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## Chapter- 13: Direct and Inverse Proportions

### Exercise 13.1 (Page 208 of Grade 8 NCERT)

**Q1.** Following are the car parking charges near a railway station up to

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.

#### Difficulty Level:

#### Known:

Parking charges for different hours.

#### Unknown:

Parking charges are direct proportion to the parking time or not.

#### Reasoning:

If two quantities are related in such a way that an increase in one lead to a corresponding proportional increase in the other, then such a variation is called direct variation.

#### Solution:

The parking charge for 1 hour in all the four cases then the variation is direct.

We have:

$$\frac{60}{4} = \frac{15}{1} = 15$$

$$\frac{100}{8} = \frac{25}{2} = 12.5$$

$$\frac{140}{12} = \frac{35}{3} = 11.67$$

$$\frac{180}{24} = \frac{15}{2} = 7.50$$

#### Answer:

Since all the values are not the same, the parking charges are not in direct proportion to parking times.

**Q2.** 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 needed to be added.

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

**Difficulty Level:**

**Known:**

Parts of red pigments used.

**Unknown:**

Parts of base used.

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in direct proportion if,

$$\frac{x}{y} = k, x = yk$$

Where,  $k$  is a constant.

**Solution:**

Let the parts of red pigments used be  $x$  and parts of base used be  $y$ .

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

Here  $x_1 = 1, \quad x_2 = 4$

$$y_1 = 8, \quad y_2 = ?$$

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

$$\frac{1}{8} = \frac{4}{y_2}$$

$$y_2 = 8 \times 4$$

$$= 32 \text{ parts}$$

**Answer:** 32 parts of base is needed for 4 parts of red pigment.

Here,

$$x_1 = 1, \quad x_2 = 7$$

$$y_1 = 8, \quad y_2 = ?$$

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

$$\frac{1}{8} = \frac{7}{y_2}$$
$$y_2 = 8 \times 7$$
$$= 56 \text{ parts}$$

**Answer:** 56 parts of base is needed for 7 parts of red pigment.

Here,

$$x_1 = 1, \quad x_2 = 12$$
$$y_1 = 8, \quad y_2 = ?$$
$$\frac{x_1}{y_1} = \frac{x_2}{y_2}$$
$$\frac{1}{8} = \frac{12}{y_2}$$
$$y_2 = 8 \times 12$$
$$= 96$$

**Answer:** 96 parts of base is needed for 12 parts of red pigment.

Here,

$$x_1 = 1, \quad x_2 = 20$$
$$y_1 = 8, \quad y_2 = ?$$
$$\frac{x_1}{y_1} = \frac{x_2}{y_2}$$
$$\frac{1}{8} = \frac{20}{y_2}$$
$$y_2 = 8 \times 20$$
$$= 160$$

**Answer:** 160 parts of base are needed for 20 parts of red pigment.

**Q3.** In question (2), above if 1 part of red pigment requires 75 mL of base, how much red pigment should we mix with 1800 mL of base?

**Difficulty Level:**

**Known:**

1 part of red pigment requires 75 ml of base.

**Unknown:**

1800 ml of base needed how much red pigment?

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in direct proportion if,

$$\frac{x}{y} = k, x = yk$$

Where,  $k$  is a constant.

**Solution:**

Let the number of parts of red pigment be  $x$ .

As the number of parts of red pigment increases, amount of base also increases in the same ratio. So, it is a case of direct proportion.

$$\begin{aligned} \text{Here } \frac{x_1}{y_1} &= \frac{x_2}{y_2} \\ x_1 &= 1, & x_2 &= x \\ y_1 &= 75, & y_2 &= 1800 \\ \frac{1}{75} &= \frac{x}{1800} \\ x &= \frac{1 \times 1800}{75} \\ x &= 24 \end{aligned}$$

**Answer:**

24 parts of red pigment should be mixed with 1800 ml of base.

**Q4.** A machine in a soft drink factory fills 840 bottles in 6 hours. How many bottles it will fill in five hours?

**Difficulty Level:**

**Known:**

840 bottles can be filled in 6 hours.

**Unknown:**

Bottles filled in 5 hours.

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in direct proportion if,

$$\frac{x}{y} = k, x = yk$$

Where,  $k$  is a constant.

**Solution:**

No of bottles	Time in hours
$x_1 = 840$	$y_1 = 6$
$x_2 = ?$	$y_2 = 5$

So, the number of bottles filled, and numbers of hours are directly proportional to each other.

$$\begin{aligned} \frac{x_1}{y_1} &= \frac{x_2}{y_2} \\ \frac{840}{6} &= \frac{x_2}{5} \\ 6x_2 &= 840 \times 5 \\ x_2 &= \frac{840 \times 5}{6} \\ x_2 &= 700 \end{aligned}$$

**Answer:** 700 bottles will be filled in 5 hours.

**Q5.** A photograph of a bacteria is 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?

**Difficulty Level: Medium**
**Known:**

Bacteria enlarged 50,000 times attain a length of 5 cm.

**Unknown:**

Actual length of the bacteria, if 20,000 times enlarged what will be the length of the bacteria?

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in direct proportion if,

$$\frac{x}{y} = k, x = yk$$

Where,  $k$  is a constant.

**Solution:**

$$\text{Actual length } , l = \frac{y_1}{x_1}$$

$$l = \frac{5}{50000}$$

$$l = 0.0001 \text{ cm}$$

**Number of times enlarged**

$$x_1 = 50,000$$

$$x_2 = 20,000$$

**Length attained**

$$y_1 = 5$$

$$y_2 = ?$$

The number of times enlarged is directly proportional to the length attained.

**Answer:**

Actual length = 0.0001 cm

Enlarged length will be 2 cm.

**Q6.** In a model of a ship, the mast is 9 cm high, while the mast of the actual ship is 12 cm high. If the length of the actual ship is 28 m, how long is the model ship?

**Difficulty Level: Medium**
**Known:**

The mast is 9 cm high while the mast of actual ships is 12 cm high.

**Unknown:**

If the length of the ship is 28m. How long is the model ship?

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in direct proportion if,

$$\frac{x}{y} = k, x = yk$$

Where,  $k$  is a constant.

**Solution:**

**Actual ship**

$$y_1 = 12 \text{ m}$$

$$x_1 = 28 \text{ m}$$

**Model ship**

$$y_2 = 9 \text{ cm}$$

$$x_2 = ?$$

More the length of the ship more would be the length of its mast. Hence, this is a direct proportion.

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

$$\frac{28}{12} = \frac{x_2}{9}$$

$$12 \times x_2 = 28 \times 9$$

$$x_2 = \frac{28 \times 9}{12}$$

$$x_2 = 21 \text{ m}$$

**Answer:** Length of the model ship is 21 m.

**Q7.** Suppose 2 kg of sugar contains  $9 \times 10^6$  crystals. How many sugar crystals are there in

- (1) 5 kg of sugar?
- (2) 1.2kg of sugar?

(i) How many crystals are there in 5 kg of crystals?

**Difficulty Level: Medium**

**Known:**

2 kg of sugar contains  $9 \times 10^6$  crystals.

**Unknown:**

Number of crystals in 5 kg Sugar

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in direct proportion if,

$$\frac{x}{y} = k, x = yk$$

Where,  $k$  is a constant.

**Solution (i):**

Amount of sugar	No. of crystals
2	$9 \times 10^6$
5	?

More the amount of sugar more will be the number of crystals. Hence this is a direct proportion.

$$\frac{x_1}{y_1} = \frac{x_2}{y_2}$$
$$\frac{2}{9 \times 10^6} = \frac{5}{y_2}$$

$$2 \times y_2 = 9 \times 10^6 \times 5$$

$$y_2 = \frac{9 \times 10^6 \times 5}{2}$$

$$y_2 = 22.5 \times 10^6$$

$$y_2 = 2.25 \times 10^7$$

**Answer (i):** Hence there are  $2.25 \times 10^7$  crystals.



(ii) How many crystals are there in 1.2 kg of Sugar?

**Difficulty Level: Medium**

**Known:**

2 kg of sugar contains  $9 \times 10^6$  crystals.

**Unknown:**

Number of crystals in 1.2 kg Sugar

**Solution (ii):**

$$\begin{aligned}\frac{x_1}{y_1} &= \frac{x_2}{y_2} \\ \frac{2}{9 \times 10^6} &= \frac{1.2}{y_2} \\ 2 \times y_2 &= 9 \times 10^6 \times 1.2 \\ y_2 &= \frac{9 \times 10^6 \times 5}{2} \\ y_2 &= 5.4 \times 10^6\end{aligned}$$

**Answer (ii):** Hence there are  $5.4 \times 10^6$  crystals.

**Q8.** 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?

**Difficulty Level: Medium**

**Known:**

The scale of representing 1cm = 18 km

**Unknown:**

The distance covered in map when the distance on road is 72 km.

**Reasoning:**

Two numbers  $x$  and  $y$  are said in direct proportion if,

$$\frac{x}{y} = k, \quad x = yk$$

Where  $k$  is a constant.

The map is a representation of very large region. The scale shows the representation of the actual length and the length represented in map.

**Solution:**

1cm on map represents 18 km of actual distance, then 2 cm on the map represents 36 km. Hence the scale is based on the concept of direct proportion.

$$1:18 = x:72$$

$$\frac{1}{18} = \frac{x}{72}$$

$$18 \times x = 72 \times 1$$

$$x = \frac{72}{18}$$

$$x = 4$$

**Answer:** The distance covered in the map would be 4 cm.

**Q9.** A 5m 60 cm high vertical pole casts a shadow 3 m 20 cm long. Find at the same time

- i) Length of the shadow cast by another pole 10 m 50 cm high.
- ii) The height of the pole which casts a shadow of 5 m long.

(i) Length of the shadow cast by another pole 10 m 50cm high.

**Difficulty Level: Medium**

**Known:**

5.6 m vertical pole casts a shadow of 3.2 m long.

**Unknown:**

The length of a shadow cast by a pole 10.5 m high.

**Reasoning:**

Two numbers  $x$  and  $y$  are said in direct proportion if

$$\frac{x}{y} = k, x = yk$$

Where  $k$  is a constant.

**Solution:**

Height of the pole	Length of the shadow
5.6m	3.2m
10.5m	?

As the height of the pole increases the length of the shadow also increases. So, it is a direct proportion.

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

$$\frac{5.6}{3.2} = \frac{10.5}{y_2}$$

$$5.6 \times = 10.5 \times 3.2$$

$$y_2 = \frac{10.5 \times 3.2}{5.6}$$

$$y_2 = 6$$

**Answer:**

If the height of the pole is 10.5 m, then length of the shadow is 6 m.

(ii) The height of the pole which casts a shadow of 5m long.

**Known:**

5.6 m vertical pole casts a shadow of 3.2 m long.

**Unknown:**

The height of the pole when the length of the shadow is 5 m long.

**Solution:**

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

$$y_1 \quad y_2$$

$$\frac{5.6}{3.2} = \frac{x_2}{5}$$

$$3.2x = 5 \times 5.6$$

$$x_2 = \frac{5 \times 5.6}{3.2}$$

$$x_2 = 8.75$$

**Answer:**

If the height of the pole is 5 m, then length of the shadow is 8.75 m.

**Q10.** A loaded truck travels 14 km in 25 minutes. If the speed remains the same, how far it travels in 5 hours?

**Difficulty Level:****Known:**

Truck travels 14km in 25 minutes.

**Unknown:**

Distance travelled in 5 hours.

**Reasoning:**

Two numbers  $x$  and  $y$  are said in direct proportion if

$$\frac{x}{y} = k, x = yk$$

Where  $k$  is a constant.

**Solution:**

In 25 minutes, it travels 14 km. In 5 hours, it will travel more distance. So, it is a case of direct proportion.

**Distance**

14

?

**Time in minutes**

25

 $5 \times 60$  (1 hour = 60 minutes)

[For comparison the unit should be same]

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

$$y_1 \quad y_2$$

$$\frac{14}{25} = \frac{x_2}{5 \times 60}$$

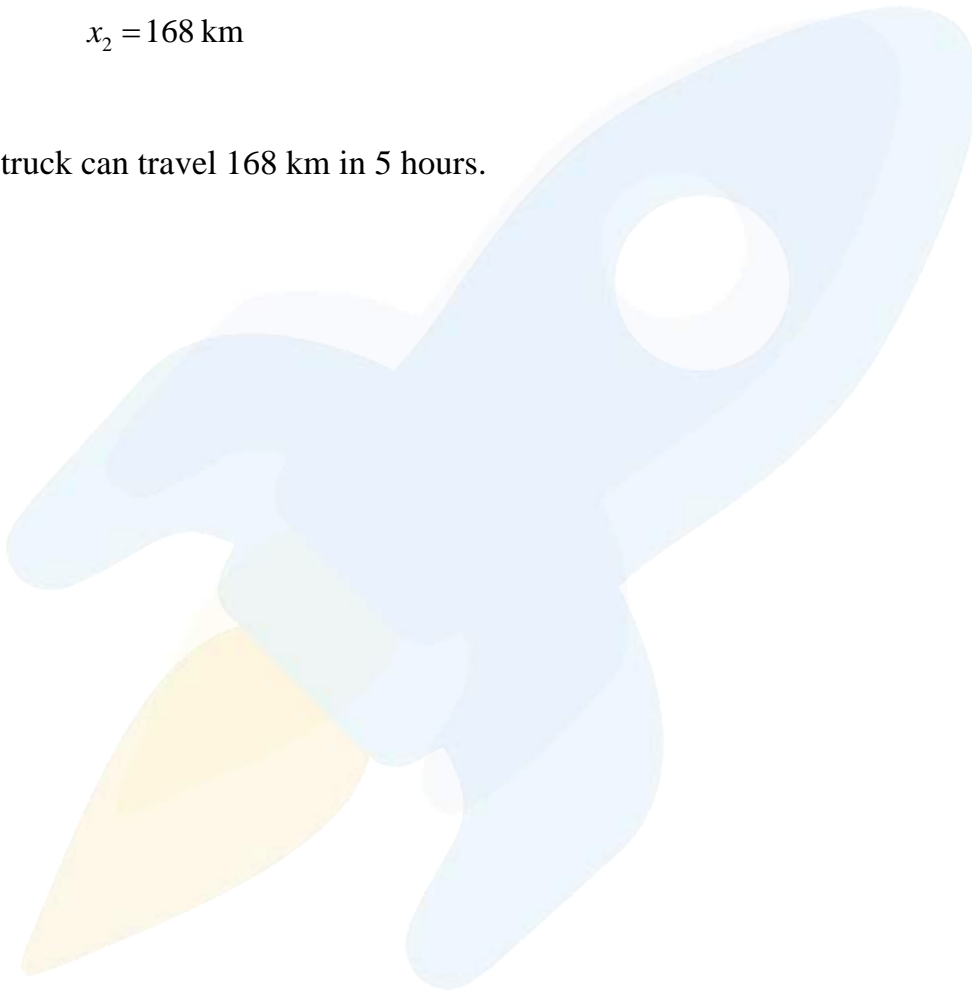
$$25x_2 = 5 \times 60 \times 14$$

$$x_2 = \frac{5 \times 60 \times 14}{25}$$

$$x_2 = 168 \text{ km}$$

**Answer:**

Hence the truck can travel 168 km in 5 hours.



## Chapter- 13: Direct and Inverse Proportions

### Exercise 13.2 (Page 213 of Grade 8 NCERT)

**Q1.** 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.

#### Reasoning:

If two quantities are related in such a way that an increase in one quantity leads to a corresponding proportional decrease in the other, then such a variation is called inverse proportion.

#### Solution:

(i) The number of workers on a job and the time to complete the job.

**Ans:** As the number of workers increase; the job will take less time to complete. Hence, they are inversely proportional.

(ii) The time taken to a journey and the distance travelled in a uniform speed.

**Ans:** For more time, more distance to travel. Hence, they are not inversely proportional.

(iii) Area of cultivated land and the crop harvested.

**Ans:** More area of land cultivated, more crop to harvest. Hence, they are not inversely proportional.

(iv) The time taken for a fixed journey and the speed of the vehicle.

**Ans:** If speed is increased, it will take less time to complete the fixed journey. Hence, they are inversely proportional.

(v) The population of a country and the area of land per person.

**Ans:** If the population of a country increases, then the area of land per person will be decreased. Hence, they are inversely proportional.

**Q2.** In a television game show, the prize money ₹ 1,00,000 is to be divided equally amongst the winners. Complete the table and find whether the prize money given to an individual winner is directly or inversely proportional to the number of winners?

<b>Number of winners</b>	1	2	4	5	8	10	20
<b>Prize for each winner (in ₹)</b>	1,00,000	50,000	...	...	...	...	...

**Difficulty Level: Medium**

**Known:**

Amount for winner 1 and winner 2.

**Unknown:**

Prize amount for 4, 5, 8, 10, and 20 winners.

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1y_1 = x_2y_2$$

**Solution:**

If winners increase the prize amount will decrease. So, it is a case of inverse proportion.

$$x_1y_1 = x_3y_3$$

$$1 \times 100000 = 4 \times y_3$$

$$y_3 = \frac{1 \times 100000}{4} \therefore y_3 = 25000$$

$$1 \times 100000 = 5 \times y_4$$

$$y_4 = \frac{1 \times 100000}{5} \therefore y_4 = 20000$$

$$1 \times 100000 = 8 \times y_5$$

$$y_5 = \frac{1 \times 100000}{8} \therefore y_5 = 12,500$$

$$1 \times 100000 = 10 \times y_6$$

$$y_6 = \frac{1 \times 100000}{10} \therefore y_6 = 10000$$

$$1 \times 100000 = 20 \times y_7$$

$$y_7 = \frac{1 \times 100000}{20} \therefore y_7 = 5000$$

**Answer:**

<b>No. of winners</b>	4	5	8	10	20
<b>Prize for winners</b>	25,000	20,000	12,500	10,000	5,000

**Q3.** 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.

- (i) Are the number of spokes and the angle 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  $40^\circ$ ?

<b>Number of spokes</b>	4	6	8	10	12
<b>Angle between a pair of consecutive spokes</b>	$90^\circ$	$60^\circ$	...	...	...

**Difficulty Level:** Medium

**Known:**

- (i) Number of spokes 4 and 6.
- (ii) Angle between the spokes is  $90^\circ$  and  $60^\circ$ .

**Unknown:**

Angle between the spokes for spoke 8, 10 and 12.

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1y_1 = x_2y_2$$

**Solution:**

(i) If the number of spoke increases, then the angle between the spoke decreases. Hence it is in inverse variation.

(ii)

$$x_1 y_1 = x_3 y_3$$

$$4 \times 90^\circ = 8 \times y_3$$

$$y_3 = \frac{4 \times 90^\circ}{8} = 45^\circ$$

$$x_1 y_1 = x_4 y_4$$

$$4 \times 90^\circ = 10 \times y_4$$

$$y_4 = \frac{4 \times 90^\circ}{10} = 36^\circ$$

$$x_1 y_1 = x_5 y_5$$

$$4 \times 90^\circ = 12 \times y_5$$

$$y_5 = \frac{4 \times 90^\circ}{12} = 30^\circ$$

**Answer:**

<b>Number of spokes</b>	8	10	12
<b>Angle between spokes</b>	30 <sup>0</sup>	36 <sup>0</sup>	45 <sup>0</sup>

(i) Are the number of spokes and the angle formed between the pairs of consecutive spokes in inverse proportion?

**Ans:** Yes, number of spokes and the angle formed between the pairs of consecutive spokes in inverse proportion, because for 4 spokes the angle is 40 but for 8 spokes it is 45.

(ii) Calculate the angle between a pair of consecutive spokes on a wheel with 15 spokes. More the number of spokes, less the angle between them.

$$x_1 y_1 = x_2 y_2$$

$$4 \times 90^\circ = 15 \times y_2$$

$$y_2 = \frac{4 \times 90^\circ}{15}$$

$$= 24^\circ$$

The angle between the pair of consecutive spokes on a wheel with 15 spokes is 24°.

(iii) How many spokes would be needed, if the angle between a pair of consecutive spokes is 40°.

$$x_1 y_1 = x_2 y_2$$

$$4 \times 90^\circ = x_2 \times 40$$

$$x_2 = \frac{4 \times 90^\circ}{40}$$

$$= 9$$

If the angle between a pair of consecutive spokes is 40°, then spokes on the wheel is 9.



**Q4.** If a box of sweets is divided into 24 children, they will get 5 sweets each. How many would each get, if the number of children is reduced to 4?

**Difficulty Level: Medium**

**Known:**

24 children get 5 sweets each.

**Unknown:**

No. of sweets getting by 20 children.  $[24 - 4 = 20]$

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1y_1 = x_2y_2$$

**Solution:**

If the number of children will decrease, the number of sweets they get will increase. Hence it is the inverse proportion.

$$x_1y_1 = x_2y_2$$

$$24 \times 5 = 20 \times y_2$$

$$y_2 = \frac{24 \times 5}{20}$$

$$y_2 = 6$$

**Answer:**

Hence, 20 children will get 6 sweets each.

**Q5.** 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?

**Difficulty Level: Medium**

**Known:**

In cattle, food is for 20 animals for 6 days.

**Unknown:**

The number of days for 30 animals  $(20 + 10 = 30)$

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1y_1 = x_2y_2$$

**Solution:**

If the number of animals increases, the number of days they can be fed will decrease, so it is in the inverse proportion.

$$x_1 y_1 = x_2 y_2$$

$$20 \times 6 = 30 \times y_2$$

$$y_2 = \frac{20 \times 6}{30}$$

$$y_2 = 4$$

**Answer:**

The food would last for 4 days for 30 animals.

**Q6.** A contractor estimates that 3 persons could rewire Jaswinder's house in 4 days. If he uses 4 persons instead of 3, how long should they take to complete the job?

**Difficulty Level: Medium****Known:**

3 persons can rewire the house in 4 days.

**Unknown:**

Number of days when 4 persons do the job.

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, \quad x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1 y_1 = x_2 y_2$$

**Solution:**

If the number of persons doing the job increases, the day will increase. so, it is inverse proportion.

$$x_1 y_1 = x_2 y_2$$

$$3 \times 4 = 4 \times y_2$$

$$y_2 = \frac{3 \times 4}{4}$$

$$y_2 = 3$$

**Answer:**

4 persons will take 3 days to complete the job.

**Q7.** A batch of bottles was 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?

**Difficulty Level:**

**Known:**

25 boxes were packed with 12 bottles in each box.

**Unknown:**

No. of boxes when 20 bottles are packed with each box.

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1y_1 = x_2y_2$$

**Solution:**

If the no. of bottles in each box increases, no. of boxes will decrease. Hence, it is Inverse proportion.

$$\begin{aligned}x_1y_1 &= x_2y_2 \\12 \times 25 &= 20 \times y_2 \\y_2 &= \frac{12 \times 25}{20} \\y_2 &= 15\end{aligned}$$

**Answer:**

Hence 15 boxes will be filled with 20 bottles in each box.

**Q8.** 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?

**Difficulty Level: Medium****Known:**

42 machines to produce a given number of articles in 63 days.

**Unknown:**

Machines required for producing same no. of articles in 54 days.

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1y_1 = x_2y_2$$

**Solution:**

If the number of days decreases, the machine required will increase. So, it is an inverse proportion.

$$\begin{aligned}x_1 y_1 &= x_2 y_2 \\42 \times 63 &= 54 \times y_2 \\y_2 &= \frac{42 \times 63}{54} \\y_2 &= 49\end{aligned}$$

**Answer:**

49 machines will be required to produce the same number of articles in 54 days.

**Q9.** A car takes 2 hours to reach a destination by travelling at a speed of 60 km/hour. How long will it take when the car travels at a speed of 80 km/hour?

**Difficulty Level: Medium****Known:**

2 hours to reach at a speed of 60 km/hour.

**Unknown:**

If the speed is 80km/hour, the number of hours to reach.

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1 y_1 = x_2 y_2$$

**Solution:**

If the speed increases, the time required to reach will decrease. Hence, it is inverse proportion.

$$\begin{aligned}x_1 y_1 &= x_2 y_2 \\60 \times 2 &= 80 \times y_2 \\y_2 &= \frac{60 \times 2}{80} \\y_2 &= \frac{3}{2} \\y_2 &= 1\frac{1}{2} \text{ hours}\end{aligned}$$

**Answer:**

Hence  $1\frac{1}{2}$  hours are required to reach the destination if the speed is increased to 80 km/hour.

**Q10.** 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?

(i) One of the persons fell ill before the work started. How long would the job take now?

**Difficulty Level: Medium**

**Known:**

2 Persons can fit the windows in 3 days.

**Unknown:**

One man (2-1) can fit the windows in how many days?

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1y_1 = x_2y_2$$

**Solution:**

If the no. of men working decreases, the number of days will increase.

$$x_1y_1 = x_2y_2$$

$$2 \times 3 = 1 \times y_2$$

$$y_2 = \frac{2 \times 3}{1}$$

$$y_2 = 6$$

**Answer:**

Hence, the job will be completed in 6 days.

(ii) How many persons would be needed to fit the windows in one day?

**Difficulty Level: Medium**

**Known:**

2 Persons can fit the windows in 3 days.

**Unknown:**

The persons need to fix the window in 1 day.

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1y_1 = x_2y_2$$

**Solution:**

If the number of days decreases, then the persons needed will be increase. Hence it is inverse proportion.

$$x_1y_1 = x_2y_2$$

$$3 \times 2 = 1 \times y_2$$

$$y_2 = \frac{3 \times 2}{1}$$

$$y_2 = 6$$

**Answer:**

6 persons will need to fix the window in one day.

**Q11.** A school has 8 periods a day each of 45 minutes of 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?

**Difficulty Level: Medium**

**Known:**

8 periods of day each of 45 min.

**Unknown:**

9 periods in a day, how many minutes each period will be?

**Reasoning:**

Two numbers  $x$  and  $y$  are said to vary in inverse proportion if

$$xy = k, x = \frac{1}{y}k$$

Where,  $k$  is a constant.

$$x_1y_1 = x_2y_2$$

**Solution:**

If the number of period increase, then the duration of the period will decrease. So, it is inverse variation.

$$x_1y_1 = x_2y_2$$

$$8 \times 45 = 9 \times y_2$$

$$y_2 = \frac{8 \times 45}{9}$$

$$y_2 = 40$$

**Answer:**

Hence, each period would be 40 minutes long.

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