CBSE Class 10 Mathematics

Important Questions

Chapter 14

Statistics

1. **Marks obtained by 70 students are given below:**

Marks	20	70	50	60	75	90	40
No. of Students	8	12	18	6	9	5	12

Find the median.

Ans.

Marks	**No . of students**	**c.f**
20	8	8
40	12	20
50	18	38
60	6	44
70	12	53
75	9	58
90	5	70

N = 70

{tex}\frac{N}{2} = \frac{{70}}{2} = 35\{/tex}

The corresponding value of marks for 35 is 50

2. **The sum of deviations of a set of values x_1, x_2, x_3 ,..... x_n, measured from 50 is -10 and the sum of deviations of the values from 46 is 70. Find the value of n and the mean.**

Ans. we have

$\sum_{i=1}^{n}(X_i - 50) = 10$ and $\sum_{i=1}^{n}(X_i - 46) = 70$

$\sum_{i=1}^{n} X_i - 50n = -10$ ..... (1)

and $\sum_{i=1}^{n} X_i - 46_m = 70$ ..... (2)

Subtracting (2) from (1), we get

-4n = -80 we get n = 20

$\sum_{i=1}^{n} X_i - 50 \times 20 = -10$

$\sum_{i=1}^{n} X_i = 990$

$Mean = \frac{1}{n}(\sum_{i=1}^{n} X_i) = \frac{990}{20} = 49.5$

hence n = 20 and mean = 49.5

3. **Prove that** $\sum (x_8 - \overline{x}) = 0$

Ans. To prove $\sum_{i=1}^{n} (X_i - \overline{X}) = 0$ algebraic sum of deviation from mean is zero

We have, $\overline{X} = \frac{1}{n}(\sum_{i=1}^{n} X_i)$

$n\overline{X} = \sum_{i=1}^{n} X_i$

Now, $\sum_{i=1}^{n} (X_i - \overline{X}) = (X_1 + X_2 + \ldots\ldots + X_n) - n\overline{X}$

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$\sum_{i=1}^{n} (X_i - \overline{X}) = \sum_{i=1}^{n} X_i - n\overline{X}$

$\sum_{i=1}^{n} (X_i - \overline{X}) = n\overline{X} - n\overline{X}$

$\sum_{i=1}^{n} (X_i - \overline{X}) = 0$

Hence, $\sum_{i=1}^{n} (X_i - \overline{X}) = 0$

4. **Compute the median from the following data**

Mid value	115	125	135	145	155	165	175	185	195
Frequency	6	25	48	72	116	60	38	22	3

Ans. Here , we are given the mid values. So, we should first find the upper and lower limits of the various classes. The difference between two consecutive values is h = 125 – 115 = 10

∴ Lower limit of a class = Midvalue - h/2

Upper limit = Midvalue + h / 2

Calculate of Median

Mid – value	Class Groups	Frequency	Cumulative frequency
115	110-120	6	6
125	120-130	25	31
135	130-140	48	79
145	140-150	72	151
155	150-160	116	267
165	160-170	60	327
175	170-180	38	365
185	180-190	22	387
195	190-200	3	390
			$N = \sum f_i = 390$

We have,

N = 390 ∴ N/2 = 390/2 = 195

The cumulative frequency first greater than N i.e. 195 is 267 and the corresponding class is 150 – 160, so, 150 – 160 is the median class.

L = 150, f = 116, h = 10, f = 151

Now,

$\text{Median} = L + \frac{\frac{n}{2} - f}{f} \times h$

$\text{Median} = 150 + \frac{195-151}{116} \times 10 = 153.8$

5. **The mean of 'n' observation is $\overline{x}$, if the first term is increased by 1, second by 2 and so on. What will be the new mean.**

Ans. I term + 1

II term + 2

III term + 3.

n term + n

The Mean of the new number is $\overline{X} + \frac{\frac{n(n+1}{2}}{n} = \overline{X} + \frac{(n+1}{2}$

6. **In a frequency distribution mode is 7.88, mean is 8.32 find the median.**

   Ans. Mode = 3 median – 2 mean

   7.88 = 3 median – 2 × 8.32

   7.88 + 16.64 = 3 median

   $\frac{24.52}{3}$ = median

   ∴ median = 8.17

7. **The mode of a distribution is 55 & the modal class is 45-60 and the frequency preceding the modal class is 5 and the frequency after the modal class is 10. Find the frequency of the modal class. (Ans:15)**

   Ans: mode = 55

   Modal class = 45 – 60

   Modal class preceding f_1 = 5

   After the modal class = f_2 = 10

   Mode = $L + \frac{f-f_1}{2f-f_1-f_2} \times h$

   $55 = 45 + \frac{f-5}{2f-5-10} \times 15$

   $10 = (\frac{f-5}{2f-15}) \times 15$

   $\frac{10}{15} = \frac{f-5}{2f-15}$

   20 f - 150 = 15f - 75

   5f = 75

   $f = \frac{75}{5} = 15$

8. **The mean of 30 numbers is 18, what will be the new mean, if each observation is increased by 2?**

   Ans: Let x_1, x_2, x_3 ..... x_{30} be 30 number with then mean equal to 18 then

   $\overline{X} = \frac{1}{n}(\sum x_i)$

   $18 = \frac{x_1+x_2+x_3.....+x_{30}}{30}$

   $x_1 + x_2 + x_3 + ... + x_{30} = 18 \times 30 = 540$

New numbers are $x_1 + 2, x_2, + 2\ x_3 + 3$ ..... $x_{30} + 2$

Let $\overline{X}$ be the mean of new numbers

then $\overline{X} = \frac{(x_1+2)+(x_2+2)+.....+(x_{30}+2)}{30}$

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

$\overline{X} = \frac{n+1}{2}$

$\frac{(x_1+x_2+.....+x_{30})+2\times30}{30}$ $\frac{540+60}{30}$

Mean of new numbers = $\frac{600}{30} = 20$

9. **Find the mean of 30 numbers given mean of ten of them is 12 and the mean of remaining 20 is 9.**

Ans: Total number of mean = 30

Mean of 10 is = 12

$12 = \frac{\sum_{i=1}^{n} X_i}{10}$

$\sum X_i = 12 \times 10 = 120$ ..... (1)

Mean of 20 numbers is = 9

$9 = \frac{\sum X_i}{20}$

$9 \times 10 \sum_{i=1}^{n} X_i$ ..... (2)

$180 = \sum X_i$

(1) + (2)

Mean of 20 numbers $= \frac{120+180}{30}$

$= \frac{300}{30} = 10$

CBSE Class 10 Mathematics

Important Questions

Chapter 14

Statistics

1 Marks Questions

1. $\sum f_i = 15, \sum f_i x_i = 3p + 36$ **and mean of any distribution is 3, then p =**

(a) 2

(b) 3

(c) 4

(d) 5

Ans. (b) 3

2. For what value of x**, the mode of the following data is 8:**

4, 5, 6, 8, 5, 4, 8, 5, 6, x, 8

(a) 5

(b) 6

(c) 8

(d) 4

Ans. (c) 8

3. The numbers are arranged in ascending order. If their median is 25, then x =

5, 7, 10, 12, 2x-8, 2x+10, 35, 41, 42, 50

(a) 10

(b) 11

(c) 12

(d) 9

Ans. (c) 12

4. The median for the following frequency distribution is

X	6	7	5	2	10	9	3
F	9	12	8	13	11	14	7

(a) 6

(b) 5

(c) 4

(d) 7

Ans. (a) 6

5. In the formula $\bar{x} = a + h\left[\frac{\sum fiui}{\sum fi}\right]$, **for finding the mean of grouped frequency distribution, h =**

(a) $\frac{xi + a}{h}$

(b) $h(xi - a)$

(c) $\frac{xi - a}{h}$

(d) $\frac{a - xi}{h}$

Ans. (c) $\frac{xi-a}{h}$

6. While computing mean of grouped data, we assume that the frequencies are

(a) evenly distributed over all the class

(b) centered at the class marks of the class

(c) centered the upper limits of the class

(d) centered the lower limits of the class

Ans. (b) centered at the class marks of the class

7. If $\sum fi = 17, \sum fixi = 4P + 63$ **and mean = 7, then P=**

(a) 12

(b) 13

(c) 14

(d) 15

Ans. (c) 14

8. If the value of mean and mode are respectively 30 and 15, then median =

(a) 22.5

(b) 24.5

(c) 25

(d) 26

Ans. (c) 25

9. The wickets taken by a bowler in 10 cricket matches are as follows

2, 6, 4, 5, 0, 2, 1, 3, 2, 3

Find the mode of the data.

(a) 1

(b) 4

(c) 2

(d) 3

Ans. (c) 2

10. Mean of the following data is

Class Interval	**50-60**	**60-70**	**70-80**	**80-90**	**90-100**
Frequency	**8**	**6**	**12**	**11**	**13**

(a) 76

(b) 77

(c) 78

(d) 80

Ans. (c) 78

11. Construction of a cumulative frequency table is useful in determining the

(a) Mean

(b) Median

(c) Mode

(d) all these conditions

Ans. (b) Median

12. In the following distribution of the heights of 60 students of a class

Height (inch)	**150-155**	**155-160**	**160-165**	**165-170**	**170-175**	**175-180**
No. of students	**15**	**13**	**10**	**8**	**9**	**5**

The sum of the lower limit of the modal class and upper limit of the median class is

(a) 310

(b) 315

(c) 320

(d) 330

Ans. (b) 315

13. Choose the correct answer from the given four options in the formula $\bar{x} = a + \frac{\sum f_i x_i}{\sum f_i}$

For finding the mean of grouped data d_i's are deviations from *a* of

(a) lower limits of the classes

(b) Upper limits of the classes

(c) Mid points of the classes

(d) Frequencies of the class marks

Ans. (c) Mid points of the classes

14. If mean of the distribution is 7.5, then p=

X	3	5	7	9	11	13
F	6	8	15	P	8	4

(a) 2

(b) 4

(c) 3

(d) 6

Ans. (c) 3

15. A shoe shop in Agra had sold hundred pairs of shoes of particular brand in a certain day with the following distribution.

Size of the shoes	4	5	6	7	8	9	10
No. of pairs sold	1	4	3	20	45	25	2

Find mode of the destitution.

(a) 20

(b) 45

(c) 1

(d) 3

Ans. (b) 45

16. If the mode of a data is 45 and mean is 27, then median is

(a) 30 (b) 27

(c) 33 (d) None of these

No. of pairs sold 1 4 3 20 45 25 2

Find mode of the destitution.

(a) 20 (b) 45 (c) 1 (d) 3

Ans. (c) 1

17. If $x_i's$ are the mid-points of the class intervals of grouped data, $f_i's$ are the corresponding frequency and $\bar{x}$ is the mean, then $\sum\left(f_i x_i - \bar{x}\right)$ is equal to

(a) 0

(b) -1

(c) 1

(d)2

Ans. (a) 0

18. Mode of the following data is

Class Interval	0-20	20-40	40-60	60-80	80-100
Frequency	12	7	6	16	6

(a) 65

(b) 66

(c) 75

(d) 70

Ans. (d) 70

19. Median of the following data is

Class	0-500	500-1000	1000-1500	1500-2000	2000-2500
Frequency	4	6	10	5	3

(a) 1000

(b) 1100

(c) 1200

(d) 1150

Ans. (c) 1200

20. If the median of the distribution is 28.5, find the value of x.

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	Total
Frequency	5	x	20	15	7	5	60

(a) 8

(b) 10

(c) 4

(d) 9

Ans. (a) 8

CBSE Class 10 Mathematics

Important Questions

Chapter 14

Statistics

2 Marks Questions

1. The following data gives the number of boys of a particular age in a class of 40 students. Calculate the mean age of students:

Age (in years)	**15**	**16**	**17**	**18**	**19**	**20**
No. of student	**3**	**8**	**10**	**10**	**5**	**4**

Ans. We have

Age (in years) (x)	No. of students (f)	fx
15	3	45
16	8	128
17	10	170
18	10	180
19	5	95
20	4	80
	$\sum f = 40$	$\sum fx = 698$

Mean $\bar{x} = \frac{\sum fx}{\sum f} = \frac{698}{40} = 17.45$ years

2. For the following grouped frequency distribution, find the mode.

Class	**3-6**	**6-9**	**9-12**	**12-15**	**15-18**	**18-21**	**21-24**
Frequency	**2**	**5**	**10**	**23**	**21**	**12**	**3**

Ans. Since the maximum frequency = 23 and it corresponds to the class 12-15

$\therefore$ Modal class = 12-15

$l = 12,\ n = 3,\ f_1 = 23,\ f_0 = 10,\ f_2 = 21$

$$M_0 = l + h\frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

$$= 12 + 3\frac{23 - 10}{2 \times 23 - 10 - 21}$$

$$= 12 + 3 \times \frac{13}{46 - 31} = 12 + \frac{39}{15}$$

$$= 12 + \frac{13}{5} = 12 + 2.6 = 14.6$$

3. Construct the cumulative frequency distribution of the following distribution:

Class	**12.5-17.5**	**17.5-22.5**	**22.5-27.5**	**27.5-32.5**	**32.5-37.5**
Frequency	**2**	**22**	**19**	**14**	**13**

Ans. The required cumulative frequency distribution of the given distribution is given below:

Class	Frequency	Cumulative frequency
12.5-17.5	2	2
17.5-22.5	22	24
22.5-27.5	19	43
27.5-32.5	14	57
32.5-37.5	13	70

4. The median and mode of a distribution are 21.2 and 21.4 respectively, find its mean.

Ans. We know that Mean = Mode + $\frac{3}{2}$ (Median – Mode)

$$= 21.4 + \frac{3}{2}(21.2 - 21.4)$$

$$= 21.4 + \frac{3}{2}(-0.2)$$

$$= 21.4 - 0.3 = 21.1$$

5. The marks distribution of 30 students in a mathematics examination are given below

Class Interval	**10-25**	**25-40**	**40-55**	**55-70**	**70-85**	**85-100**
No. of students	**2**	**3**	**7**	**6**	**0**	**6**

Ans. Since the maximum frequency = 7 and it corresponds to the class 40-55.

The modal class= 40-55

Here, $l = 40, h = 15, f_1 = 7, f_0 = 3, f_2 = 6$

We know that mode M_0 is given by

$$M_0 = l + h\frac{f1 - f0}{2f_1 - f_0 - f_2} = 40 + \frac{15(7-3)}{2(7)-3-6}$$

$$= 40 + \frac{15 \times 4}{5} = 40 + 12 = 52$$

Thus, Mode marks = 52

6. Find the mode of this data.

Construct the cumulative frequency distribution of following distribution:

Marks	**39.5-49.5**	**49.5-59.5**	**59.5-69.5**	**69.5-79.5**	**79.5-89.5**	**89.5-99.5**
Students	**5**	**10**	**20**	**30**	**20**	**15**

Ans. The required cumulative frequency distribution of the given distribution is given

below.

Marks	No. of Students	Cumulative Frequency
39.5-49.5	5	5
49.5-59.5	10	15
59.5-69.5	20	35
69.5-79.5	30	65
79.5-89.5	20	85
89.5-99.5	15	100
	$N = \sum f = 100$	

7. If the values of mean and mode are respectively 30 and 15, then median =

(a) 22.5

(b) 24.5

(c) 25

(d) 26

Ans. Median = Mode $+\frac{2}{3}$ (Mean – Mode)

$$= 15 + \frac{2}{3}(30 - 15)$$

$$= 15 + \frac{2}{3} \times 15$$

$$= 15 + 10 = 25$$

8. If the mean of the following data is 18.75. find the value of P.

xi	**10**	**15**	**P**	**25**	**30**
fi	**5**	**10**	**7**	**8**	**2**

Ans. We have

x_i	f_i	$x_i f_i$
10	5	50
15	10	150
P	7	7P
25	8	200
30	2	60
	$N=\sum f_i=32$	$\sum f_i x_i=460+7P$

Now mean $\bar{x}=\frac{\sum f_i x_i}{\sum f_i}$ = 18.75

$$18.75=\frac{406+7P}{32}$$

$$\Rightarrow 460+7P=\frac{32\times 1875}{100}$$

$$\Rightarrow 460+7P=8\times 75=600$$

$$\Rightarrow 7P=600-460$$

$$\Rightarrow 7P=140$$

$$\Rightarrow P=20$$

9. Find the mean of the following data.

Classes	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**
Frequency	**5**	**8**	**13**	**15**	**9**

Ans. We have

Classes	Mid-value x_i	Frequency f_i	$f_i x_i$
10-20	15	5	75
20-30	25	8	200
30-40	35	13	455
40-50	45	15	675
50-60	55	9	495

		$\sum f_i = 50$	$\sum f_i x_i = 1900$

Now mean $\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{1900}{50} = 38$

Hence, mean $\bar{x} = 38$

10. The following data gives the information observed life times (in hours) of 225 electrical components. Determine the modal life times of the components.

Life time (in hours)	**0-20**	**20-40**	**40-60**	**60-80**	**80-100**	**100-200**
Frequency	**10**	**35**	**52**	**61**	**38**	**29**

Ans. Since the maximum frequency = 61 and it corresponds to the class 60-80

$\therefore$ Modal class = 60-80

Here, $l = 60, h = 20, f_1 = 61, f_0 = 52, f_2 = 38$

We know that mode Mo is given by

$$Mo = l + h\frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

$$= 60 + 20\frac{61-52}{2(61)-52-38}$$

$$= 60 + 20\frac{9}{122-90}$$

$$= 60 + \frac{20\times 9}{32}$$

$$= 60 + \frac{45}{8}$$

$$= 60 + 5.625$$

$$= 65.625 hours$$

Thus, modal life times = 65.625 hours

11. Construct the cumulative frequency distribution of the following distribution:

Class Interval	**6.5-7.5**	**7.5-8.5**	**8.5-9.5**	**9.5-10.5**	**10.5-11.5**	**11.5-12.5**	**12.5-13.5**
Frequency	**5**	**12**	**25**	**48**	**32**	**6**	**1**

Ans. The required cumulative frequency distribution of the given distribution is given below:

Class Interval	Frequency	Cumulative Frequency
6.5-7.5	5	5
7.5-8.5	12	17
8.5-9.5	25	42
9.5-10.5	48	90
10.5-11.5	32	122
11.5-12.5	6	128
12.5-13.5	1	129
	$N=\sum f=129$	

12. Calculate the median from the following data:

Marks	**0-10**	**10-30**	**30-60**	**60-80**	**80-100**
No. of students	**5**	**15**	**30**	**8**	**2**

Ans. We have

Marks	No. of students (f)	C.F
0-10	5	5
10-30	15	20
30-60	30	50
60-80	8	58
80-100	2	60
	$N=\sum f=60$	

Since $\frac{N}{2}=30$ which his in the class 30-60

$\therefore$ Median class is 30-60

We know that median Me is given by

$$Me = l_1 + \frac{\frac{N}{2} - C}{f} \times h$$

Here, $l_1 = 30, h = 30, \frac{N}{2} = 30, C = 20, F = 30$

$$\therefore Me = 30 + \frac{30 - 20}{30} \times 30$$

= 30 +10= 40

Hence, median = 40

13. Find the mean of the following data:

Classes	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**
Frequency	**3**	**5**	**9**	**5**	**3**

Ans. We have

Classes	Mid-value (x_i)	Frequency (f_i)	$x_i f_i$
0-10	5	3	15
10-20	15	5	75
20-30	25	9	225
30-40	35	5	175
40-50	45	3	135
		$\sum f_i = 25$	$\sum x_i f_i = 625$

Now Mean $\bar{x} = \frac{\sum x_i f_i}{\sum f_i} = \frac{625}{25} = 25$

14. A survey conducted on 20 households in a locality by a group of students resulted in the following frequency table for the number of family members in a household. Find the mode.

Family size	1-3	3-5	5-7	7-9	9-11
No. of families	7	8	2	4	1

Ans. Since the maximum frequency = 8 and it corresponds to the class 3-5

Modal class = 3-5

Here, $l = 3, h = 2, f_1 = 8, f_0 = 7, f_2 = 2$

We know that mode Mo is given by

$$Mo = l + h\frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

$$= 3 + 2\frac{(8-7)}{2(8)-7-2}$$

$$= 3 + 2\frac{(1)}{7} = 3 + \frac{2}{7}$$

$$= 3 + 0.2857 = 3.286 \text{ nearly}$$

15. Construct the cumulative frequency distribution of the following distribution:

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	5	3	10	6	4	2

Ans. The required cumulative frequency distribution of the given distribution is given below:

Class Interval	Frequency (f)	Cumulative frequency
0-10	5	5
10-20	3	8
20-30	10	18
30-40	6	24
40-50	4	28
50-60	2	30
Total	N= 30	

16. If the values of mean and median are 26.4 and 27.2, what will be the value of mode?

Ans. We know that

Mode = 3 median -2 mean

= 3(27.2) – 2(26.4)

= 81.6 – 52.8 = 28.8

Mode = 28.8

17. The marks obtained by 30 students of class X of a certain school in a Mathematics paper consisting of 100 marks are presented in table below. Find the mean of the marks obtained by the students.

Marks obtained (xi)	**10**	**20**	**36**	**40**	**50**	**56**	**60**	**70**	**72**	**80**	**88**	**92**	**98**
students (fi)	**1**	**1**	**3**	**4**	**3**	**2**	**4**	**4**	**1**	**1**	**2**	**3**	**1**

Ans.

Marks obtained (x_i)	No. of students (f_i)	$f_i x_i$
10	1	10
20	1	20
36	3	108
40	4	160
50	3	150
56	2	112
60	4	240
70	4	280
72	1	72

80	1	80
88	2	176
92	3	276
95	1	95
	$\sum f_i = 30$	$\sum f_i x_i = 1779$

Mean $\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{1779}{30} = 59.3$

Thus, mean $\bar{x}$ = 59.3

18. A student noted the numbers of cars passing through a spot on a road for 100 periods each of 3 minutes and summarized in the table given below. Find the mode of the data.

No. of cars	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**
Frequency	7	**14**	**13**	**12**	**20**	**11**	**15**	**8**

Ans. Since the maximum frequency = 20

And it corresponds to the class 40-50

Modal class = 40-50

Here, $l = 40, h = 10, f_1 = 20, f_0 = 12, f_2 = 11$

We know that mode M_0 is given by

$$Mo = l + h\frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

$$= 40 + 10\left(\frac{20 - 12}{2(20) - 12 - 11}\right)$$

$$= 40 + \frac{80}{17} = 40 + 4.705$$

$$= 44.705 = 44.7$$

19. Construct the cumulative frequency distribution of the following distribution:

consumption (units)	**65-85**	**85-105**	**105-125**	**125-145**	**145-165**	**165-185**
Consumers (fi)	**4**	**5**	**12**	**20**	**14**	**8**

Ans. The required accumulative frequency distribution of the given distribution is given below.

Monthly consumption (in units)	No. of consumes (f_i)	Cumulative frequency (cf)
65-85	4	4
85-105	5	9
105-125	13	22
125-145	20	42
145-165	14	56
165-185	8	64
	N = 64	

20. If the values of mean and median are 53.6 and 55.81, what will be the value of mode?

Ans. We know that

Mode = 3 Median – 2 mean

Mean = $3(55.81)-2(53.6)$

$=167.43-107.2=60.23$

CBSE Class 10 Mathematics

Important Questions

Chapter 14

Statistics

3 Marks Questions

1. The following table shows the weekly wages drawn by number of workers in a factory, find the median of the following data.

Weekly wages (in Rs.)	**0-100**	**100-200**	**200-300**	**300-400**	**400-500**
No. of workers	**40**	**39**	**34**	**30**	**45**

Ans. We have

Weekly wages (in Rs.)	No. of workers (f)	C.F
0-100	49	40
100-200	39	79
200-300	34	113
300-400	30	143
400-500	45	188
	$N=\sum f=188$	

Now $\frac{N}{2}=\frac{188}{2}=94$ and this is in 200-300 class.

$\therefore$ Median class= 200-300

Here, $l_1=200,\ c=79,\ h=100,\ f=34,\ \frac{N}{2}=94$

We know that $Me = l_1 + \frac{\frac{N}{2} - c}{F} \times h$

$$= 200 + \frac{94 - 79}{34} \times 100$$

$$= 200 + \frac{1500}{34}$$

$$= 200 + \frac{750}{17} \Rightarrow 200 + 14.12$$

$$= 244.12$$

2. Find the median of the following data:

Marks	**Frequency**
Less than 10	**0**
Less than 30	**10**
Less than 50	**25**
Less than 70	**43**
Less than 90	**65**
Less than 110	**87**
Less than 130	**96**
Less than 150	**100**

Ans. First of all we shall change cumulating series into simple series.

We have

X	F	C.F
0-10	0	0
10-30	10	10
30-50	15	25
50-70	18	43
70-90	22	65

90-110	22	87
110-130	9	96
130-150	4	100
	$N=\sum f=100$	

Now $\frac{N}{2}=\frac{100}{2}=50$, which lies in 70-90 class

$\therefore$ Median class = 70-90

Here, $l_1=70, c=43, h=20, f=22, N=100$

We know that Median, Me = $l_1+\frac{\frac{N}{2}-C}{f}\times h$

$$=70+\frac{20}{22}(50-43)$$
$$=70+\frac{20\times 7}{22}=70+\frac{70}{11}$$
$$=70+6.36$$
$$=76.36$$

3. Find the median of the following data.

Wages (in rupees)	**No. of workers**
More than 150	**Nil**
More than 140	**12**
More than 130	**27**
More than 120	**60**
More than 110	**105**
More than 100	**124**
More than 90	**141**
More than 80	**150**

Ans. First of all we shall find simple frequencies.

Wages (in Rupees) (X)	No. of workers (F)	C.F
80-90	9	9
90-100	17	26
100-110	19	45
110-120	45	90
120-130	33	123
130-140	15	138
140-150	2	150
	$N = \sum f = 150$	

Now $\frac{N}{2} = \frac{150}{2} = 75$, which lies in 110-120 class

∴ Median class = 110-120

Here, $l_1 = 110, c, 45, h = 10, f = 45, N = 150$

We know that Me = $l_1 + \frac{\frac{M}{2} - C}{F} \times h$

$$= 110 + \frac{10}{45}(75 - 45)$$

$$= 110 + \frac{10 \times 30}{45} = 110 + \frac{20}{3}$$

$$= 110 + 6.67 = 116.67$$

4. Draw a less than Ogive for the following frequency distribution.

Marks	**No. of students**
0-4	**4**
4-8	**6**
8-12	**10**

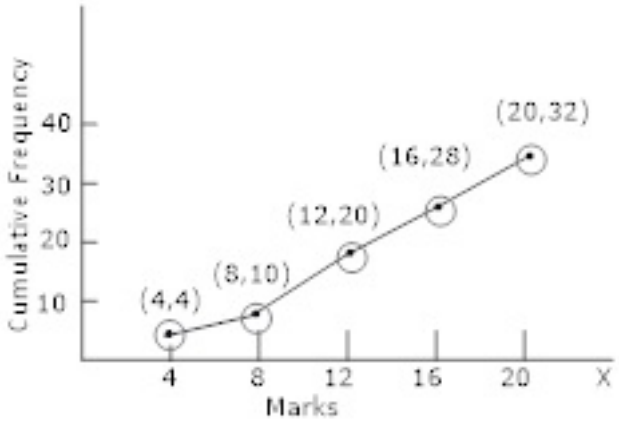
12-16	**8**
16-20	**4**

Ans. We have

Marks	Frequency (F)	C.F
0-4	4	4
4-8	6	10
8-12	10	20
12-16	8	28
16-20	4	32
	$\sum f = 32$	

Upper class limits	4	8	12	16	20
Cumulative frequency	4	10	20	28	32
Plot the points	(4,4)	(8,10)	(12,20)	(16,28)	(20,32)

Join these points by a free hand curve. We get the required Ogivewhich is as follows:



5. Find the mean age in years from the frequency distribution given below:

Age (in yrs)	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**Total**

Frequency	**3**	**12**	**21**	**15**	**5**	**4**	**2**	**3**

Ans. We have

Class-Interval	Mid value	f_i	$u_i = \frac{x_i - a}{h} = \frac{x_i - 32}{5}$	$f_i u_i$
15-19	17	3	-3	-9
20-24	22	13	-2	-26
25-29	27	21	-1	-21
30-34	32	15	0	0
35-39	37	5	1	5
40-44	42	4	2	8
45-49	47	2	3	6
Total		$\sum f_i = 63$		$\sum f_i u_i = -37$

Let assumed mean ‘a’ = 32, Here h = 5

We know that Mean $\bar{x} = a + \frac{\sum fiui}{\sum fi} \times h$

$$= 32 \frac{-37 \times 5}{63}$$

$$= 32 \frac{-185}{63}$$

$$= 32 - 2.94(nearly)$$

$$= 29.06 years$$

6. Find the median of the following frequency distribution:

Wages (in Rs.)	**200-300**	**300-400**	**400-500**	**500-600**	**600-700**
No. of Laborers	**3**	**5**	**20**	**10**	**6**

Ans. We have

Wages (in Rs.)	No. of laborers (f)	C.F
200-300	3	3
300-400	5	8
400-500	20	28
500-600	10	38
600-700	6	44
	$N = \sum f = 44$	

Now $\frac{N}{2} = \frac{44}{2} = 22$ and this lies in 400-500 class.

$\therefore$ Median class = 400-500

Here, $l_1 = 400, C = 8, h = 100, f = 20, N = 44$

We know that $Me = l_1 + \frac{\frac{N}{2} - C}{F} \times h$

$$= 400 + \frac{22-8}{20} \times 100$$
$$= 400 + \frac{14 \times 100}{20}$$
$$= 400 + 70$$
$$= 470$$

7. The following tables gives production yield per hectare of wheat of 100 farms of village:

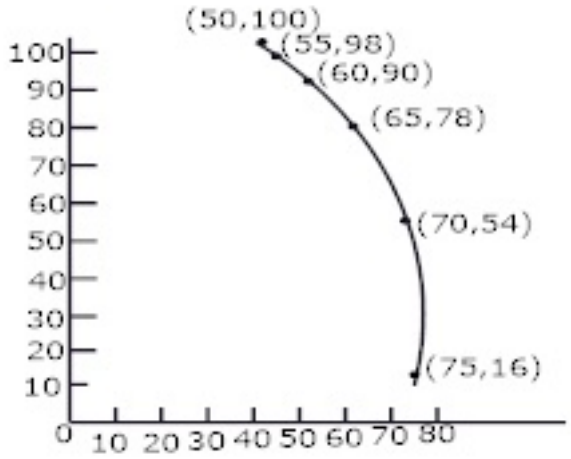
Production yield (in hr)	**50-55**	**55-60**	**60-65**	**65-70**	**70-75**	**75-80**
No. of farms	**2**	**8**	**12**	**24**	**38**	**16**

Change the distribution to a more than type distribution and draw its Ogive.

Ans. More than type Ogive

Production yield (Kg/ha)	C.F
More than or equal to 50	100
More than or equal to 55	98
More than or equal to 60	90
More than or equal to 65	78
More than or equal to 70	54
More than or equal to 75	16

Now, draw the Ogive by plotting the points (50,100), (55,98), (60,90), (65,78), (70,54), (75,16)



8. The A.M of the following distribution is 47. Determine the value of P.

Classes	**0-20**	**20-40**	**40-60**	**60-80**	**80-100**
Frequency	**8**	**15**	**20**	**P**	**5**

Ans. We have

Class Interval	Mid-value (x_i)	Frequency (f_i)	$f_i x_i$
0-20	10	8	80
20-40	30	15	450
40-60	50	20	1000

60-80	70	P	70P
80-100	90	5	450
		$\sum f_i = 48+P$	$\sum f_i x_i = 1980+70P$

Since Mean, $\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$

$$\Rightarrow 47 = \frac{1980+70P}{48+P}$$
$$\Rightarrow 2256+47P = 1980+70P$$
$$\Rightarrow 70P-47P = 2250-1980$$
$$\Rightarrow 23P = 276$$
$$\Rightarrow P = \frac{276}{23} = 12$$

Thus, P = 12

9. Thirty women were examined in a hospital by a doctor and the number of heart beats per minute were recorded and summarized as follows. Find the mean heart beats per minute for these women choosing a suitable method.

Number of heart beats per minute	No. of women
65-68	2
68-71	4
71-74	3
74-77	8
77-80	7
80-83	4
83-86	2

Ans. Let assumed mean 'a' = 75.5. We have

No. of heart	No. of women (f_i	Class Mark i.e	$u_i = \frac{xi-a}{h}$	

beats per minute	)	mid value (x_i)		$f_i u_i$
65-68	2	66.5	-3	-6
68-71	4	69.5	-2	-8
71-74	3	72.5	-1	-3
74-77	8	75.5=a	0	0
77-80	7	78.5	1	7
80-83	4	81.5	2	8
83-86	2	84.5	3	6
	$\sum f_i = 30$			$\sum f_i u_i = 4$

We know that

Mean $\bar{x} = a + \frac{\sum fixi}{\sum fi} \times h$ [By step Deviation Method]

$= 75.5 + \frac{4}{30} \times 3$

$= 75.5 + 0.4$

$= 75.9$

10. Following distribution shows the marks obtained by a class of 100 students:

Marks	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**
Frequency	**10**	**15**	**30**	**32**	**8**	**5**

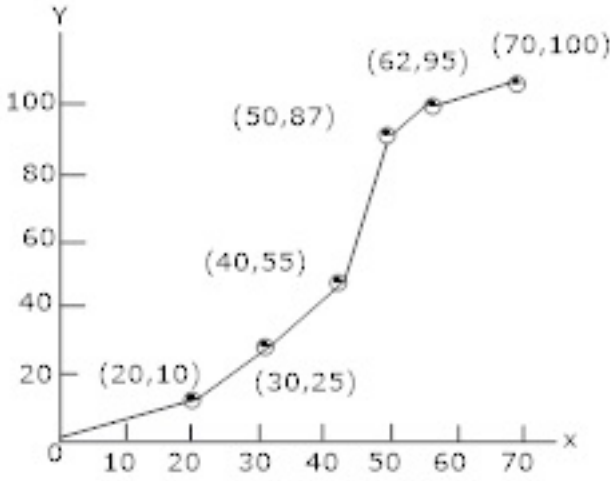
Change the distribution to less than type distribution and draw its Ogive.

Ans. Less than type Ogive

Marks	Marks	Frequency	Cumulative Frequency
10-20	Less than 20	10	10
20-30	Less than 30	15	25
30-40	Less than 40	30	55

40-50	Less than50	32	87
50-60	Less than 60	8	95
60-70	Less than 70	5	100

Now, draw the Ogiveby plotting (20,10), (30,25), (40,55), (50,87), (60,95), (70,100)



11. Following table shows the daily pocket allowances given to the children of a multi-story building. The mean of the pocket allowances is Rs. 18. Find out the missing frequency.

Class Interval	**11-13**	**13-15**	**15-17**	**17-19**	**19-21**	**21-23**	**23-25**
Frequency	**3**	**6**	**9**	**13**	**?**	**5**	**4**

Ans. Let the missing frequency = f, we have

Class interval	f_i	Mid-value	$u_i = \frac{x_i - a}{h} = \frac{x_i - 18}{2}$	f_iu_i
11-13	3	12	-3	-9
13-15	6	14	-2	-12
15-17	9	16	-1	-9
17-19	13	18	0	0
19-21	f	20	1	F
21-32	5	22	2	10

23-25	4	24	3	12
	$\sum f_i = 40 + f$			$\sum f_i u_i = f - 8$

Let assumed mean a = 18, Here h = 2

We know that mean $\bar{x} = a + \frac{\sum fixi}{\sum fi} \times h$

$$\Rightarrow 18 = 18 + \frac{(f-8)}{40+f} \times 2$$

$$\Rightarrow 0 = f - 8$$

$$\Rightarrow f = 8$$

Hence, missing frequency = 8

12. A survey regarding the heights (in cm) of 51 girls of Class X of a school was conducted and the following data was obtained. Find the median height.

Height (in cm)	No. of girls
Less than 140	**4**
Less than 145	**11**
Less than 150	**29**
Less than 155	**40**
Less than 160	**46**
Less than 165	**51**

Ans. We have,

Class Intervals	Frequency (f)	C.F
Below 140	4	4
140-145	7	11
145-150	18	29
150-155	11	40
155-160	6	46

160-165	5	51
	$N=\sum f=51$	

Here, $\frac{N}{2}=\frac{51}{2}=25.5$ which is in the class 145-150

Here, $l_1=145, h=5, N=51, C=11, F=18$

$\therefore$ Median $=l_1+\frac{\frac{N}{2}-C}{f}\times h$

$=145+\frac{25.5-11}{18}\times 5$

$=145+\frac{72.5}{18}\Rightarrow 149.03$

$\therefore$ Median height of the girls = 149.03

13. Calculate the mean for the following distribution:

Class Interval	**0-4**	**4-8**	**8-12**	**12-16**	**16-20**	**20-24**	**24-28**	**28-32**
Frequency	**2**	**5**	**8**	**16**	**14**	**10**	**8**	**3**

Ans. By stepdeviation Method

Let assumed mean a = 14

Class interval	Mid-value (x_i)	Frequency (f_i)	Deviation $d_i=x_i-a$	Product (f_id_i)
0-4	2	2	-12	-24
4-8	6	5	-8	-40
8-12	10	8	-4	-32
12-16	14	16	0	0
16-20	18	14	4	56

20-24	22	10	8	80
24-28	26	8	12	96
28-32	30	3	16	48
Total		$\sum f_i = 66$		$\sum f_i d_i = 184$

We know that Mean $\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$

$= 14 + \frac{184}{66}$

$= 14 + 2.866$

$= 16.866$

14. The percentage of marks obtained by 100 students in an examination are given below:

Marks	**30-35**	**35-40**	**40-45**	**45-50**	**50-55**	**55-60**	**60-65**
Frequency	**14**	**16**	**18**	**23**	**18**	**8**	**3**

Determine the median percentage of marks.

Ans.

Class interval	Mid-value (x_i)	Frequency (f_i)	Deviation $d_i = x_i - a$	Product $(f_i d_i)$
0-4	2	2	-12	-24
4-8	6	5	-8	-40
8-12	10	8	-4	-32
12-16	14	16	0	0
16-20	18	14	4	56
20-24	22	10	8	80
24-28	26	8	12	96
28-32	30	3	16	48
Total		$\sum f_i = 66$		$\sum f_i d_i = 184$

We know that Mean $\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$

$= 14 + \frac{184}{66}$

$= 14 + 2.866$

$= 16.866$

Therefore $\frac{n}{2} = 50$, which lies in the class 45-50

l_1(The lower limit of the median class) = 45

c(The cumulative frequency of the class preceding the median class) = 48

f(The frequency of the Median class)= 23

h(The class size) = 5

Median $= l_1 + \left[\frac{\frac{n}{2} - c}{f}\right] h$

$= 45 + \left(\frac{50 - 48}{23}\right) \times 5$

$= 45 + \frac{10}{23} = 45.4$

So, the median percentage of marks is 45.4

15. Draw a less than Ogive for the following frequency distribution:

Marks	**0-4**	**4-8**	**8-12**	**12-16**	**16-20**

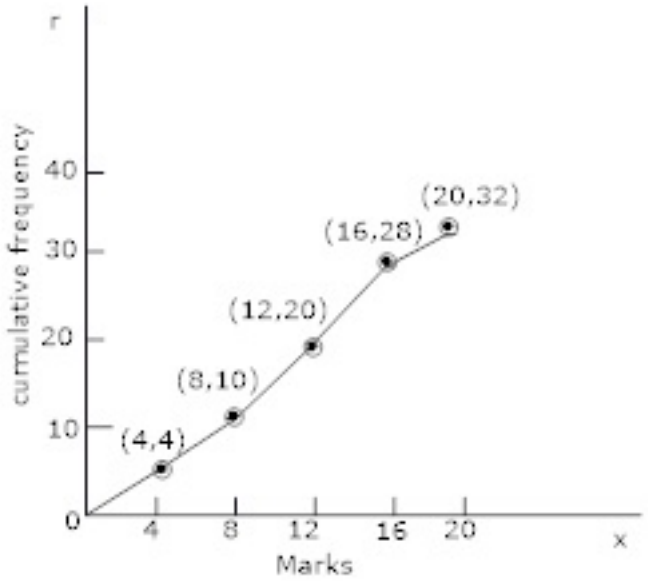
No. of students	**4**	**6**	**10**	**8**	**4**

Ans. We have

Marks	Frequency (f)	C.F
0-4	4	4
4-8	6	10
8-12	10	20
12-16	8	28
16-20	4	32
	$\sum f = 32$	

Upper class limits	4	8	12	16	20
Cumulative Frequency	4	10	20	28	32
Plot the points	(4, 4)	(8, 10)	(12, 20)	(16, 28)	(20, 32)

Joint these points by a free hand curve; we get the required Ogive which is as follows:



16. The A.M of the following frequency distribution is 53. Find the value of P.

Classes	**0-20**	**20-40**	**40-60**	**60-80**	**80-100**
Frequency	**12**	**15**	**32**	**P**	**13**

Ans. We have

Class Interval	Mid-value (x_i)	Frequency (f_i)	$f_i x_i$
0-20	10	12	120
20-40	30	15	450
40-60	50	32	1600
60-80	70	P	70P
80-100	90	13	1170
		$\sum f_i i = 72 + P$	$\sum f_i x_i = 3340 + 70P$

Since Mean $\bar{x} = \dfrac{\sum f_i x_i}{\sum f_i}$

$$\Rightarrow 53 = \frac{3340 + 70P}{72 + P}$$

$$\Rightarrow 3340 + 70P = 3816 + 53P$$

$$\Rightarrow 17P = 3816 - 3340$$

$$\Rightarrow P = \frac{476}{17}$$

$$\Rightarrow P = 28$$

Thus, P = 28

CBSE Class 10 Mathematics

Important Questions

Chapter 14

Statistics

4 Marks Questions

1. **In the following distribution, locate the median mean and mode.**

Monthly consumption of electricity	**65-85**	**85-105**	**105-125**	**125-145**	**145-165**	**165-185**	**185-205**
No. of consumers	**4**	**5**	**13**	**20**	**14**	**7**	**4**

Ans.

Monthly consumption of electricity	**No. of consumers**	**C.F**	**Class Mark (X)**	**FX**
65-85	4	4	75	300
85-105	5	9	95	475
105-125	13	22	115	1495
125-145	20	42	135	2700
145-165	14	56	155	2670
165-185	8	64	175	1400
185-205	4	68	195	780
	$N=\sum f=63$			$\sum f$x=9320

Now $\frac{N}{2}=\frac{68}{2}=34$ and this is in 125-145 class

$\therefore$ Median class = 125-145

Here, $l_1=125, c=22, h=20, f=20, \frac{N}{2}=34$

We know that $Me = l_1 + \frac{\frac{N}{2} - c}{f} \times h = 125 + \frac{34-22}{20} \times 20$

$= 125 + 12 = 137$

Hence, Median = 137

Again Mean $(\bar{x}) = \frac{\sum fx}{\sum f} = \frac{9320}{68} = 137.05$

For mode, since the maximum frequency is 20 and this corresponds to the class 125-145

Here, $l = 125, h = 20, f_1 = 20, f_0 = 13, f_2 = 14$

$$M_0 = l + h\frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

$$= 125 + 20\left(\frac{20-13}{2(20)-13-14}\right)$$

$$= 125 + 20\left(\frac{7}{13}\right) = 125 + \frac{140}{13}$$

$$= 125 + 10.76 = 135.76$$

Thus, Median = 137, Mean = 137.05 and Mode = 135.76

The three measures are approximately the same in the class.

2. **Find the mean, mode and median for the following data:**

Classes	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**
Frequency	**5**	**8**	**15**	**20**	**14**	**8**	**5**

Ans. We have

Classes	**Mid-value** (x_i)	**Frequency** (f_i)	$x_i = \frac{x-a}{10}$	$f_i x_i$	**C.f**
0-10	5	5	-3	-15	5
10-20	15	8	-2	-16	13

20-30	25	15	-1	-15	28
30-40	35	20	0	0	48
40-50	45	14	1	14	62
50-60	55	8	2	16	70
60-70	65	5	3	15	75
		$\sum f_i = 75$		$\sum f_i x_i = -1$	

Let assumed mean a = 35, h = length of class interval= 10

Mean $\bar{x} = a + \frac{\sum fixi}{\sum fi} \times h = 35 - \frac{1}{75} \times 10$

$= 35 - \frac{2}{15}$

$= 35 - 0.13$

$= 34.87$

Since, Maximum frequency = 20

∴ Modal class = 30-40

$l = 30, f_1 = 20, f_0 = 15, f_2 = 14$

Mode = $l + h\frac{f_1 - f_0}{2f_1 - f_0 - f_2}$

$= 30 + 10\left(\frac{20-15}{40-50-14}\right)$

$= 30 + \frac{50}{11}$

$= 30 + 4.55$

$= 34.55$

Hence, mode = 34.55

Since, $\frac{N}{2} = \frac{75}{2} = 37.5$, which lies in the class 30-40

i.e., Median class = 30-40

$$l_1 = 30, \frac{N}{2} = 37.5, C = 28, f = 20, h = 10$$

Median = $l_1 + \frac{\frac{N}{2} - C \times h}{f}$

$= 30 + \frac{37.5 - 28}{20} \times 10$

$= 30 + \frac{9.5}{2}$

$= 30 + 4.75$

$= 34.75$

Hence, Median = 34.75

3. **Find the mean, mode and median for the following data:**

Classes	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**
Frequency	**4**	**8**	**10**	**12**	**10**	**4**	**2**

Ans. We have

Classes	**Mid value** (x_i)	f_i	$\frac{x_i - a}{h} = u_i$	$f_i u_i$	**c.f**
10-20	15	4	-3	-12	4
20-30	25	8	-2	-16	12
30-40	35	10	-1	-10	22
40-50	45	12	0	0	34
50-60	55	10	1	10	44
60-70	65	4	2	8	48
70-80	75	2	3	6	50

		$N=\sum f_i=50$		$\sum f_iu_i=-14$	

Let assumed mean a = 45, Here h = 10

We know that mean $\left(\bar{x}\right)=a+\frac{\sum fixi}{\sum fi}\times h$

$=45-\frac{14}{50}\times 10$

$=45-\frac{14}{5}$

$=45-2.8$

Mean $\left(\bar{x}\right)=42.2$

Since maximum frequency = 12

∴ Modal class = 40-50

Here, $l=40,f_1=12,f_0=10,h=10,f_2=10$

Now Mode $=l+\frac{f_1-f2}{2f_1-f_0-f_2}\times h$

$=40+\frac{12-10}{24-10-10}\times 10$

$=40+\frac{2}{4}\times 10$

$=40+5$

$=45$

∴ Mode = 45

Now $\frac{N}{2}=\frac{50}{2}=25$

∴ Median class is 40-50

Now median $=l_1+\frac{\frac{N}{2}-c}{f}\times h$

Here $N=10,C=22,F=12,h=10,l_1=40$

∴ Median = $l_1+\frac{25-22}{12}\times 10$

$$= 40 + \frac{1}{4} \times 10$$

$$= 40 + 2.5$$

$$= 42.5$$

Thus, Median = 42.5