Statistics

Solution 1:

The ungrouped ferquency distribution table is as follows:

Number of children	Tally marks	Frequency (f)
1											11
2															16
3							6
4			1
	Total	$N = \sum f_i = 34$

Solution 2:

The ungrouped ferquency distribution table is as follows:

Number of saplings	Tally marks	Frequency (f)
2				2
3						5
4									8
5								7
6						4
7					3
8			1
	Total	$N = \sum f_i = 30$

Solution 3:

The grouped ferquency distribution table is as follows:

Class (Marks)	Tally marks	Frequency (f)
11 – 20	|||	3
21 – 30	||||	4
31 – 40	|||| ||||	9
41 – 50	|||| |||| |||| ||||	20
51 – 60	|||| |||| |||	13
61 – 70	||||	5
71 – 80	||	2
	Total	$N = \sum f = 56$

Solution 4:

The grouped ferquency distribution table is as follows:

Class (Units)	Tally marks	Frequency (f)
50 – 70	ⅣⅣ III	8
70 – 90	ⅣⅣ ⅣⅣ I	11
90 – 110	ⅣⅣ ⅣⅣ II	12
110 – 130	ⅣⅣ IIII	9
	Total	$N = \sum f = 40$

Solution 5:

The grouped ferquency distribution table is as follows:

Class (Age)	Tally marks	Frequency (f)
13 – 14	ⅣⅣ IIII	9
14 – 15	ⅣⅣ ⅣⅣ ⅣⅣ ⅣⅣ III	23
15 – 16	ⅣⅣ ⅣⅣ III	13
16 – 17	ⅣⅣ	5
	Total	$N = \sum f = 50$

Solution 6:

The grouped ferquency distribution table is as follows:

Class (Age)	Tally marks	Frequency (f)
110 – 120	III	3
120 – 130	ⅣⅣ ⅣⅣ	10
130 – 140	ⅣⅣ ⅣⅣ I	11
140 – 150	ⅣⅣ ⅣⅣ IIII	14
150 – 160	ⅣⅣ ⅣⅣ	10
	Total	$N = \sum f = 48$

Solution 7:

The grouped ferquency distribution table is as follows:

Class (Rs.)	Tally marks	Frequency (f)
50 – 100	ⅢⅢ Ⅰ	11
100 – 150	ⅢⅢ ⅠⅠ	12
150 – 200	ⅢⅢ ⅠⅠⅠⅠ	14
200 – 250	Ⅲ ⅠⅠⅠ	8
	Total	$N = \sum f = 45$

Exercise – 7.2

Solution 1:

From the given figure, we have
i.   It is a subdivided bar diagram.
ii. There are 20 boys and 50 girls in division D.
iii. There are 30 girls in division B.
iv. Division C has equal number of boys and girls, i.e. 40 boys and 40 girls.
v.   In division A, there are 30 boys and 50 girls.
    Hence the ratio of boys to girls in division A is 30 : 50, i.e. 3 : 5.
vi. Total strength of all divisions = 80 + 70 + 80 + 70 = 300
vii. Numbers of girls in
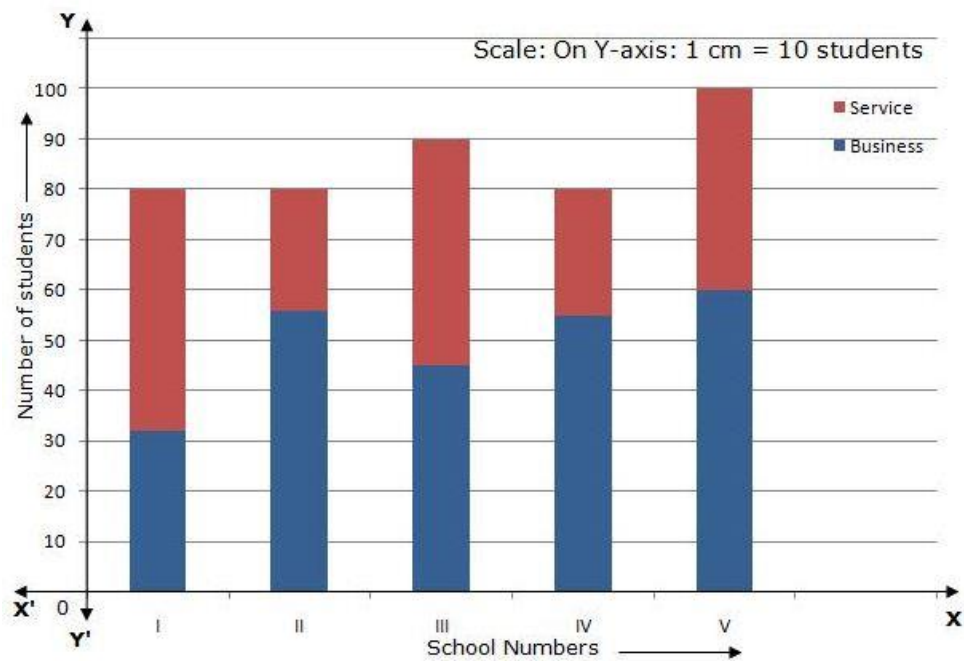   Division A = 50
    Division B = 30
    Division C = 40
    Division D = 50

Thus, the average number of girls from all divisions = $\dfrac{50 + 30 + 40 + 50}{4} = \dfrac{170}{4} = 42.5$

Solution 2:

School numbers	I	II	III	IV	V
Business (No. of students	32	56	45	55	60
Service (No. of students)	48	24	45	25	40
Total no. of students	80	80	90	80	100

The subdivided bar diagram is as follows:

Solution 3:

Year	2004-05	2005-06	2006-07	2007-08
Income	155	162	181	190
Expenditure	148	152	169	172
Total	303	314	350	362

The subdivided bar diagram is as follows:
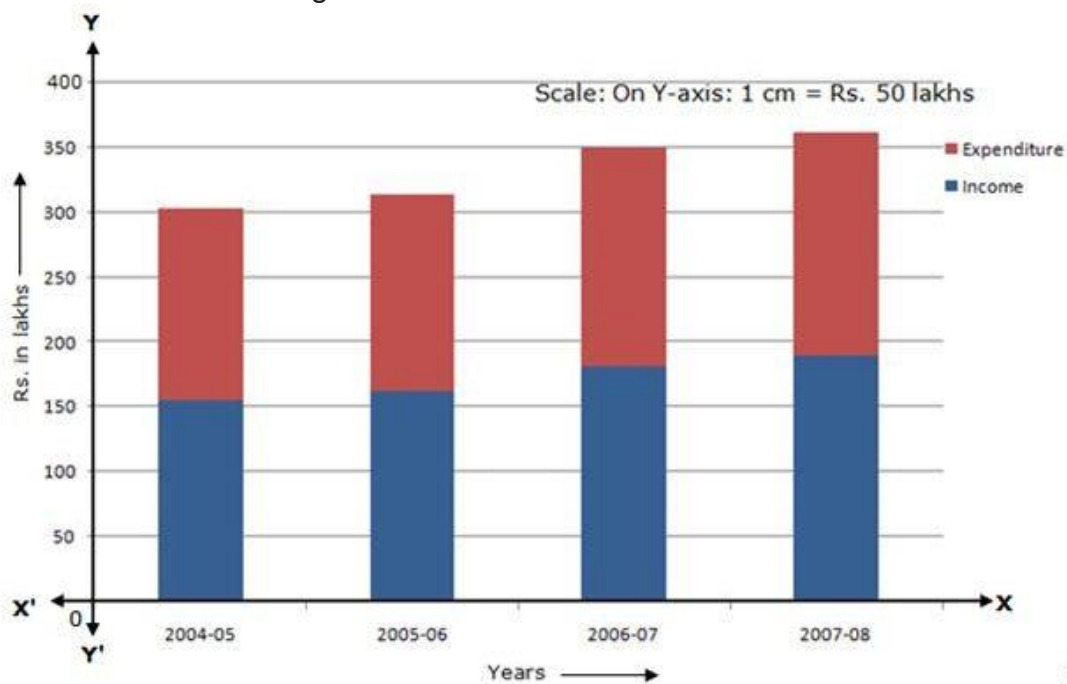
Solution 4:

Cities	Mumbai	Pune	Nagpur	Aurangabad
Black cycles	240	220	180	170
Blue cycles	135	150	230	190
Red cycles	120	140	110	205
Total	495	510	520	565

The subdivided bar diagram is as follows:
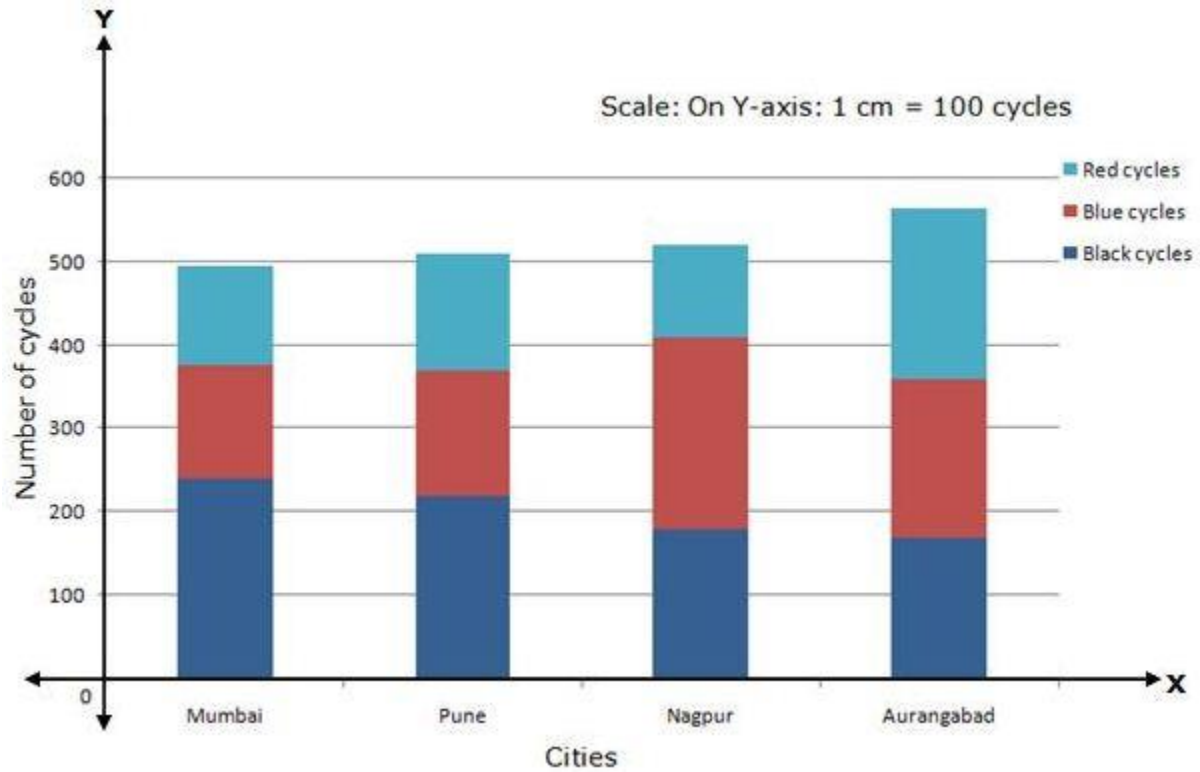
Exercise – 7.3

Solution 1:

From the bar diagram,
i.   It is a percentage bar diagram.
ii. The percentage of boys in division D is 70%.
iii. The percentage of girls in division A is 40%.
iv. Division C has the same percentage of boys and girls,
     i.e. 50% of boys and 50% of girls.
v.   Percentage of girls in
     Division A = 40%
     Division B = 60%
     Division C = 50%
     Division D = 30%

Thus, the average percentage of girls $= \dfrac{40\% + 60\% + 50\% + 30\%}{4} = \dfrac{180\%}{4} = 45\%$

Solution 2:

Percentage of passed students in division A $= \dfrac{44 \times 100}{55} = 80\%$

∴ Percentage of failed students in division A $= (100 - 80)\% = 20\%$

Percentage of passed students in division B $= \dfrac{42 \times 100}{56} = 75\%$

∴ Percentage of failed students in division B $= (100 - 75)\% = 25\%$

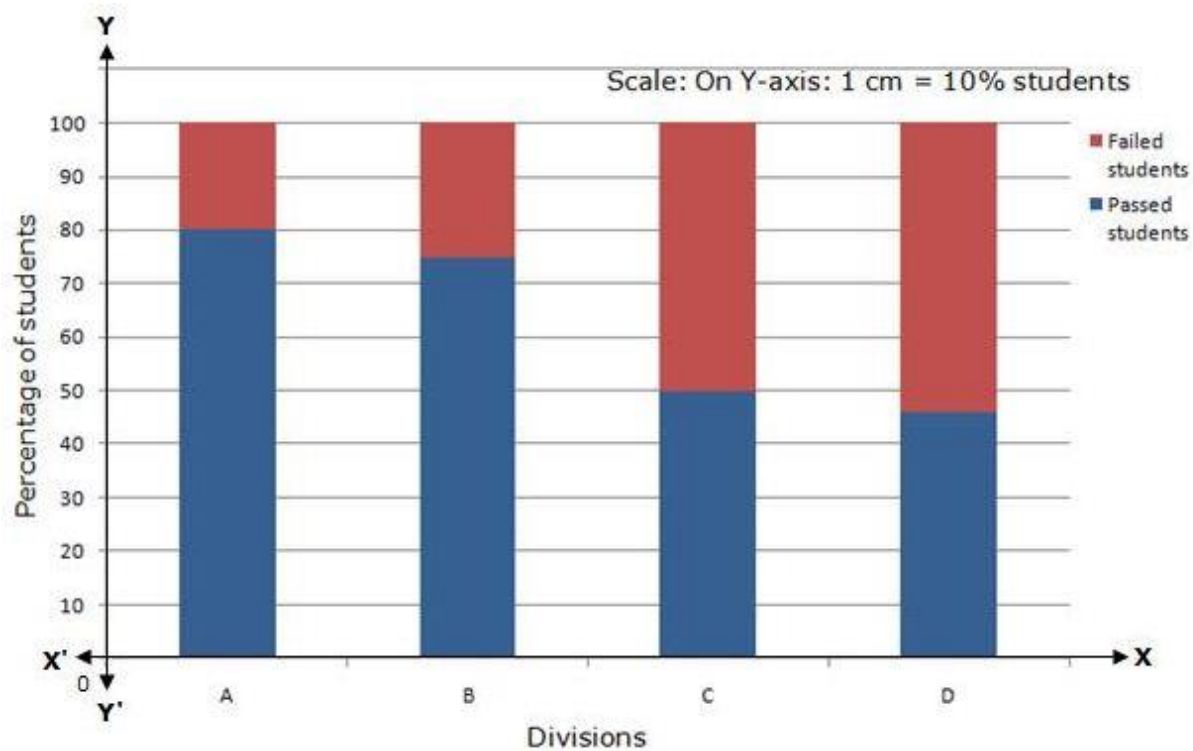Percentage of passed students in division C $= \dfrac{27 \times 100}{54} = 50\%$

∴ Percentage of failed students in division C $= (100 - 50)\% = 50\%$

Percentage of passed students in division D $= \dfrac{23 \times 100}{50} = 46\%$

∴ Percentage of failed students in division D $= (100 - 46)\% = 54\%$

The percentage bar diagram is as follows:

Scale: On Y-axis: 1 cm = 10% students

- Failed students
- Passed students

Solution 3:

Village	Pimpri	Lanji	Savangi	Vadgaon
Literate women	540	760	510	920
Illiterate women	180	190	340	230
Total	720	950	850	1150

Percentage of literate women in Pimpri = $\dfrac{540 \times 100}{720}$ = 75%

∴ Percentage of illiterate women in Pimpri = (100 – 75)% = 25%

Percentage of literate women in Lanji = $\dfrac{760 \times 100}{950}$ = 80%

∴ Percentage of illiterate women in Lanji = (100 – 80)% = 20%

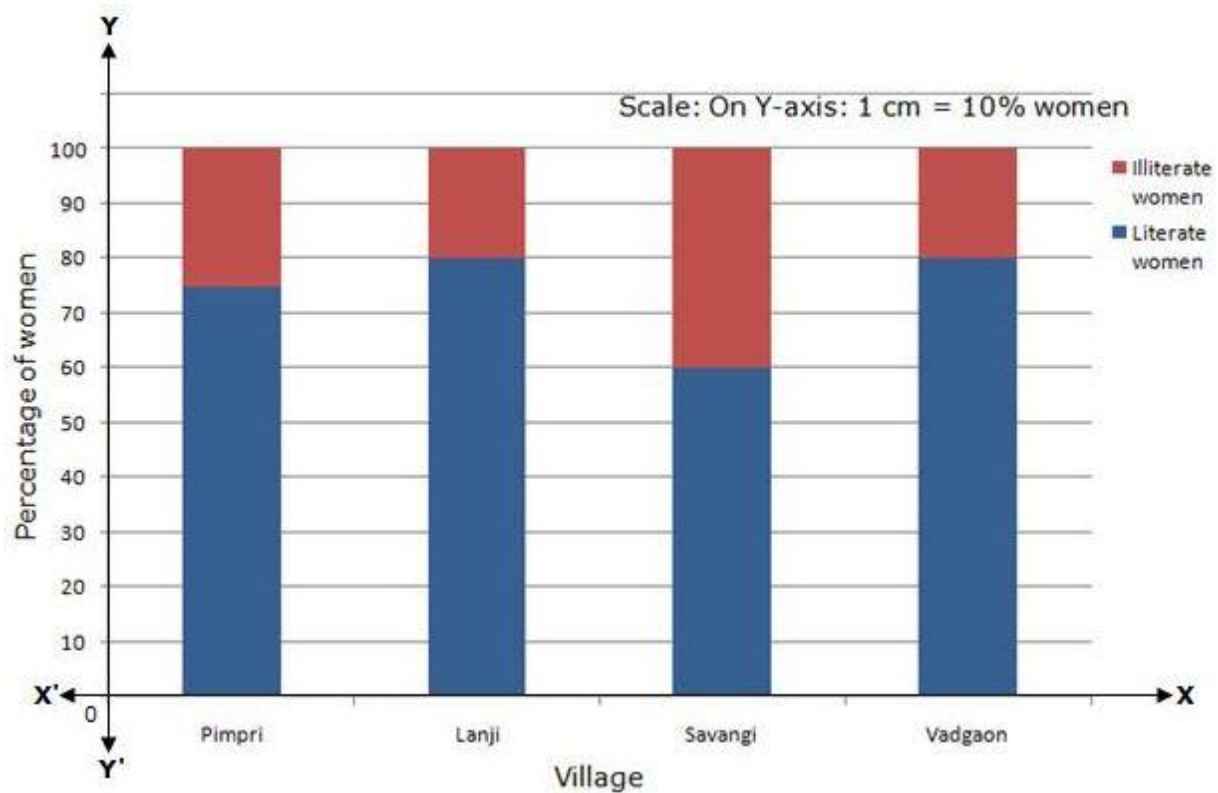Percentage of literate women in Savangi = $\dfrac{510 \times 100}{850}$ = 60%

∴ Percentage of illiterate women in Savangi = (100 – 60)% = 40%

Percentage of literate women in Vadgaon = $\dfrac{920 \times 100}{1150}$ = 80%

∴ Percentage of illiterate women in Vadgaon = (100 – 80)% = 20%

The percentage bar diagram is as follows:

Scale: On Y-axis: 1 cm = 10% women

Legend:
- Illiterate women
- Literate women

Villages: Pimpri, Lanji, Savangi, Vadgaon

Solution 4:

Region	East	West	South	North
Number of females	940	935	930	920
Number of males	1000	1000	1000	1000
Total	1940	1935	1930	1920

Percentage of females in East $= \dfrac{940 \times 100}{1940} = 48.45\% \approx 48\%$

$\therefore$ Percentage of males in East $= (100 - 48)\% = 52\%$

Percentage of females in West $= \dfrac{935 \times 100}{1935} = 48.32 \approx 48\%$

$\therefore$ Percentage of males in West $= (100 - 48)\% = 52\%$

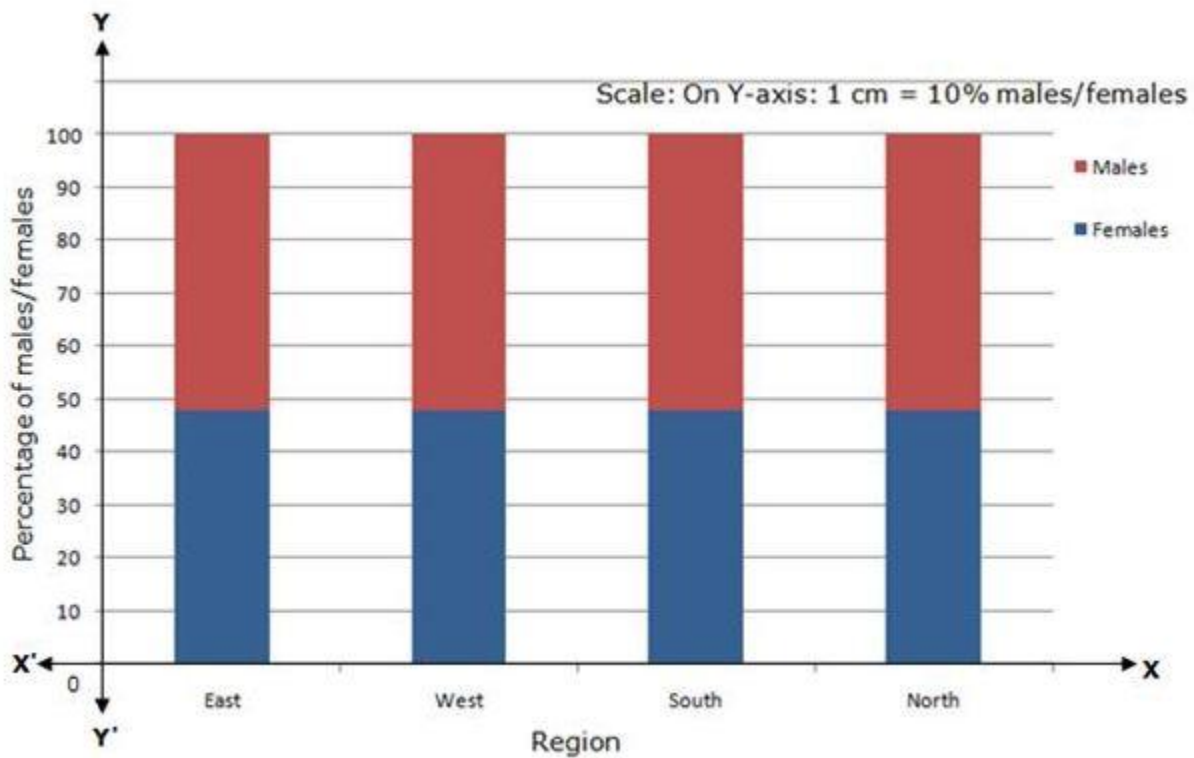Percentage of females in South $= \dfrac{930 \times 100}{1930} = 48.18\% \approx 48\%$

$\therefore$ Percentage of males in East $= (100 - 48)\% = 52\%$

Percentage of females in North $= \dfrac{920 \times 100}{1920} = 47.91 \approx 48\%$

$\therefore$ Percentage of males in North $= (100 - 48)\% = 52\%$

The percentage bar diagram is as follows:

Scale: On Y-axis: 1 cm = 10% males/females

Solution 5:

Village	A	B	C	D
Female	150	240	90	140
Male	225	160	210	110
Total	375	400	300	250

Percentage of females in village A = $\dfrac{150 \times 100}{375}$ = 40%

∴ Percentage of males in village A = (100 − 40)% = 60%

Percentage of females in village B = $\dfrac{240 \times 100}{400}$ = 60%

∴ Percentage of males in village B = (100 − 60)% = 40%

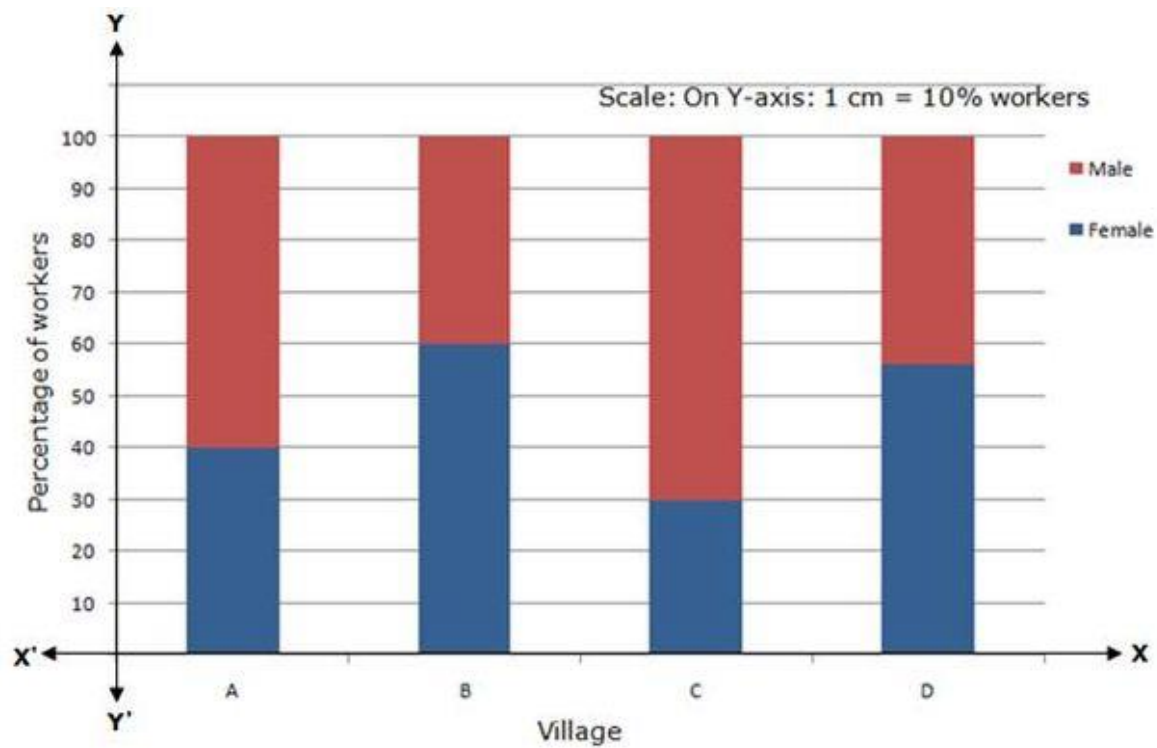Percentage of females in village C = $\dfrac{90 \times 100}{300}$ = 30%

∴ Percentage of males in village C = (100 − 30)% = 70%

Percentage of females in village D = $\dfrac{140 \times 100}{250}$ = 56%

∴ Percentage of males in village D = (100 − 56)% = 44%

The percentage bar diagram is as follows:

Scale: On Y-axis: 1 cm = 10% workers

■ Male

■ Female

Exercise – 7.4

Solution 1:

Given data : 87, 92, 63, 78, 92, 59, 72, 69

Number of observations, n = 8

$$\text{Mean, } \bar{x} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

$$= \frac{87 + 92 + 63 + 78 + 92 + 59 + 72 + 69}{8}$$

$$= \frac{612}{8}$$

$$= 76.5$$

∴ Mean = 76.5

Solution 2:

The data can be represented in a tabular form as below:

x_i	f_i	$f_i x_i$
29	1	29
34	7	238
35	6	210
36	7	252
38	5	190
40	1	40
41	1	41
43	1	43
51	1	51
	$\Sigma f_i = 30$	$\Sigma f_i x_i = 1094$

Mean, $\bar{x} = \dfrac{\Sigma f_i x_i}{\Sigma f_i}$

$= \dfrac{1094}{30}$

$= 36.47$

$\therefore$ Mean $= 36.47$

Solution 3:

Given data : 65, 70, 68, 59, 73, 55
Number of observations, n = 7
Mean $\left(\bar{x}\right)$ of seven numbers = 63

$\therefore$ Sum of seven numbers = 63 × 7 = 441
Sum of given six numbers = 65 + 70 + 68 + 59 + 73 + 55 = 390

$\therefore$ Seventh number = Sum of seven numbers – Sum of six numbers

$\qquad\qquad$ = 441 – 390

$\qquad\qquad$ = 51

$\therefore$ The seventh number is 51.

Solution 4:

Average monthly salary of 20 employees = Rs. 7650

∴ Total monthly salary of 20 employees = Rs. (7650 x 20) = Rs. 1,53,000

When the manager's salary is added, the average salary = Rs. (7650 + 550) = Rs. 8200

∴ Total monthly salary of 21 persons (20 employees + Manager)

   = Rs. (8200 x 21)

   = Rs. 1,72,200

∴ Manager's monthly salary

   = Total monthly salary of 21 persons – Total monthly salary of 20 employees

   = Rs. (172200 – 153000)

   = Rs. 19200

∴ The manager's monthly salary is Rs. 19,200.

Solution 5:

Mean weight of 25 students = 48 kg

∴ Total weight of 25 students = 48 x 25 = 1200 kg

Mean weight of the first 13 students = 50 kg

∴ Total weight of the first 13 students = 50 x 13 = 650 kg

Mean weight of the last 13 students = 46 kg

∴ Total weight of the last 13 students = 46 x 13 = 598 kg

Now, total weight of the first 13 students and last 13 students

= (650 + 598) kg

= 1248 kg

∴ Weight of 13th student

= Total weight of the first 13 students and last 13 students – Total weight of 25 students

= (1248 – 1200) kg

= 48 kg

∴ The weight of the 13th student is 48 kg.

Solution 1:

Given data: 28, 26, 17, 12, 14, 19, 27, 26, 21, 16, 15
Arranging the data in the ascending order:
12, 14, 15, 16, 17, 19, 21, 26, 26, 27, 28.
Here, n = 11 (odd number)

$\therefore$ Median $= \left(\dfrac{n+1}{2}\right)^{th}$ term

$= \left(\dfrac{11+1}{2}\right)^{th}$ term

$= \left(\dfrac{12}{2}\right)^{th}$

$= 6^{th}$ term

$\therefore$ 6th term of the data in the ascending order is 19.
$\therefore$ Median = 19.

Solution 2:

Given data:
53, 37, 39, 51, 46, 42, 44, 47, 55, 48.
Arranging the data in the ascending order:
37, 39, 42, 44, 46, 47, 48, 51, 53, 55
Here, n = 10 (even number)

$\therefore$ Mean of the $\left(\dfrac{n}{2}\right)^{th}$ term and the $\left(\dfrac{n+2}{2}\right)^{th}$ term is the median.

Observation at the $\left(\dfrac{n}{2}\right)^{th}$ term $= \dfrac{10}{2} = 5^{th}$ term

5th term of the data in ascending order is 46.

Observation at $\left(\dfrac{n+2}{2}\right)^{th}$ term $= \left(\dfrac{10+2}{2}\right) = \dfrac{12}{2} = 6^{th}$ term

6th term of the data in the ascending order is 47.

$\therefore$ Median $= \dfrac{46+47}{2} = 46.5$

$\therefore$ Median is 46.5.

Solution 3:

Observations in ascending are

6, 8, 9, 15, x, (x + 2), 21, 22, 25, 29.

Here, n = 10 (even number)

$\therefore$ Mean of the $\left(\dfrac{n}{2}\right)^{th}$ term and the $\left(\dfrac{n+2}{2}\right)^{th}$ term is the median.

Observation at the $\left(\dfrac{n}{2}\right)^{th}$ term = $\dfrac{10}{2}$ = 5th term

5th term of the data in the ascending order is x.

Observation at $\left(\dfrac{n+2}{2}\right)^{th}$ term = $\left(\dfrac{10+2}{2}\right)$ = $\dfrac{12}{2}$ = 6th term

6th term of the data in the ascending order is (x + 2).

$\therefore$ Median = $\dfrac{x + x + 2}{2}$ = $\dfrac{2x + 2}{2}$ = $\dfrac{2(x + 1)}{2}$ = x + 1

But, median = 17 (given)

$\therefore$ x + 1 = 17

$\therefore$ x = 17 – 1

$\therefore$ x = 16

Solution 4:

Weight (kg) x_i	Number of students f_i	c.f. (less than type)
35	6	6
36	5	6 + 5 = 11
38	8	11 + 8 = 19
40	9	19 + 9 = 28
42	2	28 + 2 = 30
44	7	30 + 7 = 37
45	4	37 + 4 = 41
	Total number of students, n = Σf_i = 41	

Here, n = 41 (odd number)

$\therefore$ Median $= \left(\dfrac{n+1}{2}\right)^{th}$ term

$= \left(\dfrac{41+1}{2}\right)^{th}$ term

$= \left(\dfrac{42}{2}\right)^{th}$

$= 21^{st}$ term

Now, 21st term in the cumulative frequency column corresponds to c.f. 28.

And, the weight corresponding to c.f. 28 is 40 kg.

$\therefore$ Median weight is 40 kg.

Solution 5:

Marks x_i	Number of students f_i	c.f. (more than type)
32	6	38 + 6 = 44
27	4	34 + 4 = 38
26	7	27 + 7 = 34
24	9	18 + 9 = 27
23	16	2 + 16 = 18
21	2	2
	$\Sigma f_i = 44$	

Here, $n = 44$ (even number)

$\therefore$ Mean of the $\left(\dfrac{n}{2}\right)^{th}$ term and the $\left(\dfrac{n+2}{2}\right)^{th}$ term is the median.

Observation at the $\left(\dfrac{n}{2}\right)^{th}$ term $= \dfrac{44}{2} = 22^{nd}$ term

22nd term in the cumulative frequency column corresponds to c.f. 27.
And, the marks corresponding to c.f. 27 is 24.

Observation at the $\left(\dfrac{n+2}{2}\right)^{th}$ term $= \left(\dfrac{44+2}{2}\right) = \dfrac{46}{2} = 23^{rd}$ term

23rd term in the cumulative frequency column corresponds to c.f. 27.
Hence, the marks corresponding to c.f. 27 is 24.
$\therefore$ Median of the given data is 24 marks.

Exercise – 7.6

Solution 1:

Arranging the given data in a tabular form, we have

Observations	12	17	18	19	24	27
Frequency	1	1	3	1	1	1

Here, the maximum frequency is 3 and corresponds to observation 18.

$\therefore$ The mode is 18.

Solution 2:

Arranging the given data in a tabular form, we have

Observations	14	17	18	22	23	25	28
Frequency	4	1	3	1	1	1	2

Here, the maximum frequency is 4 and corresponds to observation 14.
$\therefore$ The mode is 14.

Solution 3:

Here, the maximum frequency is 27 and corresponds to the age 19 years.
∴ The mode is 19 years.

Solution 4:

Here, the maximum frequency is 20 and corresponds to height 148 cm.
∴ The mode is 148 cm.

Solution 5:

Here, the maximum frequency is 4 and corresponds to the weights 60 kg and 47 kg.
∴ The modes are 60 kg and 47 kg.

Solution 6:

Here, the maximum frequency is 22 and corresponds to 19 marks.
∴ The mode is 19 marks.