SpeedLabs

MATHS

CBSE 8th

TEEVRA EDUTECH PVT. LTD.

Direct and Inverse Proportion
Exercise 13.1

Q.1: Following are the car parking charges near a railway station upto

4 hours Rs 60

8 hours Rs 100

12 hours Rs 140

24 hours Rs 180

Check if the parking charges are in direct proportion to the parking time.

Sol: Charges per hour,

$k_1 = \frac{60}{4} = \text{Rs } 15$

$k_2 = \frac{100}{8} = \text{Rs } 12.5$

$k_3 = \frac{140}{12} = \text{Rs } 11.67$

$k_4 = \frac{180}{24} = \text{Rs } 7.5$

Here charges per hour are not same or $k_1 \neq k_2 \neq k_3 \neq k_4$.

So, the parking charges are not in direct proportion to the parking time.

Q.2 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 need to be added.

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

Sol: Let the ratio of parts of red pigment and parts of base be $\frac{x}{y}$.

Here $x_1 = 1, y_1 = 8$

$k = \frac{x_1}{y_1} = \frac{1}{8}$

When $x_2 = 4, y_2 = ?$

$k = \frac{x_2}{y_2} \qquad \Rightarrow y_2 = \frac{x_2}{k} = \frac{4}{\frac{1}{8}} = 4 \times 8 = 32$

When $x_3 = 7, y_3 = ?$

$k = \frac{x_3}{y_3} \qquad \Rightarrow y_3 = \frac{x_3}{k} = \frac{7}{\frac{1}{8}} = 7 \times 8 = 56$

When $x_4 = 12, y_4 = ?$

$k = \frac{x_4}{y_4} \qquad \Rightarrow y_4 = \frac{x_4}{k} = \frac{12}{\frac{1}{8}} = 12 \times 8 = 96$

When $x_5 = 20, y_5 = ?$

$k = \frac{x_5}{y_5} \qquad \Rightarrow y_5 = \frac{x_5}{k} = \frac{20}{\frac{1}{8}} = 20 \times 8 = 160$

Parts of red pigment	1	4	7	12	20
Parts of base	8	32	56	96	160

Q.3 In Q.2 above, if 1part of a red pigment requires 75 mL of base, how much red pigment should we mix with 1800 mL of base?

Sol: Let the parts of red pigment mix with 1800 mL base be x.

Parts of red pigment	1	*x*
Parts of base (in mL)	75	1800

It is in direct proportion.

$\therefore \frac{1}{75} = \frac{x}{1800} \quad \left(\because \frac{x_1}{y_1} = \frac{x_2}{y_2}\right)$

$\Rightarrow 75 \times x = 1 \times 1800$

$\Rightarrow x = \frac{1800}{75}$

$\Rightarrow x = 24$ parts

With base 1800 mL, 24 parts red pigment should be mixed.

Q.4 A machine in a soft drink factory fills 840 bottles in six hours. How many bottles will it fill in five hours?

Sol: Let the number of bottles filled in five hours be x.

Number of bottles	840	*x*
Time taken (in hours)	6	5

Here, ratio of hours and bottles are in direct proportion.

$\therefore \frac{6}{840} = \frac{5}{x} \quad \left(\because \frac{x_1}{y_1} = \frac{x_2}{y_2}\right)$

$\Rightarrow x \times 6 = 5 \times 840$

$\Rightarrow x = \frac{5 \times 840}{6} = 700$

Hence, machine will fill 700 bottles in five hours.

Q.5 A photograph of a bacteria 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?

Sol: Let enlarged length of bacteria be x.

Actual length of the bacteria $= \frac{5}{50000} = \frac{1}{10000}$

$= 1 \times 10^{-4}\text{cm} = 10^{-4}$ cm

Length of bacteria (in cm)	5	*x*	*y*
Number of times photograph of Bacteria was enlarged	50000	1	20000

Here length and enlarged length of bacteria are in direct proportion.

$\therefore \frac{5}{50000} = \frac{x}{20000} \quad \left(\because \frac{x_1}{y_1} = \frac{x_2}{y_2}\right)$

$\Rightarrow x \times 50{,}000 = 5 \times 20{,}000$

$\Rightarrow x = \frac{5 \times 20{,}000}{50{,}000} = 2$

Hence, the enlarged length of bacteria is 2 cm.

Q.6 In a model of a ship, the mast is 9 cm high, while the mast of the actual ship is 12 m high. If the length of the ship is 28 m, how long is the model ship?

Sol: Let the length of model ship be x.

-	Height of mast	Length of ship
Model ship	9 cm	*x*
Actual ship	12 m	28 m

Here, length of mast and actual length of ship are in direct proportion.

$\therefore \frac{12}{9} = \frac{28}{x} \quad \left(\because \frac{x_1}{y_1} = \frac{x_2}{y_2}\right)$

$\Rightarrow 12 \times x = 28 \times 9$

$\therefore x = \frac{28 \times 9}{12} = \frac{252}{12} = 21$

Hence, length of the model ship is 21 cm

Q.7 Suppose 2 kg of sugar contains 9 x 106 crystals. How many sugar crystals are there in (i) 5 kg of sugar? (ii) 1.2 kg of sugar?

Sol:

(i) Let sugar crystals be x.

Amount of sugar (in kg)	2	5
Number of crystals	9×10^6	*x*

In this problem, if weight of sugar increases, the number of crystals increases and if weight is decreased, the number of crystals is lessened. So, it is a matter of direct proportion.

$\therefore \frac{2}{9\times10^6} = \frac{5}{x} \quad \left(\because \frac{x_1}{y_1} = \frac{x_2}{y_2}\right)$

$\Rightarrow 2 \times x = 5 \times 9 \times 10^6$

$\Rightarrow x = \frac{5\times9\times10^6}{2} = \frac{45}{2} \times 10^6 = 22.5 \times 10^6 = 2.25 \times 10^7$ Hence, the number of sugar crystals is 2.25 × 107.

(ii) Let the sugar crystals be x.

Amount of sugar (in kg)	2	1.2
Number of crystals	9×10^6	y

$\frac{2}{9\times10^6} = \frac{1.2}{y}$

$y = \frac{1.2\times9\times10^6}{2} = 5.4 \times 10^6$

Hence, the number of sugar crystals is 5.4×10^6.

Q.8 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?

Sol: Let distance covered in the map be x.

Distance covered on road in (in km)	18	72
Distance represented on map (in cm)	1	x

Here actual distance and distance covered in the map are in direct proportion

$\therefore \frac{18}{1} = \frac{72}{x} \quad \left(\because \frac{x_1}{y_1} = \frac{x_2}{y_2}\right)$

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

$\Rightarrow x = \frac{72}{18} \Rightarrow x = 4$

Hence, distance covered in the map is 4 cm.

Q.9 A 5 m 60 cm high vertical pole casts a shadow 3 m 20cm long. Find at the same time (i) The length of the shadow cast by another pole 10 m 50 cm high (ii) The height of a pole which casts a shadow 5 m long.

Sol: Since, height of a pole and the length of a shadow are in direct proportion.

Since 1 m = 100 cm

5 m 60 cm = $5 \times 100 + 60 = 500 + 60 = 560$ cm

3 m 20 cm = $3 \times 100 + 20 = 300 + 20 = 320$ cm

10 m 50 cm = $10 \times 100 + 50 = 1000 + 50 = 1050$ cm

5 m = $5 \times 100 = 500$ cm

(i) Let the length of the shadow of another pole be y.

Height of pole (in m)	5.60	10.50
Length of shadow (in m)	3.20	x

$\therefore \frac{560}{320} = \frac{1050}{y} \quad \left(\because \frac{x_1}{y_1} = \frac{x_2}{y_2} \right)$

$\Rightarrow 560 \times y = 320 \times 1050$

$\therefore y = \frac{320 \times 1050}{560} = \frac{336000}{560} = 600$ cm $= 6$ m.

Hence, length of the shadow of another pole is 6 m.

(ii) Let height of the pole be x.

Height of pole (in m)	5.60	y
Length of shadow (in m)	3.20	5

$\therefore \frac{560}{320} = \frac{x}{500} \quad \left(\because \frac{x_1}{y_1} = \frac{x_2}{y_2} \right)$

$\Rightarrow x \times 320 = 560 \times 500$

$\therefore x = \frac{560 \times 500}{320} = \frac{280000}{320} = 875 = 8$ m 75cm

Hence, height of the pole is 8 m 75 cm.

Q.10 A loaded truck travels 14 km in 25 minutes. If the speed remains the same, how far can it travel in 5 hours?

Sol: Let distance covered in 5 hours be x km.

1hour = 60 minutes

5 hours = 5 × 60 = 300 minutes.

Distance travelled (in km)	14	*x*
Time (in min)	25	300

$\therefore \frac{14}{25} = \frac{x}{300} \quad \left(\because \frac{x_1}{y_1} = \frac{x_2}{y_2}\right)$

$\Rightarrow 25 \times x = 300 \times 14$

$\Rightarrow x\ \frac{300 \times 14}{25} = 168$

Hence, the distance covered in hours is 168 km.