = 170$$

∴ Rashmi will type 170 words in 10 minutes.

Question 12:
Solution: (c) 8

x	3	x_1
y	36	96

x and y vary directly. Then x =ky, where k is the constant of proportionality.⇒k= $\frac{x}{y}$

Now, $\frac{3}{36}=\frac{x_1}{96}$

$\frac{96\times 30}{36}=x_1$

$8=x_1$

∴ Value of x=8

Question 13:
Solution: (a) 10

x	15	9
y	6	y_1

Since x and y vary inversely, xy = constant
.Now, $15\times 6=9\times y_1$

$\frac{90}{9}=y_1$

$10=y_1$

∴ Value of y = 10, when x = 9.

C. **Question 14.**
(i)
Solution: Let x be the number of days taken by 4 persons to complete the work.

No. of days	4	x
No. of persons	3	4

Clearly, more workers will take less number of days.
So, it is a case of inverse proportion.
Now, $4\times 3=x\times 4$

$x=3$

Therefore, 4 persons can do the piece of work in 3 days.

(ii)
Solution: Let x min be the time taken by 6 pipes to fill the tank.

No. of pipes	5	6
Time (in min)	144	x

Clearly, more number of pipes will take less time to fill the tank.

So, it is a case of inverse proportion.
Now, $5\times144=6\times x$

$$x=\frac{5\times144}{6}$$

$$x=120 \text{ min}$$

$\therefore$ 6 pipes can fill the tank in 120 min.

(iii)
Solution: Let *x* min be the time taken by the car travelling at 45 km/h.
Now, 1 h 30 min = (60+30) min

Speed(in km/hr)	60	45
Time(in min)	90	x

Clearly, a car travelling at a less speed will take more time.
So, it is a case of inverse proportion.
Now, $60\times90=45\times x$

$$x=\frac{60\times90}{45}$$

$$x=120 \text{ min} = 2 \text{ h}$$

$\therefore$ The car will take 2 h if it travels at a speed of 45 km/h.

(iv)
Solution: Let Rs *x* be the cost of 5 oranges.

No. of oranges	8	5
Cost of oranges	20.80	x

Clearly, less number of oranges will cost less.
So, it is a case of direct variation.
Now, $\frac{8}{20.80}=\frac{5}{x}$

$$x=\frac{5\times20.80}{8}$$

$$x=13$$

$\therefore$ The cost of 5 oranges is Rs 13.

(v)
Solution: Let x be the number of sheets that weigh 500 g.

No. of sheets	12	x
Weight(in grams)	50	500

More number of sheets will weigh more.
So, it is a case of direct variation.

Now, $\frac{12}{50} = \frac{x}{500}$

$x = \frac{12 \times 500}{50}$

$x = 120$

∴ 120 sheets will weigh 500 g.