Direct and Indirect Proportional: Exercise 13.2

Q.1 Which of the following are in inverse proportion?
(i) The number of workers on a job and the time to complete the job.
(ii) The time taken for a journey and the distance travelled in a uniform speed.
(iii) Area of cultivated land and the crop harvested.
(iv) The time taken for a fixed journey and the speed of the vehicle.
(v) The population of a country and the area of land per person.

Sol. (i) Situation: The number of workers on a job and the time to complete the job.
Since, more workers will take less time to complete the job and less workers will take more time to complete the job. So, this situation is in inverse proportion.

(ii) Situation: The time taken for a journey and the distance travelled in a uniform speed.
Since, speed is constant and as time will increase then more distance will be covered. So, this situation is in direct proportion.

(iii) Situation: Area of cultivated land and the crop harvested.
This situation is in direct proportion.

(iv) Situation: The time taken for a fixed journey and the speed of the vehicle.
Since, with more speed we can cover more distance in less time. So, this situation is in inverse proportion.

(v) Situation: The population of a country and the area of land per person.
Since, the population increases then area of land per person will decrease. So, is in inverse proportion.

Q.2 In a Television game show, the prize money of Rs 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?

Number of winners	1	2	4	5	8	10	20
Prize for each winner (in Rs)	1,00,000	50,000	...	...	...	...	...

Sol. The given information in tabular form:

Number of winners	1	2	4	5	8	10	20
Prize for each winner (in Rs)	1,00,000	50,000	p_1	p_2	p_3	p_4	p_5

Since, the number of winners and prize money both are inversely proportional.
Now, 1 x 100000 = 2 x 50000
100000 = 100000

For p_1:
1 x 100000 = 4 x p_1

$$p_1 = \frac{100000}{4} = 25000$$

For p_2:
1 x 100000 = 5 x p_2

$$p_2 = \frac{100000}{5} = 20000$$

For p_3:
1 x 100000 = 8 x p_3

$$p_3 = \frac{100000}{8} = 12500$$

For p_4:

1 x 100000 = 10 x p_4

$$p_4 = \frac{100000}{10} = 10000$$

For p_5:

1 x 100000 = 20 x p_5

$$p_5 = \frac{100000}{20} = 5000$$

Thus, the complete table:

Number of winners	1	2	4	5	8	10	20
Prize for each winner (in Rs)	1,00,000	50,000	25000	20000	12500	10000	5000

Q.3 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°	60°	...	...	...

(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 is 40°?

Sol. The given information in tabular form:

Number of spokes	4	6	8	10	12
Angle between a pair of consecutive spokes	90°	60°	p_1	p_2	p_3

From the table:

4 x 90° = 6 x 60°

360° = 360°

Thus, the number of spokes and the angle between the consecutive spokes are inversely proportional to each other.

So, p_1 x 8 = 360°

$$p_1 = \frac{360°}{8} = 45°$$

p_2 x 10 = 360°

$$p_2 = \frac{360°}{10} = 36°$$

p_3 x 12 = 360°

$$p_3 = \frac{360°}{12} = 30°$$

Thus, the complete table:

Number of spokes	4	6	8	10	12
Angle between a pair of consecutive spokes	90°	60°	**45⁰**	**36⁰**	**30⁰**

(i) Yes, the number of spokes and the angles formed between the pairs of consecutive spokes both are inversely proportional.

(ii) Let p be the angle between a pair of consecutive spokes on a wheel with 15 spokes.
So, $p \times 15 = 360°$

$$p = \frac{360°}{15} = 24°$$

Thus, the angle between a pair of consecutive spokes on a wheel with 15 spokes = 24°

(iii) Let q be the number of spokes with angle of 40° between a pair of consecutive spokes.
So, $q \times 40° = 360°$

$$q = \frac{360°}{40°} = 9$$

Thus, the number of spokes with angle of 40° between a pair of consecutive spokes = 9

Q.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?

Sol. Given: Total number of children = 24.
Since, the number of the children is reduced by 4.
So, remaining number of children = 24 – 4 = 20
Let p be the number of sweets with these remaining children.
The given information in tabular form:

Number of children	24	20
Number of sweet	5	p

Since, number of children is reduced then number of sweets received by each child will increase. Thus, it is an inverse proportion.
So, 24 x 5 = 20 x x

$$x = \frac{24 \times 5}{20} = 6$$

Thus, now each child will get = 6 sweets

Q.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?

***Sol.* Given:** Total number of animals in Farmer's cattle = 20
Since, farmer can feed the food 20 these animals for 6 days.
Number of animals after adding 10 more animals in cattle = 20 + 10 = 30
The given information in tabular form:

Number of animals	20	30
Number of days	6	p

Since, less the number of animals in cattle can be feed to animals for more number of days. Thus, it is an inverse proportion.
So, 20 x 6 = 30 x p

$$p = \frac{20 \times 6}{30} = 4$$

Thus, the number of days for which the food will last after adding 10 more animals in the cattle = 4

Q.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?

Sol. Let p be the number of days to complete the job by 4 persons.
The given information in tabular:

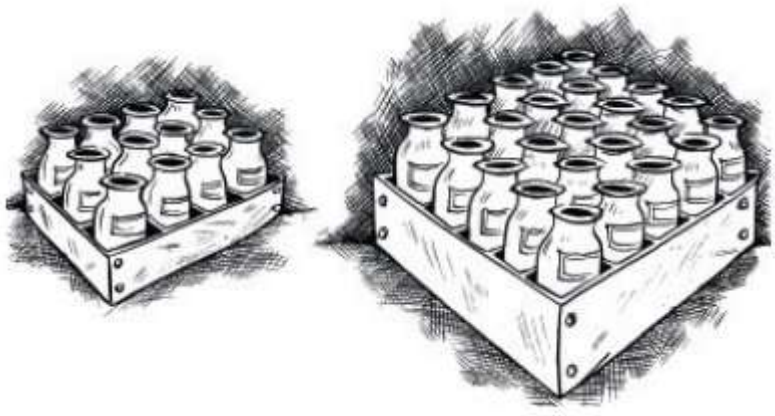
Number of days	4	p
Number of persons	3	4

Since, more the number of persons will take less number of days required to complete the job. So, it is an inverse proportion.
Therefore, 4 x 3 = p x 4

$$p = \frac{4 \times 3}{4} = 3$$

Thus, the number of days taken by 4 persons to complete the job = 3

Q.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?



***Sol.* Given:** A batch of bottles were packed in 25 boxes with 12 bottles in each box.
Let p be the number of boxes required to pack 20 bottles in each box.
The given information in tabular form:

Number of bottles	12	20
Number of boxes	25	p

Since, more the number bottles will require less number of boxes. So, it is an inverse proportion.
So, 12 x 25 = 20 x p

$$p = \frac{12 \times 25}{20} = 15$$

Thus, the number of boxes required to pack 20 bottles = 15

Q.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?

Sol. **Given:** A factory requires 42 machines to produce articles in 63 days.

Let p be the number of machines required to produce the articles in 54 days.

The given information in tabular form:

Number of machines	42	20
Number of days	63	54

Since, more the number of machines will take less number of days to produce articles. Thus, it is an inverse proportion.

So, 42 x 63 = 54 x p

$$p = \frac{42 \times 63}{54} = 49$$

Thus, the number of machines required to produce the articles = 49

Q.9 A car takes 2 hours to reach a destination by travelling at the speed of 60 km/h. How long will it take when the car travels at the speed of 80 km/h?

Sol. **Given:** Car takes 2 hours to reach a destination by travelling at the speed of 60 km/h.

Let p be the time taken by car when travelling at the speed of 80 km/h.

The given information in tabular form:

Speed (km/hr)	60	80
Time taken (hours)	2	p

Since, more the speed of car will take less time to reach the destination. Thus, it is an inverse proportion.

So, 60 x 2 = 80 x p

$$p = \frac{60 \times 2}{80} = \frac{3}{2} = 1\frac{1}{2}$$

Thus, the time required by car when travelling at the speed of 80 km/h = $1\frac{1}{2}$ hrs or 1 hour 30 minutes

Q.10 Two persons could fit new windows in a house in 3 days.
(i) One of the persons fell ill before the work started. How long would the job take now?
(ii) How many persons would be needed to fit the windows in one day?

Sol. **(i) Given:** Two persons could fit new windows in a house in 3 days.

Let p be the number of days required to complete the job after one person became ill .

The given information in tabular form:

Number of persons	2	1
Number of days	3	p

Since, less the number of persons will take more number of days required to complete the task. Thus, it is an inverse proportion.

So, 2 x 3 = 1 x p

$p = 6$

Thus, the number of days required to complete the task by 1 person = 6

(ii) Let q be the number of persons required to complete the job in one day.

The given information in tabular form:

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Number of persons	2	q
Number of days	3	1

Since, for completion the task in less the number of days more number of persons required. Thus, it is an inverse proportion.
So, 2 x 3 = q x 1
q = 6
Thus, the number of persons required to complete the job in one day = 6

Q.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?
Sol. **Given:** A school has 8 periods in a day each of 45 minutes duration.
Let p be the duration of each period, if the school has 9 periods in a day.
The given information in tabular form:

Duration of each period (min)	45	p
Number of periods	8	9

Here, more the number of periods is increased then duration of each period will decrease. Thus, it is an inverse proportion.
So, 45 x 8 = p x 9
p = 40
Thus, the duration of each period, if the school has 9 periods a days = 40 min.

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