Direct and Indirect Proportional: 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. The given information in tabular form:

No. of hours	4	8	12	24
Parking charges (Rs.)	60	100	140	180
Ratio = $\frac{\text{Parking charges (Rs.)}}{\text{Number of hours}}$	$\frac{60}{4}=15$	$\frac{100}{8}=\frac{25}{2}$	$\frac{140}{12}=\frac{35}{3}$	$\frac{180}{24}=\frac{15}{2}$

Since, the parking charge per hour (or ratio) are not same. So, the parking charges are not in directly proportional 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. Since, mixture of paint is made by mixing 1 part of red pigments with 8 parts of base. Here, red pigments and base both are directly proportional. The given information in tabular form:

Parts of red pigment	1	4	7	12	20
Parts of base	8	B_1	B_2	B_3	B_4

Now according to direct proportion,

$\frac{B_1}{4}=\frac{8}{1}$

$B_1 = 4 \times 8 = 32$

$\frac{B_2}{7}=\frac{8}{1}$

$B_2 = 7 \times 8 = 56$

$\frac{B_3}{12}=\frac{8}{1}$

$B_3 = 8 \times 12 = 96$

$\frac{B_4}{20}=\frac{8}{1}$

$B_4 = 8 \times 20 = 160$

Thus, the complete table is:

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

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

***Sol.* Given:** 1 part of a red pigment requires 75 mL of base.
Let x be the part of red pigment to be mix with 1800 mL of base.
So, information in tabular form:

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

Since, the parts of red pigment and base both are directly proportional.

So, $\frac{1}{75} = \frac{x}{1800}$

$x = \frac{1 \times 1800}{75}$

$x = 24$

Thus, required red pigment for 1800 mL of base = 24 parts

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 p be the number of bottles filled in five hours.
The given information in tabular form:

No. of bottles	840	p
Time taken (in hrs)	6	5

Since, the number of bottles and time taken both are directly proportional,

So, $\frac{840}{6} = \frac{p}{5}$

$p = \frac{840 \times 5}{6}$

$p = 700$

Thus, Number of bottles filled in five hours = 700 bottles

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 p *be* the actual length and q be the enlarged 20,000 times length of bacteria.
The given information in tabular form:

Length of bacteria (cm)	5	p	q
No. of times bacteria enlarged	50000	1	20000

Since, the number of times enlarged photograph of bacteria and length of bacteria both are directly proportional.

So, $\frac{5}{50000} = \frac{p}{1}$

$$p = \frac{1}{10000} = 10^{-4}$$

Thus, the actual length of bacteria = 10^{-4} cm

Now for the length of bacteria when the photograph of bacteria is enlarged 20,000 times:

$$\frac{5}{50000} = \frac{q}{20000}$$

$$q = \frac{20000 \times 5}{50000} = 2$$

Thus, the length of bacteria when the photograph of bacteria is enlarged 20,000 times = 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. Given: in actual ship, height = 12 m, length = 28 m and in model ship, height = 9 cm.

Let p be the length of model ship.

The given information can be tabulated as shown below:

	Height	Length
Model ship	9 cm	p
Actual ship	12 m	28 m

Since, the dimensions of actual ship and model ship both are directly proportional.

So, $\frac{12}{9} = \frac{28}{p}$

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

p = 21 cm

Thus, the length of the model ship = 21 cm

Q.7 Suppose 2 kg of sugar contains 9×10^6 crystals. How many sugar crystals are there in (i) 5 kg of sugar? (ii) 1.2 kg of sugar?

***Sol.* Given**: 2 kg of sugar contains = 9×10^6 crystals

(i) Let p be the number of crystals in 5 kg sugar.

The given information in tabular form:

Quantity of sugar (kg)	2	5	1.2
Number of crystals	9×10^6	p	q

Since, the quantity of sugar and the number of crystals both are directly proportional.

So, $\frac{2}{9 \times 10^6} = \frac{5}{p}$

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

$p = 2.25 \times 10^7$

Thus, the no. of sugar crystals in 5 Kg. sugar = 2.25×10^7

(ii) Let q be the number of crystals in 1.2 kg sugar.

Since, the quantity of sugar and the number of crystals both are directly proportional.

So, $\frac{2}{9\times10^6} = \frac{1.2}{q}$

$q = \frac{1.2\times9\times10^6}{2}$

$q = 5.4 \times 10^6$

Thus, the number of sugar crystals in 1.2kg sugar = 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.* Given:** road map with a scale of 1 cm representing 18 km and Rashmi drives 72 km on a road.

Let p cm be the distance covered in the map.

The given information in tabular form:

Distance covered on road (km)	18	72
Distance on map (cm)	1	p

Since, the distance covered on road and distance on map both are directly proportional.

So, $\frac{18}{1} = \frac{72}{p}$

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

$p = 4$

Thus, the distance represented on the map for 72 km = 4 cm

Q.9 A 5 m 60 cm high vertical pole casts a shadow 3 m 20 cm 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 5m long.

***Sol.* Given: pole of vertical height** 5 m 60 cm or 560 cm casts a shadow = 3 m 20 cm or 320 cm long.

(i) Let p be the length of the shadow of the other pole of height 10 m 50 cm or 1050 cm.

The given information can be tabulated as shown below:

Height of pole (in cm)	560	1050
Length of shadow (in cm)	320	p

Since, the height of pole and length of shadow both are directly proportional.

So, $\frac{560}{320} = \frac{1050}{p}$

$p = \frac{1050\times320}{560}$

$p = 600$ cm

Thus, the length of the shadow of another pole of height 10 m 50 cm or 1050 cm = 600 cm or 6 m

(ii) Let q be the height of the pole which casts a shadow 5m long.

The given information in tabular form:

Height of pole (cm)	560	q

Length of shadow (cm)	320	500

Since, the length of pole and length of shadow both are directly proportional.

So, $\frac{560}{320} = \frac{q}{500}$

$$q = \frac{560 \times 500}{320}$$

q = 875 cm

Thus, the height of the pole = 875 cm or 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. **Given:** Time ken by **a** loaded truck to travel 14 km = 25 minutes

Let p be the distance travelled by the truck in 5 hours or 300 minutes.

The given information in tabular form:

Distance travelled (km)	14	p
Time (min)	25	300

Since, the distance travelled by truck and time taken both are directly proportional,.

So, $\frac{14}{25} = \frac{p}{300}$

$$p = \frac{14 \times 300}{25}$$

p = 168

Thus, the distance travelled by the truck in 5 hours of 300 min. = 168 km