EXERCISE 13.1

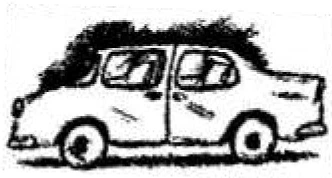
1. The following are the car parking charges near a railway station up to,

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.

Solution:

Charges per hour:

C1 = 60/4 = Rs. 15

C2 = 100/8 = Rs. 12.50

C3 = 140/12 = Rs. 11.67

C4 = 180/24 = Rs.7.50

Here, the charges per hour are not the same, i.e. C1 ≠ C2 ≠ C3 ≠ C4

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

2. A mixture of paint is prepared by mixing 1 part of red pigments with 8 parts of the base. In the following table, find the parts of the base that need to be added.

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

Solution:

Let the ratio of parts of red pigment and parts of the base be a/b.

Case 1: Here, $a_1 = 1$, $b_1 = 8$

$a_1/b_1 = 1/8 = k$ (say)

Case 2: When $a_2 = 4$, $b_2 = ?$

$$k = \frac{a_2}{b_2}$$

$b_2 = a_2/k = 4/(1/8) = 4\times8 = 32$

Case 3: When $a_3 = 7$, $b_3 = ?$

$$k = \frac{a_3}{b_3}$$

$b_3 = a_3/k = 7/(1/8) = 7\times8 = 56$

Case 4: When $a_4 = 12$, $b_4 = ?$

$$k = \frac{a_4}{b_4}$$

$b_4 = a_4/k = 12/(1/8) = 12\times8 = 96$

Case 5: When $a_5 = 20$, $b_5 = ?$

$$k = \frac{a_5}{b_5}$$

$b_5 = a_5/k = 20/(1/8) = 20\times8 = 160$

When combining results for all the cases, we get

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

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

Solution:

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

Parts of red pigment	1	x
Parts of base	75	1800

Since it is in direct proportion,

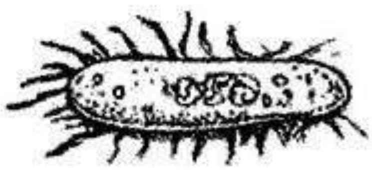
$$\frac{1}{75} = \frac{x}{1800}$$

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

$$x = \frac{1 \times 1800}{75} = 24$$

Hence, with the base 1800 mL, 24 parts of the red pigment should be mixed.

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



Solution:

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

Here, the ratio of hours and bottles is in direct proportion.

$$\frac{6}{840} = \frac{5}{x}$$

6x = 5×840

x = 5×840/6 = 700

Hence, the machine will fill 700 bottles in five hours.

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?

Solution:

Let the enlarged length of bacteria be x.

Actual length of bacteria = 5/50000 = 1/10000 cm = 10^{-4} cm

Length	5	x
Enlarged length	50,000	20,000

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

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

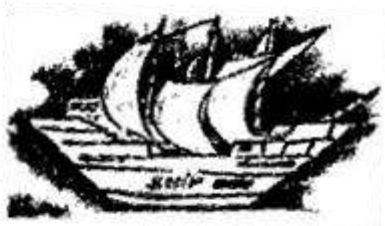
$\Rightarrow$
$x \times 50000 = 5 \times 20000$

$x = \frac{5 \times 20000}{50000}$

x= 2cm

Hence, the enlarged length of bacteria is 2 cm.

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?



Solution:

Let the length of the model ship be x.

Length of actual ship (in m)	12	28
Length of model ship (in cm)	9	x

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

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

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

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

x = 21 cm

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

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?

Solution:

(i) Let sugar crystals be x.

Weight of sugar (in kg)	2	5
No. of crystals	9×10^6	x

Here, the weight of sugar and the number of crystals are in direct proportion.

$$\frac{2}{9\times10^6}=\frac{5}{x}$$

$\Rightarrow$

$$x\times2=5\times9\times10^6$$

$$x=\frac{5\times9\times10^6}{2}$$

=

$$22.5\times10^6=2.25\times10^7$$

Hence, the number of sugar crystals is 2.25×10^7.

(ii) Let sugar crystals be x.

Here, the weight of sugar and the number of crystals are in direct proportion.

Weight of sugar (in kg)	2	1.2
No. of crystals	9×10^6	x

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

$\Rightarrow$

$$x\times2=1.2\times9\times10^6$$

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

=

$$0.6\times9\times10^6=5.4\times10^6$$

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

8. Rashmi has a road map with a scale of 1 cm representing 18 km. She drives on the road for 72 km. What would be her distance covered on the map?

Solution:

Let the distance covered in the map be x.

Actual distance (in km)	18	72
Distance covered in map (in cm)	1	x

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

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

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

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

x = 4 cm

Hence, the distance covered on the map is 4 cm.

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 5 m long.

Solution:

Here, the height of the pole and the length of the shadow are in direct proportion.

And 1 m = 100 cm

5 m 60 cm = 5×100+60 = 560 cm

3 m 20 cm = 3×100+20 = 320 cm

10 m 50 cm = 10×100+50 = 1050 cm

5 m = 5×100 = 500 cm

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

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

$$\frac{560}{320}=\frac{1050}{x}$$

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

$x = \frac{1050 \times 320}{560}$

x= 600 cm = 6m

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

(ii) Let the height of the pole be x.

Height of pole (in cm)	560	x
Length of shadow (in cm)	320	500

$\frac{560}{320} = \frac{x}{500}$

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

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

= 875 cm = 8 m 75 cm

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

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

Solution:

Let the distance covered in 5 hours be x km.

1 hour = 60 minutes

Therefore, 5 hours = 5×60 = 300 minutes

Distance (in km)	14	x
Time (in minutes)	25	300

Here, the distance covered and time are in direct proportion.

$\frac{14}{25} = \frac{x}{300}$

$\Rightarrow$ 25x = 300(14)

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

x = 168

Therefore, the truck can travel 168 km in 5 hours.