Statistics

Practice Set 6.1

Q. 1. The following table shows the number of students and the time they utilized daily for their studies. Find the mean time spent by students for their studies by direct method.

Time (hrs.)	0-2	2-4	4-6	6-8	8-10
No. of students	7	18	12	10	3

Answer :

Time	Class mark(x_i)	No of students(f_i)	$x_i \times f_i$
0-2	1	7	7
2-4	3	18	54
4-6	5	12	60
6-8	7	10	70
8-10	9	3	27
Total		$\sum f_i = 50$	$\sum x_i \times f_i = 218$

$$\Rightarrow \text{Mean} = \bar{x} = \frac{\sum x_i \times f_i}{\sum f_i} = \frac{218}{50} = 4.36$$

$$\Rightarrow \text{Mean } \bar{x} = 4.36$$

Q. 2. In the following table, the toll paid by drivers and the number of vehicles is shown. Find the mean of the toll by 'assumed mean' method.

Toll	300-400	400-500	500-600	600-700	700-800
No. of drivers	80	110	120	70	40

Answer :

Time	Class mark(x_i)	$p_i = x_i - A$ $p_i = x_i - 550$	$p_i = \frac{d_i}{100}$	No of Drivers (f_i)	$p_i \times f_i$
300-400	350	-200	-2	80	-160
400-500	450	-100	-1	110	-110
500-600	550 = A	0	0	120	0
600-700	650	100	1	70	70
700-800	750	200	2	40	80
Total				$\sum f_i = 420$	$\sum p_i \times f_i = -120$

$$\Rightarrow \text{Mean} = \bar{p} = \frac{\sum p_i \times f_i}{\sum f_i} = \frac{-120}{420} = -0.2857$$

$$\Rightarrow \bar{p} \times 100 = -28.57$$

$$\Rightarrow \text{Mean } \bar{x} = A + 100\,\bar{p}$$

$$\Rightarrow \bar{x} = 550 + (-28.57)$$

$$\Rightarrow \text{Mean } \bar{x} = 521.43$$

Mean toll is Rs 521.43

Q. 3. A milk centre sold milk to 50 customers. The table below gives the number of customers and the milk they purchased. Find the mean of the milk sold by direct method.

Milk Sold (Litre)	1-2	2-3	3-4	4-5	5-6
No. of Customers	17	13	10	7	3

Answer :

Milk sold	Class mark(x_i)	No of customers(f_i)	$x_i \times f_i$
1-2	1.5	17	25.5
2-3	2.5	13	32.5
3-4	3.5	10	35
4-5	4.5	7	31.5
5-6	5.5	3	16.5
Total		$\sum f_i = 50$	$\sum x_i \times f_i = 141$

$$\Rightarrow \text{Mean} = \bar{x} = \frac{\sum x_i \times f_i}{\sum f_i} = \frac{141}{50} = 2.82 \text{ litre}$$

$$\Rightarrow \text{Mean } \bar{x} = 2.82 \text{ litre}$$

Mean of the milk sold is 2.82 litre

Q. 4. A frequency distribution table for the production of oranges of some farm owners is given below. Find the mean production of oranges by 'assumed mean' method.

Production (Thousand rupees)	25-30	30-35	35-40	40-45	45-50
No. of farm owners	20	25	15	10	10

Answer :

Production	Class mark(x_i)	$p_i = x_i - A$ $p_i = x_i - 37.5$	No of Owners (f_i)	$p_i \times f_i$
25-30	27.5	-10	20	-200
30-35	32.5	-5	25	-125
35-40	37.5 = A	0	15	0
40-45	42.5	5	10	50
45-50	47.5	10	10	100
Total			$\sum f_i = 80$	$\sum p_i \times f_i = -175$

$$\Rightarrow \text{Mean } \bar{P} = \frac{\sum p_i \times f_i}{\sum f_i} = \frac{-175}{80} = -2.19$$

$$\text{Mean } \bar{x} = \bar{P} + 37.5$$

= 37.5-2.19

= 35.31

⇒The amount is given in thousands or rupees

∴ 35.31× 1000 = Rs 35130

Q. 5. A frequency distribution of funds collected by 120 workers in a company for the drought affected people are given in the following table. Find the mean of the funds by 'step deviation' method.

Fund (Rupees)	0-500	500-1000	1000-1500	1500-2000	2000-2500
No. of workers	35	28	32	15	10

Answer :

Fund	Class mark(x_i)	$d_i = x_i - A$ $d_i = x_i - 1250$	$p_i = \frac{d_i}{100}$	No of workers (f_i)	$p_i \times f_i$
0-500	250	-1000	-10	35	-350
500-1000	750	-500	-5	28	-140
1000-1500	1250 = A	0	0	32	0
1500-2000	1750	500	5	15	75
2000-2500	2250	1000	10	10	100
Total				$\sum f_i = 120$	$\sum p_i \times f_i = 315$

$$\Rightarrow \text{Mean} = \bar{p} = \frac{\sum p_i \times f_i}{\sum f_i} = \frac{-315}{120} = -2.625$$

$$\Rightarrow \bar{P} \times 100 = -262.5$$

$$\Rightarrow \text{Mean } \bar{x} = A + 100\,\bar{p}$$

$\Rightarrow \bar{x} = 1250 - 262.5$

$\Rightarrow \bar{x} = 987.5$

∴Mean of the funds is Rs 987.5

Q. 6. The following table gives the information of frequency distribution of weekly wages of 150 workers of a company. Find the mean of the weekly wages by 'step deviation' method.

Weekly wages (Rupees)	1000-2000	2000-3000	3000-4000	4000-5000
No. of workers	25	45	50	30

Answer :

Fund	Class mark(x_i)	$p_i = \frac{d_i}{100}$	No of workers (f_i)	$p_i \times f_i$
1000-2000	1500	15	25	375
2000-3000	2500	25	45	1125
3000-4000	3500	35	50	1750
4000-5000	4500	45	30	1350
Total			$\sum f_i = 150$	$\sum p_i \times f_i = 4600$

$\text{Mean} = \bar{p} = \frac{\sum p_i \times f_i}{\sum f_i} = \frac{4600}{150} = 30.6667$

$\Rightarrow \bar{P} \times 100 = 3066.677$

$\Rightarrow \text{Mean } \bar{x} = 100\,\bar{p}$

$\Rightarrow \bar{x} = 3066.67$

∴ Mean of weekly wages is Rs 3066.67

Practice Set 6.2

Q. 1. The following table shows classification of number of workers and the number of hours they work in a software company. Find the median of the number of hours they work.

Daily No. of hours	8-10	10-12	12-14	14-16
Number of workers	150	500	300	50

Answer :

Daily hours Class	No of workers (f_i)	Cumulative frequency less than(cf)
8-10	150	150
10-12	500	650
12-14	300	950
14-16	50	1000

⇒ N = 1000

$$\frac{N}{2} = 500$$

⇒ 500 Lies in class 10-12

⇒ Median class 10-12

L = lower limit of median class = 10

N = sum of frequencies = 1000

h = class interval of median class = 2

f = frequency of median class = 500

cf = cumulative frequency of class preceding median class = 150

$$\Rightarrow \text{Median} = L + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$$

$$\Rightarrow \text{Median} = 10 + \left[\frac{500-150}{500}\right] \times 2$$

$$\Rightarrow \text{Median} = 11.4$$

Q. 2. The frequency distribution table shows the number of mango trees in a grove and their yield of mangoes. Find the median of data.

No. of Mangoes	50-100	100-150	150-200	200-250	250-300
No.of trees	33	30	90	80	17

Answer :

No of mangoes Class	No of trees (f_i)	Cumulative frequency less than(cf)
50-100	33	33
100-150	30	63
150-200	90	153
200-250	80	233
250-300	17	250

⇒ N = 250

$$\frac{N}{2} = 125$$

⇒ 125 Lies in class 100-150

⇒ Median class 100-150

L = lower limit of median class = 100

N = sum of frequencies = 250

h = class interval of median class = 50

f = frequency of median class = 30

cf = cumulative frequency of class preceding median class = 33

$$\Rightarrow \text{Median} = L + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$$

$$\Rightarrow \text{Median} = 100 + [\frac{\frac{250}{2} - 33}{30}] \times 50$$

$$\Rightarrow 100 + [\frac{125 - 33}{30}] \times 50$$

$$\Rightarrow \text{Median} = 253.33$$

Q. 3. The following table shows the classification of number of vehicles and their speeds on Mumbai-Pune express way. Find the median of the data.

Average Speed of Vehicles (Km/hr)	60-64	64-69	69-74	75-79	79-84	84-89
No. of vehicles	10	34	55	85	10	6

Answer :

The class is discontinuous between 69-74 and 75-79

Converting the to continuous class

Avg speed Class	Continuous class	No of trees (f_i)	Cumulative frequency less than(cf)
60-64	59.5-64.5	10	10
64-69	64.5-69.5	34	44
69-74	69.5-74.5	55	99
75-79	74.5-79.5	85	184
79-84	79.5-84.5	10	194
84-89	84.5-89.5	6	200

$\Rightarrow N = 200$

$$\frac{N}{2} = 100$$

$\Rightarrow$ 100 Lies in class 74.5-79.5

⇒ Median class 74.5-79.5

L = lower limit of median class = 74.5

N = sum of frequencies = 200

h = class interval of median class = 5

f = frequency of median class = 85

cf = cumulative frequency of class preceding median class = 99

$$\Rightarrow \text{Median} = L + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$$

$$\Rightarrow \text{Median} = 75 + \left[\frac{100-99}{85}\right] \times 5$$

$$\Rightarrow \text{Median} = 74.558$$

Q. 4. The production of electric bulbs in different factories is shown in the following table. Find the median of the productions.

No. of bulbs Produced (Thusands)	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of factories	12	35	20	15	8	7	8

Answer :

No of bulbs Class	No of factories (f_i)	Cumulative frequency less than(cf)
30-40	12	12
40-50	35	47
50-60	20	67
60-70	15	82
70-80	8	90
80-90	7	97
90-100	8	105

⇒ N = 105

$$\frac{N}{2} = 52.5$$

⇒ 52.5 Lies in class 50-60

⇒ Median class 50-60

L = lower limit of median class = 50

N = sum of frequencies = 105

h = class interval of median class = 10

f = frequency of median class = 20

cf = cumulative frequency of class preceding median class = 47

Practice Set 6.3

Q. 1. The following table shows the information regarding the milk collected from farmers on a milk collection centre and the content of fat in the milk, measured by a lactometer. Find the mode of fat content.

Content of fat (%)	2-3	3-4	4-5	5-6	6-7
Milk collected (Litre)	30	70	80	60	20

Answer :

Content of fat (%)	Milk collected (Litre)
2-3	30
3-4	70-f_0
4-5	80-f_1
5-6	60-f_2
6-7	20

⇒ Maximum amount of milk collected in class 4-5

⇒ 4-5 is modal class

L = lower limit of modal class = 4

h = class interval of modal class = 1

f_1 = frequency of modal class = 80

f_2 = frequency of class succeeding modal class = 60

f_0 = frequency of class preceding modal class = 70

$$\Rightarrow \text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$\Rightarrow \text{Mode} = 4 + \left[\frac{80-70}{2\times 80-70-60}\right] \times 1$$

$$\Rightarrow \text{Mode} = 4 + \left[\frac{10}{30}\right] \times 1$$

$$\Rightarrow \text{Mode} = 4.33 \text{ litre}$$

Q. 2. Electricity used by some families is shown in the following table. Find the mode for use of electricity.

Use of electricity (Unit)	0-20	20-40	40-60	60-80	80-100	100-120
No. of families	13	50	70	100	80	17

Answer :

Use of electricity (Unit)	No. of families
0-20	13
20-40	50
40-60	70-f_0
60-80	100-f_1
80-100	80-f_2
100-120	17

⇒ Maximum amount of Electricity in class 60-80

⇒ 60-80 is modal class

L = lower limit of modal class = 60

h = class interval of modal class = 20

f_1 = frequency of modal class = 100

f_2 = frequency of class succeeding modal class = 80

f_0 = frequency of class preceding modal class = 70

$$\Rightarrow \text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$\Rightarrow \text{Mode} = 60 + \left[\frac{100 - 70}{2 \times 100 - 70 - 80}\right] \times 20$$

$$\Rightarrow \text{Mode} = 60 + \left[\frac{30}{50}\right] \times 20$$

$$\Rightarrow \text{Mode} = 72 \text{ families}$$

Q. 3. Grouped frequency distribution of supply of milk to hotels and the number of hotels is given in the following table. Find the mode of the supply of milk.

Milk (Litre)	1-3	3-5	5-7	7-9	9-11	11-13
No. of hotels	7	5	15	20	35	18

Answer :

Milk (Litre)	No of hotels
1-3	7
3-5	5
5-7	15
7-9	$20\text{-}f_0$
9-11	$35\text{-}f_1$
11-13	$18\text{-}f_2$

⇒ Maximum amount of Electricity in class 9-11

⇒ 9-11 is modal class

L = lower limit of modal class = 9

h = class interval of modal class = 2

f_1 = frequency of modal class = 35

f_2 = frequency of class succeeding modal class = 18

f_0 = frequency of class preceding modal class = 20

$$\Rightarrow \text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$\Rightarrow \text{Mode} = 9 + \left[\frac{35 - 20}{2 \times 35 - 18 - 20}\right] \times 2$$

$$\Rightarrow \text{Mode} = 9 + \left[\frac{15}{32}\right] \times 2$$

$$\Rightarrow \text{Mode} = 9.94 \text{ hotels}$$

Q. 4. The following frequency distribution table gives the ages of 200 patients treated in a hospital in a week. Find the mode of ages of the patients.

Age (Years)	Less than 5	5-9	10-14	15-19	20-24	25-29
No. of patients	38	32	50	36	24	20

Answer :

Age (years)		No of patients
0-4	-0.5-4.5	38
5-9	4.5-9.5	32-f_0
10-14	9.5-14.5	50-f_1
15-19	14.5-19.5	36-f_2
20-24	19.5-24.5	24
25-29	24.5-29.5	20

⇒ Maximum amount of Electricity in class 9.5-14.5

⇒ 9.5-14.5 is modal class

L = lower limit of modal class = 9.5

h = class interval of modal class = 5

f_1 = frequency of modal class = 50

f_2 = frequency of class succeeding modal class = 36

f_0 = frequency of class preceding modal class = 32

$$\Rightarrow \text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$\Rightarrow \text{Mode} = 9.5 + \left[\frac{50 - 32}{2 \times 50 - 36 - 32}\right] \times 5$$

$$\Rightarrow \text{Mode} = 9.5 + \left[\frac{18}{32}\right] \times 5$$

⇒ Mode = 12.31 years

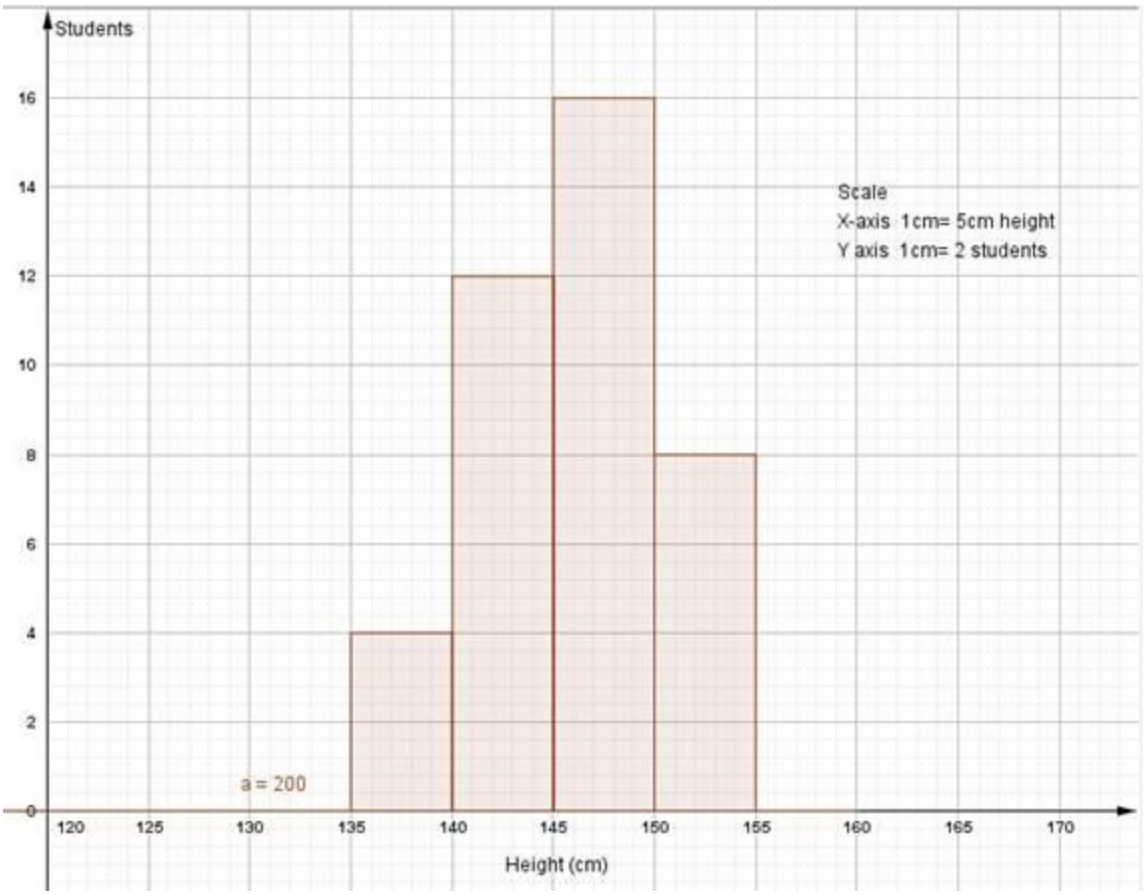
Mode age of the patient 12.31 years

Practice Set 6.4

Q. 1. Draw a histogram of the following data.

Height of student (cm)	135-140	140-145	145-150	150-155
No. of students	4	12	16	8

Answer :

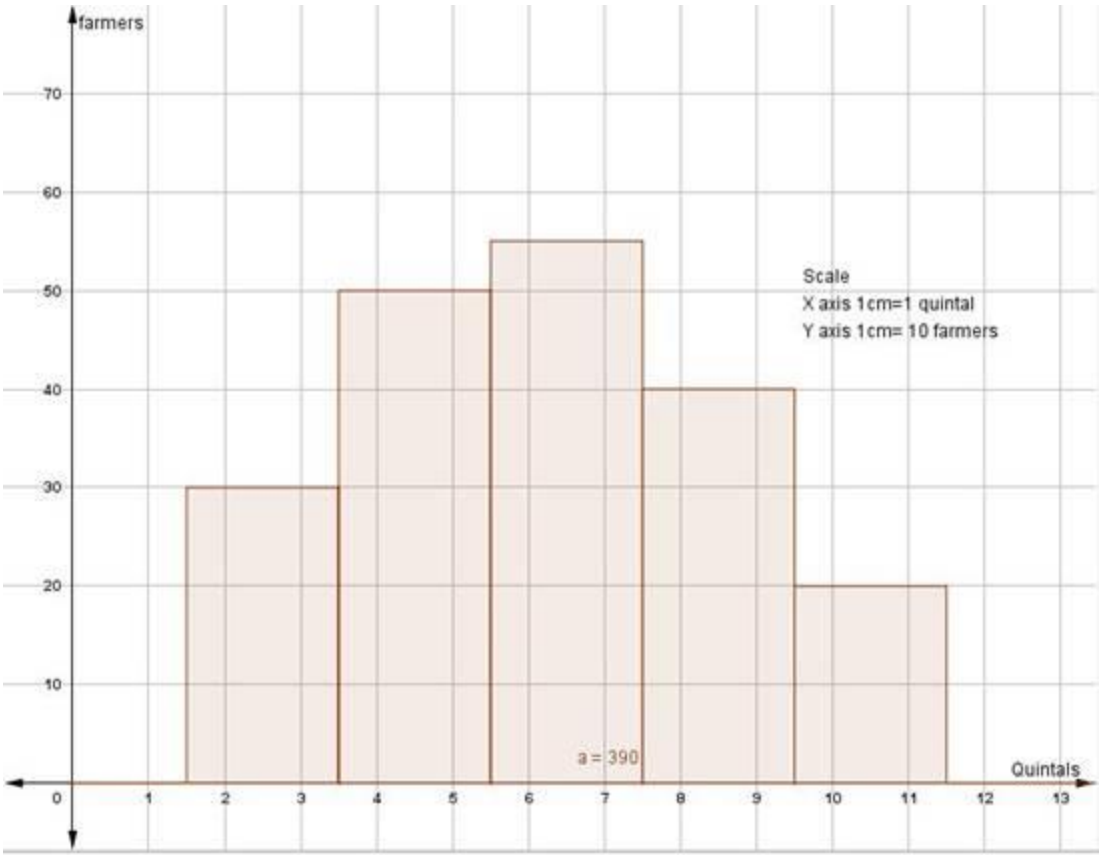


Q. 2. The table below shows the yield of jowar per acre. Show the data by histogram.

Yields per acre (quintal)	2-3	4-5	6-7	8-9	10-11
No. of farmers	30	50	55	40	20

Answer :

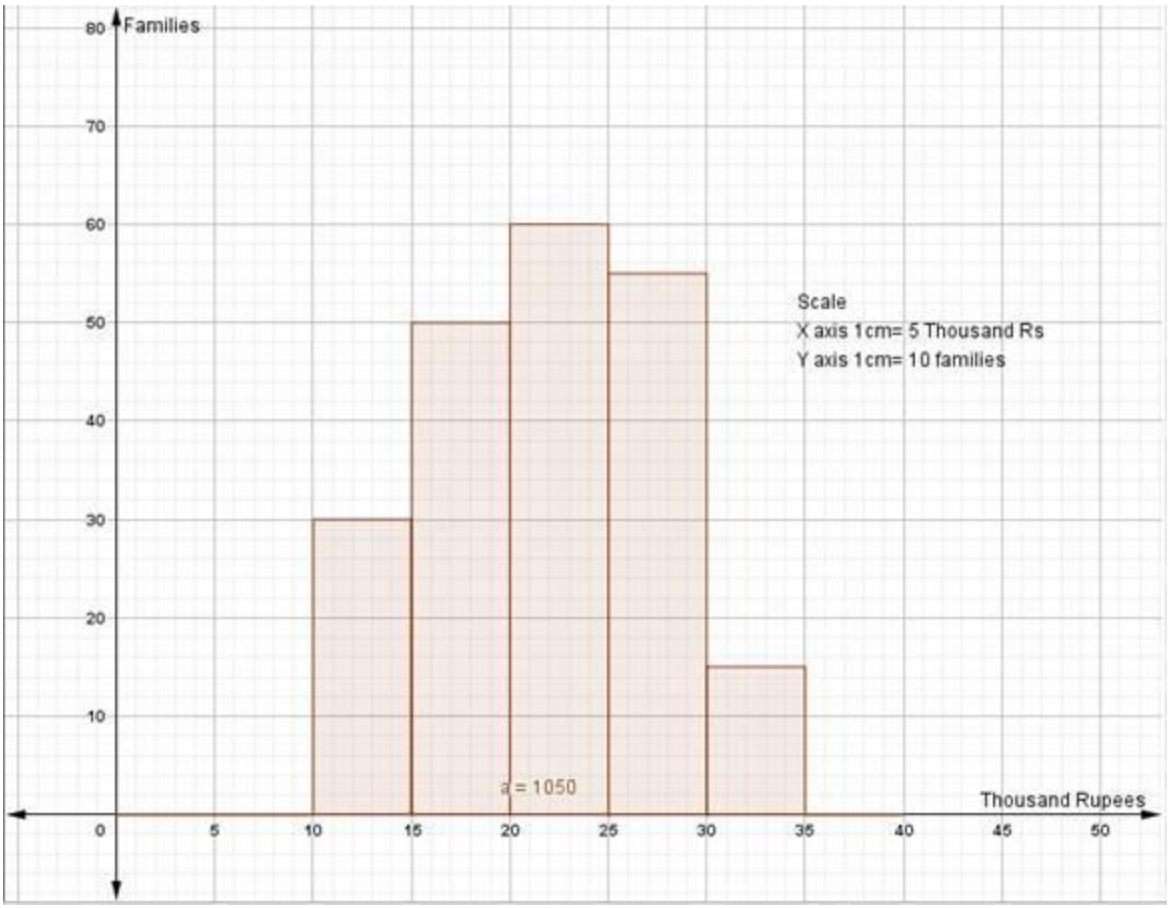
Continuous class	1.5-3.5	3.5-5.5	5.5-7.5	7.5-9.5	9.5-11.5
frequency	30	50	55	40	20



Q. 3. In the following table, the investment made by 210 families is shown. Present it in the form of a histogram.

Investment (Thousand Rupees)	10-15	15-20	20-25	25-30	30-35
No. of families	30	50	60	55	15

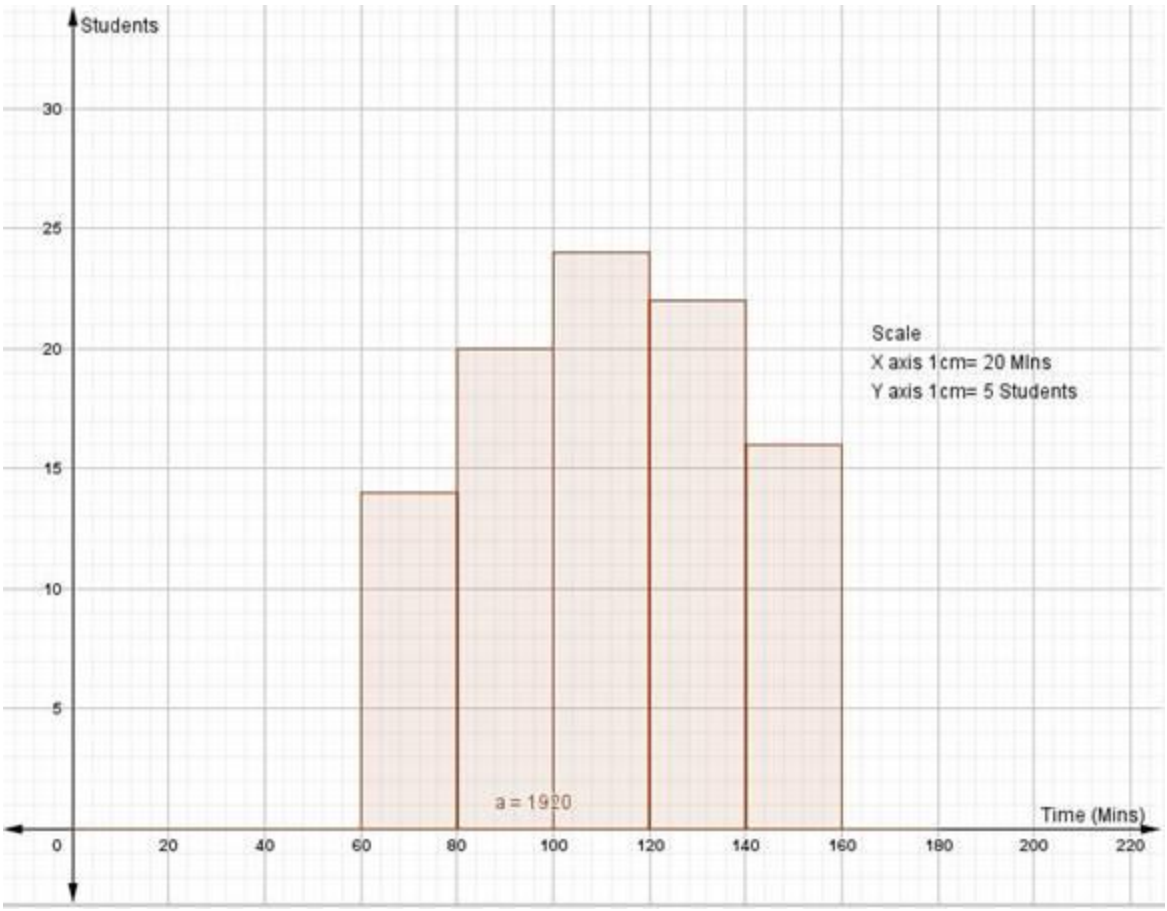
Answer :



Q. 4. Time alloted for the preparation of an examination by some students is shown in the table. Draw a histogram to show the information.

Time (minutes)	60-80	80-100	100-120	120-140	140-160
No. of students	14	20	24	22	16

Answer :



Practice Set 6.5

Q. 1. Observe the following frequency polygon and write the answers of the questions below it.

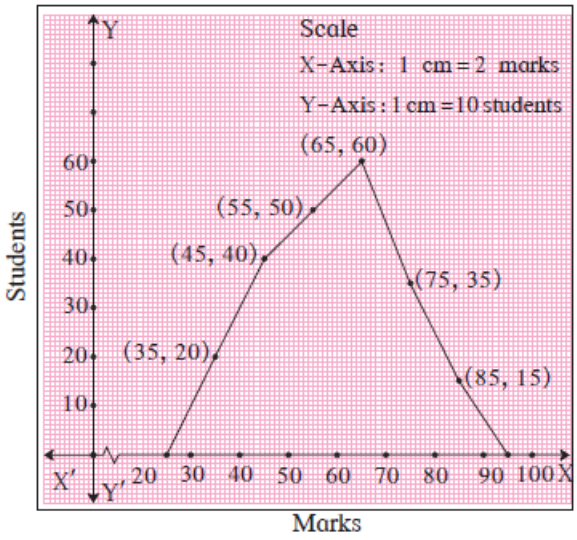


fig 6.6

(1) Which class has the maximum number of students?
(2) Write the classes having zero frequency.
(3) What is the class-mark of the class, having frequency of 50 students?
(4) Write the lower and upper class limits of the class whose class mark is 85.
(5) How many students are in the class 80-90?

Answer :

(1) Class 60-70 has maximum number of students

(2) Class 20-30 and class 90-100 have zero frequency

(3) Frequency 50 students is for class 50-60

Class mark for this class is 55

(4) Class mark is 85 for class 80-90

Lower limit = 80

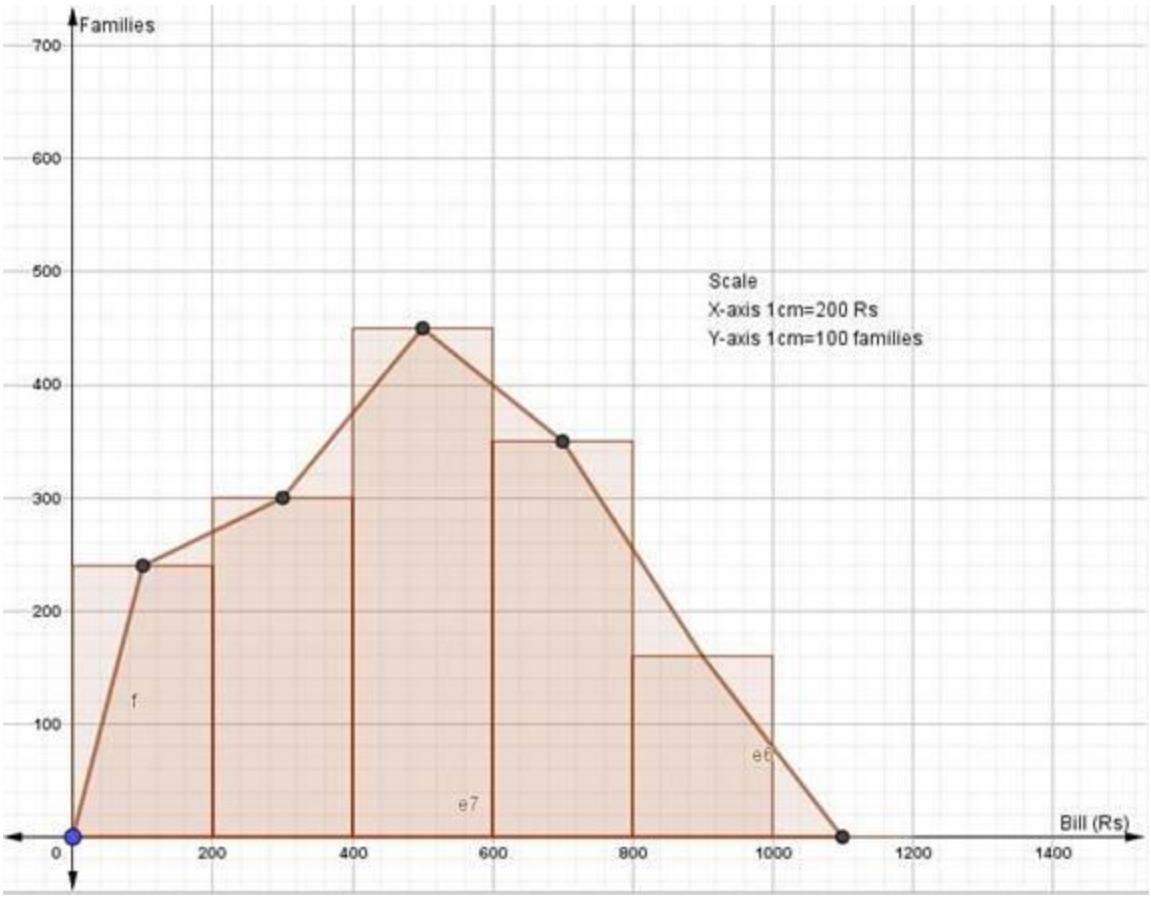
Upper limit = 90

(5) There are 15 students in class 80-90

Q. 2. Show the following data by a frequency polygon.

Electricity bill (Rs)	0-200	200-400	400-600	600-800	800-1000
Families	240	300	450	350	160

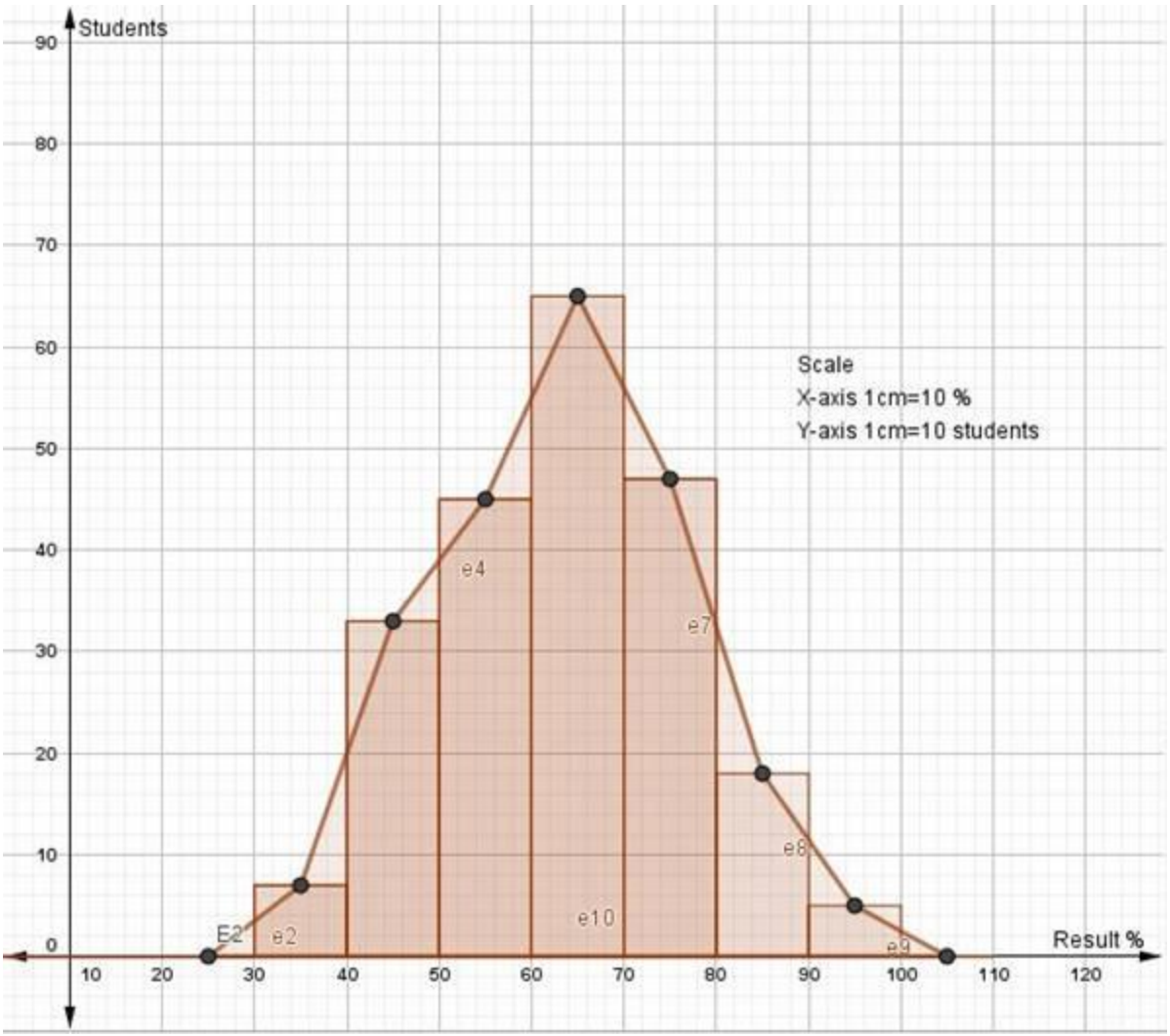
Answer :



Q. 3. The following table shows the classification of percentages of marks of students and the number of students. Draw a frequency polygon from the table.

Result (Percentage)	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	7	33	45	65	47	18	5

Answer :



Practice Set 6.6

Q. 1. The age group and number of persons, who donated blood in a blood donation camp is given below. Draw a pie diagram from it.

Age group (Yrs)	20-25	25-30	30-35	35-40
No. of persons	80	60	35	25

Answer : Let us find the measures of central angles and show them in a table.

Know that,

$$\text{Measures of central angles} = \frac{\text{No. of persons}}{\text{Total number of persons}} \times 360°$$

Age group (yrs)	No. of persons	Measure of central angles
20-25	80	$\frac{80}{200} \times 360° = 144°$
25-30	60	$\frac{60}{200} \times 360° = 108°$
30-35	35	$\frac{35}{200} \times 360° = 63°$
35-40	25	$\frac{25}{200} \times 360° = 45°$
Total	200	360°

Now we shall show the table into a pie chart.

Q. 2. The marks obtained by a student in different subjects are shown. Draw a pie diagram showing the information.

Subject	English	Marathi	Science	Mathematics	Social science	Hindi
Marks	50	70	80	90	60	50

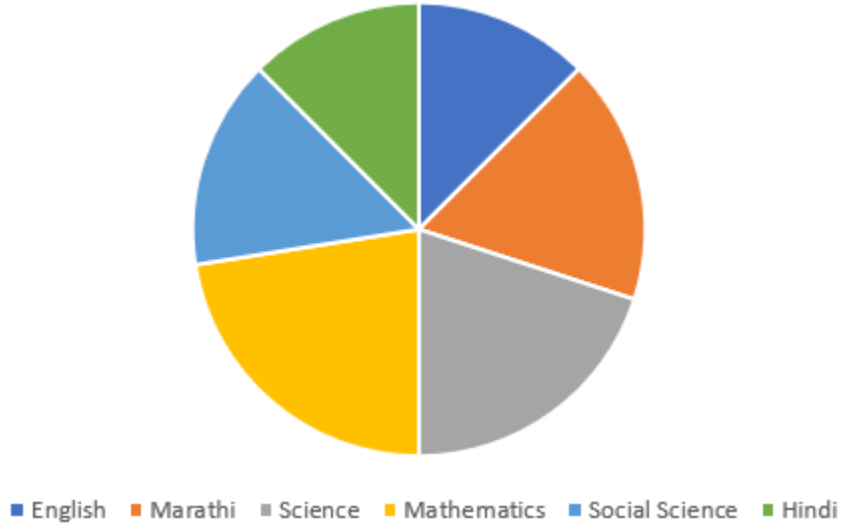
Answer : Let us find the measures of central angles and show them in a table.

Know that,

$$\text{Measures of central angles} = \frac{\text{Marks}}{\text{Total Marks}} \times 360°$$

Subject	Marks	Measure of central angles
English	50	$\frac{50}{400} \times 360° = 45°$
Marathi	70	$\frac{70}{400} \times 360° = 63°$
Science	80	$\frac{80}{400} \times 360° = 72°$
Mathematics	90	$\frac{90}{400} \times 360° = 81°$
Social Science	60	$\frac{60}{400} \times 360° = 54°$
Hindi	50	$\frac{50}{400} \times 360° = 45°$
Total	400	360°

Now we shall show the table into a pie chart.



Q. 3. In a tree plantation programme, the number of trees planted by students of different classes is given in the following table. Draw a pie diagram showing the information.

Standard	5 th	6 th	7 th	8 th	9 th	10 th
No. of trees	40	50	75	50	70	75

Answer :

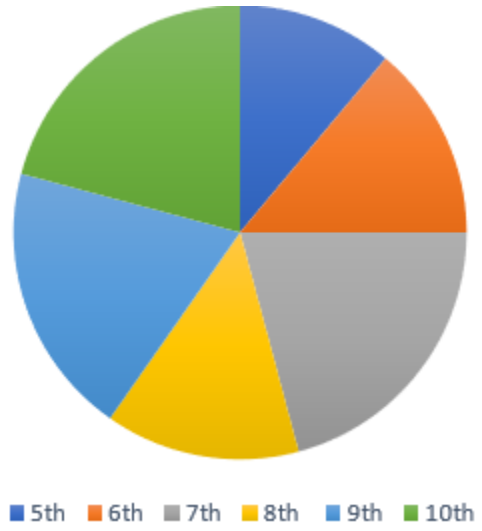
Let us find the measures of central angles and show them in a table.

Know that,

$$\text{Measures of central angles} = \frac{\text{No. of trees}}{\text{Total number of trees}} \times 360°$$

Standard	No. of trees	Measure of central angles
5^{th}	40	$\frac{40}{360} \times 360° = 40°$
6^{th}	50	$\frac{50}{360} \times 360° = 50°$
7^{th}	75	$\frac{75}{360} \times 360° = 75°$
8^{th}	50	$\frac{50}{360} \times 360° = 50°$
9^{th}	70	$\frac{70}{360} \times 360° = 70°$
10^{th}	75	$\frac{75}{360} \times 360° = 75°$
Total	360	360°

Now we shall show the table into a pie chart.



Q. 4. The following table shows the percentages of demands for different fruits registered with a fruit vendor. Show the information by a pie diagram.

Fruits	Mango	Sweet line	Apples	Cheeku	Oranges
Percentages of demand	30	15	25	20	10

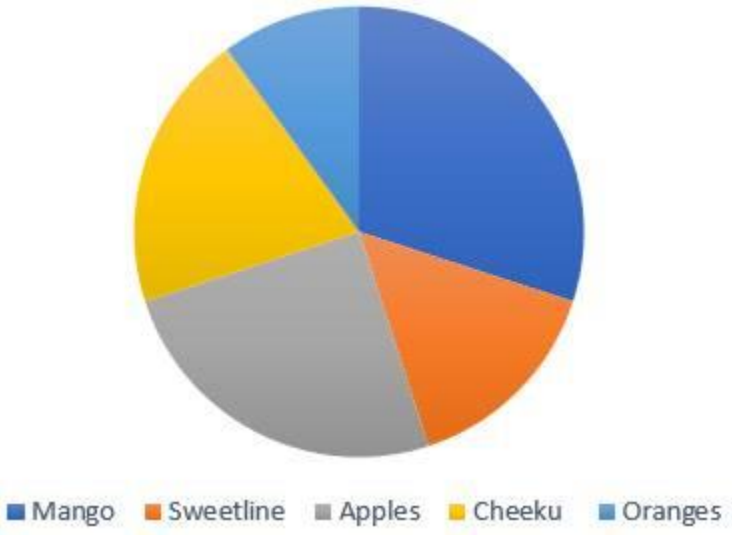
Answer : Let us find the measures of central angles and show them in a table.

Know that,

$$\text{Measures of central angles} = \frac{\text{Percentages of demand}}{\text{Total percentages of demand}} \times 360°$$

Fruits	Percentages of demand	Measure of central angles
Mango	30	$\frac{30}{100} \times 360° = 108°$
Sweetline	15	$\frac{15}{100} \times 360° = 54°$
Apples	25	$\frac{25}{100} \times 360° = 90°$
Cheeku	20	$\frac{20}{100} \times 360° = 72°$
Oranges	10	$\frac{10}{100} \times 360° = 36°$
Total	100	360°

Now we shall show the table into a pie chart.



Q. 5. The pie diagram in figure 6.13 shows the proportions of different workers in a town.

Answer the following questions with its help.
(1) If the total workers is 10,000; how many of them are in the field of construction?
(2) How many workers are working in the administration?

(3) What is the percentage of workers in production?

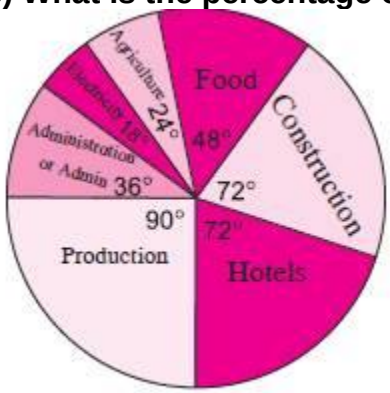


fig 6.13

Answer : (1) Given: total number of workers = 10000

And central angle for number of workers in construction = 72°

And we know that,

$$\text{Central angle for workers in construction} = \frac{\text{No. of workers in construction}}{\text{Total number of workers}} \times 360°$$

$$\Rightarrow \text{No. of workers in construction} = \frac{\text{Central angle for workers in construction} \times \text{Total no.of workers}}{360°}$$

$$\Rightarrow \text{No. of workers in construction} = \frac{72° \times 10000}{360°}$$

⇒ No. of workers in construction = 2000

Thus, number of workers in the field of construction = 2000.

(2) We know that,

$$\text{Central angle for workers in admin} = \frac{\text{No. of workers in admin}}{\text{Total number of workers}} \times 360°$$

$$\Rightarrow \text{No. of workers in admin} = \frac{\text{Central angle for workers in admin} \times \text{Total no. of workers}}{360^\circ}$$

$$\Rightarrow \text{No. of workers in admin} = \frac{36^\circ \times 10000}{360^\circ}$$

⇒ No. of workers in admin = 1000

Thus, number of workers working in administration = 1000

(3) First, let us find the number of workers working in production.

We know that,

$$\text{Central angle for workers in production} = \frac{\text{No. of workers in production}}{\text{Total number of workers}} \times 360^\circ$$

$$\Rightarrow \text{No. of workers in production} = \frac{\text{Central angle for workers in production} \times \text{Total no. of workers}}{360^\circ}$$

$$\Rightarrow \text{No. of workers in production} = \frac{90^\circ \times 10000}{360^\circ}$$

⇒ No. of workers in production = 2500

In terms of percentage,

$$\text{Percentage of workers in production} = \frac{\text{No. of workers in production}}{\text{Total no. of workers}} \times 100$$

$$\text{Percentage of workers in production} = \frac{\text{No. of workers in production}}{\text{Total no. of workers}} \times 100$$

$$\Rightarrow \text{Percentage of workers in production} = \frac{2500}{10000} \times 100$$

Thus, percentage of workers in production = 25%

Q. 6. The annual investments of a family are shown in the adjacent pie diagram. Answer the following questions based on it.

(1) If the investment in shares is Rs 2000/, find the total investment.
(2) How much amount is deposited in bank?
(3) How much more money is invested in immovable property than in mutual fund?
(4) How much amount is invested in post?

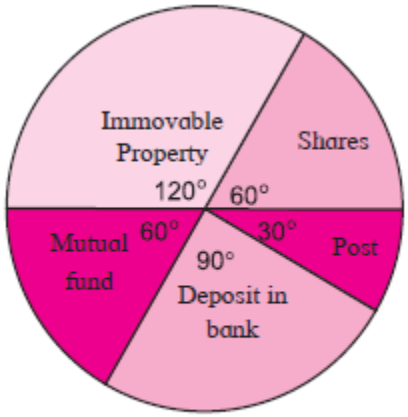


fig 6.14

Answer :

(1) Given: Investment in shares = Rs. 2000

And central angle for investment in shares = 60°

And we know that,

$$\text{Central angle for investment in shares} = \frac{\text{Investment in shares}}{\text{Total investment}} \times 360°$$

$$\Rightarrow \text{Total investment} = \frac{\text{Investment in shares}}{\text{Central angle for investment in shares}} \times 360°$$

$$\Rightarrow \text{Total investment} = \frac{2000}{60°} \times 360°$$

$$\Rightarrow \text{Total investment} = 12000$$

Thus, total investment is Rs. 12000.

(2) We know that, total investment = Rs. 12000

Central angle for deposits in banks = 90°

And we know that,

$$\text{Central angle for deposits in bank} = \frac{\text{Deposits in bank}}{\text{Total investment}} \times 360°$$

$$\Rightarrow \text{Deposits in bank} = \frac{\text{Central angle for deposits in bank} \times \text{Total investment}}{360°}$$

$$\Rightarrow \text{Deposits in bank} = \frac{90° \times 12000}{360°}$$

$$\Rightarrow \text{Deposits in bank} = 3000$$

Thus, deposits in bank is Rs. 3000.

(3) Firstly, let us find money invested in immovable property.

We know that, total investment = Rs. 12000

Central angle for investment in immovable property = 120°

And we know that,

$$\text{Central angle for investment in immovable property} = \frac{\text{Investment in immovable property}}{\text{Total investment}} \times 360°$$

$$\Rightarrow \text{Investment in immovable property} = \frac{\text{Central angle for investment in immovable property} \times \text{Total investment}}{360°}$$

$$\Rightarrow \text{Investment in immovable property} = \frac{120° \times 12000}{360°}$$

⇒ Investment in immovable property = 4000 …(i)

Now, let us find money invested in mutual fund.

We know that, total investment = Rs. 12000

Central angle for investment in mutual fund = 60°

And we know that,

$$\text{Central angle for investment in mutual fund} = \frac{\text{Investment in mutual fund}}{\text{Total investment}} \times 360°$$

$$\Rightarrow \text{Investment in mutual fund} = \frac{\text{Central angle for investment in mutual fund} \times \text{Total investment}}{360°}$$

$$\Rightarrow \text{Investment in mutual fund} = \frac{60° \times 12000}{360°}$$

⇒ Investment in mutual fund = 2000 …(ii)

Subtract (ii) from (i),

The additional money invested in immovable property than mutual fund = (Investment in immovable property) – (Investment in mutual fund)

= 4000 – 2000

= 2000

Thus, Rs. 2000 more money is invested in immovable property than mutual fund.

(4) We know that, total investment = Rs. 12000

Central angle for investment in post = 30°

And we know that,

$$\text{Central angle for investment in post} = \frac{\text{Investment in post}}{\text{Total investment}} \times 360°$$

$$\Rightarrow \text{Investment in post} = \frac{\text{Central angle for investment in post} \times \text{Total investment}}{360°}$$

$$\Rightarrow \text{Investment in post} = \frac{30° \times 12000}{360°}$$

⇒ Investment in post = 1000

Thus, investment in post is Rs. 1000.

Miscellaneous Problems 6

Q. 1 A. Find the correct answer from the alternatives given.

The persons of O- blood group are 40%. The classification of persons based on blood groups is to be shown by a pie diagram. What should be the measures of angle for the persons of O- blood group?

A. 114°
B. 140°
C. 104°
D. 144°

Answer : Given is, percentage of persons of O- blood group = 40%

⇒ Sample of persons of O- blood group = 40

& Total sample of persons = 100

(∵, 40/100 implies that out of 100 samples, 40 are persons of O- blood group)

And we know,

$$\text{Central angle for persons of O} - \text{blood group} = \frac{\text{Sample of persons of O} - \text{blood group}}{\text{Total sample of persons}} \times 360°$$

$$\Rightarrow \text{Central angle for persons of O} - \text{blood group} = \frac{40}{100} \times 360°$$

⇒ Central angle for persons of O- blood group = 144°

Thus, the correct option is (D).

Q. 1 B. Find the correct answer from the alternatives given.

Different expenditures incurred on the construction of a building were shown by a pie diagram. The expenditure Rs 45,000 on cement was shown by a sector of central angle of 75°. What was the total expenditure of the construction?

A. 2,16,000
B. 3,60,000
C. 4,50,000
D. 7,50,000

Answer : The pie diagram shows, the central angle for expenditure on cement = 75°

Also, expenditure on cement = Rs. 45,000

We know that,

$$\text{Central angle for expenditure on cement} = \frac{\text{Expenditure on cement}}{\text{Total expenditure on the contruction}} \times 360°$$

$$\Rightarrow \text{Total expenditure on the construction} = \frac{\text{Expenditure on cement}}{\text{Central angle for expenditure on cement}} \times 360°$$

$$\Rightarrow \text{Total expenditure on the construction} = \frac{45000}{75°} \times 360°$$

⇒ Total expenditure on the construction = 216000

Thus, the correct option is (A).

Q. 1 C. Find the correct answer from the alternatives given.

Cumulative frequencies in a grouped frequency table are useful to find . . .

A. Mean
B. Median
C. Mode
D. All of these

Answer : The cumulative frequency of a set of data or class intervals of a frequency table is the sum of the frequencies of the data up to a required level. It can be used to determine the number of items that have values below a particular level.

Mean is simple or arithmetic average of a range of values or quantities, computed by dividing the total of all values by the number of values. And The **mode** of a set of data values is the value that appears most often.

While, **median** is the middle value of the set of ordered data. The position of the median is given by $\{(n + 1)/2\}^{th}$ value, where n is the number of values in a set of data.

So, the formula can be applied in the cumulative frequency in an arranged data to find the median.

Thus, (B) is the correct option.

Q. 1 D. Find the correct answer from the alternatives given.

The formula to find mean from a grouped frequency table is

$$\overline{X} = A\frac{\sum f_i u_i}{\sum f_i} \times h\ g$$

In the formula u_i =……

A. $\frac{X_i + A}{g}$

B. $(X_i - A$

C. $\frac{X_i - A}{g}$

D. $\frac{A - X_i}{g}$

Answer : Among the given option, $(X_i - A)/g$ is the correct option.

Where X_i = values in the given data corresponding to i^{th} position.

A = Assumed mean

g = class size

Thus, (C) is the correct option.

Q. 1 E. Find the correct answer from the alternatives given.

Distance Covered per litre (km)	12-14	14-16	16-18	18-20
No. of cars	11	12	20	7

The median of the distances covered per litre shown in the above data is in the group . . . . .
A. 12-14
B. 14-16
C. 16-18
D. 18-20

Answer :

Distance (km)	No. of cars (f)	Cumulative frequency (cf)
12-14	11	11
14-16	12	**23**
16-18	**20**	43
18-20	7	50

Here, $(n/2)^{th} = (50/2)^{th} = 25^{th}$ term

cf = 23<25 ⇒ Median class = 16-18

Median class is the next class of interval of cumulative frequency.

Thus, option (C) is correct.

Q. 1 F. Find the correct answer from the alternatives given.

No. of trees planted by each student	1-3	4-6	7-9	10-12
No. of students	7	8	6	4

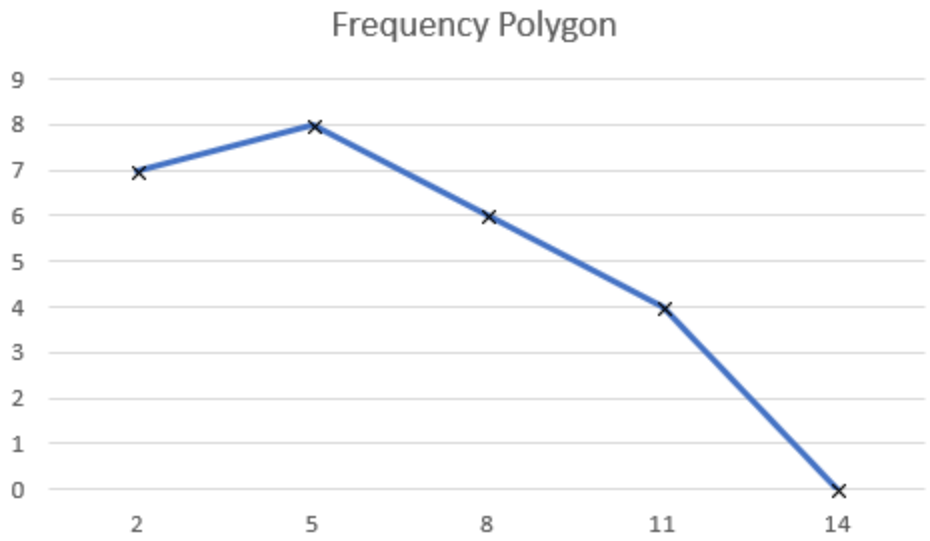
The above data is to be shown by a frequency polygon. The coordinates of the points to show number of students in the class 4-6 are . . . .

A. (4, 8)
B. (3, 5)
C. (5, 8)
D. (8, 4)

Answer : First, draw a table converting the given class into continuous class.

Class	Continuous Class	Class mark	Frequency
1-3	0.5-3.5	2	7
4-6	3.5-6.5	5	8
7-9	6.5-9.5	8	6
10-12	9.5-12.5	11	4

Drawing it into a frequency polygon.



Class	Continuous Class	Class mark	Frequency	Coordinate
1-3	0.5-3.5	2	7	(2,7)
4-6	3.5-6.5	5	8	(5,8)
7-9	6.5-9.5	8	6	(8,6)
10-12	9.5-12.5	11	4	(11,4)

So, the coordinates of the points to show number of students in the class 4-6 are (5,8).

Thus, option (C) is correct.

Q. 2. The following table shows the income of farmers in a grape season. Find the mean of their income.

Income (Thousand Rupees)	20-30	30-40	40-50	50-60	60-70	70-80
Farmers	10	11	15	16	18	14

Answer :

Class (Income in Rs. 1000)	Class Mark x_i	Frequency (farmers) f_i	Class Mark × Frequency x_if_i
20-30	25	10	250
30-40	35	11	385
40-50	45	15	675
50-60	55	16	880
60-70	65	18	1170
70-80	75	14	1050
TOTAL		$\Sigma f_i = 84$	$\Sigma x_if_i = 4410$

Mean is given by

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

⇒ Mean = 4410/84

⇒ Mean = 52.5

Now, since the income is given in thousand rupees.

Then, Mean = 52.5 × 1000

⇒ Mean = 52500

Thus, mean income is Rs. 52,500.

Q. 4. The weekly wages of 120 workers in a factory are shown in the following frequency distribution table. Find the mean of the weekly wages.

Weekly wages (Rupees)	0-2000	2000-4000	4000-6000	6000-8000
No. of workers	15	35	50	20

Answer :

Class (Weekly wages in Rs.)	Class Mark x_i	Frequency (No. of workers) f_i	Class Mark × Frequency x_if_i
0-2000	1000	15	15000
2000-4000	3000	35	105000
4000-6000	5000	50	250000
6000-8000	7000	20	140000
TOTAL		$\Sigma f_i = 120$	$\Sigma x_if_i = 510000$

Mean is given by

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

⇒ Mean = 510000/120

⇒ Mean = 4250

Thus, mean weekly wages is Rs. 4250.

Q. 5. The following frequency distribution table shows the amount of aid given to 50 flood affected families. Find the mean of the amount of aid.

Amount of aid (Thosand rupees)	50-60	60-70	70-80	80-90	90-100
No. of families	7	13	20	6	4

Answer :

Class (Amount of aid in Rs. 1000)	Class Mark x_i	Frequency (No. of families) f_i	Class Mark × Frequency x_if_i
50-60	55	7	385
60-70	65	13	845
70-80	75	20	1500
80-90	85	6	510
90-100	95	4	380
TOTAL		$\Sigma f_i = 50$	$\Sigma x_if_i = 3620$

Mean is given by

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

⇒ Mean = 3620/50

⇒ Mean = 72.4

Now, since the amount of aid is given in thousand rupees.

Then, Mean = 72.4 × 1000

⇒ Mean = 72400

Thus, mean amount of aid is Rs. 72,400.

Q. 6. The distances covered by 250 public transport buses in a day is shown in the following frequency distribution table. Find the median of the distances.

Distance (km)	200-210	210-220	220-230	230-240	240-250
No. of buses	40	60	80	50	20

Answer : Let us prepare cumulative frequency table:

Class (Distance in km)	Frequency (No. of buses) F	Cumulative frequency cf
200-210	40	40
210-220	60	100
220-230	80	180
230-240	50	230
240-250	20	250

Here, N = 250

N/2 = 250/2 = 125

Since, cumulative frequency 180 is just greater than 125. ⇒ median class = 220-230

Median is given by

$$\text{Median} = L + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$$

Where l = lower limit of the median class

N = Sum of frequencies

h = class interval of the median class

cf = Cumulative frequency of the class preceding the median class

f = Frequency of the median class

Here, Median class = 220-230

L = 220

N/2 = 125

h = 10

cf = 100

f = 80

Putting all these values in the median formula, we get

$$\text{Median} = 220 + \left[\frac{125 - 100}{80}\right] \times 10$$

⇒ Median = 220 + 250/80

⇒ Median = 220 + 3.125 = 223.125

Or Median is approximately 223.13 km

Thus, median of the distances is 223.13 km.

Q. 7. The prices of different articles and demand for them is shown in the following frequency distribution table. Find the median of the prices.

Price (Rupees)	20 less than	20-40	40-60	60-80	80-100
No. of articles	140	100	80	60	20

Answer : Let us prepare cumulative frequency table:

Class (Price in Rs.)	Frequency (No. of articles) f	Cumulative frequency cf
0-20	140	140
20-40	100	240
40-60	80	320
60-80	60	380
80-100	20	400

Here, N = 400

N/2 = 400/2 = 200

Since, cumulative frequency 240 is just greater than 200 ⇒ median class = 20-40

Median is given by

$$\text{Median} = L + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$$

Where l = lower limit of the median class

N = Sum of frequencies

h = class interval of the median class

cf = Cumulative frequency of the class preceding the median class

f = Frequency of the median class

Here, Median class = 20-40

L = 20

N/2 = 200

h = 20

cf = 140

f = 100

Putting all these values in the median formula, we get

$$\text{Median} = 20 + \left[\frac{200 - 140}{100}\right] \times 20$$

⇒ Median = 20 + 1200/100

⇒ Median = 20 + 12 = 32

Thus, median of the prices is Rs. 32.

Q. 8. The following frequency table shows the demand for a sweet and the number of customers. Find the mode of demand of sweet.

Weight of sweet (gram)	0-250	250-500	500-750	750-1000	1000-1250
No. of customers	10	60	25	20	15

Answer : Given the distribution table, notice that maximum number of customers has demand for 250-500 grams. (Since, 60 is the maximum number of customers)

So, modal class = 250-500

Mode is given by

$$\text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

Where L = lower class limit of the modal class

h = class interval of the modal class

f_1 = frequency of the modal class

f_0 = frequency of the class preceding the modal class

f_2 = frequency of the class succeeding the modal class

Here, Modal class = 250-500

L = 250

h = 250

f_1 = 60

f_0 = 10

$f_2 = 25$

Putting these values in the formula,

$$\text{Mode} = 250 + \left[\frac{60 - 10}{2 \times 60 - 10 - 25}\right] \times 250$$

$$\Rightarrow \text{Mode} = 250 + \left[\frac{50}{85}\right] \times 250$$

⇒ Mode = 250 + 147.06

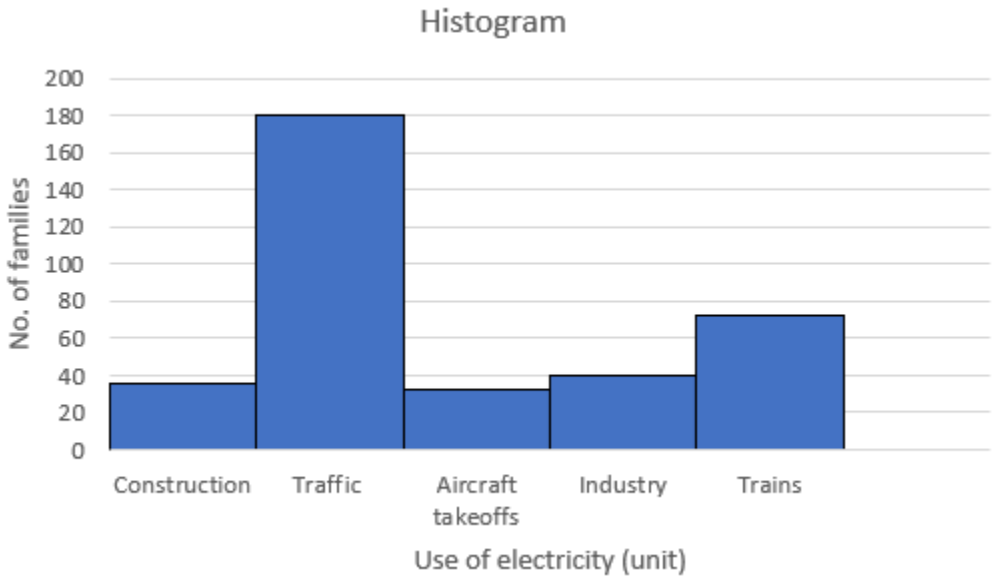
⇒ Mode = 397.06

Thus, mode of demand of sweet is 397.06 grams.

Q. 9. Draw a histogram for the following frequency distribution.

Use of electricity (Unit)	50-70	70-90	90-110	110-130	130-150	150-170
No. of families	150	400	460	540	600	350

Answer : Let values in use of electricity be x-values and values in no. of families be y-axis.



Thus, this is the histogram.

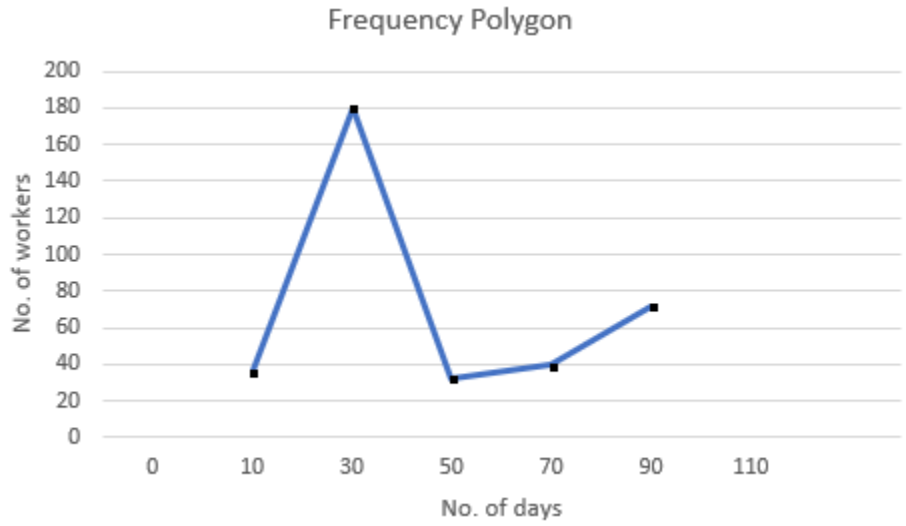
Q. 10. In a handloom factory different workers take different periods of time to weave a saree. The number of workers and their required periods are given below. Present the information by a frequency polygon.

No. of days	8-10	10-12	12-14	14-16	16-18	18-20
No. of workers	5	16	30	40	35	14

Answer : First, draw a frequency table.

Class	Class mark	Frequency
8-10	9	5
10-12	11	16
12-14	13	30
14-16	15	40
16-18	17	35
18-20	19	14

Drawing it into a frequency polygon.



Q. 11. The time required for students to do a science experiment and the number of students is shown in the following grouped frequency distribution table. Show the information by a histogram and also by a frequency polygon.

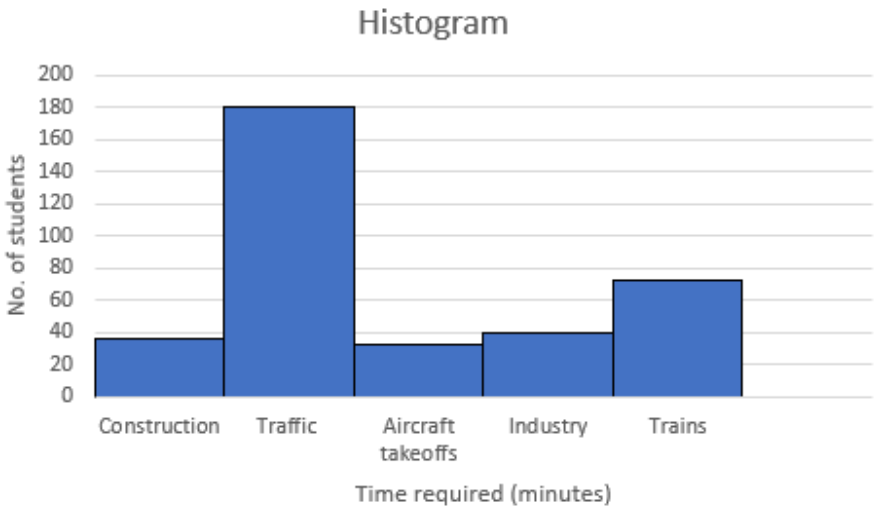
Time required for Experiment (minutes)	20-22	22-24	24-26	26-28	28-30	30-32
No. of students	8	16	22	18	14	12

Answer : First, draw a frequency table.

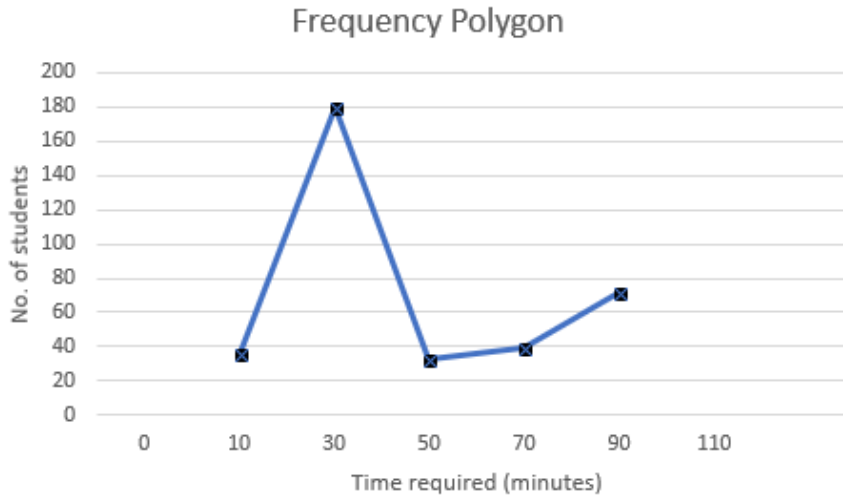
Class	Class mark	Frequency
20-22	21	8
22-24	23	16
24-26	25	22
26-28	27	18
28-30	29	14
30-32	31	12

Drawing it on a histogram.

Let time required for experiment (minutes) be x-values and number of students be y-axis.



Drawing it into a frequency polygon.



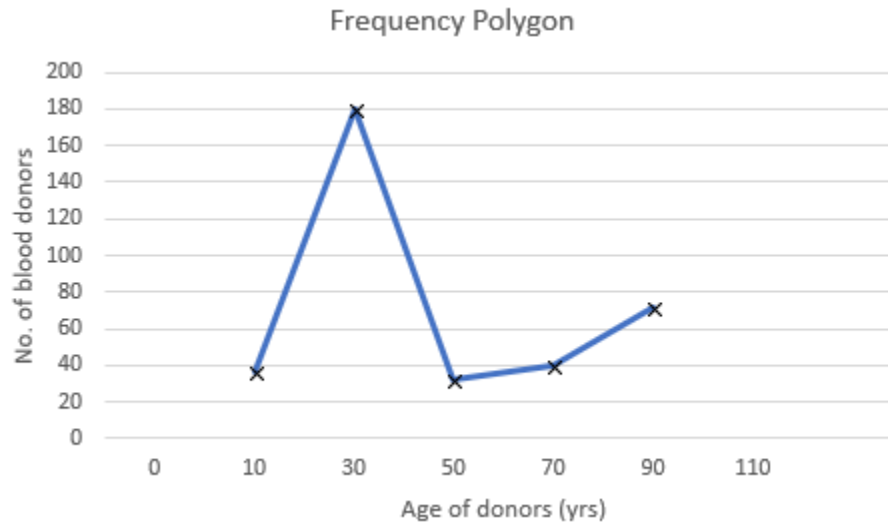
Q. 12. Draw a frequency polygon for the following grouped frequency distribution table.

Age of donor (Yrs.)	20-24	25-29	30-34	35-39	40-44	45-49
No. of blood doners	38	46	35	24	15	12

Answer : First, draw a frequency table.

Class	Continuous class	Class mark	Frequency
20-24	19.5-24.5	22	38
25-29	24.5-29.5	27	46
30-34	29.5-34.5	32	35
35-39	34.5-39.5	37	24
40-44	39.5-44.5	42	15
45-49	44.5-49.5	47	12

The representation into a frequency polygon will be as such.



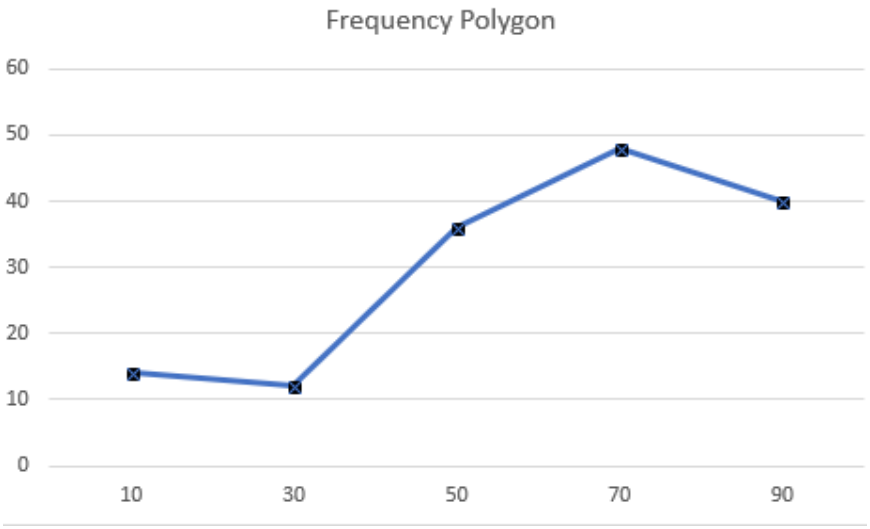
Q. 13. The following table shows the average rainfall in 150 towns. Show the information by a frequency polygon.

Average rainfall (cm)	0-20	20-40	40-60	60-80	80-100
No. of towns	14	12	36	48	40

Answer : First, draw a frequency table.

Class	Class mark	Frequency
0-20	10	14
20-40	30	12
40-60	50	36
60-80	70	48
80-100	90	40

Representing the information into a frequency polygon.



Q. 14. Observe the adjacent pie diagram. It shows the percentages of number of vehicles passing a signal in a town between 8 am and 10 am

(1) Find the central angle for each type of vehicle.
(2) If the number of two-wheelers is 1200, find the number of all vehicles.

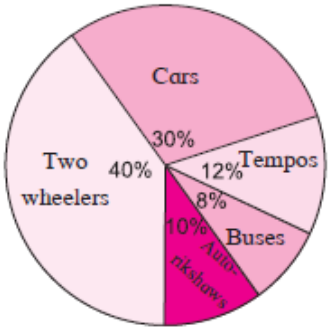


fig 6.15

Answer : (1) To find central angle for cars:

Given that, percentage of cars passing a signal in a town = 30%

⇒ Number of cars = 30

& Total number of vehicles = 100

Central angle for cars is given by,

$$\text{Central angle for cars} = \frac{\text{Number of cars}}{\text{Total number of vehicles}} \times 360°$$

$$\Rightarrow \text{Central angle for cars} = \frac{30}{100} \times 360°$$

⇒ Central angle for cars = 108°

Thus, central angle for cars is 108°.

To find central angle for tempos:

Given that, percentage of tempos passing a signal in a town = 12%

⇒ Number of tempos = 12

& Total number of vehicles = 100

Central angle for tempos is given by,

$$\text{Central angle for tempos} = \frac{\text{Number of tempos}}{\text{Total number of vehicles}} \times 360°$$

$$\Rightarrow \text{Central angle for tempos} = \frac{12}{100} \times 360°$$

⇒ Central angle for tempos = 43.2°

By approximating, we get

Central angle for tempos = 43°

Thus, central angle for tempos is 43.2°.

To find central angle for buses:

Given that, percentage of buses passing a signal in a town = 8%

⇒ Number of buses = 8

& Total number of vehicles = 100

Central angle for buses is given by,

$$\text{Central angle for buses} = \frac{\text{Number of buses}}{\text{Total number of vehicles}} \times 360°$$

$$\Rightarrow \text{Central angle for buses} = \frac{8}{100} \times 360°$$

⇒ Central angle for buses = 28.8°

By approximating, we get

Central angle for buses = 29°

Thus, central angle for buses is 29°.

To find central angle for auto-rikshaws:

Given that, percentage of auto-rikshaws passing a signal in a town = 10%

⇒ Number of auto-rikshaws = 10

& Total number of vehicles = 100

Central angle for auto-rikshaws is given by,

$$\text{Central angle for auto} - \text{rikshaws} = \frac{\text{Number of auto} - \text{rikshaws}}{\text{Total number of vehicles}} \times 360°$$

$$\Rightarrow \text{Central angle for auto} - \text{rikshaws} = \frac{10}{100} \times 360°$$

⇒ Central angle for auto-rikshaws = 36°

Thus, central angle for auto-rikshaws is 36°.

To find central angle for two-wheelers:

Given that, percentage of two-wheelers passing a signal in a town = 40%

⇒ Number of two-wheelers = 40

& Total number of vehicles = 100

Central angle for two-wheelers is given by,

$$\text{Central angle for two} - \text{wheelers} = \frac{\text{Number of two} - \text{wheelers}}{\text{Total number of vehicles}} \times 360°$$

$$\Rightarrow \text{Central angle for two} - \text{wheelers} = \frac{40}{100} \times 360°$$

⇒ Central angle for two-wheelers = 144°

Thus, central angle for two-wheelers is 144°.

Check: Add all central angles for vehicles (cars + tempos + buses + auto-rikshaws + two-wheelers) = 108° + 43° + 29° + 36° + 144° = 360°

Hence, it's correct.

(2). Given: Number of two-vehicles = 1200

And central angle for two-vehicles = 144° (as found in part (1))

Then,

$$\text{Central angle for two} - \text{wheelers} = \frac{\text{Number of two} - \text{wheelers}}{\text{Total number of vehicles}} \times 360°$$

$$\Rightarrow \text{Total number of vehicles} = \frac{\text{Number of two-wheelers}}{\text{Central angle for two-vehicles}} \times 360°$$

$$\Rightarrow \text{Total number of vehicles} = \frac{1200}{144°} \times 360°$$

⇒ Total number of vehicles = 3000

Thus, there are total 3000 vehicles in all.

Q. 15. The following table shows causes of noise pollution. Show it by a pie diagram.

Construction	Traffic	Aricraft take offs	Industry	Trains
10%	50%	9%	20%	11%

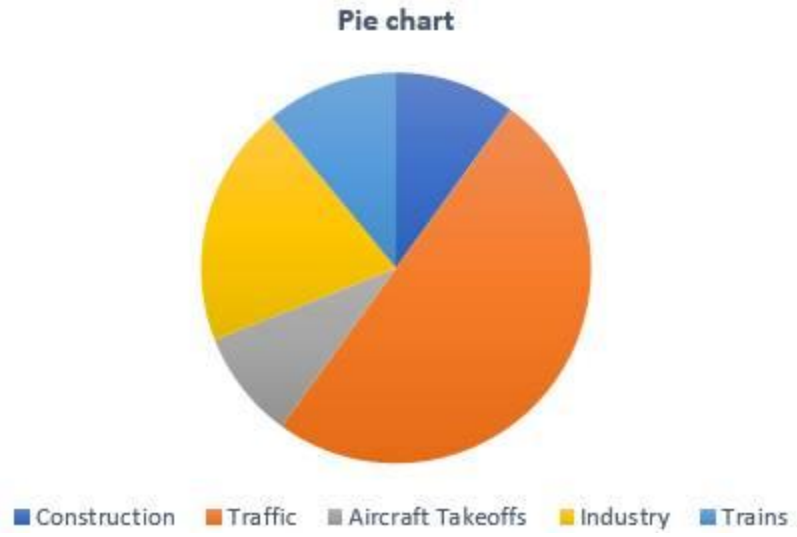
Answer : Let us find the measures of central angles and show them in a table.

Know that,

$$\text{Measures of central angles} = \frac{\text{No. of scores}}{\text{Total number of scores}} \times 360°$$

Component	Percentage (%)	Measure of central angles
Construction	10	$\frac{10}{100} \times 360° = 36°$
Traffic	50	$\frac{50}{100} \times 360° = 180°$
Aircraft takeoffs	9	$\frac{9}{100} \times 360° = 32.4°$
Industry	20	$\frac{20}{100} \times 360° = 72°$
Trains	11	$\frac{11}{100} \times 360° = 39.6°$
Total	100	360°

Now we shall show the table into a pie chart.



Q. 16. A survey of students was made to know which game they like. The data obtained in the survey is presented in the adjacent pie diagram. If the total number of students are 1000,

(1) How many students like cricket?

(2) How many students like football?
(3) How many students prefer other games?

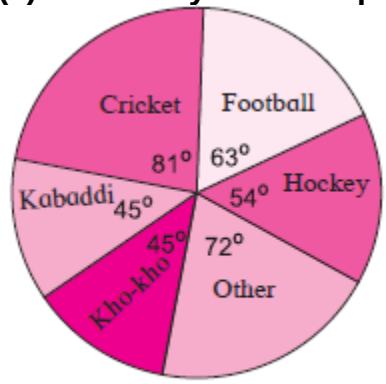


fig 6.16

Answer : (1) Central angle for cricket = 81°

Total number of students = 1000

Then,

$$\text{Central angle for cricket} = \frac{\text{Number of students who like cricket}}{\text{Total number of students}} \times 360°$$

$$\Rightarrow \text{Number of students who like cricket} = \frac{\text{Central angle for cricket} \times \text{Total number of students}}{360°}$$

$$\Rightarrow \text{Number of students who like cricket} = \frac{81° \times 1000}{360°}$$

⇒ Number of students who like cricket = 225

Thus, 225 students like cricket.

(2) Central angle for football = 63°

Total number of students = 1000

Then,

$$\text{Central angle for football} = \frac{\text{Number of students who like football}}{\text{Total number of students}} \times 360°$$

$$\Rightarrow \text{Number of students who like football} = \frac{\text{Central angle for football} \times \text{Total number of students}}{360^\circ}$$

$$\Rightarrow \text{Number of students who like football} = \frac{63^\circ \times 1000}{360^\circ}$$

⇒ Number of students who like football = 175

Thus, 175 students like football.

(3) Central angle for other games = 72°

Total number of students = 1000

Then,

$$\text{Central angle for other games} = \frac{\text{Number of students who like other games}}{\text{Total number of students}} \times 360^\circ$$

$$\Rightarrow \text{Number of students who like other games} = \frac{\text{Central angle for other games} \times \text{Total number of students}}{360^\circ}$$

$$\Rightarrow \text{Number of students who like other games} = \frac{72^\circ \times 1000}{360^\circ}$$

⇒ Number of students who like other games = 200

Thus, 200 students like other games.

Q. 17. Medical check up of 180 women was conducted in a health centre in a village. 50 of them were short of haemoglobin, 10 suffered from cataract and 25 had respiratory disorders. The remaining women were healthy. Show the information by a pie diagram.

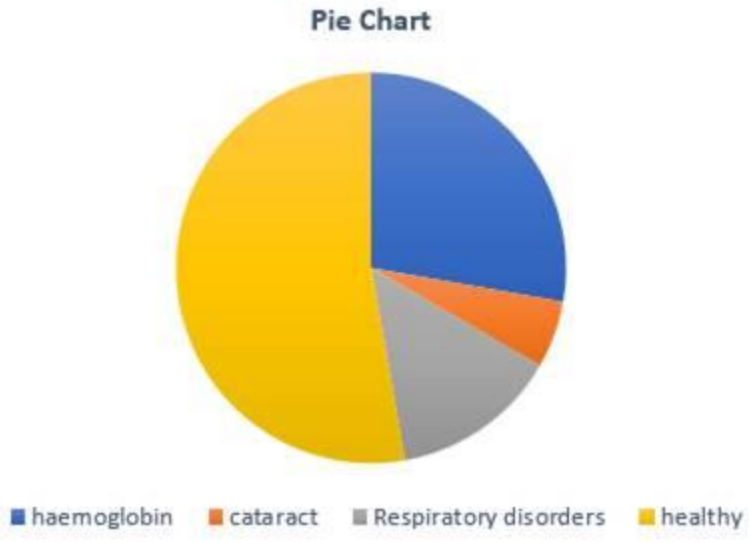
Answer : First lets show it by a table.

Know that,

$$\text{Measures of central angles} = \frac{\text{No. of scores}}{\text{Total number of scores}} \times 360^\circ$$

Component	Values	Measure of central angles
Haemoglobin	50	$\frac{50}{180} \times 360° = 100°$
Cataract	10	$\frac{10}{180} \times 360° = 20°$
Respiratory disorders	25	$\frac{25}{180} \times 360° = 50°$
Healthy	180 − (50 + 10 + 25) = 180 − 85 = 95	$\frac{95}{180} \times 360° = 190°$
Total	180	360°

Now we shall show the table into a pie chart.



Q. 18

On an environment day, students in a school planted 120 trees under plantation project. The information regarding the project is shown in the following table. Show it by a pie diagram.

Tree name	Karanj	Behada	Arjun	Bakul	Kadunimb
No. of trees	20	28	24	22	26

Answer :

First lets show it by a table.

Know that,

$$\text{Measures of central angles} = \frac{\text{No. of trees}}{\text{Total number of trees}} \times 360°$$

Tree name	No. of trees	Measure of central angles
Karanj	20	$\frac{20}{120} \times 360° = 60°$
Behada	28	$\frac{28}{120} \times 360° = 84°$
Arjun	24	$\frac{24}{120} \times 360° = 72°$
Bakul	22	$\frac{22}{120} \times 360° = 66°$
Kadunimb	26	$\frac{26}{120} \times 360° = 78°$
Total	120	360°

Now we shall show the table into a pie chart.

First lets show it by a table.

Know that,

$$\text{Measures of central angles} = \frac{\text{No. of trees}}{\text{Total number of trees}} \times 360°$$

Tree name	No. of trees	Measure of central angles
Karanj	20	$\frac{20}{120} \times 360° = 60°$
Behada	28	$\frac{28}{120} \times 360° = 84°$
Arjun	24	$\frac{24}{120} \times 360° = 72°$
Bakul	22	$\frac{22}{120} \times 360° = 66°$
Kadunimb	26	$\frac{26}{120} \times 360° = 78°$
Total	120	360°

Now we shall show the table into a pie chart.


Pie Chart
Karanj
Behada
Arjun
Bakul
Kadunimb