Exercise 5.1

1. (a)

Height of a child (x)	1	2
Weight of a child y	2	4

Here with the increase in x the y is also increase in the same manner.
it's a direct variation.

(b)

Distance (x)	5	8
Time taken (y)	2	3

Here with the increase in but y is not increase in the same manner.
it is not a direct variation.

(c)

Wages of worker (x)	₹ 200	₹ 400
working hour (y)(hour)	1	2

Here with the increase in x the y is also increase in the same manner.
it is a direct variation.

(d)

No of student (x)	1	2
Fees paid by then (y)₹	500	1000

Here with the increase in x they is also increase in the same manner.
it is a direct variation.

(e)

No of rainy day	(x)	
Amount of rainfall	(y)	2 cm

Here with the increase in but y is not increase in the same manner.
it is not a direct variation

2. (a) $\dfrac{5}{15}$, $\dfrac{1}{3}$; $\dfrac{8}{24}$, $\dfrac{1}{3}$; $\dfrac{9}{27}$, $\dfrac{1}{3}$; $\dfrac{11}{33}$, $\dfrac{1}{3}$

$\dfrac{5}{15}$ $\dfrac{8}{24}$ $\dfrac{9}{27}$ $\dfrac{11}{33}$

Since, the ratio of the corresdoing values of x and y is equal $\dfrac{1}{3}$, x and y are in direct variation and the constant of variation is $\dfrac{1}{3}$.

(b) $\dfrac{3}{5}$ $\dfrac{5}{3}$ $\dfrac{6}{10}$ $\dfrac{9}{15}$ $\dfrac{10}{6}$

The ratio are not corresdonation.
x and y are not direct variation.

(c) $\dfrac{8}{2}$, $\dfrac{4}{1}$; $\dfrac{16}{4}$, $\dfrac{4}{1}$; $\dfrac{20}{5}$, $\dfrac{4}{1}$; $\dfrac{32}{8}$, $\dfrac{4}{1}$; $\dfrac{60}{15}$, $\dfrac{4}{1}$

$$\frac{8}{2} \quad \frac{16}{4} \quad \frac{20}{5} \quad \frac{32}{8} \quad \frac{60}{15}$$

Since the ratio of the corresdoning values of x and y is equal $\frac{4}{1}$, x and y are indirect

variation and the constant of variation is $\frac{4}{1}$.

3. (a) Since x and y vary directly

$$\frac{x_1}{8} \quad \frac{60}{4}$$

$$4x_1 \quad 8 \quad 60$$
$$x_1 \quad 8 \quad 60$$
$$x_1 \quad \frac{8 \quad 60}{4}$$

$$x_1 \quad 120$$

Similarly
$$\frac{x_2}{15} \quad \frac{60}{4}$$

$$4x_2 \quad 15 \quad 60$$
$$x_2 \quad \frac{60 \quad 15}{4} \quad 225$$

again,
$$\frac{x_3}{20} \quad \frac{60}{40}$$

$$4x_3 \quad 60 \quad 20$$
$$x_3 \quad \frac{60 \quad 20}{4}$$

$$x_3 \quad 300$$

and,
$$\frac{x_4}{25} \quad \frac{60}{4}$$

$$4x_4 \quad 60 \quad 25$$
$$x_4 \quad \frac{60 \quad 25}{4}$$

$$x_4 \quad 375$$

So the missing entries are

60	120	180	225	300	375
4	8	12	15	20	25

(b)
$$\frac{90}{45} \quad \frac{2}{1}$$

$$\frac{x_1}{3.5} \quad \frac{2}{1}$$

$$x_1 \quad 3.5 \quad 2 \quad 7$$
$$\frac{x_2}{6.5} \quad \frac{2}{1}$$

$$x_2 \quad 6.5 \quad 2 \quad 13$$
$$\frac{15}{x_3} \quad \frac{2}{1}$$

$$15x_1 \quad 2x_3$$

$$x_3 \quad \frac{15}{2} \quad 7.5$$

$$\frac{x_4}{9.25} \quad \frac{2}{1}$$

$$x_4 \quad 2 \quad 9.25$$
$$x_4 \quad 18.5$$
$$\frac{26.5}{x_5} \quad \frac{2}{1}$$

$$26.5 \quad 2 \quad x_5$$
$$x_5 \quad \frac{26.5}{2}$$

$$x_5 \quad 13.25$$

So the missing entries are.

x	7	9	13	15	18.5	26.5
y	3.5	4.5	6.5	7.5	9.25	13.25

4. Cost of 15 note books is ₹ 240

Cost of books ₹	Number of note book
240	15

$$\frac{240}{160} \quad \frac{15}{x} \qquad \text{(cross multiply)}$$
$$240 \quad x \quad 15 \quad 160$$
$$x \quad \frac{15 \quad 160}{240} \quad 10$$

Thus, 10 note books can be buy for ₹ 160.

5. 20 litres petrol consumed for 115 km.

Distance (km)	Petrol (litres)
115	20

$$\frac{115}{345} \quad \frac{20}{x} \qquad \text{(cross multiply)}$$
$$115x \quad 345 \quad 20$$
$$x \quad \frac{345 \quad 20}{115} \quad 60$$

60 litres used for 345 km.

6. 110 metres distance covered in 130 minutes

Distance	Time taken
110	130
275	x

$$\frac{110}{275} \quad \frac{130}{x}$$

$$110x = 130 \times 275$$
$$x = \frac{130 \times 275}{110} = 325 \text{ minutes}$$

Thus, Ansh takes 325 minutes to walk a distance of 275 metres.

7. Average speed of train $= 70\,\text{km/h}$

   Time taken $= 25$ mintes $= \frac{25}{60}$ hour

   Distance $=$ speed × time taken

   $$= 70 \times \frac{25}{60} = 29.11\,\text{km}$$

8.

No of battles	Coustmer
5	8
x	32

   $$\frac{5}{x} = \frac{8}{32}$$
   $$5 \times 32 = 8x$$
   $$\frac{160}{8} = x = 20$$

   20 Bottles are required to make 32 serving.

9.

Us dollars	Rupees (₹)
150	7425
250	x

   $$\frac{150}{250} = \frac{7425}{x}$$
   $$150x = 7425 \times 250$$
   $$x = \frac{7425 \times 250}{150} = ₹12375$$

   ₹ 12375 will be the worth of 250 us dollars.

10. 8 women $=$ 5 men

    1 women $= \frac{5}{8}$ men

    12 women $= \frac{5}{8} \times 12 = 7.5$ men

    12 women and 8 men $= (7.5 + 8)$ men $= 15.5$ men

No of men	Earning (in ₹)
5	625
15.5	x

    $$\frac{5}{15.5} = \frac{625}{x}$$
    $$5 \times x = 625 \times 15.5$$
    $$x = \frac{625 \times 15.5}{5} = 1937.5$$

Exercise 5.2

1. (a)

Number of burger	x	10
Cost of per burger	y	15

   Here with the increase in x the y also deceases in the same manner.

It is an inverse variation.

(b)

Number of workers x	5	10
Time taken y	2	1

Here with the increase in x the y also decease in the same manner.
It is a inverse variation.

(c)

Petrol used (l)	5	6.
Distance (km)	2	3

Here we increase in x the y is also increase in the same manner.
It is not a inverse variation.

(d)

Number of children	5	10
Amount o food conceded ₹	100	200

Here we increase in x the y is also increase in the same manner.
It is not a inverse variation.

(e)

Speed x	100	150
Distance y	2	1

Here we increase in x then y is also increase in the same manner.
Here it is a inverse variation.

2. (a) x y 2 16   32; 4   8   32;
   8 4   32; 3 12   36; 12 3   36
   Since the product xy in each case is not the same, x, and y show inverse variation.

   (b) xy 6 10   60; 4 15   60; 12 5   60; 30 2   60; 15 4   60.
   Since the product xy each case in the same x and y show inverse variation.

   (c) xy 42 2   84; 4   21   84; 14 6   84; 7 12   84; 28 3   84
   Since the product xy in each case in the same x and y show inverse variation.

3. (a) x and y nary inversely.

$$45 \quad 2 \quad x_1 \quad 15$$
$$15x_1 \quad 90$$
$$x_1 \quad \frac{90}{15} \quad 6 \qquad\qquad x_1 \quad 6$$

and,
$$45 \quad 2 \quad 10 \quad x_2$$
$$10x_2 \quad 90$$
$$x_2 \quad \frac{90}{10} \quad 9 \qquad\qquad x_2 \quad 9$$

And,
$$x_3 \quad 18 \quad 4 \quad 2$$
$$x_3 \quad \frac{90}{18} \quad 5 \qquad\qquad x_3 \quad 5$$

again
$$45 \quad 2 \quad 30 \quad x_4$$
$$90 \quad 30x_4$$
$$x_4 \quad \frac{90}{30} \quad 3 \qquad\qquad x_4 \quad 3$$

(b) x_1 10 12   20
$$10x_1 \quad 240$$

$$x_1 = \frac{240}{10} = 24 \qquad\qquad x_1 = 24$$

$$12 \times 20 = 16 \times x_2$$
$$240 = 16x_2$$
$$x_2 = \frac{240}{16} = 15 \qquad\qquad x_2 = 15$$

$$12 \times 20 = x_3 \times 30$$
$$240 = 30x_3$$
$$x_3 = \frac{240}{30} = 8 \qquad\qquad x_3 = 8$$

again ;
$$12 \times 20 = x_4 \times 15$$
$$15x_4 = 240$$
$$x_4 = \frac{240}{15} = 16 \qquad\qquad x_4 = 16$$

4.

No of students	Days
200	30
300	x

$$\frac{200}{300} = \frac{x}{30} \text{ (cross multiply)}$$
$$300x = 200 \times 30$$
$$x = \frac{200 \times 30}{300} = 20 \, \text{days}$$

5.

reading pages	finish book
8	15
x	10

$$\frac{15}{10} = \frac{x}{8} \text{ (cross multiply)}$$
$$10x = 15 \times 18$$
$$x = \frac{15 \times 8}{10} = 12 \, \text{pages}$$

6.

No of children	chocolates
8	5
10	x

$$\frac{8}{10} = \frac{x}{5} \text{ (cross multiply)}$$
$$10x = 8 \times 5$$
$$x = \frac{40}{10} = 4 \, \text{chocolates}$$

7.

Spraying machines	times taken (min)
5	36
2	x

$$\frac{5}{2} = \frac{x}{36}$$
$$2x = 36 \times 5$$
$$x = \frac{36 \times 5}{2} = 90 \, \text{minutes.}$$

8.

Time consumed (hours)	pumps
24	5
6	x

$$\frac{24}{6} = \frac{x}{5} \quad \text{(cross multiple)}$$

$$6 \times x = 24 \times 5$$

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

9. Speed (km/h)

Speed (km/h)	time taken (hours)
60	9
54	x

$$\frac{60}{54} = \frac{x}{9}$$

$$60 \times 9 = x \times 54 \quad \text{(cross multiplied)}$$

$$x = \frac{60 \times 9}{54} = 10 \text{ hour}$$

10.

Weight of potatoes (kg)	Cost (₹)
10	18
x	20

$$\frac{18}{20} = \frac{x}{10}$$

$$20x = 18 \times 10$$

$$x = \frac{18 \times 10}{20} = 9 \text{ kg}$$

11.

Packed in boxes	Bottles in each box
25	12
x	20

$$\frac{12}{20} = \frac{x}{25}$$

$$25 \times 12 = 20 \times x$$

$$x = \frac{25 \times 12}{20} = 15 \text{ Packed.}$$

12. (a) $x = 4, y = 6$

x is in inverse variation with y

x_1	y_1	x_2	y_2
4	6	x	12

$$24 = x \times 12$$

$$x = \frac{24}{12} = 2 \Rightarrow x = 2$$

(b) $x = 7, y = 4$

x is in inverse variation with y

x_1	y	x_2	y_2
7	4	2	y_2

$$28 = 2y_2 \qquad y_2 = 14 \qquad y = 12$$

(c)

$$x = 20$$

$$x \times y = 300$$

$$20 \times y = 300$$

$$y = \frac{300}{20} = 15 \qquad\qquad y = 15$$

(d) $\qquad\qquad y = 16$

$\qquad\qquad x \times y = 176$

$\qquad\qquad x \times 16 = 176$

$$x = \frac{176}{16} = 11 \qquad\qquad x = 11$$

Exercise 5.3

1. (a) $83\% = \dfrac{83}{100}$
(b) $38\% = \dfrac{38}{100} = 0.38$
(c) $45\% = \dfrac{\overset{9}{45}}{\underset{20}{100}} = \dfrac{9}{20} = 9:20$

2. (a) 5% of $x = 20$

$\qquad \dfrac{5}{100} \times x = 20$

$\qquad\qquad 5x = 20 \times 100$

$\qquad\qquad x = \dfrac{20 \times 100}{\overset{4}{\underset{1}{5}}}$

$\qquad\qquad x = 400$

(b) 8.5% of $x = 1.615$

$\qquad \dfrac{8.5}{100} \times x = 1.615$

$\qquad\qquad x = \dfrac{1.615 \times 100}{8.5} = 19$

3. Let the number be x.

Then $\qquad 8.5\%$ of $x = 51$

$\qquad\qquad \dfrac{8.5}{100} \times x = 51$

$\qquad\qquad\qquad x = \dfrac{51 \times 100}{8.5} = 600$

4. Let the maximum marks be x.

$\qquad\qquad$ Bharti scored marks $= 410$

$\qquad\qquad$ his percentage of marks $= 82\%$

$\qquad\qquad\qquad 82\%$ of $x = 410$

$\qquad\qquad\qquad \dfrac{82}{100} \times x = 410$

$\qquad\qquad\qquad\qquad x = \dfrac{410 \times 100}{82} = 500$

5. $\qquad$ Jagan's per month income $= ₹ 18000$

$\qquad\qquad$ He spent on rent $= 14\%$ of his income

$\qquad$ He spent on other things $= 54\%$ of his income

$\qquad\qquad$ Total spent $= 14 + 54 = 68\%$ of his income

$\qquad\qquad\qquad$ He saved $= 100 - 68 = 32\%$ of his income

$\qquad\qquad$ He saved per month $= 32\%$ of $₹ 18000$

$\qquad\qquad\qquad\qquad = \dfrac{32}{100} \times 18000 = ₹ 5760$

6. $\qquad\qquad$ Percentage of Men $= 45\%$

$\qquad\qquad$ Percentage of Women $= 30\%$

$\qquad$ Percentage of Children $= 100 - (45 + 30)$

$\qquad\qquad\qquad = 100 - 75 = 25\%$

7. Boy's percentage = 60%

Number of girls = 120,

Let total no. of students be x.

$$60\% \text{ of } x = 120 = x$$

$$\frac{60}{100}x = 120 = x \qquad\qquad \frac{3x}{5} = 120 = x$$

$$120 = x - \frac{3x}{5} \qquad\qquad 120 = \frac{5x - 3x}{5}$$

$$120 = \frac{2x}{5}$$

$$x = \frac{120 \times 5}{2} = 60 \times 5 = 300.$$

8.

Percentage of copper = 20%

Percentage of Zinc = 35%

rest (Nickel) = $100 - (20 + 35) = 100 - 55 = 45\%$

Quantity of nickel in the allow = 45% of 1.5 kg

$$= \frac{45}{100} \times 1.5 \times 1000 \,\text{gm} = 45 \times 15 = 675 \,\text{gm}.$$

9. Let the school was open for x days in a year.

Rajant went to school for = 260 days

his attendance was = 80%

$$80\% \text{ of } x = 260 \qquad\qquad \frac{80 \overset{4}{x}}{\underset{5}{100}} = 260$$

$$\frac{4x}{5} = 260 \qquad\qquad x = \frac{5 \times 260}{4} = 325.$$

10.

Suppose Bharat's income = ₹ 100

Amar's income = ₹ (100 − 20) = ₹ 80

If Amar's income is ₹ 80, then Bharat's income = ₹ 100

If marA's income is ₹ 1, then Bharat's income = ₹ $\dfrac{100}{80}$

If Amar's income is ₹ 100, then Bharat's income = ₹ $\dfrac{100}{80} \times 100$ = ₹ 125

Bharat's income is (125 − 100) = 25% more

11.

Suppose the price of the item was = ₹ 100

Company reduces the price = 5%

New price of the item = ₹ $\left(100 - \dfrac{100 \times 5}{100}\right)$ = ₹ 95

Then, C.P. of the item for retailer = ₹ 95

Let the percentage of x increment to sell the item for old price.

then $\qquad\qquad 95 + \dfrac{95 \times x}{100} = 100$

or $\qquad\qquad \dfrac{9500 + 95x}{100} = 100$

or $\qquad\qquad 95x = 10000 - 9500$

$$x = \frac{500}{95} = \frac{100}{19} = 5\frac{5}{19}\%$$

12. Let third person (C) gets $= ₹\, x$

Then, second person (B) gets $= 50\%$ of $x = \dfrac{50 \times x}{100} = ₹\, \dfrac{x}{2}$

and first person (A) gets $= 50\%$ of $\dfrac{x}{2} = \dfrac{50}{100} \times \dfrac{x}{2} = ₹\, \dfrac{x}{4}$

$$x + \frac{x}{2} + \frac{x}{4} = ₹\, 3500$$

$$\frac{4x + 2x + x}{4} = ₹\, 3500$$

$$\frac{7x}{4} = 3500$$

$$x = \frac{\overset{500}{3500} \times 4}{7} = 500 \times 4 = 2000$$

A gets $= ₹\, \dfrac{2000}{4} = ₹\, 500$

B gets $= ₹\, \dfrac{2000}{2} = ₹\, 1000$

C gets $= ₹\, 2000$

13. Let the total votes were $= x$

(a) Winner candidate got $= 53\%$ of x

Winner candidate got $= \dfrac{53}{100} \times x = \dfrac{53x}{100}$

His opponent candidate got $= 31\%$ of x

$$\frac{31}{100}x = 31000$$

$$x = \frac{31000 \times 100}{31} = 100000$$

(b) Winner candidate got $= \dfrac{53}{100} \times 100000 = 53000$

Now, the winning margin $= 53000 - 31000 = 22000$

14. Let the number $= 100$

Number after the increment of 40% $= 100 + 40 = 140$

Decreament in the new number $= 40\%$ of 140

$$= \frac{40}{100} \times 140 = 56$$

Final number $= 140 - 56 = 84$

Net decrease $= 100 - 84 = 16$

Hence, there is a net decrease of 16%.

Exercise 5.4

1. A can do a piece of work in $= 10$ days

Work done by A in 1 day $= \dfrac{1}{10}$

Similarly, work done by B in 1 day $= \dfrac{1}{15}$

work done by $(A \quad B)$ together in 1 day $\dfrac{1}{10} \quad \dfrac{1}{15} \quad \dfrac{3 \quad 2}{30} \quad \dfrac{5}{30} \quad \dfrac{1}{6}$

$(A \quad B)$ will do the work together in $\dfrac{1}{\frac{1}{6}} \quad 6\,\text{days.}$

2. A can finish a work in $= 18$ days

B can finish a work in $\dfrac{A}{2}$ day $\dfrac{18}{2}$ days $= 9$ days

Work done by A in 1 day $\dfrac{1}{18}$

Work done by B in 1 day $\dfrac{1}{9}$

Work done by $(A \quad B)$ together in 1 day $\dfrac{1}{18} \quad \dfrac{1}{9} \quad \dfrac{1 \quad 2}{18} \quad \dfrac{3}{18} \quad \dfrac{1}{6}$

They can finish together $\dfrac{1}{6}$ part of the work in a day.

3.   Man can do a piece of work in $= 5$ days

(Man + Son) together can do the same work in $= 3$ days

Work done by man in 1 day $\dfrac{1}{5}$ part

Work done by (Man + Son) in 1 day $\dfrac{1}{3}$

Work done in only son in 1 day $\dfrac{1}{3} \quad \dfrac{1}{5} \quad \dfrac{5 \quad 3}{15} \quad \dfrac{2}{15}$

Son can do the work in $\dfrac{1}{\frac{2}{15}} \quad \dfrac{15}{2} \quad 7\dfrac{1}{2}$ days

4. A can do a job in $= 16$ days

B can do the same job in $= 12$ days

$A \quad B \quad C$ can do the job $= 4$ days

Work done by A in day $\dfrac{1}{16}$

Work done by B in 1 day $\dfrac{1}{12}$

Work done by $(A \quad B \quad C)$ in 1 day $\dfrac{1}{4}$

Work done by C in 1 day   Work done by $(A \quad B \quad C)$ in 1 day

– work done by $(A \quad B)$ in 1 day

$\dfrac{1}{4} \quad \dfrac{1}{16} \quad \dfrac{1}{12} \quad \dfrac{12 \quad 3 \quad 4}{48} \quad \dfrac{12 \quad 7}{48} \quad \dfrac{5}{48}$

C alone can do the job $\dfrac{1}{\frac{5}{48}} \quad \dfrac{48}{5}$ days $\quad 9\dfrac{3}{5}$ days.

5. $\dfrac{1}{4}$ part of the work done by P in $= 10$ days

Whole part, i.e. 1 work done by P completely in $\quad 10 \quad 4 \quad 40$ days

63

40% part of the work done by Q in = 15 days

Whole part i.e. 1 work done by Q completely in $\dfrac{15 \times 100}{40} = 37\dfrac{1}{2}$ days.

$\dfrac{1}{3}$ part of the work done by Q = 13 days

Whole part i.e., 1 work done by R in = 13 × 3 = 39 days

Since Q takes less time (i.e., number of days) to complete the work therefore, Q will complete the work first.

6. No. of pages that Mohan type in 6 hours = 32

No. of pages that Sohan type in 1 hours = $\dfrac{32}{6} = \dfrac{16}{3}$

No. of page that Elan type in 5 hours = 40

No. of that Elan type in 1 hours = $\dfrac{40}{5} = 8$

No. of pages that they type together in 1 hour = $\dfrac{16}{3} + 8 = \dfrac{16 + 24}{3} = \dfrac{40}{3}$

Time taken by both to type $\dfrac{40}{3}$ pages = 1 hour

Time taken by both to type 1 page = $\dfrac{3}{40}$ hours

and time taken by both to type 110 pages = $\dfrac{3}{40} \times 110$ hours = $\dfrac{33}{4} = 8\dfrac{1}{4}$ hours.

7. Work done by $(A + B)$ in 1 day = $\dfrac{1}{72}$ part

Work done by $(B + C)$ in 1 day = $\dfrac{1}{120}$ part

Work done by $(C + A)$ in 1 day = $\dfrac{1}{90}$ part

Work done by $2(A + B + C)$ in 1 day = $\dfrac{1}{72} + \dfrac{1}{120} + \dfrac{1}{90} = \dfrac{5 + 3 + 4}{360}$

$= \dfrac{12}{360} = \dfrac{1}{30}$ part

Work done by $(A + B + C)$ in 1 day = $\dfrac{1}{2} \times \dfrac{1}{30} = \dfrac{1}{60}$ part

Work done by A in 1 day = $\dfrac{1}{60} - \dfrac{1}{120} = \dfrac{2 - 1}{120} = \dfrac{1}{120}$ part

A will complete the work in $\dfrac{1}{\frac{1}{120}} = 120$ days.

Work done by B in 1 day = $\dfrac{1}{60} - \dfrac{1}{90} = \dfrac{3 - 2}{180} = \dfrac{1}{180}$ part

B will complete the work in $\dfrac{1}{\frac{1}{180}} = 180$ days

Work done by C in 1 day = $\dfrac{1}{60} - \dfrac{1}{72} = \dfrac{6 - 5}{360} = \dfrac{1}{360}$ part

C will complete the work in $\dfrac{1}{\dfrac{1}{360}}=360$ days.

8.

Work done by A in 1 day $=\dfrac{1}{15}$ part

Work done by B in 1 day $=\dfrac{1}{20}$ part

Work done by $(A+B)$ together in 1 day $=\dfrac{1}{15}+\dfrac{1}{20}=\dfrac{4+3}{60}=\dfrac{7}{60}$ part

Work done by $(A+B)$ together in 4 days $=\dfrac{7}{60}\times4=\dfrac{7}{15}$ part

Remaining part $=1-\dfrac{7}{15}=\dfrac{8}{15}$ part

$\dfrac{8}{15}$ part of the work is left

9.

Work done by A in 5 days $=\dfrac{1}{3}$ part

Work done by A in 1 day $=\dfrac{1}{3\times5}=\dfrac{1}{15}$ part

Work done by B in 10 days $=\dfrac{2}{3}$ part

Work done by B in 1 day $=\dfrac{2}{3\times10}=\dfrac{2}{30}=\dfrac{1}{15}$ part

Work done by $(A+B)$ in 1 day $=\dfrac{1}{15}+\dfrac{1}{15}=\dfrac{2}{15}$

$(A+B)$ both can do the work in $=\dfrac{1}{\dfrac{2}{15}}=\dfrac{15}{2}$ days $=7\dfrac{1}{2}$ days.

10.

A pipe can fill the tank in 1 hour $=\dfrac{1}{16}$

Work done by (pipe + leak) in 1 hour $=\dfrac{1}{24}$

Work done by leak to empty the tank in 1 hour $=\dfrac{1}{16}-\dfrac{1}{24}=\dfrac{3-2}{48}=\dfrac{1}{48}$

Time taken by leak to empty the filled tank $=\dfrac{1}{\dfrac{1}{48}}=48.$

11. Number of tank that a tap can fill in 6 hour = 1 tank

Number of tank that a tap can fill in 1 hour $=\dfrac{1}{6}$ tank

After half the tank is filled three more similar taps are opened
So, there are 4 taps

Part of tank filled by 1 tap in 1 hour $=\dfrac{1}{6}$ part

Part of tank filled by 4 taps in 1 hour $=\dfrac{1}{6}\times4=\dfrac{4}{6}=\dfrac{2}{3}$ part

Then, time taken by 4 taps to fill $\frac{2}{3}$ part of tank = 1 hour

Time taken by 4 taps to 1/2 part of tank

$$\frac{1}{2} \quad 3 \text{ time taken by 4 taps to } \frac{1}{2} \text{ part of tank}$$

$$\frac{3}{2} \quad \frac{1}{2} \quad \frac{3}{4} \text{ hours.}$$

Exercise 5.5

1. Cost of the car   ₹ 60,000

Spent on its repairing   ₹ 10,000

      Total C.P.   ₹ 60,000 + ₹ 10,000   ₹ 70,000

      S.P.   ₹ 77,000

      gain   S.P. – C.P.

          ₹ 77,000 – ₹ 70,000

          ₹ 7000

      gain % $\dfrac{gain}{C.P.}$ 100 $\dfrac{7000}{70000}$ 100   10%

2. C.P. of T.V.   ₹ 6,000

      loss = 15% ; S.P. of T.V. =?

      S.P.   C.P. $\dfrac{100 \quad loss\,\%}{100}$

         ₹ 6000 $\dfrac{100 \quad 15}{100}$ ₹ $\dfrac{6000 \quad 85}{100}$ ₹ 5100

3. Let the C.P. of each pen be ₹ 1.

      S.P. of 15 pens = C.P. of 12 pens

but, C.P. of 12 pens   ₹ 12

      S.P. of 15 pens   ₹ 12 and, C.P. of 15 pens   ₹ 15

Here,   C.P. > S.P.

so   loss = C.P. – S.P.   15   12   ₹ 3

      loss% $\dfrac{loss}{C.P.}$ 100 % $\dfrac{3}{15}$ 100   20%

4. Let C.P. of each book be ₹ 1.

      S.P. of 16 books = C.P. of 17 books

but, C.P. of 17 books   ₹ 17

      S.P. of 16 books   ₹ 17 and C.P. of 16 books   ₹ 16

Here,   S.P. > C.P.

so,   gain   S.P. – C.P.   17   16   ₹1

      gain% $\dfrac{gain}{C.P.}$ 100 $\dfrac{1}{16}$ 100   6.25%

5. Let C.P. of the article   ₹ x

      loss $\dfrac{1}{20}$ x ₹ $\dfrac{x}{20}$

      S.P.   ₹ 6270

by   loss   C.P. – S.P.

      $\dfrac{x}{20}$ x 6270

$$6270 = x - \frac{x}{20}$$

$$6270 = \frac{19x}{20}$$

$$x = \frac{6270 \times 20}{19} = ₹6600$$

6.   C.P. of the wheat $= ₹35000$

Value of spoiled wheat $= \frac{1}{7}$ of $35000 = \frac{35000}{7} = ₹5000$

Value of Good wheat $= ₹35000 - ₹5000 = ₹30000$

gain $= \frac{10}{100} \times 30{,}000 = ₹3000$

loss $= \frac{25}{100} \times 5000 = ₹1250$

Since,   gain $>$ loss

net gain $= 3000 - 1250 = ₹1750$

gain % $= \frac{gain}{C.P.} \times 100 = \frac{1750}{35000} \times 100 = 5\%$

7.   C.P. of 75 kg Mangoes $= ₹30 \times 75 = ₹2250$

C.P. of $\frac{1}{3}$ i.e., 25 kg Mango $= \frac{1}{3} \times 2250 = ₹750$

C.P. of remaining i.e., 50 kg Mangoes $= 2250 - 750 = ₹1500$

S.P. of 25 kg Mangoes + S.P. of 50 kg Mangoes

$= $ S.P. of 75 kg Mangoes.

$\frac{750 \times (100 + 5)}{100} + $ S.P. of 50 kg Mangoes $= \frac{2250 \times (100 + 10)}{100}$

S.P. of 50 kg Mangoes $= \frac{2250 \times 110}{100} - \frac{750 \times 95}{100}$

$= \frac{247500 - 71250}{100} = \frac{176250}{100} = 1762.5$

S.P. of per kg i.e., 1 kg Mangoes $= \frac{1762.5}{50} = ₹35.25$

8.   S.P. of 6 bananas $=$ C.P. of 5 bananas

Let C.P. of each banana $= ₹1$

Then C.P. of 5 bananas $= ₹5$

S.P. of 6 bananas $= ₹5$

but C.P. of 6 bananas $= ₹6$

Since C.P. $>$ S.P. There is a loss.

loss $=$ C.P. $-$ S.P. $= ₹6 - ₹5 = ₹1$

loss % $= \frac{loss}{C.P.} \times 100 = \frac{1}{6} \times 100 = \frac{50}{3} = 16\frac{2}{3}\%$

9.   Total C.P. of 5 fans $= ₹4050 + 50 = ₹4100$

gain $= 15\%$, S.P. $= ?$

S.P. of 5 fans $= \frac{C.P.\ of\ 5\ Fans \times (100 + gain\ \%)}{100}$

$= \frac{₹4100 \times (100 + 15)}{100} = ₹41 \times 115 = ₹4715$

$$\text{S.P. of 1 fan} = \frac{₹4715}{5} = ₹943$$

10. Let C.P. of a calculator fan $= ₹x$

 gain $= \frac{1}{8}$ of $x = ₹\frac{x}{8}$

 S.P. of a calculator fan $= ₹1152$

 gain $=$ S.P. $-$ C.P.

 $\frac{x}{8} = 1152 - x$ $\frac{x}{8} + x = 1152$

 $\frac{9x}{8} = 1152$ $x = \dfrac{\overset{128}{\cancel{1152}} \times 8}{9} = 128 \times 8 = 1024$

 C.P. of a calculator fan $= ₹1024$

11. Let C.P. of the article $= ₹x$

 then, $(114\% \text{ of } x - 110\% \text{ of } x) = ₹65$

  $\frac{114}{100} \times x - \frac{110}{100} \times x = ₹65$

   $\frac{114x - 110x}{100} = 65$

    $4x = 65 \times 100$

     $x = \frac{65 \times 100}{4} = ₹1625$

12.   Total bought eggs $= 200$

       Broken eggs $= 38$

      Remaining eggs $= 200 - 38 = 162$

     Let C.P. of each eggs $= ₹1$

    then, C.P. of 200 eggs $= ₹200$ and C.P. of 162 eggs $= ₹162$

  S.P. of one dozen (i.e., 12) eggs $= ₹48$

       S.P. of 1 egg $= ₹\frac{48}{12} = ₹4$

 and   S.P. on 162 egg $= ₹4 \times 162 = ₹648$

        gain $= 8\%$

       C.P. $= \frac{\text{S.P.} \times 100}{(100 + P\%)} = \frac{648 \times 100}{108} = ₹600$

13. Let Rice of the sugar before reduction $= ₹x$ per kg

 Now, price of sugar $= \frac{x \times 80}{100} = ₹\frac{4x}{5}$ per kg

 $\frac{160}{\frac{4x}{5}} - \frac{160}{x} = 5$ $\frac{5 \times 160}{4x} - \frac{160}{x} = 5$

 $\frac{800 - 640}{4x} = 5$ $\frac{160}{4x} = 5$

   $160 = 20x$ $x = \frac{160}{20} = 8$

 The reduced price $= 80\%$ of 8 kg $= \frac{80}{100} \times 8\,\text{kg} = ₹6.40$ per kg.

14. $P =$ S.P. of 100 toys $-$ C.P. of 100 toys

S.P. of 20 toys = S.P. of 100 toys – C.P. of 100 toys

C.P. of 100 toys = S.P. of 100 toys – S.P. of 20 toys

C.P. of 100 toys = S.P. of 80 toys

Let C.P. of 1 toys $= ₹1$

C.P. of 100 toys $= ₹100 =$ s.P. of 80 toys

S.P. of 80 toys $= ₹100$

S.P. of 1 toys $= ₹\dfrac{100}{800} = ₹\dfrac{5}{4}$

$P = $ S.P. of 1 toy – C.P. of 1 toy

$= ₹\dfrac{5}{4} - ₹1 = ₹\dfrac{5}{4} - 1 = ₹\dfrac{1}{4}$

$P\% = \dfrac{P}{C.P.} \times 100\% = \dfrac{\frac{1}{4}}{1} \times 100 = 25\%$

15. Let the merchant mixes 3 kg and 2 kg of rice of both respectively.

Total weight = 3 kg + 2 kg = 5 kg

C.P. of 5 kg rice $= ₹(35 \times 3 + 45 \times 2) = ₹195$

S.P. of 5 kg rice $= ₹(41.60 \times 5) = ₹208$

So, $P = $ S.P. – C.P. $= ₹208 - ₹195 = ₹13$

$P\% = \dfrac{P}{C.P.} \times 100\% = \dfrac{13}{195} \times 100 = \dfrac{1300}{195} = 6.66\%$

16. Given : Loss = C.P. of 45 apples – S.P. of 45 apples

S.P. of 3 apples = C.P. of 45 apples – S.P. of 45 apples

S.P. of 48 apples = C.P. of 45 apples

Let C.P. of each apple $= ₹1$

S.P. of 48 apples $= ₹45$

Loss = C.P. – S.P. $= ₹48 - ₹45 = ₹3$

Loss % $= \dfrac{\text{Loss}}{\text{C.P.}} \times 100 = \dfrac{3}{48} \times 100 = \dfrac{100}{16} = 6.25\%$

17. Correct weight = 1 kg = 1000 gm

False weight = 900 gm

error $= 1000 - 900 = 100$ gm

$P = \dfrac{\text{error}}{\text{correct wt.} - \text{error}} \times 100\%$

$= \dfrac{100 \times 100}{1000 - 100} = \dfrac{100 \times 100}{900} = \dfrac{100}{9} = 11\dfrac{1}{9}\%$

18. S.P. $= 200 \times \dfrac{100 - 10}{100} = \dfrac{200 \times 90}{100} = ₹180$

After 5% further reduction, the new S.P. $= 180 \times \dfrac{100 - 5}{100} = \dfrac{180 \times 95}{100} = ₹171$

19. Selling price of one rice quintal $= ₹896$

Profit $= 12\%$

Cost price $= \dfrac{100}{100 + \text{Gain}} \times SP = CP = ₹\dfrac{100}{100 + 12} \times 896$

$$₹\frac{100 \times 896}{112} = ₹\,800$$

Cost price of 100 kg rice	₹ 800
Cost price of 1 kg rice	$₹\frac{800}{100} = ₹\,8$
Selling price of one quintal sugar	₹ 896
coss	44%

$$\text{Cost price} = \frac{100}{100 - \text{Loss}} \times SP \quad CP = \frac{100}{100 - 44} \times 896 = ₹\frac{89600}{56} = ₹\,1600$$

Cost price of 100 kg sugar	₹ 1600
Cost price of 1 kg sugar	₹ 16
Selling price of 1 kg rice	$₹\frac{896}{100} = ₹\,8.96$
Selling price of 1 kg sugar	$₹\frac{896}{100} = ₹\,8.96$
Cost price of $(1+1)$ kg rice and sugar	$₹(8+16) = ₹\,24$
Selling price $(1+1)$ kg rice and sugar	$₹(8.96+8.96) = ₹\,17.92$
Profit	$₹(24-17.92) = ₹\,6.08$
Profit %	$\dfrac{\text{Profit} \times 100}{\text{Cost price}}$

$$= \frac{6.08 \times 100}{24} = \frac{76}{3}\%$$

$$= 25\frac{1}{3}\%$$

20. Let cost price of wrist watch $= ₹\,x$

selling price $= ₹\,990$; gain $= ₹\frac{x}{8}$

Gain	S.P. − C.P.
$\dfrac{x}{8}$	$990 - x$
$\dfrac{x}{8} + x$	990
$\dfrac{x + 8x}{8}$	990
$\dfrac{9x}{8}$	990
x	$\dfrac{990 \times 8}{9} = ₹\,880$

Hence cost price of wrist watch $= ₹\,880$

Profit $= ₹(990 - 880) = ₹\,110$

Profit percent $= \dfrac{\text{Profit} \times 100}{\text{Cost price}}$

$$= \frac{110 \times 100}{880} = 12.5\%$$

21. Let cost price of Laptop $= ₹\,x$

Selling price of Laptop $= ₹\,x \times \dfrac{6}{5} = ₹\frac{6x}{5}$

$$\text{Profit} = ₹ \frac{6x}{5} - x = ₹ \frac{x}{5}$$

$$\% \text{ profit} = \frac{x/5}{x} \times 100 = 20\%$$

22. Let cost price of one fan $= ₹ x$

other fan $= ₹ (3120 - x)$

profit of one fan $= ₹ x \times \frac{36}{100} = ₹ \frac{36}{100} x$

selling price $= ₹ x + \frac{36x}{100} = \frac{136x}{100}$ (SP = CP + Profit)

Loss on other fan $= ₹ (3120 - x) \times \frac{15}{100}$

$$= ₹ \frac{46800 - 15x}{100}$$

$$= ₹ \frac{46800 - 15x}{100} \quad (SP = CP - Loess)$$

Selling price $= (3120 - x) - \frac{(46800 - 15x)}{100}$

$$= \frac{31200 - 100x - 46800 + 15x}{100}$$

$$= \frac{265200 - 85x}{100}$$

According to question ; $\frac{136x}{100} = \frac{265200 - 85x}{100}$

$$136x = 265200 - 85x$$

$$136x + 85x = 265200$$

$$221x = 265200$$

$$x = \frac{265200}{221} = ₹ 1200$$

Cost price of one fan $= ₹ 1200$

Cost price of other fan $= ₹ (3120 - 1200) = ₹ 1920$

Exercise 5.6

1. Let the C.P. be ₹ 100.

Then M.P. $= ₹ 100 + 20\% \text{ of } ₹ 100 = 100 + 20 = ₹ 120$

Discount $= 10\% \text{ of M.P.} = ₹ 120 \times \frac{10}{100} = ₹ 12$

S.P. = M.P. – discount $= ₹ 120 - 12 = ₹ 108$

Gain = S.P. – C.P. $= ₹ 108 - 100 = ₹ 8$

Gain $\% = \frac{\text{Gain}}{\text{C.P.}} \times 100 = \frac{8}{100} \times 100 = 8\%.$

2. Let C.P. be ₹ x.

Then after 10% loss,

$$\text{S.P.} = x - x \times \frac{10}{100} = \frac{90x}{100},$$

But, given S.P. $= ₹ 5.4$ per kg

$$\frac{90x}{100} = 5.4 \qquad\qquad x = \frac{5.4 \times 100}{90} = ₹6$$

To earn a profit of 20%, the new S.P. would be

$$\text{S.P.} = \text{C.P.} + P \times x \times \frac{20}{100}$$

$$\frac{120x}{100} = \frac{120}{100} \times 6 = \frac{72}{10} = ₹7.20$$

3. Discount % = 10 %

Gain % = 26 %

Let C.P.= ₹100 and M.P. = ₹x

$$\text{S.P.} = \text{C.P.} + \text{Gain}$$
$$= 100 + 126 = ₹126$$

and $\qquad$ S.P. = M.P. – 10% of M.P.

keâ $\qquad\qquad = x - \frac{10x}{100} = \frac{90x}{100}$

$$90\% \text{ of } x = 126$$
$$90\% \text{ of } x = 126$$
$$\frac{90}{100} \times x = 126$$
$$x = \frac{126 \times 100}{90} = ₹140$$

Hence, M.P. = 40% above C.P.

4. Let M.P. = ₹ 100, D = 10 % and P = 20 %

$$\text{Discount} = D \% \text{ of M.P.}$$
$$= \frac{10}{100} \times 100 = ₹10$$

$$\text{S.P.} = \text{M.P.} - \text{Discount}$$
$$\text{S.P.} = 100 - 10 = ₹10$$

then S.P. = ₹ 90

$$\text{C.P.} = \frac{100 \times \text{G.P.}}{100 + P\%} = \frac{100 \times 90}{100 + 20}$$

$$\text{C.P.} = \frac{100}{120} \times 90 = ₹75$$

$$\text{New discount} = \frac{15}{100} \times 100 = ₹15$$

$$\text{New S.P.} = 100 - 15 = ₹85$$
$$P = \text{S.P.} - \text{C.P.} = 85 - 75 = ₹10$$

$$\text{New } P\% = \frac{P}{\text{C.P.}} \times 100 = \frac{10}{75} \times 100 = \frac{40}{3} = 13.33\%$$

5. Let M.P. = ₹x

$$(80\% x) - (75\% \text{ of } x) = ₹500$$

$$5\% \text{ of } x = 500 \qquad\qquad x = \frac{500 \times 100}{5} = ₹10,000$$

Cost price = 80% of 10,000

$$= \frac{80}{100} \times 10,000 = ₹8000.$$

6. Given, $d = 5\%$, Let M.P. $= ₹ x$

$$\text{S.P.} = \text{M.P.} - d \times x = x - \frac{5}{100} \times x = \frac{x}{20} = \frac{19x}{20}$$

C.P. $= ₹ 23.75$

$$\frac{19x}{20} = 23.75$$

$$x = \frac{20 \times 23.75}{19} = 25$$

Hence, M.P. $= ₹ 25$.

7. Let C.P. $= ₹ x$

Then M.P. $= x + \frac{20x}{100} = ₹ \frac{120x}{100}$

$d = 15\%$

$$\text{Discount} = 15\% \text{ of } \frac{120x}{100} = \frac{15}{100} \times \frac{120x}{100}$$

S.P. = M.P. – Discount

$$= \frac{120x}{100} - \frac{15}{100} \times \frac{120x}{100} = \frac{120x}{100}\left(1 - \frac{15}{100}\right)$$

$$= \frac{120x}{100} \times \frac{85}{100} = ₹ 1.02x$$

$$P = \text{S.P.} - \text{C.P.} = ₹ (1.02x - x) = ₹ 0.02x$$

$$P\% = \frac{P}{\text{C.P.}} \times 100 = \frac{0.02x}{x} \times 100 = 2\%$$

8. Let the shopkeeper paid $₹ x$ for it.

$$80 = x + x \times \frac{15}{100} - 11 \qquad 80 + 11 = \frac{115x}{100}$$

$$69 = \frac{115x}{100} \qquad\qquad x = \frac{69 \times 100}{115} = \frac{\overset{60}{6900}}{\underset{1}{115}} = 60$$

$$x = ₹ 60$$

9. Let M.P. $= ₹ x$

$d_1 = 5\%, d_2 = 7\%$

$$d_1 = ₹ \frac{5x}{100} \qquad\qquad\qquad \ldots(1)$$

$$\text{S.P.}_1 = \text{M.P.} - d = x - \frac{5x}{100} = \frac{95x}{100}$$

$$P_1 = \text{S.P}_1 - \text{C.P.} = \frac{95x}{100} - \text{C.P.}$$

$$d_2 = \frac{7x}{100} \qquad\qquad\qquad \ldots(2)$$

$$\text{S.P.}_2 = \text{M.P.} - d_2 = x - \frac{7x}{100} = \frac{93x}{100}$$

$$P_2 = S.P._2 - C.P. = \frac{93x}{100} - C.P. \text{ Now, } P_2 - P_1 = 15$$

$$\frac{95x}{100} - d = 15 \quad \frac{93x}{100} - C.P. \qquad\qquad \frac{95x}{100} - \frac{93x}{100} = 15$$

$$\frac{2x}{100} = 15$$

$$x = \frac{15 \times 100}{2} = 750$$

Hence, the M.P. of the article is ₹ 750.

10. Let C.P. of the table be ₹ x.

$$625 = x + \frac{x \times 20}{100} + 25$$

$$625 - 25 = \frac{120x}{100} \qquad\qquad 600 = \frac{120x}{100}$$

$$x = \frac{600 \times 100}{120} \qquad\qquad x = 500$$

Hence, C.P. of the table is ₹ 500.

11. C.P. of the stationary = ₹ 900

sale tax on it = 6%

Sales tax = 6% of ₹ 900

$$= \frac{6}{100} \times 900 = ₹ 54$$

Hence, Rachit paid ₹ 900 + 54 = ₹ 954 to the shopkeeper.

12. Let printed price of the book = ₹ 100

Then, S.P. = ₹ 90

Now, S.P. = ₹ 90, $P = 12\%$

$$\text{C.P.} = \frac{90 \times 100}{112} = ₹\frac{1125}{14}$$

$$\text{C.P. : M.P.} = \frac{1125}{14} : 100$$

$$= 1125 : 1400 = 45 : 56.$$

13. Given, M.P. of 2 set of bowls = ₹ 399, $P = 14\%$

Let C.P. of one set of bowls = ₹ x

M.P. of 1 set of bowls = ₹ $\frac{399}{2}$ = ₹ 199.5

$$x + x \times \frac{14}{100} = ₹ 199.5$$

$$\frac{114x}{100} = ₹ 199.5$$

$$x = \frac{199.5 \times 100}{114} = \frac{19950}{114} = 175$$

Hence, the shopkeeper paid ₹ 1150 for one set of bowls.

14. Let S.P. (without tax) = ₹ x

$$x + x \times \frac{8}{100} = ₹ 1242$$

$$\frac{108x}{100} = 1242$$

$$x = \frac{1242 \times 100}{108} = \frac{2300}{2} = ₹ 1150$$

Hence, the S.P. (without tax) = ₹ 1150.

15. Let M.P. $= ₹ x$, $d = 5\%$, $g = 10\%$, C.P. $= ₹ 950$

$$\text{S.P.} = \text{C.P.}\left(\frac{100+g\%}{100}\right) = \frac{950 \times 110}{100} = 95 \times 11 = ₹ 1045$$

but, $\qquad$ S.P. $= \text{M.P.} - d = MP\left(1 - \frac{d\%}{100}\right)$

$$1045 = x\left(1 - \frac{5}{100}\right)$$

$$1045 = \frac{95x}{100}$$

$$x = \frac{1045 \times 100}{95} = 11 \times 100$$

$$x = 1100$$

Hence, M.P. of a saree is ₹ 1100.

6 $\qquad$ Compound Interest

Exercise 6.1

1.

Principal for the first year	₹ 2000
R	$= 10\%$
Interest for the first year	$= \frac{PRT}{100} = \frac{2000 \times 10 \times 1}{100} = ₹ 200$
Amount after the end of first year	$= ₹ (2000 + 200)$
Principal for the second fear	$= ₹ 2200 \qquad ₹ \frac{2200 \times 10 \times 1}{100}$
Interest for the second year	$= ₹ 220$
Amount after the end of second year	$= ₹ (2200 + 220) = ₹ 2420$
Compound interest	= Final Amount − Principal
	$= ₹ (2420 - 2000) = ₹ 420$

2.

Principal for the first year	$= ₹ 7,000$; $R = 12\%$
Interest for the first year	$= \frac{P \times R \times T}{100}$
	$= \frac{7000 \times 12 \times 1}{100} = ₹ 840$
Amount after the end of first year	$= ₹ (7000 + 840)$
	$= 7840$
Principal for the second year	$= ₹ 7840$
Interest for the second year	$= ₹ \frac{7840 \times 12}{100} \times 1 = ₹ 940.80$
Amount after the end of first year	$= ₹ (7840 + 940.80) = ₹ 8780.8$
Compound interest	= final Amount − Principal
	$= ₹ (8780.80 - 7000) = ₹ 1780.80$