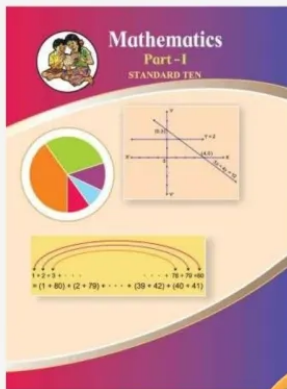


Maharashtra Board Solutions for Class 10-Maths (Part 1): Chapter 6-Statistics

BOOK SOLUTIONS
CLASS 10

CHAPTER 6
Statistics



Maharashtra Board Solutions→

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Maharashtra Board Solutions for Class 10-Maths (Part 1): Chapter 6- Statistics

Class 10: Maths Chapter 6 solutions. Complete Class 10 Maths Chapter 6 Notes.

Maharashtra Board Solutions for Class 10-Maths (Part 1): Chapter 6- Statistics

Maharashtra Board 10th Maths Chapter 6, Class 10 Maths Chapter 6 solutions

Practice Set 6.1

Question 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

Solution:

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Class Time (hrs.)	Class mark x_i	Frequency (No. of students) f_i	Frequency $\times$ Class mark $f_i x_i$
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	–	$\Sigma f_i = 50$	$\Sigma f_i x_i = 218$

$$\text{Mean} = \bar{X} = \frac{\sum_{i=1}^N f_i x_i}{\sum f_i} = \frac{218}{50} = 4.36$$

$\therefore$ The mean of the time spent by the students for their studies is 4.36 hours.

Question 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 vehicles	80	110	120	70	40

Solution:

Let us take the assumed mean (A) = 550

Class Toll (₹)	Class mark x_i	$d_i = x_i - A$ $= x_i - 550$	Frequency (No. of vehicles) f_i	Frequency $\times$ Deviation $f_i d_i$
300 – 400	350	– 200	80	– 16000
400 – 500	450	– 100	110	– 11000
500 – 600	550 $\rightarrow$ A	0	120	0
600 – 700	650	100	70	7000
700 – 800	750	200	40	8000
Total	–	–	$\Sigma f_i = 420$	$\Sigma f_i d_i = -12000$

Here, $\Sigma f_i d_i = -12000$, $\Sigma f_i = 420$

$$\bar{d} = \frac{\Sigma f_i d_i}{\Sigma f_i} = \frac{-12000}{420} = -28.57$$

$$\begin{aligned} \text{Mean} = \bar{X} &= A + \bar{d} \\ &= 550 + (-28.57) \\ &= 521.43 \end{aligned}$$

$\therefore$ The mean of the toll paid by the drivers is ₹ 521.43.

Question 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

Solution:

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Class Milk Sold (Litre)	Class mark x_i	Frequency (No. of customers) f_i	Frequency $\times$ Class mark $f_i x_i$
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	–	$\Sigma f_i = 50$	$\Sigma f_i x_i = 141$

Here, $\Sigma f_i x_i = 141$, $\Sigma f_i = 50$

$$\text{Mean} = \bar{X} = \frac{\sum_{i=1}^N f_i x_i}{\sum f_i} = \frac{141}{50} = 2.82$$

$\therefore$ The mean of the milk sold is 2.82 litres.

Question 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

Solution:

Let us take the assumed mean (A) = 37.5

Class Production (Thousand rupees)	Class mark x_i	$d_i = x_i - A$ $= x_i - 37.5$	Frequency (No. of farm owners) f_i	Frequency $\times$ Deviation $f_i d_i$
25 – 30	27.5	– 10	20	– 200
30 – 35	32.5	– 5	25	– 125
35 – 40	37.5 $\rightarrow A$	0	15	0
40 – 45	42.5	5	10	50
45 – 50	47.5	10	10	100
Total	–	–	$\Sigma f_i = 80$	$\Sigma f_i d_i = -175$

Here, $\Sigma f_i d_i = -175$, $\Sigma f_i = 80$

$$\bar{d} = \frac{\Sigma f_i d_i}{\Sigma f_i} = \frac{-175}{80} = -2.19$$

$$\text{Mean} = \bar{X} = A + \bar{d}$$

$$\begin{aligned} &= 37.5 + (-2.19) \\ &= 35.31 \\ &= ₹(35.31 \times 1000) \\ &= ₹ 35310 \end{aligned}$$

$\therefore$ The mean of the production of oranges is ₹ 35310.

Question 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 (₹)	0 – 500	500 – 1000	1000 – 1500	1500 – 2000	2000 – 2500
No. of workers	35	28	32	15	10

Solution:

Here, we take $A = 1250$ and $g = 500$

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Class Fund (₹)	Class mark x_i	$d_i = x_i - A$ $= x_i - 1250$	$u_i = \frac{d_i}{g} = \frac{d_i}{500}$	Frequency (No. of workers) f_i	$f_i u_i$
0 – 500	250	– 1000	– 2	35	– 70
500 – 1000	750	– 500	– 1	28	– 28
1000 – 1500	1250 → A	0	0	32	0
1500 – 2000	1750	500	1	15	15
2000 – 2500	2250	1000	2	10	20
Total	–	–	–	$\Sigma f_i = 120$	$\Sigma f_i u_i = -63$

Here, $\Sigma f_i u_i = -63$, $\Sigma f_i = 120$, $g = 500$

$$\bar{u} = \frac{\Sigma f_i u_i}{\Sigma f_i} = \frac{-63}{120} = -0.525$$

$$\begin{aligned} \text{Mean} = \bar{X} &= A + \bar{u} g = 1250 + (-0.525 \times 500) \\ &= 1250 - 262.5 \\ &= 987.5 \end{aligned}$$

∴ The mean of the funds collected is ₹ 987.5.

Question 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 (₹)	1000 – 2000	2000 – 3000	3000 – 4000	4000 – 5000
No. of workers	25	45	50	30

Solution:

Here, we take $A = 2500$ and $g = 1000$.

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Class Weekly wages (₹)	Class mark x_i	$d_i = x_i - A$ $= x_i - 2500$	$u_i = \frac{d_i}{g} = \frac{d_i}{1000}$	Frequency (No. of workers) f_i	$f_i u_i$
1000 – 2000	1500	– 1000	–1	25	–25
2000 – 3000	2500 → A	0	0	45	0
3000 – 4000	3500	1000	1	50	50
4000 – 5000	4500	2000	2	30	60
Total	–	–	–	$\Sigma f_i = 150$	$\Sigma f_i u_i = 85$

Here, $\Sigma f_i u_i = 85$, $\Sigma f_i = 150$

$$\bar{u} = \frac{\Sigma f_i u_i}{\Sigma f_i} = \frac{85}{150} = 0.57$$

Mean = $\bar{X} = A + \bar{u}g$

$$= 2500 + 0.57 (1000)$$

$$= 2500 + 570 = 3070$$

∴ The mean of the weekly wages is ₹ 3070.

Question 1.

The daily sale of 100 vegetable vendors is given in the following table. Find the mean of the sale by direct method. (Textbook pg. no. 133 and 134)

Daily sale (in ₹)	1000 – 1500	1500 – 2000	2000 – 2500	2500 – 3000
No. of vendors	15	20	35	30

Solution:

Class Daily sale (in ₹)	Class mark x_i	Frequency (No. of vendors) f_i	Frequency × Class mark $f_i x_i$
1000 – 1500	1250	15	18750
1500 – 2000	1750	20	35000
2000 – 2500	2250	35	78750
2500 – 3000	2750	30	82500
Total		$N = \sum f_i = 100$	$\sum f_i x_i = 215000$

$$\text{Mean} = \bar{X} = \frac{\sum_{i=1}^N f_i x_i}{\sum f_i} = \frac{215000}{100} = 2150$$

The mean of the sale is 2150.

Question 2.

The amount invested in health insurance by 100 families is given in the following frequency table. Find the mean of investments using direct method and assumed mean method. Check whether the mean found by the two methods is the same as calculated by step deviation method (Ans: ₹ 2140). (Textbook pg. no. 135 and 136)

Amount invested (₹)	800 – 1200	1200 – 1600	1600 – 2000	2000 – 2400	2400 – 2800	2800 – 3200
No. of families	3	15	20	25	30	7

Solution:

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Direct method:

Class Amount invested (₹)	Class mark x_i	Frequency (No. of families) f_i	Frequency $\times$ Class mark $f_i x_i$
800 – 1200	1000	3	3000
1200 – 1600	1400	15	21000
1600 – 2000	1800	20	36000
2000 – 2400	2200	25	55000
2400 – 2800	2600	30	78000
2800 – 3200	3000	7	21000
Total	–	$N = \sum f_i = 100$	$\sum f_i x_i = 214000$

$$\text{Mean} = \bar{X} = \frac{\sum_{i=1}^N f_i x_i}{\sum f_i} = \frac{214000}{100} = 2140$$

$\therefore$ The mean of investments in health insurance is ₹ 2140.

Assumed mean method:

Class Amount invested (₹)	Class mark x_i	$d_i = x_i - A$ $= x_i - 2200$	Frequency (No. of families) f_i	Frequency $\times$ Deviation $f_i d_i$
800 – 1200	1000	–1200	3	–3600
1200 – 1600	1400	–800	15	–12000
1600 – 2000	1800	–400	20	–8000
2000 – 2400	2200 $\rightarrow A$	0	25	0
2400 – 2800	2600	400	30	12000
2800 – 3200	3000	800	7	5600
Total	–	–	$N = \sum f_i = 100$	$\sum f_i d_i = -6000$

$$\bar{d} = \frac{\sum f_i d_i}{\sum f_i} = \frac{-6000}{100} = -60$$

$$\begin{aligned} \text{Mean} = \bar{X} &= A + \bar{d} \\ &= 2200 + (-60) = 2140 \end{aligned}$$

$\therefore$ The mean of investments in health insurance is ₹ 2140.

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∴ Mean found by direct method and assumed mean method is the same as calculated by step deviation method.

Question 3.

The following table shows the funds collected by 50 students for flood affected people. Find the mean of the funds.

Fund (₹)	0 – 500	500 – 1000	1000 – 1500	1500 – 2000	2000 – 2500	2500 – 3000
No. of students	2	4	24	18	1	1

If the number of scores in two consecutive classes is very low, it is convenient to club them. So, in the above example, we club the classes 0 – 500, 500 – 1000 and 2000 – 2500, 2500 – 3000. Now the new table is as follows

Fund (₹)	0 – 1000	1000 – 1500	1500 – 2000	2000 – 3000
No. of students	6	24	18	2

- Solve by direct method.
- Verify that the mean calculated by assumed mean method is the same.
- Find the mean in the above example by taking $A = 1750$. (Textbook pg. no. 137)

Solution:

- Direct method:

Class Fund (₹)	Class mark x_i	Frequency (No. of students) f_i	Frequency × Class mark $f_i x_i$
0 – 1000	500	6	3000
1000 – 1500	1250	24	30000
1500 – 2000	1750	18	31500
2000 – 3000	2500	2	5000
Total	–	$N = \sum f_i = 50$	$\sum f_i x_i = 69500$

$$\text{Mean} = \bar{X} = \frac{\sum_{i=1}^N f_i x_i}{\sum f_i} = \frac{69500}{50} = 1390$$

∴ The mean of the funds is ₹ 1390.

ii. Assumed mean method:

Here, $A = 1250$

Class Fund (₹)	Class mark x_i	$d_i = x_i - A$ $= x_i - 1250$	Frequency (No. of students) f_i	Frequency × Deviation $f_i d_i$
0 – 1000	500	–750	6	– 4500
1000 – 1500	1250 → A	0	24	0
1500 – 2000	1750	500	18	9000
2000 – 3000	2500	1250	2	2500
Total	–	–	$N = \sum f_i = 50$	$\sum f_i d_i = 7000$

$$\bar{d} = \frac{\sum f_i d_i}{\sum f_i} = \frac{7000}{50} = 140$$

$$\begin{aligned} \text{Mean} = \bar{X} &= A + \bar{d} \\ &= 1250 + 140 \end{aligned}$$

$$\text{Mean} = 1390$$

∴ The mean calculated by assumed mean method is the same.

iii. Step deviation method:

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Here, we take $A = 1750$ and $g = 250$

Class Fund (₹)	Class mark x_i	$d_i = x_i - A$ $= x_i - 1750$	$u_i = \frac{d_i}{g} = \frac{d_i}{250}$	Frequency (No. of students) f_i	$f_i u_i$
0 – 1000	500	-1250	-5	6	-30
1000 – 1500	1250	-500	-2	24	-48
1500 – 2000	1750 → A	0	0	18	0
2000 – 3000	2500	750	3	2	6
Total	–	–	–	$N = \sum f_i = 50$	$\sum f_i u_i = -72$

$$\bar{u} = \frac{\sum f_i u_i}{\sum f_i} = \frac{-72}{50} = -1.44$$

$$\begin{aligned} \text{Mean} = \bar{X} &= A + \bar{u} g \\ &= 1750 + (-1.44) \times 250 \\ &= 1750 - 360 \\ &= 1390 \end{aligned}$$

∴ The mean of the funds is ₹ 1390.

Practice Set 6.2

Question 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

Solution:

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Class Daily No. of hours	Frequency (No. of workers) f_i	Cumulative frequency (less than)
8 – 10	150	150 $\rightarrow cf$
10 – 12	500 $\rightarrow f$	650
12 – 14	300	950
14 – 16	50	1000
Total	$\Sigma f_i = 1000$	–

Here, total frequency = $\Sigma f_i = N = 1000$

$$\therefore \frac{N}{2} = \frac{1000}{2} = 500$$

Cumulative frequency which is just greater than (or equal) to 500 is 650.

$\therefore$ The median class is 10 – 12.

Now, $L = 10$, $f = 500$, $cf = 150$, $h = 2$

$$\begin{aligned} \therefore \text{Median} &= L + \left[\frac{\frac{N}{2} - cf}{f} \right] h \\ &= 10 + \left(\frac{500 - 150}{500} \right) 2 \\ &= 10 + 0.7 \times 2 \\ &= 10 + 1.4 \\ &= 11.4 \end{aligned}$$

$\therefore$ The median of the number of hours the workers work is 11.4 hours.

Question 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

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Solution:

Class No. of Mangoes	Frequency (No. of trees) f_i	Cumulative frequency (less than)
50 – 100	33	33
100 – 150	30	63 $\rightarrow cf$
150 – 200	90 $\rightarrow f$	153
200 – 250	80	233
250 – 300	17	250
Total	250	–

Here, total frequency = $\sum f_i = N = 250$

$$\therefore N/2 = 250/2 = 125$$

Cumulative frequency which is just greater than (or equal) to 125 is 153.

$\therefore$ The median class is 150 – 200.

Now, $L = 150$, $f = 90$, $cf = 63$, $h = 50$

$$\begin{aligned}
 \therefore \text{Median} &= L + \left[\frac{\frac{N}{2} - cf}{f} \right] h \\
 &= 150 + \left(\frac{125 - 63}{90} \right) 50 \\
 &= 150 + \left(\frac{62}{90} \right) 50 \\
 &= 150 + 34.4 \\
 &= 184.4 \approx 184
 \end{aligned}$$

$\therefore$ The median of the given data is 184 mangoes (approx).

Question 3.

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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	65 – 69	70 – 74	75 – 79	80 – 84	85 – 89
No. of vehicles	10	34	55	85	10	6

Solution:

Class Average Speed of Vehicles (Km/hr)	Continuous classes	Frequency (No. of vehicles) f_i	Cumulative frequency (less than)
60 – 64	59.5 – 64.5	10	10
65 – 69	64.5 – 69.5	34	44
70 – 74	69.5 – 74.5	55	99 $\rightarrow cf$
75 – 79	74.5 – 79.5	85 $\rightarrow f$	184
80 – 84	79.5 – 84.5	10	194
85 – 89	84.5 – 89.5	6	200
Total	–	200	–

Here, total frequency = $\sum f_i = N = 200$

$\therefore N/2 = 200/2 = 100$

Cumulative frequency which is just greater than (or equal) to 100 is 184.

$\therefore$ The median class is 74.5 – 79.5.

Now, $L = 74.5$, $f = 85$, $cf = 99$, $h = 5$

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$$\begin{aligned}\therefore \text{Median} &= L + \left[\frac{\frac{N}{2} - cf}{f} \right] h \\ &= 74.5 + \left(\frac{100 - 99}{85} \right) 5 \\ &= 74.5 + 0.059 \\ &= 74.559 \approx 75\end{aligned}$$

$\therefore$ The median of the given data is 75 km/hr (approx.).

Question 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 (Thousands)	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
No. of factories	12	35	20	15	8	7	8

Solution:

Class No. of bulbs produced (Thousands)	Frequency (No. of factories) f_i	Cumulative frequency (less than)
30 – 40	12	12
40 – 50	35	47 $\rightarrow cf$
50 – 60	20 $\rightarrow f$	67
60 – 70	15	82
70 – 80	8	90
80 – 90	7	97
90 – 100	8	105
Total	105	–

Cumulative frequency which is just greater than (or equal) to 52.5 is 67.

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∴ The median class is 50 – 60.

Now, $L = 50$, $f = 20$, $cf = 47$, $h = 10$

$$\begin{aligned}\therefore \text{Median} &= L + \left[\frac{\frac{N}{2} - cf}{f} \right] h \\ &= 50 + \left(\frac{52.5 - 47}{20} \right) 10 \\ &= 50 + \frac{5.5}{20} \times 10 \\ &= 50 + 2.75 \\ &= 52.75 \\ &= 52.75 \times 1000 \\ &= 52750 \text{ lamps}\end{aligned}$$

∴ The median of the productions is 52750 bulbs (approx.).

Question 1.

If the number of scores is odd, then the $(n+1)^{\text{th}}$ score is the median of the data. That is, the number of scores below as well as above K_{n+1} is $n-1$. Verify the fact by taking $n = 2m + 1$. (Textbk pg. no. 139)

Solution:

Given that, $n = 2m + 1$

∴ The sequence of the terms of scores can be 1, 2, 3, ..., $2m + 1$

$$\text{Here, } \frac{n+1}{2} = \frac{2m+1+1}{2} = \frac{2m+2}{2} = \frac{2(m+1)}{2} = m+1$$

The sequence of the terms of scores is 1, 2, 3,, m , $m+1$, $m+2$, ..., $2m+1$

Thus, we have to prove that $m+1$ is the middle term if the number of scores is $2m+1$

i.e. to prove

number of terms from 1 to m = number of terms from $m+2$ to $2m+1$...(i)

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Consider the L.H.S. of equation (i)

The sequence is an A.P. with $a = 1, d = 1, t_{n_1} = m$

$$t_{n_1} = a + (n_1 - 1)d$$

$$\therefore m = 1 + (n_1 - 1)1$$

$$\therefore m = 1 + n_1 - 1$$

$$\therefore m = n_1$$

Consider the R.H.S. of equation (ii)

The sequence is an A.P. with $a = m + 2, d = 1, t_{n_2} = 2m + 1$

$$t_{n_2} = a + (n_2 - 1)d$$

$$\therefore 2m + 1 = m + 2 + (n_2 - 1)1$$

$$\therefore 2m + 1 = m + n_2 + 1$$

$$\therefore m = n_2$$

$$\therefore \text{number of terms from } 1 \text{ to } m = \text{number of terms from } m + 2 \text{ to } 2m + 1 = m = n - 12$$

$$\therefore m + 1 \text{ is the middle term if the number of scores is } 2m + 1.$$

Question 2.

If the number of the scores is even, then the mean of the middle two terms is the median. This is because the number of terms below $Kn/2$ and above $Kn/2 + 2$ is equal, which is $n/2 - 2$. Verify this by taking $n = 2m$. (Textbook pg. no. 139)

Solution:

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Given that, $n = 2m$

The sequence of the terms of scores can be 1, 2, 3, ..., $2m$.

Here $\frac{n}{2} = \frac{2m}{2} = m$, and

$$\frac{n+2}{2} = \frac{2m+2}{2} = \frac{2(m+1)}{2} = m+1$$

The sequence of the terms of scores is 1, 2, 3 ... $m-1$, m , $m+1$, $m+2$, ..., $2m$

Thus, we have to prove that m and $m+1$ are the middlemost terms if the number of scores is $2m$.

i.e. to prove

number of terms from 1 to $m-1$ = number of terms from $m+2$ to $2m$...(i)

Consider the L.H.S. of equation (i)

The sequence is an A.P. with $a = 1$, $d = 1$, $t_{n_1} = m-1$

$$t_{n_1} = a + (n_1 - 1)d$$

$$\therefore m-1 = 1 + (n_1 - 1)1$$

$$\therefore m-1 = 1 + n_1 - 1$$

$$\therefore n_1 = m-1$$

Consider the R.H.S. of equation (i)

The sequence is an A.P. with $a = m+2$, $d = 1$, $t_{n_2} = 2m$

$$t_{n_2} = a + (n_2 - 1)d$$

$$\therefore 2m = m+2 + (n_2 - 1)1$$

$$\therefore 2m = m+2 + n_2 - 1$$

$$\therefore n_2 = m-1$$

$$\therefore \text{number of terms from 1 to } m-1 = \text{number of terms from } m+2 \text{ to } 2m = m-1 = n-2$$

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$\therefore m$ and $m + 1$ are the middlemost terms if the number of scores is $2m$.

Practice Set 6.3

Question 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

Solution:

Class Content of fat (%)	Frequency Milk collected (Litre)
2 – 3	30
3 – 4	$70 \rightarrow f_0$
4 – 5	$80 \rightarrow f_1$
5 – 6	$60 \rightarrow f_2$
6 – 7	20

Here, the maximum frequency is 80.

$\therefore$ The modal class is 4 – 5.

L = lower class limit of the modal class = 4

h = class interval of the modal class = 1

f_1 = frequency of the modal class = 80

f_0 = frequency of the class preceding the modal class = 70

f_2 = frequency of the class succeeding the modal class = 60

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$$\begin{aligned}
 \therefore \text{Mode} &= L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) h \\
 &= 4 + \left[\frac{80 - 70}{2(80) - 70 - 60} \right] 1 \\
 &= 4 + \frac{10}{160 - 130} = 4 + \frac{10}{30} \\
 &= 4 + 0.33 = 4.33
 \end{aligned}$$

$\therefore$ The mode of the fat content is 4.33%.

Question 2.

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

Class Fund (₹)	Class mark x_i	Frequency (No. of students) f_i	Frequency $\times$ Class mark $f_i x_i$
0 – 1000	500	6	3000
1000 – 1500	1250	24	30000
1500 – 2000	1750	18	31500
2000 – 3000	2500	2	5000
Total	–	$N = \sum f_i = 50$	$\sum f_i x_i = 69500$

$$\text{Mean} = \bar{X} = \frac{\sum_{i=1}^N f_i x_i}{\sum f_i} = \frac{69500}{50} = 1390$$

Solution:

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Class Use of electricity (Unit)	Frequency No. of families
0 – 20	13
20 – 40	50
40 – 60	70 $\rightarrow f_0$
60 – 80	100 $\rightarrow f_1$
80 – 100	80 $\rightarrow f_2$
100 – 120	17

Here, the maximum frequency is 100.

$\therefore$ The modal class is 60 – 80.

L = lower class limit of the modal class = 60

h = class interval of the modal class = 20

f_1 = frequency of the modal class = 100

f_0 = frequency of the class preceding the modal class = 70

f_2 = frequency of the class succeeding the modal class = 80

$$\begin{aligned}
 \therefore \text{Mode} &= L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) h \\
 &= 60 + \left[\frac{100 - 70}{2(100) - 70 - 80} \right] 20 = 60 + \left(\frac{30}{200 - 150} \right) 20 \\
 &= 60 + 12 = 72
 \end{aligned}$$

$\therefore$ The mode of use of electricity is 72 units.

Question 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.

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

Solution:

Class Milk (Litre)	Frequency No. of hotels
1 – 3	7
3 – 5	5
5 – 7	15
7 – 9	20 $\rightarrow f_0$
9 – 11	35 $\rightarrow f_1$
11 – 13	18 $\rightarrow f_2$

Here, the maximum frequency is 35.

$\therefore$ The modal class is 9 – 11.

L = lower class limit of the modal class = 9

h = class interval of the modal class = 2

f_1 = frequency of the modal class = 35

f_0 = frequency of the class preceding the modal class = 20

f_2 = frequency of the class succeeding the modal class = 18

$$\begin{aligned}
 \therefore \text{Mode} &= L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) h \\
 &= 9 + \left[\frac{35 - 20}{2(35) - 20 - 18} \right] 2 \\
 &= 9 + \left(\frac{15}{70 - 38} \right) 2 \\
 &= 9 + 0.9375 \\
 &= 9.9375 \approx 9.94
 \end{aligned}$$

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∴ The mode of the supply of milk is 9.94 litres (approx.).

Question 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

Solution:

Class Age (years)	Continuous class	Frequency (No. of patients)
Less than 5	0 – 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

Here, the maximum frequency is 50.

The modal class is 9.5 – 14.5.

L = lower class limit of the modal class = 9.5

h = class interval of the modal class = 5

f_1 = frequency of the modal class = 50

f_0 = frequency of the class preceding the modal class = 32

f_2 = frequency of the class succeeding the modal class = 36

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$$\begin{aligned}\text{Mode} &= L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) h \\ &= 9.5 + \left[\frac{50 - 32}{2(50) - 32 - 36} \right] 5 \\ &= 9.5 + \left(\frac{18}{100 - 68} \right) 5 \\ &= 9.5 + 2.8125 \\ &= 12.3125 \approx 12.31\end{aligned}$$

∴ The mode of the ages of the patients is 12.31 years (approx.).

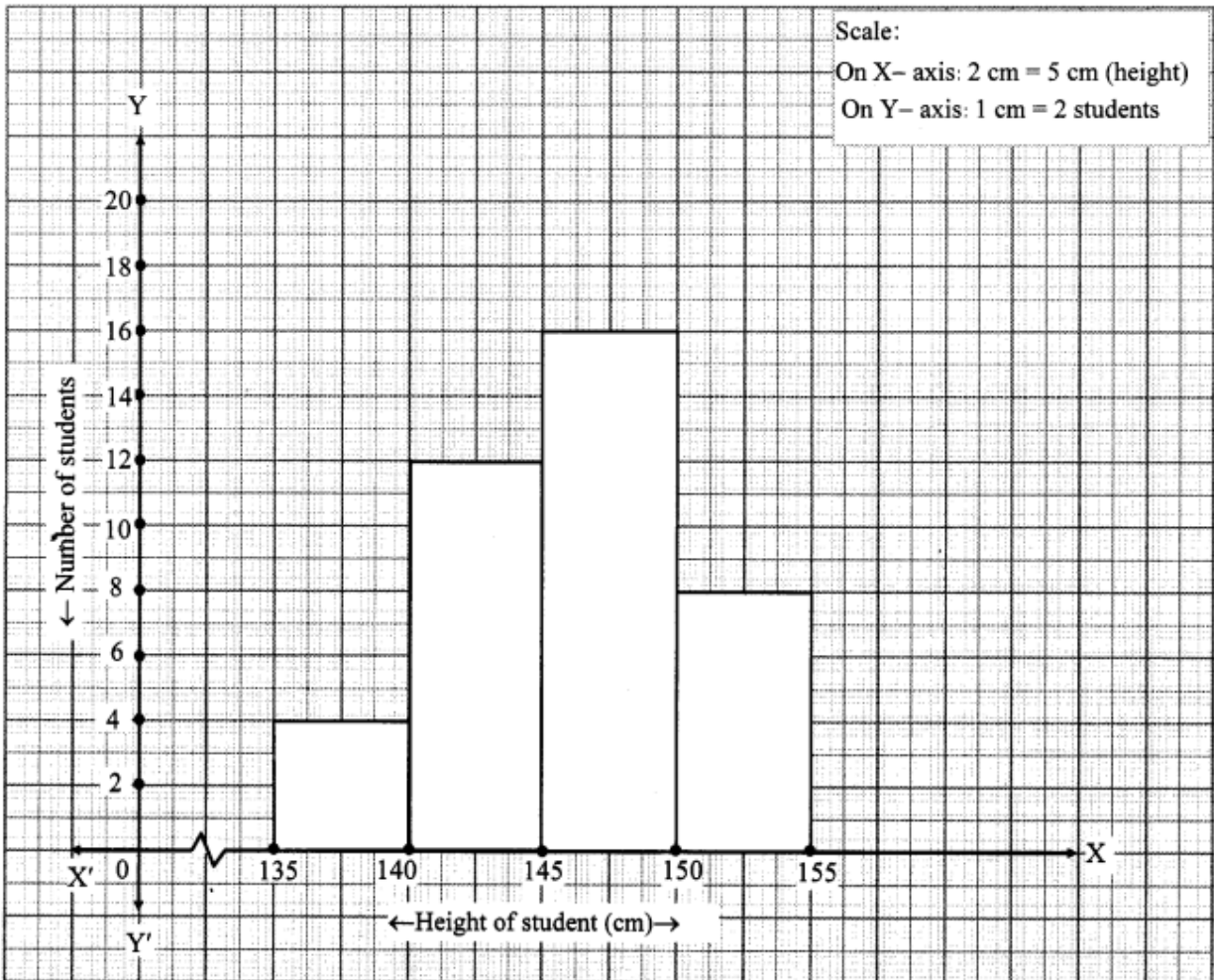
Practice Set 6.4

Question 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

Solution:



Question 2.

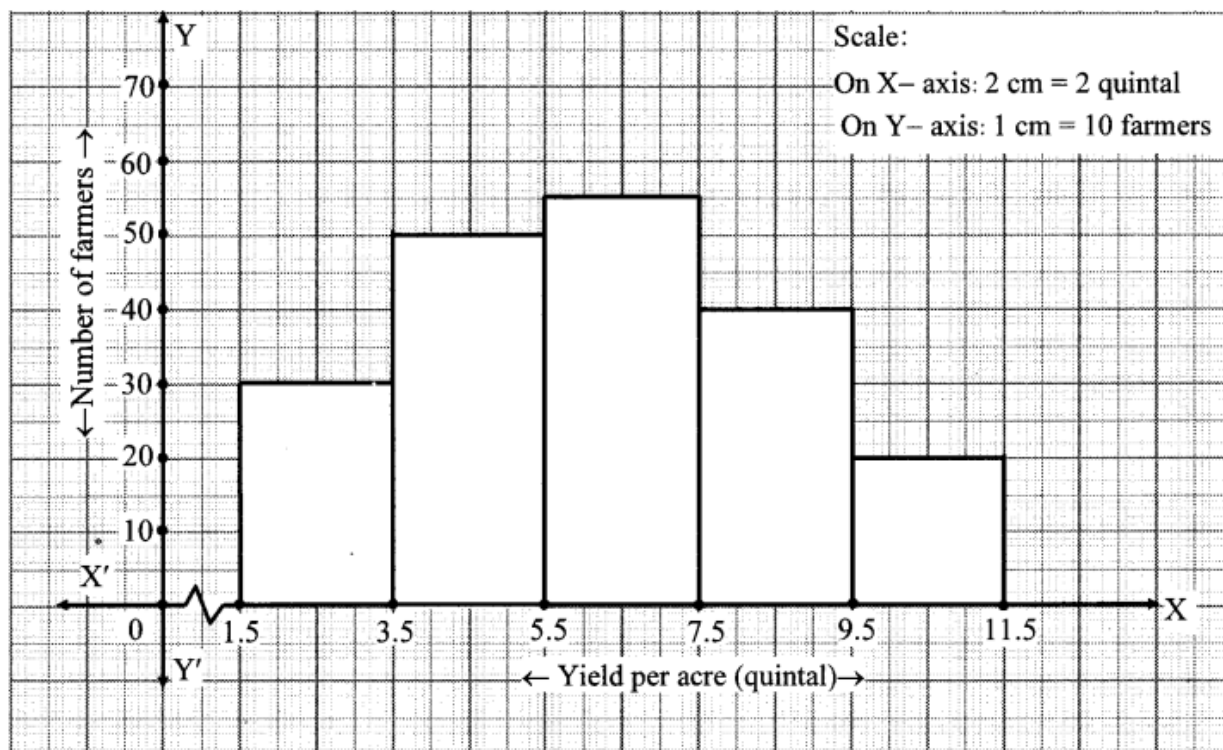
The table below shows the yield of jowar per acre. Show the data by histogram.

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

Solution:

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Class Yield per acre (quintal)	Continuous classes	No. of farmers
2 – 3	1.5 – 3.5	30
4 – 5	3.5 – 5.5	50
6 – 7	5.5 – 7.5	55
8 – 9	7.5 – 9.5	40
10 – 11	9.5 – 11.5	20



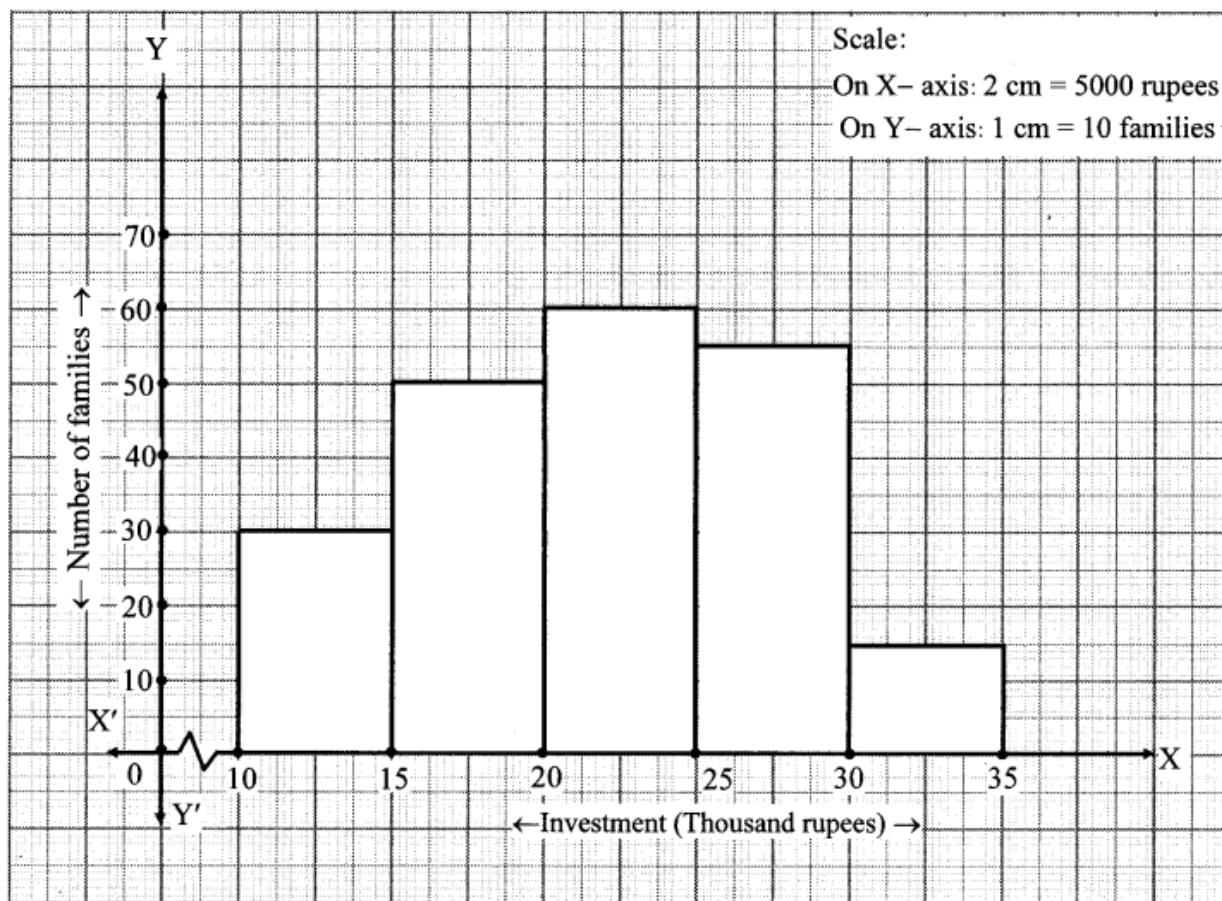
Question 3.

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

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Solution:



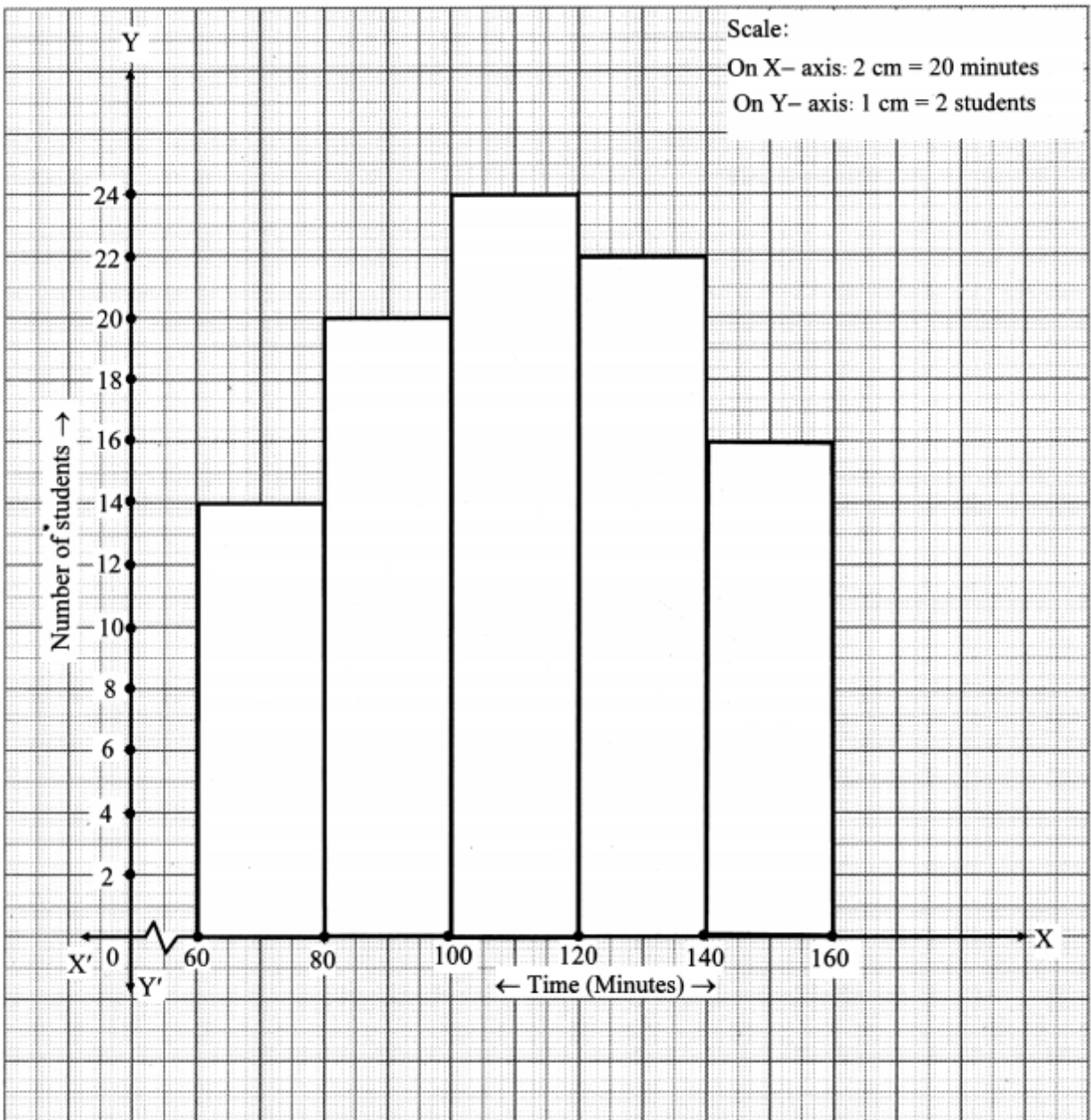
Question 4.

Time allotted 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

Solution:

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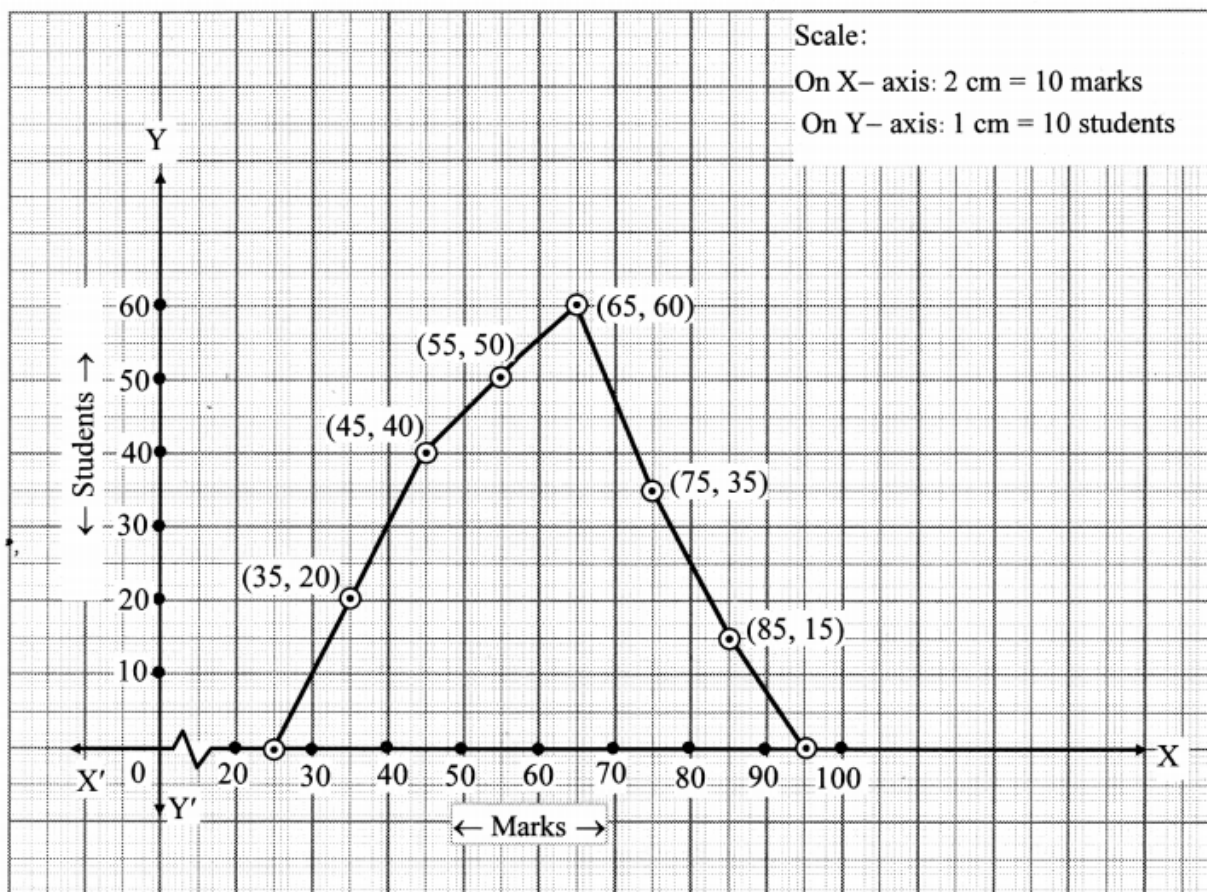
Practice Set 6.5

Question 1.

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

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



Solution:

- The class 60 – 70 has the maximum number of students.
- The classes 20 – 30 and 90 – 100 have frequency zero.
- The class mark of the class having 50 students is 55.

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iv. The lower and upper class limits of the class having class mark 85 are 80 and 90 respectively.

v. There are 15 students in the class 80 – 90.

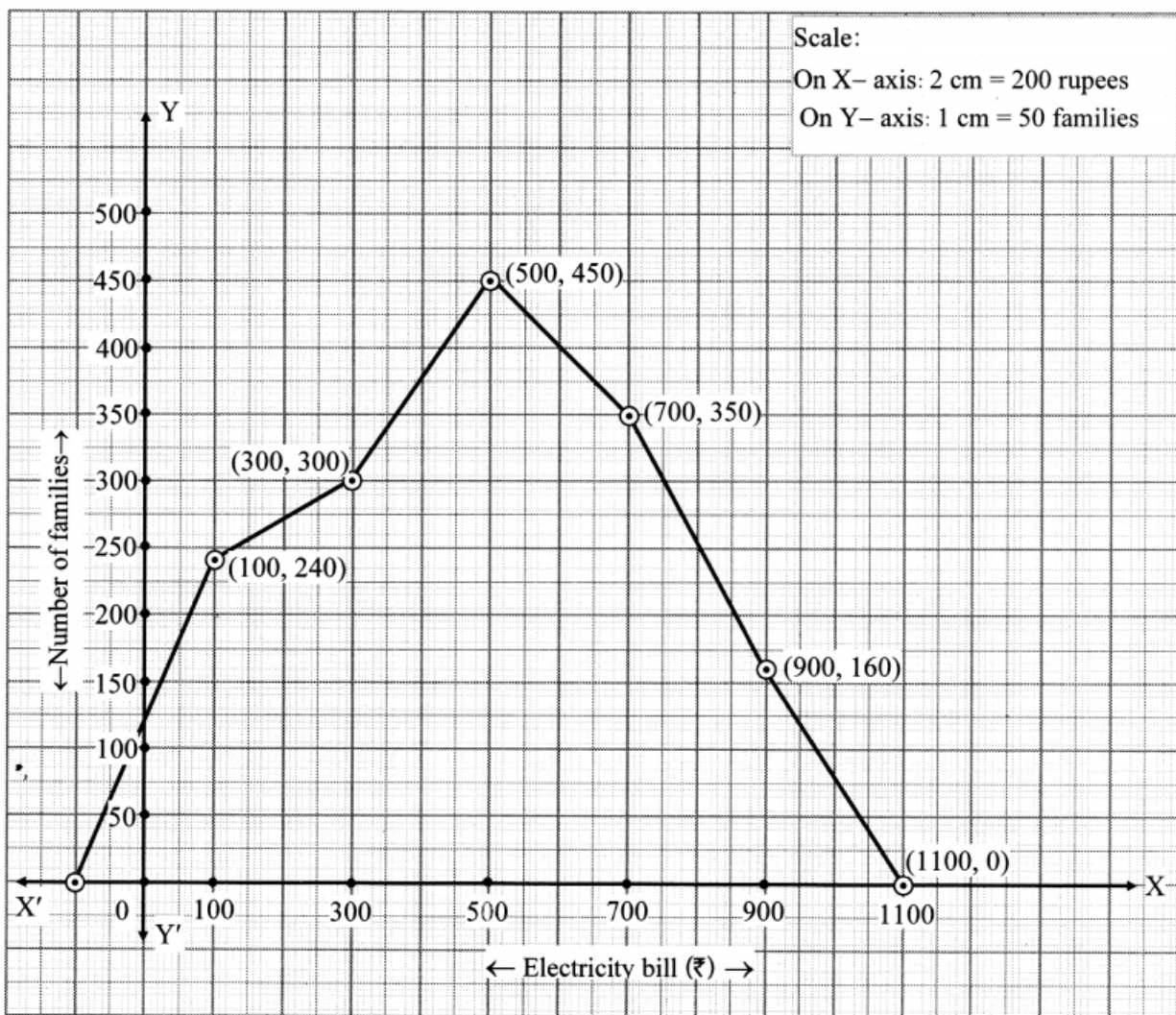
Question 2.

Show the following data by a frequency polygon.

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

Solution:

Class Electricity bill (₹)	0 – 200	200 – 400	400 – 600	600 – 800	800 – 1000	1000 – 1200
Class mark	100	300	500	700	900	1100
Frequency (Families)	240	300	450	350	160	0
Co-ordinates of points	(100, 240)	(300, 300)	(500, 450)	(700, 350)	(900, 160)	(1100, 0)



Question 3.

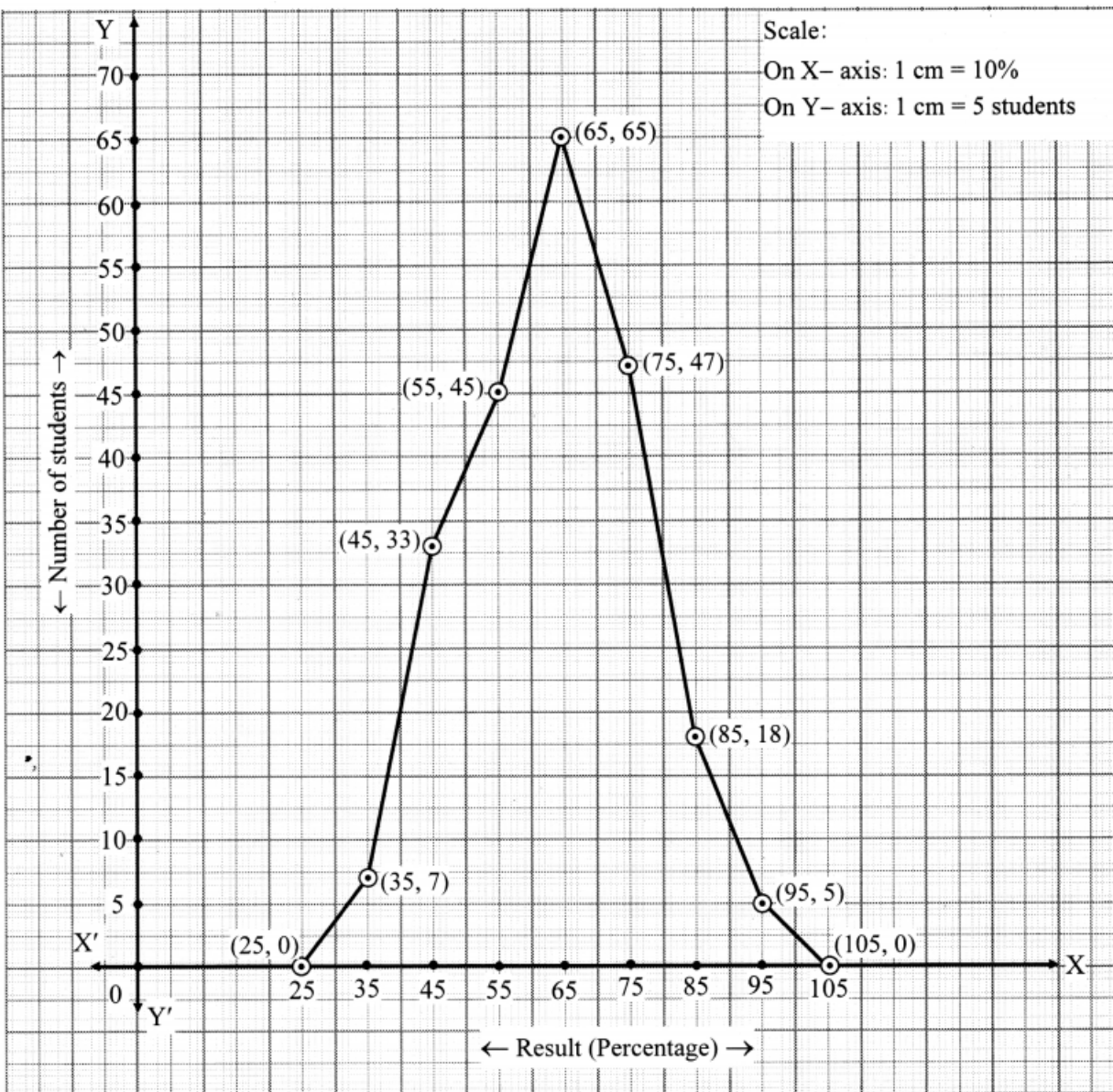
The following table shows the classification of percentages of marks of students and the number of students. Draw a frequency polygon from the table.

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

Solution:

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Class Result (%)	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100	100 – 110
Class mark	25	35	45	55	65	75	85	95	105
Frequency (No. of students)	0	7	33	45	65	47	18	5	0
Co-ordinates of points	(25, 0)	(35, 7)	(45, 33)	(55, 45)	(65, 65)	(75, 47)	(85, 18)	(95, 5)	(105, 0)



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Practice Set 6.6

Question 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.

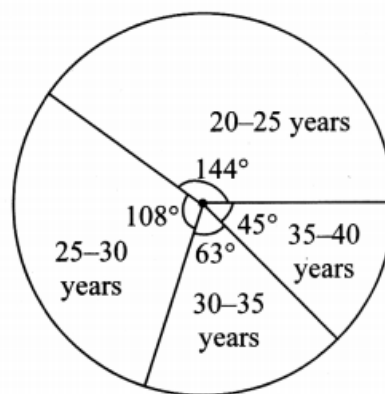
Age group (Yrs)	20 – 25	25 – 30	30 – 35	35 – 40
No. of persons	80	60	35	25

Solution:

Total number of persons = $80 + 60 + 35 + 25 = 200$

Measure of central angle (θ) = $\frac{\text{Number of scores in the components}}{\text{Total number of scores}} \times 360^\circ$

Age group (Yrs)	No. of persons	Measure of central angle (θ)
20 – 25	80	$\frac{80}{200} \times 360 = 144^\circ$
25 – 30	60	$\frac{60}{200} \times 360 = 108^\circ$
30 – 35	35	$\frac{35}{200} \times 360 = 63^\circ$
35 – 40	25	$\frac{25}{200} \times 360 = 45^\circ$
Total	200	360°



Question 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

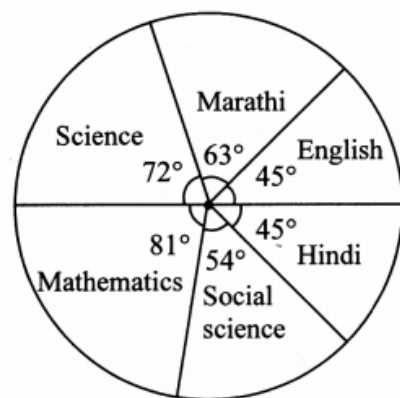
Solution:

Total marks obtained = $50 + 70 + 80 + 90 + 60 + 50 = 400$

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Measure of central angle (θ) = $\frac{\text{Number of scores in the components}}{\text{Total number of scores}} \times 360^\circ$

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



Question 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

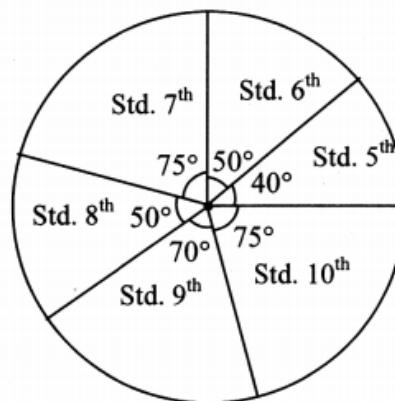
Solution:

Total number of trees planted = 40 + 50 + 75 + 50 + 70 + 75 = 360

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Measure of central angle (θ) = $\frac{\text{Number of scores in the components}}{\text{Total number of scores}} \times 360^\circ$

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



Question 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 lime	Apples	Chikoo	Oranges
Percentages of demand	30	15	25	20	10

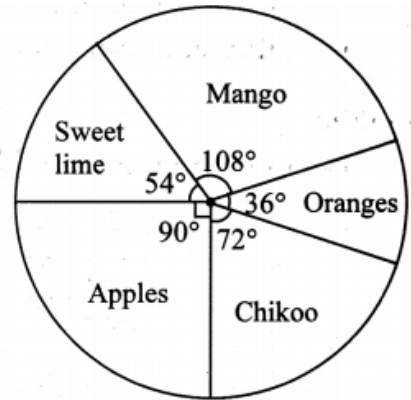
Solution:

Total percentage = 30 + 15 + 25 + 20 + 10 = 100%

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$$\text{Measure of central angle } (\theta) = \frac{\text{Percentage of components}}{100} \times 360^\circ$$

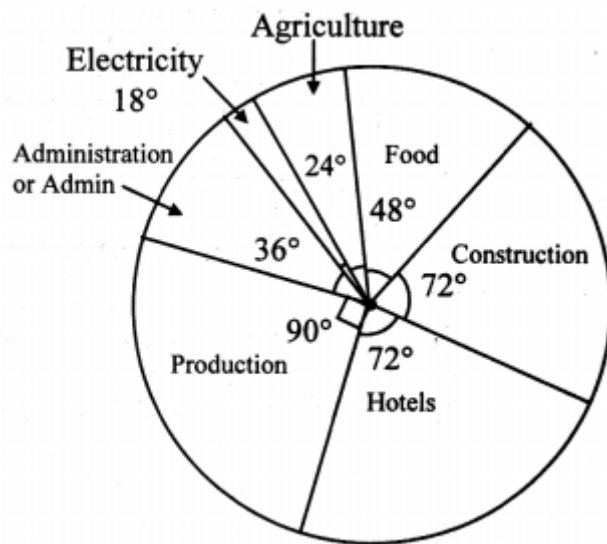
Fruits	Percentages of demand	Measure of central angle (θ)
Mango	30	$\frac{30}{100} \times 360 = 108^\circ$
Sweet lime	15	$\frac{15}{100} \times 360 = 54^\circ$
Apples	25	$\frac{25}{100} \times 360 = 90^\circ$
Chikoo	20	$\frac{20}{100} \times 360 = 72^\circ$
Oranges	10	$\frac{10}{100} \times 360 = 36^\circ$
Total	100	360°



Question 5.

The pie diagram in the given figure shows the proportions of different workers in a town. Answer the following questions with its help.

- If the total workers is 10,000, how many of them are in the field of construction?
- How many workers are working in the administration?
- What is the percentage of workers in production?



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Solution:

$$\text{Measure of central angle } (\theta) = \frac{\text{Number of scores in the components}}{\text{Total number of scores}} \times 360^\circ$$

i. Central angle for construction field (θ) = 72°

$$\therefore 72^\circ = \frac{\text{Number of workers in construction}}{10000} \times 360^\circ$$

$$\therefore \text{Number of workers in construction} = \frac{72^\circ \times 10000}{360^\circ} = 2000$$

$\therefore$ There are 2000 workers working in the field of construction.

ii. Central angle for administration field (θ) = 36°

$$\therefore 36^\circ = \frac{\text{Number of workers in administration}}{10000} \times 360^\circ$$

$$\therefore \text{Number of workers in administration} = \frac{36^\circ \times 10000}{360^\circ} = 1000$$

$\therefore$ There are 1000 workers working in the administration.

iii. Central angle for production field (θ) = 90°

$$\therefore 90^\circ = \frac{\text{Number of workers in production}}{10000} \times 360^\circ$$

$$\therefore \text{Number of workers in production} = \frac{90^\circ \times 10000}{360^\circ} = 2500$$

$$\therefore \text{Percentage of number of workers in production} = \frac{2500}{10000} \times 100 = 25\%$$

$\therefore$ 25% of workers are working in the production field.

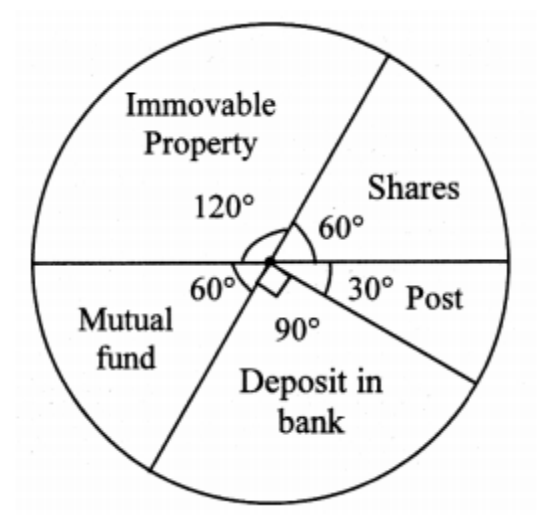
Question 6.

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

i. If the investment in shares is ? 2000, find the total investment.

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- ii. How much amount is deposited in bank?
- iii. How much more money is invested in immovable property than in mutual fund?
- iv. How much amount is invested in post?



Solution:

$$\text{Measure of central angle } (\theta) = \frac{\text{Number of scores in the components}}{\text{Total number of scores}} \times 360^\circ$$

i. Central angle for shares (θ) = 60°

$$\therefore 60^\circ = \frac{\text{Amount invested in shares}}{\text{Total investment}} \times 360^\circ$$

$$\therefore 60^\circ = \frac{2000}{\text{Total investment}} \times 360^\circ$$

$$\therefore \text{Total investment} = \frac{2000 \times 360^\circ}{60^\circ} = ₹ 12000$$

The total investment is ₹ 12000.

ii. Central angle for deposit in bank (θ) = 90°

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$$\begin{aligned}\therefore 90^\circ &= \frac{\text{Amount deposited in bank}}{\text{Total investment}} \times 360^\circ \\ \therefore 90^\circ &= \frac{\text{Amount deposited in bank}}{12000} \times 360^\circ \\ \therefore \text{Amount deposited in bank} &= \frac{90^\circ \times 12000}{360^\circ} = ₹ 3000\end{aligned}$$

∴ The amount deposited in bank is ₹ 3000.

iii. Difference in central angle for immovable property and mutual fund (θ) = $120^\circ - 60^\circ = 60^\circ$

$$\begin{aligned}\therefore 60^\circ &= \frac{\text{Difference in investments}}{12000} \times 360^\circ \\ \therefore \text{Difference in investments} &= \frac{60^\circ \times 12000}{360^\circ} = ₹ 2000\end{aligned}$$

∴ ₹ 2000 more is invested in immovable property than in mutual fund.

iv. Central angle for post (θ) = 30°

$$\begin{aligned}\therefore 30^\circ &= \frac{\text{Amount invested in post}}{12000} \times 360^\circ \\ \therefore \text{Amount invested in post} &= \frac{30^\circ \times 12000}{360^\circ} = ₹ 1000\end{aligned}$$

∴ The amount invested in post is ₹ 1000.



Maharashtra Board Solutions

Class 10 Maths (Part 1)

- Chapter 1- Linear Equations in Two Variables
- Chapter 2- Quadratic Equations
- Chapter 3- Arithmetic Progression
- Chapter 4- Financial Planning
- Chapter 5- Probability
- Chapter 6- Statistics

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The Maharashtra State Board of Secondary and Higher Secondary Education or MSBSHSE (Marathi: महाराष्ट्र राज्य माध्यमिक आणि उच्च माध्यमिक शिक्षण मंडळ), is an **autonomous and statutory body established in 1965**. The board was amended in the year 1977 under the provisions of the Maharashtra Act No. 41 of 1965.

The Maharashtra State Board of Secondary & Higher Secondary Education (MSBSHSE), Pune is an independent body of the Maharashtra Government. There are more than 1.4 million students that appear in the examination every year. The Maha State Board conducts the board examination twice a year. This board conducts the examination for SSC and HSC.

The Maharashtra government established the Maharashtra State Bureau of Textbook Production and Curriculum Research, also commonly referred to as Ebalbharati, in 1967 to take up the responsibility of providing quality textbooks to students from all classes studying under the Maharashtra State Board. MSBHSE prepares and updates the curriculum to provide holistic development for students. It is designed to tackle the difficulty in understanding the concepts with simple language with simple illustrations. Every year around 10 lakh students are enrolled in schools that are affiliated with the Maharashtra State Board.

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How many state boards are there in Maharashtra?

The Maharashtra State Board of Secondary & Higher Secondary Education, conducts the HSC and SSC Examinations in the state of Maharashtra through its nine Divisional Boards located at Pune, Mumbai, Aurangabad, Nasik, Kolhapur, Amravati, Latur, Nagpur and Ratnagiri.

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