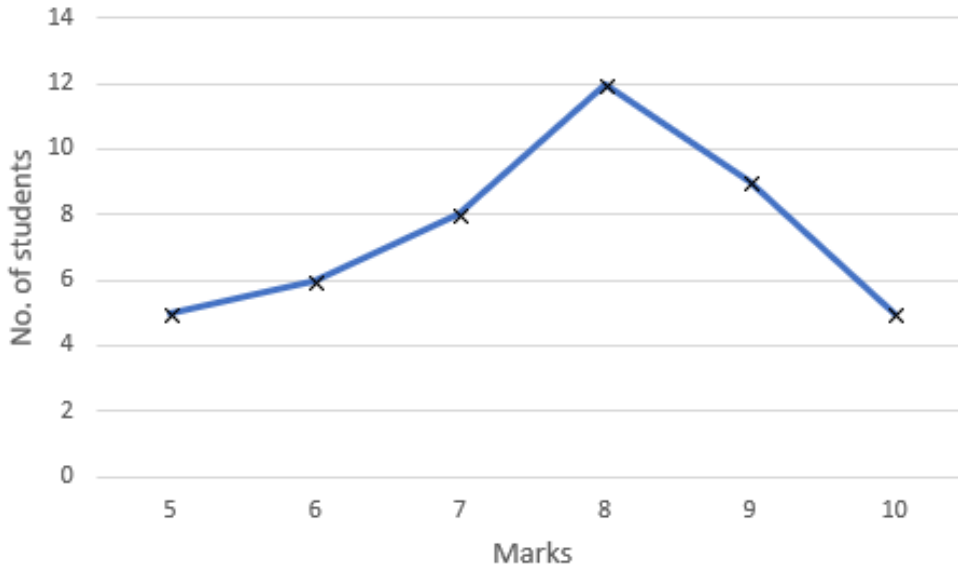# Statistics

Exercise 9.1

Q. 1. Write the mark wise frequencies in the following frequency distribution table.

Marks	Up to 5	Up to 6	Up to 7	Up to 8	Up to 9	Up to 10
No of students	5	11	19	31	40	45

Answer : The mark wise frequency representation indicates the upper range of the marks and their corresponding frequencies. Let's form a frequency table showing mark wise frequencies.

Marks	Number of students (frequency)
5	5
6	11 − 5 = 6
7	19 − 11 = 8
8	31 − 19 = 12
9	40 − 31 = 9
10	45 − 40 = 5

We can also represent marks and their corresponding frequencies on a graph, which will show relationship between them.

Q. 2. The blood groups of 36 students of IX class are recorded as follows.

A   O   A   O   A   B   O   A   B   A   B   O

B   O   B   O   O   A   B   O   B   AB   O   A

O   O   O   A   AB   O   A   B   O   A   O   B

Represent the data in the form of a frequency distribution table. Which is the most common and which is the rarest blood group among these students?

Answer : Given the blood groups of 36 students can be represented in the form of frequency distribution table.

Just count the occurrence of blood groups in the data and formulate a table.
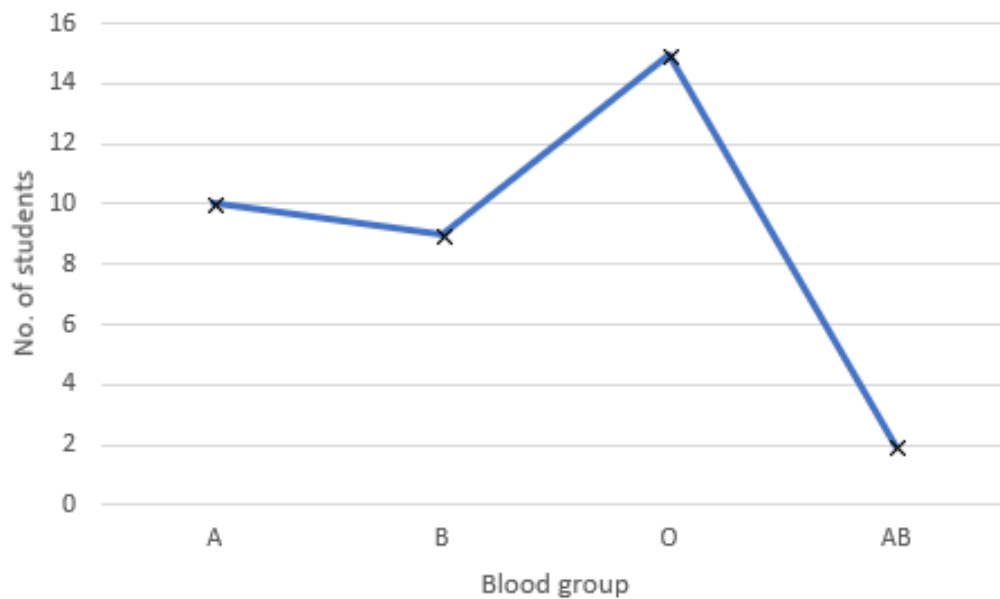
Count of blood group:

A = 10

B = 9

O = 15

AB = 2

Blood Group	No. of students (frequency)
A	10
B	9
O	15
AB	2

Representing the same on a graph to show the relationship between blood group and number of students (frequency),

From the frequency table as well as from the graph, notice that:

Most common blood group = O [As O has the greatest no. of occurrence, i.e., frequency = 15]

Rarest blood group = AB [As AB has the least no. of occurrence, i.e., frequency = 2]

Q. 3. Three coins were tossed 30 times simultaneously. Each time the number of heads occurring was noted down as follows;

1 2 3 2 3 1 1 1 0 3 2

1 2 2 1 1 2 3 2 0 3 0

1 2 3 2 2 3 1 1

Prepare a frequency distribution table for the data given above.

Answer : Given the number of heads on tossing three coins can be represented in the form of frequency distribution table.

Just count the occurrence of number of heads in the data and formulate a table.

Count of occurrence of head by 3 coins:
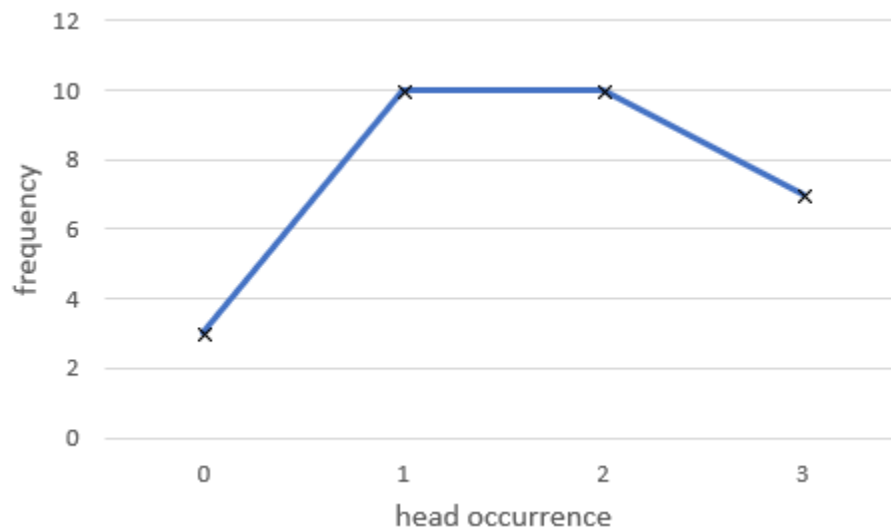
0 (head occurred 0 times) = 3

1 (head occurred 1 times) = 10

2 (head occurred 2 times) = 10

3 (head occurred 3 times) = 7

Head occurrence	Frequency
0	3
1	10
2	10
3	7

It can also be analyzed and represented graphically:

Q. 4. A TV channel organized a SMS(Short Message Service) poll on prohibition on smoking, giving options like A – complete prohibition, B – prohibition in public places only, C – not necessary. SMS results in one hour were

A	B	A	B	C	B				
A	B	B	A	C	C	B	B	A	B
B	A	B	C	B	A	B	C	B	A
B	B	A	B	B	C	B	A	B	A
B	C	B	B	A	B	C	B	B	A
B	B	A	B	B	A	B	C	B	A
B	B	A	B	C	A	B	B	A	

Represent the above data as grouped frequency distribution table. How many appropriate answers were received? What was the majority of peoples' opinion?

Answer : Given the poll options (A, B & C) can be represented in the form of frequency distribution table.

Just count the occurrence of each option in the data and formulate a table.
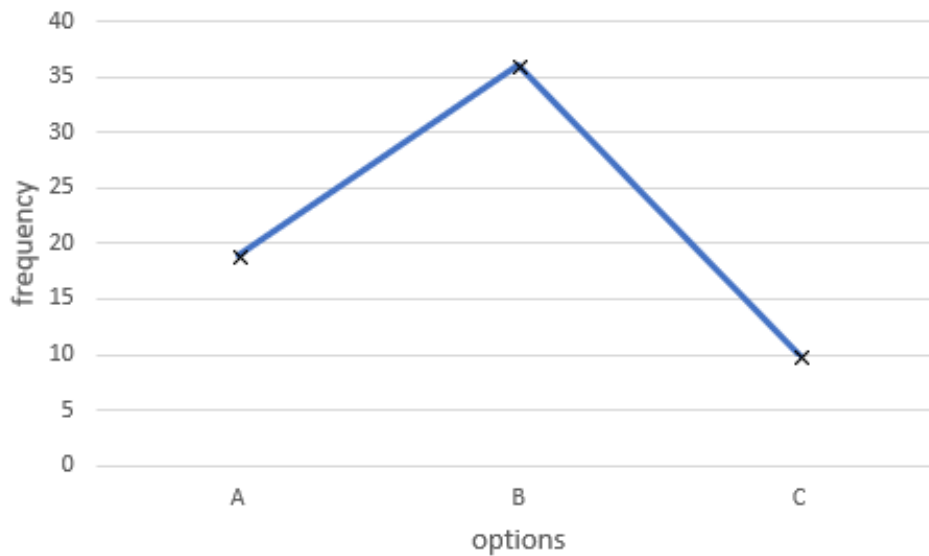
Count of occurrence of options are:

A (complete prohibition) = 19

B (prohibition in public places only) = 36

C (not necessary) = 10

Options	Frequency
A	19
B	36
C	10

It can also be analyzed and represented graphically:

To find number of appropriate answers received in poll, add total frequency.
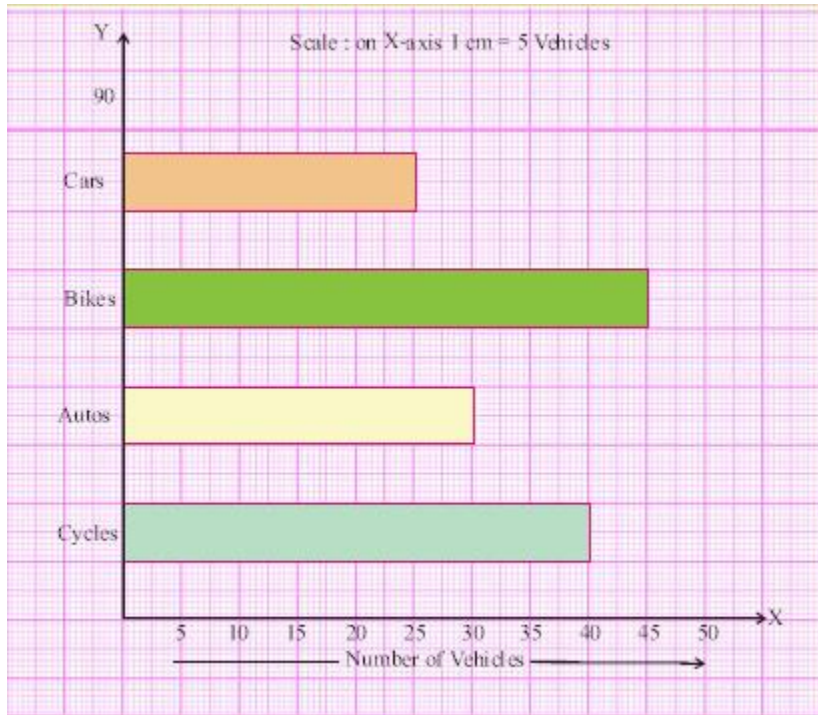
That is, 19 + 36 + 10 = 65

Thus, total number of appropriate answers received = 65

To analyze majority votes on poll, mark the highest frequency.

Note that, highest frequency is 36 that is of option B.

And hence, majority of people's opinion is B, i.e., prohibition in public places only.

Q. 5. Represent the data in the adjacent bar graph as frequency distribution table.

Answer : Analyzing a bar graph is very easy. Just note down the parameters and its corresponding frequencies by observing the bar graph.
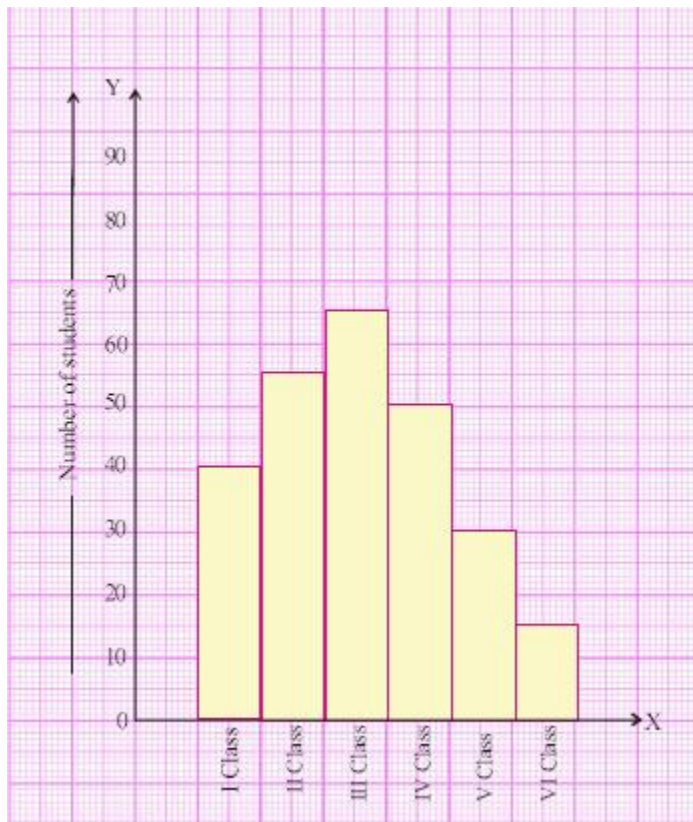
There are 4 parameters for vehicles namely, cycles, autos, bikes and cars.

So now, create a table consisting of these vehicles and their corresponding frequencies.

Vehicles	No. of vehicles (frequency)
Cycles	40
Autos	30
Bikes	45
Cars	25

Thus, this is the required frequency distribution table.

Q. 6. Identify the scale used on the axes of the adjacent graph. Write the frequency distribution from it.

Answer : Observe that, on x-axis we have classes from I Class to VI Class.

The scale used in x-axis is class on a unit interval.

And on y-axis, we have number of students.

The scale used on y-axis is from 0 to 90 with an interval of 10 units.

Analyzing a histogram is very easy. Just note down the parameters and its corresponding frequencies by observing the bar graph.

There are 6 parameters for classes namely, I Class, II Class, III Class, IV Class, V Class and VI Class.

So now, create a table consisting of these classes and their corresponding frequencies (number of students).

Class	No. of students (frequency)
I Class	40
II Class	55
III Class	65
IV Class	50
V Class	30
VI Class	15

Thus, this is the required frequency distribution table.

Q. 7. The marks of 30 students of a class, obtained in a test (out of 75), are given below:

42, 21, 50, 37, 42, 37, 38, 42, 49, 52, 38, 53, 57, 47, 29
59, 61, 33, 17, 17, 39, 44, 42, 39, 14, 7, 27, 19, 54, 51.
Form a frequency table with equal class intervals. (Hint : one of them being 0-10)

Answer : Given are marks of 30 students of a class, obtained in a test (out of 75).

Note that these marks lie between 0 to 75.

So, these should be distributed in a way such that, the interval remains same in each distribution.

If we distribute it in a class interval equals to 5. Then, range would get maximized, i.e., 0-5, 5-10, 10-15, 15-20,…, 70-75.

But if we distribute it in a class interval of 10. Then the range will be optimized.

So, let's make a table.

Marks (class interval)	No. of students (frequency)
0-10	1
10-20	4
20-30	3
30-40	7
40-50	7
50-60	7
60-70	1
70-80	0

Thus, this is the required frequency distribution table.

Q. 8. The electricity bills (in rupees) of 25 houses in a locality are given below. Construct a grouped frequency distribution table with a class size of 75.

170, 212, 252, 225, 310, 712, 412, 425, 322, 325, 192, 198, 230, 320, 412, 530, 602, 724, 370, 402, 317, 403, 405, 372, 413

Answer : Given are electricity bills (in rupees) of 25 houses in locality.

To construct a grouped frequency distribution table with a class size of 75, note down smallest and largest number from the data.

Smallest number = 170

Largest number = 724

So, let the class interval start from 150.

Then, add 75 to 150 = 150 + 75 = 225

⇒ First class interval = 150-225

Similarly,

Second class interval = 225-300 [∵ 225 + 75 = 300]

And so on…

For frequencies, count the occurrence of the numbers lying between the particular class interval.

Let us construct a table in order to show these class intervals along with their frequencies.

Electricity bill (in Rs.) (class interval)	Frequency
150-225	4
225-300	3
300-375	7
375-450	7
450-525	0
525-600	1
600-675	1
675-750	2

Thus, this is the required frequency distribution table.

Q. 9. A company manufactures car batteries of a particular type. The life (in years) of 40 batteries were recorded as follows:

2.6   3.0   3.7   3.2   2.2   4.1   3.5   4.5

3.5   2.3   3.2   3.4   3.8   3.2   4.6   3.7

2.5   4.4   3.4   3.3   2.9   3.0   4.3   2.8

3.5   3.2   3.9   3.2   3.2   3.1   3.7   3.4

4.6   3.8   3.2   2.6   3.5   4.2   2.9   3.6

Construct a grouped frequency distribution table with exclusive classes for this data, using class intervals of size 0.5 starting from the interval 2 - 2.5.

Answer : Given are life (in years) of 40 batteries.

Know that, when the lower limit is included, but the upper limit is excluded, then it is an exclusive class interval. For example – 150-153, 153-156, etc … are exclusive type of class intervals. In the class interval 150 - 153, 150 is included but 153 is excluded. Usually in the case of continuous variate, exclusive type of class intervals are used.

We can arrange the data in ascending order since the data is very large. We have

2.2, 2.3, 2.5, 2.6, 2.6, 2.8, 2.9, 2.9, 3.0, 3.0, 3.1, 3.2, 3.2, 3.2, 3.2, 3.2, 3.2, 3.2, 3.3, 3.4, 3.4, 3.4, 3.5, 3.5, 3.5, 3.5, 3.6, 3.7, 3.7, 3.7, 3.8, 3.8, 3.9, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.6

This makes calculation of frequencies easier.

So, let the class interval start from 2.0.

Then, add 0.5 to 2.0 = 2.0 + 0.5 = 2.5

⇒ First class interval = 2.0-2.5

Similarly,

Second class interval = 2.5-3.0 [∵ 2.5 + 0.5 = 3.0]

And so on…

For frequencies, count the occurrence of the numbers lying between the particular class interval.

Let us construct a table in order to show these class intervals along with their frequencies.

Life of batteries (in years) (class interval)	Frequency
2.0 – 2.5	2
2.5 – 3.0	6
3.0 – 3.5	14
3.5 – 4.0	11
4.0 – 4.5	4
4.5 – 5.0	3

Thus, this is the required frequency distribution table.

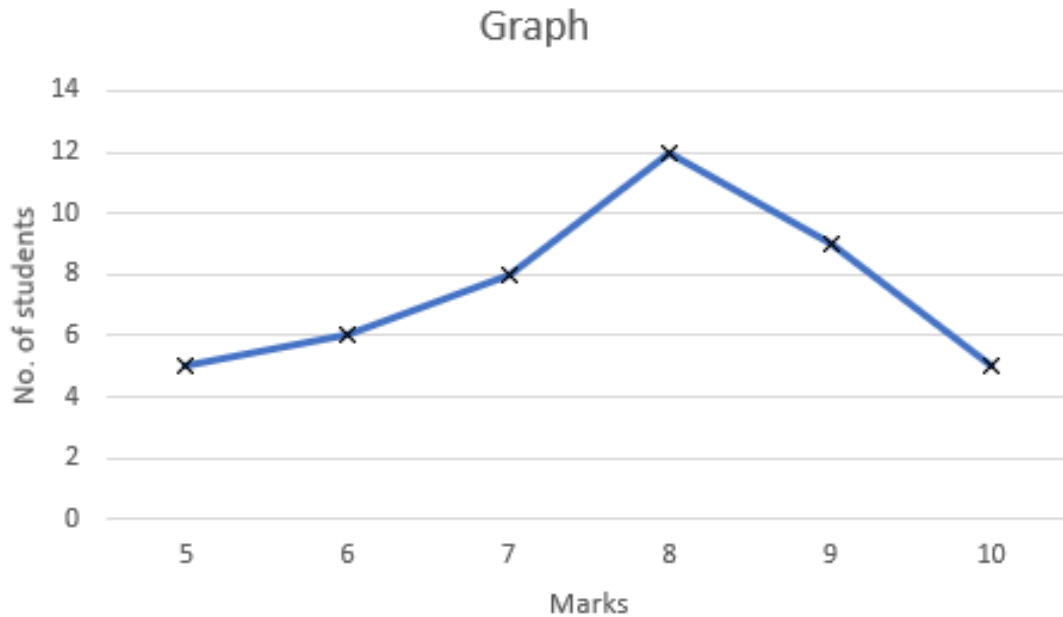**Q. 10. Write the mark wise frequencies in the following frequency distribution table.**

Marks	Up to 5	Up to 6	Up to 7	Up to 8	Up to 9	Up to 10
No of students	5	11	19	31	40	45

Answer : The mark wise frequency representation indicates the upper range of the marks and their corresponding frequencies. Let's form a frequency table showing mark

wise frequencies.

Marks	Number of students (frequency)
5	5
6	11 – 5 = 6
7	19 – 11 = 8
8	31 – 19 = 12
9	40 – 31 = 9
10	45 – 40 = 5

We can also represent marks and their corresponding frequencies on a graph, which will show relationship between them.

Graph

Q. 11. **The blood groups of 36 students of IX class are recorded as follows.**

A O A O A B O A B A B O
B O B O O A B O B AB O A
O O O A AB O A B O A O B
Represent the data in the form of a frequency distribution table. Which is the most common and which is the rarest blood group among these students?

Answer : Given the blood groups of 36 students can be represented in the form of frequency distribution table.

Just count the occurrence of blood groups in the data and formulate a table.

Count of blood group:
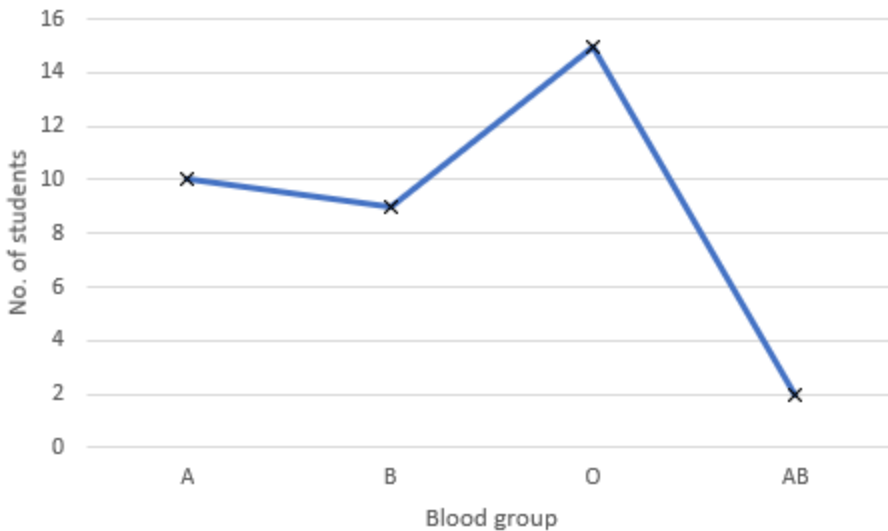
A = 10

B = 9

O = 15

AB = 2

Blood Group	No. of students (frequency)
A	10
B	9
O	15
AB	2

Representing the same on a graph to show the relationship between blood group and number of students (frequency),

From the frequency table as well as from the graph, notice that:

Most common blood group = O [As O has the greatest no. of occurrence, i.e., frequency = 15]

Rarest blood group = AB [As AB has the least no. of occurrence, i.e., frequency = 2]

Q. 12. Three coins were tossed 30 times simultaneously. Each time the number of heads occurring was noted down as follows;

1 2 3 2 3 1 1 1 0 3 2
1 2 2 1 1 2 3 2 0 3 0
1 2 3 2 2 3 1 1
Prepare a frequency distribution table for the data given above.

Answer : Given the number of heads on tossing three coins can be represented in the form of frequency distribution table.

Just count the occurrence of number of heads in the data and formulate a table.

Count of occurrence of head by 3 coins:

0 (head occurred 0 times) = 3
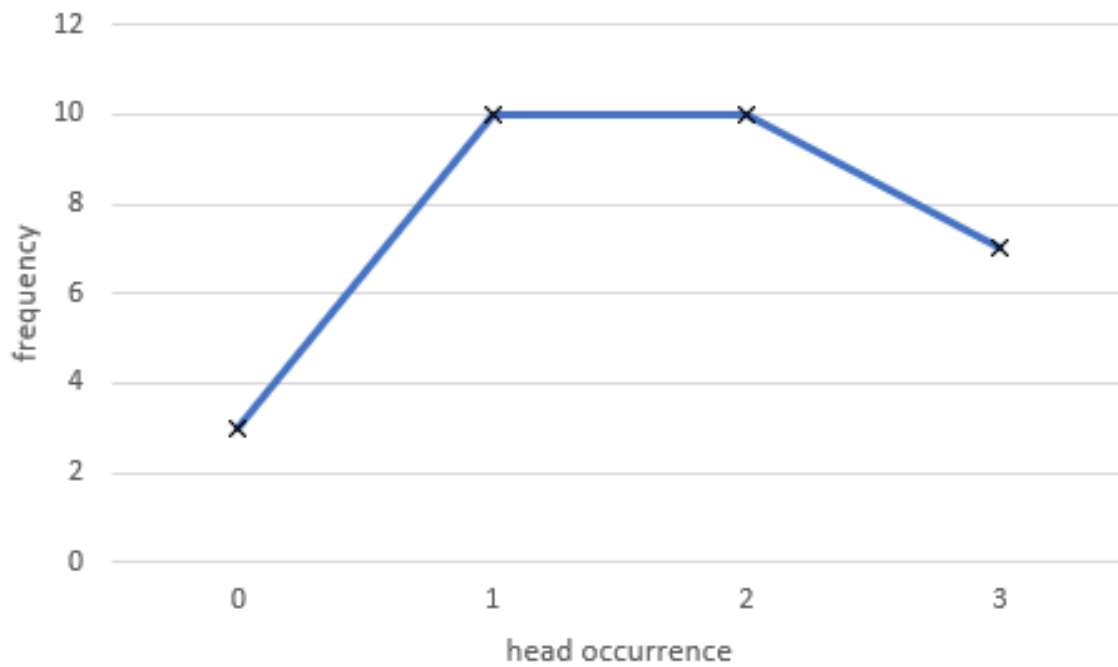
1 (head occurred 1 times) = 10

2 (head occurred 2 times) = 10

3 (head occurred 3 times) = 7

Head occurrence	Frequency
0	3
1	10
2	10
3	7

It can also be analyzed and represented graphically:

Q. 13. A TV channel organized a SMS(Short Message Service) poll on prohibition on smoking, giving options like A – complete prohibition, B – prohibition in public places only, C – not necessary. SMS results in one hour were A B A B C B

A B B A C C B B A B
B A B C B A B C B A
B B A B B C B A B A
B C B B A B C B B A
B B A B B A B C B A
B B A B C A B B A
Represent the above data as grouped frequency distribution table. How many appropriate answers were received? What was the majority of peoples' opinion?

Answer : Given the poll options (A, B & C) can be represented in the form of frequency distribution table.

Just count the occurrence of each option in the data and formulate a table.

Count of occurrence of options are:
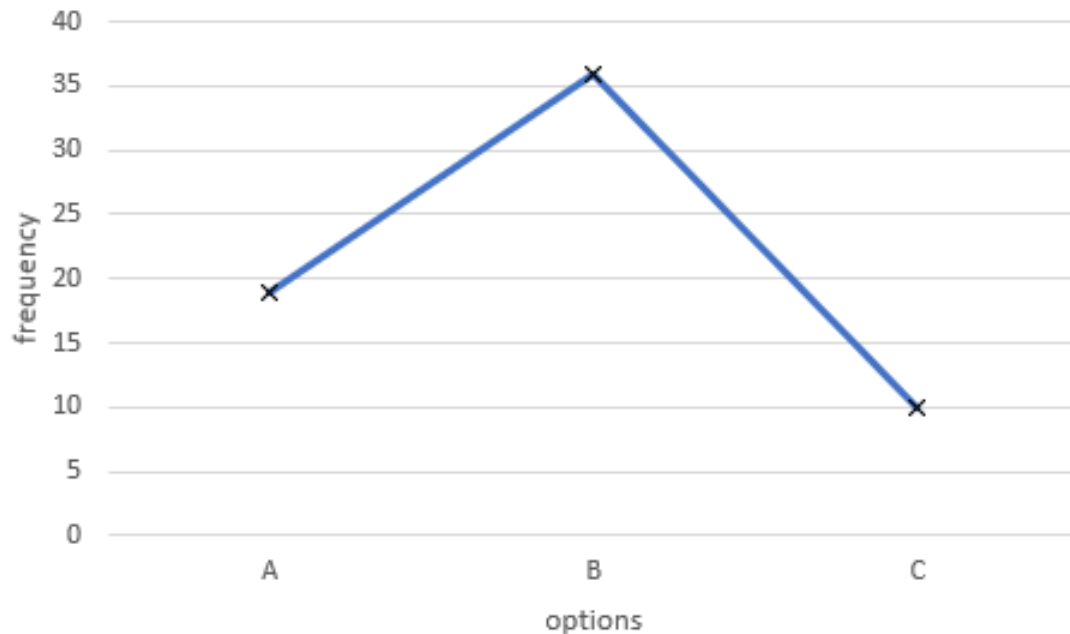
A (complete prohibition) = 19

B (prohibition in public places only) = 36

C (not necessary) = 10

Options	Frequency
A	19
B	36
C	10

It can also be analyzed and represented graphically:

To find number of appropriate answers received in poll, add total frequency.

That is, 19 + 36 + 10 = 65

Thus, **total number of appropriate answers received = 65**

To analyze majority votes on poll, mark the highest frequency.

Note that, highest frequency is 36, that is of option B.

And hence, **majority of people's opinion is B**, i.e., prohibition in public places only.

Q. 14. Represent the data in the adjacent bar graph as frequency distribution table.
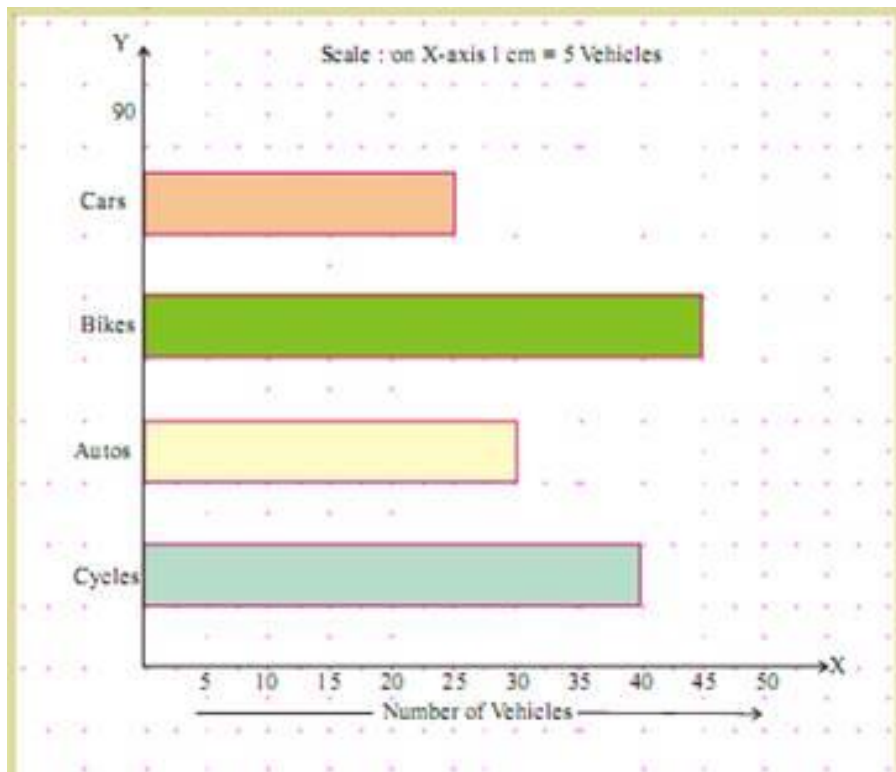
Scale : on X-axis 1 cm = 5 Vehicles

Answer : Analyzing a bar graph is very easy. Just note down the parameters and its corresponding frequencies by observing the bar graph.

There are 4 parameters for vehicles namely, cycles, autos, bikes and cars.

So now, create a table consisting of these vehicles and their corresponding frequencies.

Vehicles	No. of vehicles (frequency)
Cycles	40
Autos	30
Bikes	45
Cars	25

Thus, this is the required frequency distribution table.

Q. 15. Identify the scale used on the axes of the adjacent graph. Write the frequency distribution from it.

Answer : Observe that, on x-axis we have classes from I Class to VI Class.

The scale used in x-axis is class on a unit interval.

And on y-axis, we have number of students.

The scale used on y-axis is from 0 to 90 with an interval of 10 units.

Analyzing a histogram is very easy. Just note down the parameters and its corresponding frequencies by observing the bar graph.
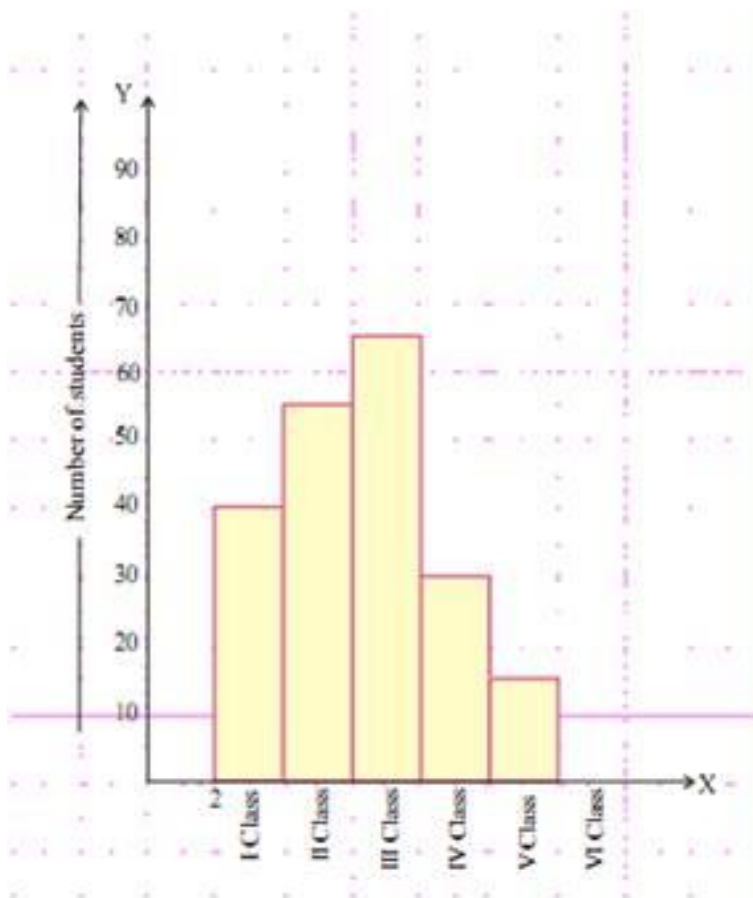
There are 6 parameters for classes namely, I Class, II Class, III Class, IV Class, V Class and VI Class.

So now, create a table consisting of these classes and their corresponding frequencies (number of students).

Class	No. of students (frequency)
I Class	40
II Class	55
III Class	65
IV Class	50
V Class	30
VI Class	15

Thus, this is the required frequency distribution table.

Q. 16. The marks of 30 students of a class, obtained in a test (out of 75), are given below:

42, 21, 50, 37, 42, 37, 38, 42, 49, 52, 38, 53, 57, 47, 29

59, 61, 33, 17, 17, 39, 44, 42, 39, 14, 7, 27, 19, 54, 51.
Form a frequency table with equal class intervals. (Hint : one of them being 0-10)

Answer : Given are marks of 30 students of a class, obtained in a test (out of 75).

Note that these marks lie between 0 to 75.

So, these should be distributed in a way such that, the interval remains same in each distribution.

If we distribute it in a class interval equals to 5. Then, range would get maximized, i.e., 0-5, 5-10, 10-15, 15-20, …, 70-75.

But if we distribute it in a class interval of 10. Then the range will be optimized.

So, let's make a table.

Marks (class interval)	No. of students (frequency)
0-10	1
10-20	4
20-30	3
30-40	7
40-50	7
50-60	7
60-70	1
70-80	0

Thus, this is the required frequency distribution table.

Q. 17. The electricity bills (in rupees) of 25 houses in a locality are given below. Construct a grouped frequency distribution table with a class size of 75.

170, 212, 252, 225, 310, 712, 412, 425, 322, 325, 192, 198, 230, 320, 412, 530, 602, 724, 370, 402, 317, 403, 405, 372, 413

Answer : Given are electricity bills (in rupees) of 25 houses in locality.

To construct a grouped frequency distribution table with a class size of 75, note down smallest and largest number from the data.

Smallest number = 170

Largest number = 724

So, let the class interval start from 150.

Then, add 75 to 150 = 150 + 75 = 225

⇒ First class interval = 150-225

Similarly,

Second class interval = 225-300 [∵, 225 + 75 = 300]

And so on…

For frequencies, count the occurrence of the numbers lying between the particular class interval.

Let us construct a table in order to show these class intervals along with their frequencies.

Electricity bill (in Rs.) (class interval)	Frequency
150-225	4
225-300	3
300-375	7
375-450	7
450-525	0
525-600	1
600-675	1
675-750	2

Thus, this is the required frequency distribution table.

Q. 18. A company manufactures car batteries of a particular type. The life (in years) of 40 batteries were recorded as follows:

2.6 3.0 3.7 3.2 2.2 4.1 3.5 4.5
3.5 2.3 3.2 3.4 3.8 3.2 4.6 3.7
2.5 4.4 3.4 3.3 2.9 3.0 4.3 2.8
3.5 3.2 3.9 3.2 3.2 3.1 3.7 3.4
4.6 3.8 3.2 2.6 3.5 4.2 2.9 3.6
Construct a grouped frequency distribution table with exclusive classes for this data, using class intervals of size 0.5 starting from the interval 2 - 2.5.

Answer : Given are life (in years) of 40 batteries.

Know that, when the lower limit is included, but the upper limit is excluded, then it is an exclusive class interval. For example – 150-153, 153-156, etc … are exclusive type of class intervals. In the class interval 150 - 153, 150 is included but 153 is excluded. Usually in the case of continuous variate, exclusive type of class intervals are used.

We can arrange the data in ascending order since the data is very large. We have

2.2, 2.3, 2.5, 2.6, 2.6, 2.8, 2.9, 2.9, 3.0, 3.0, 3.1, 3.2, 3.2, 3.2, 3.2, 3.2, 3.2, 3.3, 3.4, 3.4, 3.4, 3.5, 3.5, 3.5, 3.5, 3.6, 3.7, 3.7, 3.7, 3.8, 3.8, 3.9, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.6

This makes calculation of frequencies easier.

So, let the class interval start from 2.0.

Then, add 0.5 to 2.0 = 2.0 + 0.5 = 2.5

⇒ First class interval = 2.0-2.5

Similarly,

Second class interval = 2.5-3.0 [∵, 2.5 + 0.5 = 3.0]

And so on…

For frequencies, count the occurrence of the numbers lying between the particular class interval.

Let us construct a table in order to show these class intervals along with their frequencies.

Life of batteries (in years) (class interval)	Frequency
2.0 – 2.5	2
2.5 – 3.0	6
3.0 – 3.5	14
3.5 – 4.0	11
4.0 – 4.5	4
4.5 – 5.0	3

Thus, this is the required frequency distribution table.

Exercise 9.2

Q. 1. Weights of parcels in a transport office are given below.

Weight (kg)	50	65	75	90	110	120
No of parcels	25	34	38	40	47	16

Find the mean weight of the parcels.

Answer : Given is the frequency distribution table for ungrouped data.

We have

Weight (kg) x_i	No. of parcels (frequency) f_i	$x_i f_i$
50	25	50 × 25 = 1250
65	34	65 × 34 = 2210
75	38	75 × 38 = 2850
90	40	90 × 40 = 3600
110	47	110 × 47 = 5170
120	16	120 × 16 = 1920
TOTAL	$\Sigma f_i = 200$	$\Sigma x_i f_i = 17000$

⇒ 25 number of parcels have weight each 50 kg,

34 number of parcels have weight each 65 kg,

And so on…

This also implies that,

Total weight of 25 parcels = 1250,

Total weight of 34 parcels = 2210,

And so on…

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Total sum of all the parcels}}{\text{Total number of parcels}}$$

$$\Rightarrow \text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$$\Rightarrow \text{Mean} = \frac{17000}{200} \ [\because \Sigma x_i f_i = 17000 \ \& \ \Sigma f_i = 200]$$

$$\Rightarrow \text{Mean} = 85$$

Thus, mean weight of the parcel is 85 kg.

Q. 2. Number of families in a village in correspondence with the number of children are given below:

No of children	0	1	2	3	4	5
No of families	11	25	32	10	5	1

Find the mean number of children per family.

Answer : Given is the frequency distribution table for ungrouped data.

We have

No. of children x_i	No. of families (frequency) f_i	$x_i f_i$
0	11	0 × 11 = 0
1	25	1 × 25 = 25
2	32	2 × 32 = 64
3	10	3 × 10 = 30
4	5	4 × 5 = 20
5	1	5 × 1 = 5
TOTAL	$\Sigma f_i = 84$	$\Sigma x_i f_i = 144$

$\Rightarrow$ 11 families each have no children,

25 families each have 1 child,

And so on…

This also implies that,

Total number of children of 11 families = 0 × 11 = 0,

Total number of children of 25 families = 1 × 25 = 25,

And so on…

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Total sum of children}}{\text{Total number of families}}$$

$$\Rightarrow \text{Mean} = \frac{\sum x_i f_i}{\sum f_i}$$

$$\Rightarrow \text{Mean} = \frac{144}{84} \ [\because \sum x_i f_i = 144 \ \& \ \sum f_i = 84]$$

$$\Rightarrow \text{Mean} = 1.7143$$

Thus, mean number of children per family is 1.7143.

Q. 3. If the mean of the following frequency distribution is 7.2 find value of 'K'.

X	2	4	6	8	10	12
F	4	7	10	16	K	3

Answer : Given is the frequency distribution table for ungrouped data.

We have

X (xᵢ)	F (frequency) (fᵢ)	xᵢfᵢ
2	4	$2 \times 4 = 8$
4	7	$4 \times 7 = 28$
6	10	$6 \times 10 = 60$
8	16	$8 \times 16 = 128$
10	K	$10 \times K = 10K$
12	3	$12 \times 3 = 36$
TOTAL	$\Sigma f_i = 40 + K$	$\Sigma x_i f_i = 260 + 10K$

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Sum of all observation}}{\text{Total number of observation}}$$

$$\Rightarrow \text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$$\Rightarrow 7.2 = \frac{260 + 10K}{40 + K} \quad [\because \text{Mean} = 7.2]$$

$\Rightarrow 7.2(40 + K) = 260 + 10K$

$\Rightarrow 288 + 7.2K = 260 + 10K$

$\Rightarrow 10K - 7.2K = 288 - 260$

$\Rightarrow 2.8K = 28$

$\Rightarrow K = 28/2.8$

$\Rightarrow K = 10$

Thus, K = 10.

Q. 4. Number of villages with respect to their population as per India census 2011 are given below.

Population (in thousands)	12	5	30	20	15	8
Villages	20	15	32	35	36	7

Find the average population in each village.

Answer : Given is the frequency distribution table for ungrouped data.

We have

Population (in thousands) x_i	Villages (frequency) f_i	x_if_i
12	20	$12 \times 20 = 240$
5	15	$5 \times 15 = 75$
30	32	$30 \times 32 = 960$
20	35	$20 \times 35 = 700$
15	36	$15 \times 36 = 540$
8	7	$8 \times 7 = 56$
TOTAL	$\Sigma f_i = 145$	$\Sigma x_if_i = 2571$

⇒ 20 villages each have 12k population,

15 villages each have 5k population,

And so on…

This also implies that,

Total population of 20 villages = 12 × 20 = 240,

Total population of 15 villages = 5 × 15 = 75,

And so on…

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Total population}}{\text{Total number of villages}}$$

$$\Rightarrow \text{Mean} = \frac{\sum x_i f_i}{\sum f_i}$$

$$\Rightarrow \text{Mean} = \frac{2571}{145} \ [\because \sum x_i f_i = 2571 \ \& \ \sum f_i = 145]$$

⇒ Mean = 17.731

⇒ Mean = 17.731 × 1000

⇒ Mean = 17731

Thus, average population in each village is 17731.

Q. 5. AFLATOUN social and financial educational program intiated savings program among the high school children in Hyderabad district. Mandal wise savings in a month are given in the following table.

Mandal	No. of schools	Total amount saved (in rupees)
Amberpet	6	2154
Thriumalgiri	6	2478
Saidabad	5	975
Khairathabad	4	912
Secundrabad	3	600
Bahadurpura	9	7533

Find arithmetic mean of school wise savings in each mandal. Also find the arithmetic mean of saving of all schools.

Answer : Given is the frequency distribution table for ungrouped data.

We have

Mandal	No. of schools x_i	Total amount saved (Rs.) (frequency) f_i
Amberpet	6	2154
Thriumalgiri	6	2478
Saidabad	5	975
Khairathabad	4	912
Secundrabad	3	600
Bahadurpura	9	7533
TOTAL	33	14652

To find arithmetic mean of school wise savings in each mandal,

A common formula is:

$$Mean = \frac{Total\ amount\ saved\ per\ mandal}{Total\ number\ of\ schools\ in\ that\ mandal}$$

In 'Amberpet':

$$Mean = \frac{2154}{6}$$

$\Rightarrow$ Mean = Rs 359

In 'Thriumalgiri':

$$Mean = \frac{2478}{6}$$

$\Rightarrow$ Mean = Rs 413

In 'Saidabad':

$$Mean = \frac{975}{5}$$

$\Rightarrow$ Mean = Rs 195

In 'Khairathabad':

$$\text{Mean} = \frac{912}{4}$$

$\Rightarrow$ Mean = Rs 228

In 'Secundrabad':

$$\text{Mean} = \frac{600}{3}$$

$\Rightarrow$ Mean = Rs 200

In 'Bahadurpura':

$$\text{Mean} = \frac{7533}{9}$$

$\Rightarrow$ Mean = Rs 837

For arithmetic mean of savings of all the school:

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Total savings of all the school}}{\text{Total number of schools}}$$

$\Rightarrow \text{Mean} = \frac{14652}{33}$

$\Rightarrow$ Mean = 444

Thus, arithmetic mean of savings of all the schools is Rs 444.

Q. 6. The heights of boys and girls of IX class of a school are given below.

Height (cm)	135	140	147	152	155	160
Boys	2	5	12	10	7	1
Girls	1	2	10	5	6	5

Compare the heights of the boys and girls
[Hint : Find median heights of boys and girls]

Answer :

We have

Height (cm)	Boys x_i	Cumulative Frequency cf_{xi}	Girls y_i	Cumulative Frequency Cf_{yi}
135	2	2	1	1
140	5	2 + 5 = 7	2	1 + 2 = 3
147	12	7 + 12 = 19	10	3 + 10 = 13
152	10	19 + 10 = 29	5	13 + 5 = 18
155	7	29 + 7 = 36	6	18 + 6 = 24
160	1	36 + 1 = 37	5	24 + 5 = 29
TOTAL		N_{xi} = 37		N_{yi} = 29

We shall find median of the heights of the boys and girls separately.

Median of heights of boys:

$N_{xi} = 37$

$$\frac{N_{xi} + 1}{2} = \frac{37 + 1}{2}$$

$$\Rightarrow \frac{N_{xi}+1}{2} = \frac{38}{2} = 19$$

Cumulative frequency = 19 falls in the height of 147 cm.

Thus, median height of boys is 147 cm.

Now, median of heights of girls:

$N_{yi} = 29$

$$\frac{N_{yi} + 1}{2} = \frac{29 + 1}{2}$$

$$\Rightarrow \frac{N_{yi}+1}{2} = \frac{30}{2} = 15$$

Cumulative frequency = 15 falls in the height of 18.

Cumulative frequency, 18 falls in the height of 152 cm.

∴ Median height of boys is 147 cm whereas median height of girls in the class is 152 cm.

Q. 7. Centuries scored and number of cricketers in the world are given below.

No. of centuries	5	10	15	20	25
No. of cricketers	56	23	39	13	8

Find the mean, median and mode of the given data.

Answer : We have

No. of centuries (x_i)	No. of cricketers frequency (f_i)	$x_i f_i$	Cumulative Frequency (cf)
5	56	5 × 56 = 280	56
10	23	10 × 23 = 230	56 + 23 = 79
15	39	15 × 39 = 585	79 + 39 = 118
20	13	20 × 13 = 260	118 + 13 = 131
25	8	25 × 8 = 200	131 + 8 = 139
TOTAL	$\Sigma f_i = 139$	$\Sigma x_i f_i = 1555$	N = 139

For mean:

Mean is given by

$$\text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$$\Rightarrow \text{Mean} = \frac{1555}{139}$$

$\Rightarrow$ Mean = 11.19

For median:

Total observation, N = 139

Since, N is odd (that is, 139 is odd),

$$\frac{N+1}{2} = \frac{139+1}{2}$$

$$\Rightarrow \frac{N+1}{2} = \frac{140}{2}$$

$$\Rightarrow \frac{N+1}{2} = 70$$

Cumulative frequency = 79 is just greater than 70.

And cumulative frequency, 79 falls in no. of century, 10.

⇒ Median = 10

For mode:

Mode is the value having highest frequency in the data.

From the table given above, 56 is the greatest frequency in the given frequencies.

Thus, the corresponding value in 'number of centuries', 5 is the mode.

⇒ Mode = 5

Q. 8. On the occasion of New year's day a sweet stall prepared sweet packets. Number of sweet packets and cost of each packet are given as follows.

Cost of packet (in ₹)	₹25	₹50	₹75	₹100	₹125	₹150
No of packets	20	36	32	29	22	11

Find the mean, median and mode of the data.

Answer : We have

Cost of packet (in ₹) (x_i)	No. of packets frequency (f_i)	$x_i f_i$	Cumulative Frequency (cf)
₹25	20	25 × 20 = 500	20
₹50	36	50 × 36 = 1800	20 + 36 = 56
₹75	32	75 × 32 = 2400	56 + 32 = 88
₹00	29	100 × 29 = 2900	88 + 29 = 117
₹125	22	125 × 22 = 2750	117 + 22 = 139
₹150	11	150 × 11 = 1650	139 + 11 = 150
TOTAL	$\Sigma f_i = 150$	$\Sigma x_i f_i = 12000$	N = 150

For mean:

Mean is given by

$$\text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$\Rightarrow$ Mean $= \dfrac{12000}{150}$

$\Rightarrow$ Mean = 80

For median:

Total observation, N = 150

Since, N is even (that is, 150 is even),

$$\dfrac{N}{2} = \dfrac{150}{2}$$

$\Rightarrow \dfrac{N}{2} = 75$

& $\dfrac{N}{2} + 1 = \dfrac{150}{2} + 1$

$\Rightarrow \dfrac{N}{2} + 1 = 75 + 1 = 76$

Cumulative frequencies = 88 is just greater than 75 and 76.

And cumulative frequencies, 75 and 76 falls in cost of packet, '75.

$\Rightarrow$ Median = 75

For mode:

Mode is the value having highest frequency in the data.

From the table given above, 36 is the greatest frequency in the given frequencies.

Thus, the corresponding value in 'cost of packet', 50 is the mode.

$\Rightarrow$ Mode = 50

Q. 9. The mean (average) weight of three students is 40 kg. One of the students Ranga weighs 46 kg. The other two students, Rahim and Reshma have the same weight. Find Rahims weight.

Answer : Given: Mean of three students = 40 kg

The three students are Ranga, Rahim and Reshma, where

Ranga's weight = 46 kg

Let Rahim's weight = x

And Reshma's weight = y [∵ Rahim's weight = Reshma's weight, according to the question]

Mean is given by

$$\text{Mean} = \frac{\text{Ranga's weight} + \text{Rahim's weight} + \text{Reshma's weight}}{\text{Total number of students}}$$

$\Rightarrow 40 = \frac{46+x+x}{3}$ [∵ Mean = 40]

$\Rightarrow 120 = 46 + 2x$

$\Rightarrow 2x = 120 - 46 = 74$

$\Rightarrow x = 74/2$

$\Rightarrow x = 37$

Thus, Rahim's weight = 37 kg

Q. 10. The donations given to an orphanage home by the students of different classes of a secondary school are given below.

Class	Donation by each student (in ₹)	No. of students donated
VI	5	15
VII	7	15
VIII	10	20
IX	15	16
X	20	14

Find the mean, median and mode of the data.

Answer : We have

Class	Donation by each student (in ₹) (x_i)	No. of students donated (Frequency) (f_i)	$x_i f_i$	Cumulative Frequency (cf)
VI	5	15	5 × 15 = 75	15
VII	7	15	7 × 15 = 105	15 + 15 = 30
VIII	10	20	10 × 20 = 200	30 + 20 = 50
IX	15	16	15 × 16 = 240	50 + 16 = 66
X	20	14	20 × 14 = 280	66 + 14 = 80
TOTAL		$\Sigma f_i = 80$	$\Sigma x_i f_i = 900$	N = 80

For mean:

Mean is given by

$$\text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$$\Rightarrow \text{Mean} = \frac{900}{80}$$

⇒ Mean = 11.25

For median:

Total observation, N = 80

Since, N is even (that is, 80 is even),

$$\frac{N}{2} = \frac{80}{2}$$

$$\Rightarrow \frac{N}{2} = 40$$

$$\& \frac{N}{2} + 1 = \frac{80}{2} + 1$$

$$\Rightarrow \frac{N}{2} + 1 = 40 + 1 = 41$$

Cumulative frequencies = 50 is just greater than 40 and 41.

And cumulative frequencies, 50 falls in donation by each student, 10.

⇒ Median = 10

For mode:

Mode is the value having highest frequency in the data.

From the table given above, 20 is the greatest frequency in the given frequencies.

Thus, the corresponding value in 'donation by each student', 10 is the mode.

⇒ Mode = 10

Q. 11. There are four unknown numbers. The mean of the first two numbers is 4 and the mean of the first three is 9. The mean of all four number is 15, if one of the four number is 2 find the other numbers.

Answer : Given: There are 4 unknown numbers, but one of the number is 2.

Let $x_1 = 2$, $x_2 = ?$, $x_3 = ?$ and $x_4 = ?$

According to the question, mean of first two numbers = 4

Mean of first two numbers is given by,

$$\text{Mean} = \frac{\text{Sum of first two numbers}}{2}$$

$$\Rightarrow \text{Mean} = \frac{x_1 + x_2}{2}$$

$$\Rightarrow 4 = \frac{2 + x_2}{2}$$

⇒ 8 = 2 + x_2

⇒ x_2 = 8 − 2 = 6

We have $x_1 = 2$ and $x_2 = 6$. ...(i)

Also, according to the question, mean of first three numbers = 9

$$\text{Mean} = \frac{\text{Sum of first three numbers}}{3}$$

$$\Rightarrow \text{Mean} = \frac{x_1 + x_2 + x_3}{3}$$

$$\Rightarrow 9 = \frac{2+6+x_3}{3} \text{ [from (i)]}$$

$\Rightarrow 27 = 8 + x_3$

$\Rightarrow x_3 = 27 - 8$

$\Rightarrow x_3 = 19$

We have now, $x_1 = 2$, $x_2 = 6$ and $x_3 = 19$ ...(ii)

Also, according to the question, mean of all four numbers = 15

$$\text{Mean} = \frac{\text{Sum of all 4 numbers}}{4}$$

$$\Rightarrow 15 = \frac{x_1 + x_2 + x_3 + x_4}{4}$$

$\Rightarrow 60 = 2 + 6 + 19 + x_4$ [from (ii)]

$\Rightarrow 60 = 27 + x_4$

$\Rightarrow x_4 = 60 - 27$

$\Rightarrow x_4 = 33$

Thus, we have $x_1 = 2$, $x_2 = 6$, $x_3 = 19$ & $x_4 = 33$.

Q. 1. Weights of parcels in a transport office are given below.

Weight (kg)	50	65	75	90	110	120
No of parcels	25	34	38	40	47	16

Find the mean weight of the parcels.

Answer : Given is the frequency distribution table for ungrouped data.

We have

Weight (kg) x_i	No. of parcels (frequency) f_i	x_if_i
50	25	$50 \times 25 = 1250$
65	34	$65 \times 34 = 2210$
75	38	$75 \times 38 = 2850$
90	40	$90 \times 40 = 3600$
110	47	$110 \times 47 = 5170$
120	16	$120 \times 16 = 1920$
TOTAL	$\sum f_i = 200$	$\sum x_if_i = 17000$

⇒ 25 number of parcels have weight each 50 kg,

34 number of parcels have weight each 65 kg,

And so on…

This also implies that,

Total weight of 25 parcels = 1250,

Total weight of 34 parcels = 2210,

And so on…

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Total sum of all the parcels}}{\text{Total number of parcels}}$$

$$\Rightarrow \text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$$\Rightarrow \text{Mean} = \frac{17000}{200} \quad [\because \Sigma x_i f_i = 17000 \ \& \ \Sigma f_i = 200]$$

$\Rightarrow$ Mean = 85

Thus, mean weight of the parcel is 85 kg.

Q. 2. Number of families in a village in correspondence with the number of children are given below:

No of children	0	1	2	3	4	5
No of families	11	25	32	10	5	1

Find the mean number of children per family.

Answer : Given is the frequency distribution table for ungrouped data.

We have

No. of children x_i	No. of families (frequency) f_i	x_if_i
0	11	$0 \times 11 = 0$
1	25	$1 \times 25 = 25$
2	32	$2 \times 32 = 64$
3	10	$3 \times 10 = 30$
4	5	$4 \times 5 = 20$
5	1	$5 \times 1 = 5$
TOTAL	$\sum f_i = 84$	$\sum x_if_i = 144$

$\Rightarrow$ 11 families each have no children,

25 families each have 1 child,

And so on…

This also implies that,

Total number of children of 11 families = 0 × 11 = 0,

Total number of children of 25 families = 1 × 25 = 25,

And so on…

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Total sum of children}}{\text{Total number of families}}$$

$$\Rightarrow \text{Mean} = \frac{\sum x_i f_i}{\sum f_i}$$

$$\Rightarrow \text{Mean} = \frac{144}{84} \quad [\because, \sum x_i f_i = 144 \text{ \& } \sum f_i = 84]$$

⇒ Mean = 1.7143

Thus, mean number of children per family is 1.7143.

Q. 3. If the mean of the following frequency distribution is 7.2 find value of 'K'.

X	2	4	6	8	10	12
F	4	7	10	16	K	3

Answer : Given is the frequency distribution table for ungrouped data.

We have

X (x$_i$)	F (frequency) (f$_i$)	x$_i$f$_i$
2	4	2 × 4 = 8
4	7	4 × 7 = 28
6	10	6 × 10 = 60
8	16	8 × 16 = 128
10	K	10 × K = 10K
12	3	12 × 3 = 36
TOTAL	Σf$_i$ = 40 + K	Σx$_i$f$_i$ = 260 + 10K

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Sum of all observation}}{\text{Total number of observation}}$$

$$\Rightarrow \text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$$\Rightarrow 7.2 = \frac{260+10K}{40+K} \quad [\because, \text{Mean} = 7.2]$$

$\Rightarrow 7.2(40 + K) = 260 + 10K$

$\Rightarrow 288 + 7.2K = 260 + 10K$

$\Rightarrow 10K - 7.2K = 288 - 260$

$\Rightarrow 2.8K = 28$

$\Rightarrow K = 28/2.8$

$\Rightarrow K = 10$

Thus, K = 10.

Q. 4. Number of villages with respect to their population as per India census 2011 are given below.

Population (in thousands)	12	5	30	20	15	8
Villages	20	15	32	35	36	7

Find the average population in each village.

Answer : Given is the frequency distribution table for ungrouped data.

We have

Population	Villages	$x_i f_i$
(in thousands) x_i	(frequency) f_i	
12	20	$12 \times 20 = 240$
5	15	$5 \times 15 = 75$
30	32	$30 \times 32 = 960$
20	35	$20 \times 35 = 700$
15	36	$15 \times 36 = 540$
8	7	$8 \times 7 = 56$
TOTAL	$\sum f_i = 145$	$\sum x_i f_i = 2571$

$\Rightarrow$ 20 villages each have 12k population,

15 villages each have 5k population,

And so on…

This also implies that,

Total population of 20 villages = 12 × 20 = 240,

Total population of 15 villages = 5 × 15 = 75,

And so on…

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Total population}}{\text{Total number of villages}}$$

$$\Rightarrow \text{Mean} = \frac{\sum x_i f_i}{\sum f_i}$$

$$\Rightarrow \text{Mean} = \frac{2571}{145} \ [\because \sum x_i f_i = 2571 \ \& \ \sum f_i = 145]$$

$\Rightarrow$ Mean = 17.731

$\Rightarrow$ Mean = 17.731 × 1000

$\Rightarrow$ Mean = 17731

Thus, average population in each village is 17731.

Q. 5. AFLATOUN social and financial educational program intiated savings program among the high school children in Hyderabad district. Mandal wise savings in a month are given in the following table.

Mandal	No. of schools	Total amount saved (in rupees)
Amberpet	6	2154
Thriumalgiri	6	2478
Saidabad	5	975
Khairathabad	4	912
Secundrabad	3	600
Bahadurpura	9	7533

Find arithmetic mean of school wise savings in each mandal. Also find the arithmetic mean of saving of all schools.

Answer :

Given is the frequency distribution table for ungrouped data.

We have

Mandal	No. of schools x_i	Total amount saved (Rs.) (frequency) f_i
Amberpet	6	2154
Thriumalgiri	6	2478
Saidabad	5	975
Khairathabad	4	912
Secundrabad	3	600
Bahadurpura	9	7533
TOTAL	33	14652

To find arithmetic mean of school wise savings in each mandal,

A common formula is:

$$\text{Mean} = \frac{\text{Total amount saved per mandal}}{\text{Total number of schools in that mandal}}$$

In 'Amberpet':

$$\text{Mean} = \frac{2154}{6}$$

⇒ **Mean = Rs 359**

In 'Thriumalgiri':

$$\text{Mean} = \frac{2478}{6}$$

⇒ **Mean = Rs 413**

In 'Saidabad':

$$\text{Mean} = \frac{975}{5}$$

⇒ **Mean = Rs 195**

In 'Khairathabad':

$$\text{Mean} = \frac{912}{4}$$

⇒ **Mean = Rs 228**

In 'Secundrabad':

$$\text{Mean} = \frac{600}{3}$$

⇒ **Mean = Rs 200**

In 'Bahadurpura':

$$\text{Mean} = \frac{7533}{9}$$

⇒ **Mean = Rs 837**

For arithmetic mean of savings of all the school:

Mean of such ungrouped data is given by

$$\text{Mean} = \frac{\text{Total savings of all the school}}{\text{Total number of schools}}$$

$$\Rightarrow \text{Mean} = \frac{14652}{33}$$

$\Rightarrow$ Mean = 444

Thus, arithmetic mean of savings of all the schools is Rs 444.

Q. 6. The heights of boys and girls of IX class of a school are given below.

Height (cm)	135	140	147	152	155	160
Boys	2	5	12	10	7	1
Girls	1	2	10	5	6	5

Compare the heights of the boys and girls
[Hint : Find median heights of boys and girls]

Answer : We have

Height (cm)	Boys x_i	Cumulative Frequency cf_{xi}	Girls y_i	Cumulative Frequency Cf_{yi}
135	2	2	1	1
140	5	2 + 5 = 7	2	1 + 2 = 3
147	12	7 + 12 = 19	10	3 + 10 = 13
152	10	19 + 10 = 29	5	13 + 5 = 18
155	7	29 + 7 = 36	6	18 + 6 = 24
160	1	36 + 1 = 37	5	24 + 5 = 29
TOTAL		$N_{xi} = 37$		$N_{yi} = 29$

We shall find median of the heights of the boys and girls separately.

Median of heights of boys:

$N_{xi} = 37$

$$\frac{N_{xi} + 1}{2} = \frac{37 + 1}{2}$$

$$\Rightarrow \frac{N_{xi}+1}{2} = \frac{38}{2} = 19$$

Cumulative frequency = 19 falls in the height of 147 cm.

Thus, median height of boys is 147 cm.

Now, median of heights of girls:

$N_{yi} = 29$

$$\frac{N_{yi} + 1}{2} = \frac{29 + 1}{2}$$

$$\Rightarrow \frac{N_{yi}+1}{2} = \frac{30}{2} = 15$$

Cumulative frequency = 15 falls in the height of 18.

Cumulative frequency, 18 falls in the height of 152 cm.

∴ **Median height of boys is 147 cm whereas median height of girls in the class is 152 cm.**

Q. 7. Centuries scored and number of cricketers in the world are given below.

No. of centuries	5	10	15	20	25
No. of cricketers	56	23	39	13	8

Find the mean, median and mode of the given data.

Answer : We have

No. of centuries (x_i)	No. of cricketers frequency (f_i)	$x_i f_i$	Cumulative Frequency (cf)
5	56	$5 \times 56 = 280$	56
10	23	$10 \times 23 = 230$	$56 + 23 = 79$
15	39	$15 \times 39 = 585$	$79 + 39 = 118$
20	13	$20 \times 13 = 260$	$118 + 13 = 131$
25	8	$25 \times 8 = 200$	$131 + 8 = 139$
TOTAL	$\Sigma f_i = 139$	$\Sigma x_i f_i = 1555$	$N = 139$

For mean:

Mean is given by

$$\text{Mean} = \frac{\sum x_i f_i}{\sum f_i}$$

$$\Rightarrow \text{Mean} = \frac{1555}{139}$$

⇒ **Mean = 11.19**

For median:

Total observation, N = 139

Since, N is odd (that is, 139 is odd),

$$\frac{N+1}{2} = \frac{139+1}{2}$$

$$\Rightarrow \frac{N+1}{2} = \frac{140}{2}$$

$$\Rightarrow \frac{N+1}{2} = 70$$

Cumulative frequency = 79 is just greater than 70.

And cumulative frequency, 79 falls in no. of century, 10.

⇒ **Median = 10**

For mode:

Mode is the value having highest frequency in the data.

From the table given above, 56 is the greatest frequency in the given frequencies.

Thus, the corresponding value in 'number of centuries', 5 is the mode.

⇒ **Mode = 5**

Q. 8. On the occasion of New Year 's Day a sweet stall prepared sweet packets. Number of sweet packets and cost of each packet are given as follows.

Cost of packet (in ₹)	₹25	₹50	₹75	₹100	₹125	₹150
No of packets	20	36	32	29	22	11

Find the mean, median and mode of the data.

Answer : We have

Cost of packet (in ₹) (x_i)	No. of packets frequency (f_i)	$x_i f_i$	Cumulative Frequency (cf)
₹25	20	25 × 20 = 500	20
₹50	36	50 × 36 = 1800	20 + 36 = 56
₹75	32	75 × 32 = 2400	56 + 32 = 88
₹100	29	100 × 29 = 2900	88 + 29 = 117
₹125	22	125 × 22 = 2750	117 + 22 = 139
₹150	11	150 × 11 = 1650	139 + 11 = 150
TOTAL	$\sum f_i = 150$	$\sum x_i f_i = 12000$	N = 150

For mean:

Mean is given by

$$\text{Mean} = \frac{\sum x_i f_i}{\sum f_i}$$

$$\Rightarrow \text{Mean} = \frac{12000}{150}$$

⇒ **Mean = 80**

For median:

Total observation, N = 150

Since, N is even (that is, 150 is even),

$$\frac{N}{2} = \frac{150}{2}$$

$$\Rightarrow \frac{N}{2} = 75$$

$$\& \frac{N}{2} + 1 = \frac{150}{2} + 1$$

$$\Rightarrow \frac{N}{2} + 1 = 75 + 1 = 76$$

Cumulative frequencies = 88 is just greater than 75 and 76.

And cumulative frequencies, 75 and 76 falls in cost of packet, '75.

⇒ **Median = 75**

For mode:

Mode is the value having highest frequency in the data.

From the table given above, 36 is the greatest frequency in the given frequencies.

Thus, the corresponding value in 'cost of packet', 50 is the mode.

⇒ **Mode = 50**

Q. 9. The mean (average) weight of three students is 40 kg. One of the students Ranga weighs 46 kg. The other two students, Rahim and Reshma have the same weight. Find Rahims weight.

Answer : Given: Mean of three students = 40 kg

The three students are Ranga, Rahim and Reshma, where

Ranga's weight = 46 kg

Let Rahim's weight = x

And Reshma's weight = y [∵, Rahim's weight = Reshma's weight, according to the question]

Mean is given by

$$\text{Mean} = \frac{\text{Ranga's weight} + \text{Rahim's weight} + \text{Reshma's weight}}{\text{Total number of students}}$$

$\Rightarrow 40 = \frac{46+x+x}{3}$ [∵, Mean = 40]

$\Rightarrow 120 = 46 + 2x$

$\Rightarrow 2x = 120 - 46 = 74$

$\Rightarrow x = 74/2$

$\Rightarrow x = 37$

Thus, Rahim's weight = 37 kg

Q. 10. The donations given to an orphanage home by the students of different classes of a secondary school are given below.

Class	Donation by each student (in ₹)	No. of students donated
VI	5	15
VII	7	15
VIII	10	20
IX	15	16
X	20	14

Find the mean, median and mode of the data.

Answer : We have

Class	Donation by each student (in ₹) (x_i)	No. of students donated (Frequency) (f_i)	x_if_i	Cumulative Frequency (cf)
VI	5	15	$5 \times 15 = 75$	15
VII	7	15	$7 \times 15 = 105$	$15 + 15 = 30$
VIII	10	20	$10 \times 20 = 200$	$30 + 20 = 50$
IX	15	16	$15 \times 16 = 240$	$50 + 16 = 66$
X	20	14	$20 \times 14 = 280$	$66 + 14 = 80$
TOTAL		$\sum f_i = 80$	$\sum x_if_i = 900$	$N = 80$

For mean:

Mean is given by

$$\text{Mean} = \frac{\sum x_i f_i}{\sum f_i}$$

$$\Rightarrow \text{Mean} = \frac{900}{80}$$

⇒ **Mean = 11.25**

For median:

Total observation, N = 80

Since, N is even (that is, 80 is even),

$$\frac{N}{2} = \frac{80}{2}$$

$$\Rightarrow \frac{N}{2} = 40$$

& $$\frac{N}{2} + 1 = \frac{80}{2} + 1$$

$$\Rightarrow \frac{N}{2} + 1 = 40 + 1 = 41$$

Cumulative frequencies = 50 is just greater than 40 and 41.

And cumulative frequencies, 50 falls in donation by each student, 10.

⇒ **Median = 10**

For mode:

Mode is the value having highest frequency in the data.

From the table given above, 20 is the greatest frequency in the given frequencies.

Thus, the corresponding value in 'donation by each student', 10 is the mode.

⇒ **Mode = 10**

Q. 11. There are four unknown numbers. The mean of the first two numbers is 4 and the mean of the first three is 9. The mean of all four number is 15, if one of the four number is 2 find the other numbers.

Answer : Given: There are 4 unknown numbers, but one of the number is 2.

Let $x_1 = 2$, $x_2 = ?$, $x_3 = ?$ and $x_4 = ?$

According to the question, mean of first two numbers = 4

Mean of first two numbers is given by,

$$\text{Mean} = \frac{\text{Sum of first two numbers}}{2}$$

$$\Rightarrow \text{Mean} = \frac{x_1 + x_2}{2}$$

$$\Rightarrow 4 = \frac{2 + x_2}{2}$$

⇒ 8 = 2 + x_2

⇒ x_2 = 8 − 2 = 6

We have $x_1 = 2$ and $x_2 = 6$. …(i)

Also, according to the question, mean of first three numbers = 9

$$\text{Mean} = \frac{\text{Sum of first three numbers}}{3}$$

$$\Rightarrow \text{Mean} = \frac{x_1 + x_2 + x_3}{3}$$

$$\Rightarrow 9 = \frac{2 + 6 + x_3}{3} \quad \text{[from (i)]}$$

⇒ 27 = 8 + x_3

⇒ x_3 = 27 − 8

⇒ x_3 = 19

We have now, $x_1 = 2$, $x_2 = 6$ and $x_3 = 19$ …(ii)

Also, according to the question, mean of all four numbers = 15

$$\text{Mean} = \frac{\text{Sum of all 4 numbers}}{4}$$

$$\Rightarrow 15 = \frac{x_1 + x_2 + x_3 + x_4}{4}$$

$\Rightarrow 60 = 2 + 6 + 19 + x_4$ [from (ii)]

$\Rightarrow 60 = 27 + x_4$

$\Rightarrow x_4 = 60 - 27$

$\Rightarrow x_4 = 33$

Thus, we have $x_1 = 2$, $x_2 = 6$, $x_3 = 19$ & $x_4 = 33$.