CBSE Test Paper 05

Chapter 14 Statistics

1. The wickets taken by a bowler in 10 cricket matches are 2, 6, 4, 5, 0, 2, 1, 3, 2, 3. The median of the data is **(1)**
   a. 2.5
   b. 1
   c. 2
   d. 3
2. The measure of central tendency that can be obtained graphically is **(1)**
   a. none of these
   b. median
   c. mode
   d. mean
3. In the given data if n = 230, l = 40, cf = 76, h = 10, f = 65, then its median is **(1)**
   a. 48
   b. 40
   c. 47
   d. 46
4. The times, in seconds, taken by 75 athletes to run a 500m race are tabulated as below:

Class	65-85	85-105	105-125	125-145	145-165	165-185	185-205
Frequency	4	5	18	20	17	7	4

   The number of athletes who completed the race in less than 125 seconds is **(1)**
   a. 20
   b. 17
   c. 18
   d. 27
5. In a data, if l = 40, h = 15, f_1= 7, f_0 = 3, f_2 = 6, then the mode is **(1)**
   a. 82
   b. 62
   c. 52
   d. 72

6. If $\Sigma f_i = 11$, $\Sigma f_i x_i = 2p + 52$ and the mean of any distribution is 6, find the value of p. **(1)**

7. The mean of a set of numbers is $\overline{x}$. If each number is multiplied by k, then find the mean of the new set. **(1)**

8. A set of numbers consists of four 5's, six 7's, ten 9's, eleven 12's, three 13's, two 14's. Find the mode of this set of numbers. **(1)**

9. Find the value of x, if the mode of the following data is 25: **(1)**
   15, 20, 25,18,14,15, 25,15,18,16, 20, 25, 20, x, 18

10. Following distribution gives cumulative frequencies of 'more than type' :

Marks obtained	**More than or equal to 5**	**More than or equal to 10**	**More than or equal to 15**	**More than or equal to 20**
Number of students (cumulative frequency)	30	23	8	2

   Change the above data to a continuous grouped frequency distribution. **(1)**

11. The arithmetic mean of the following data is 25, find the value of k. **(2)**

x_i	5	15	25	35	45
f_i	3	k	3	6	2

12. The annual profits earned by 30 shops of a shopping complex in a locality are recorded in the table shown below:

Profit(in lakhs Rs)	**Number of Shops**
More than or equal to 5	30
More than or equal to 10	28
More than or equal to 15	16

More than or equal to 20	14
More than or equal to 25	10
More than or equal to 30	7
More than or equal to 35	3

If we draw the frequency distribution table for the above data, find the frequency corresponding to the class 20-25. **(2)**

13. Find the value of p for the following distribution whose mean is 16.6. **(2)**

x	8	12	15	p	20	25	30
f	12	16	20	24	16	8	4

14. Draw an ogive to represent the following frequency distribution: **(3)**

Class-interval	0-4	5-9	10-14	15-19	20-24
No. of students	2	6	10	5	3

15. Five coins were simultaneously tossed 1000 times, and at each toss the number of heads was observed. The number of tosses during which 0,1,2,3,4 and 5 heads were obtained are shown in the table below. Find the mean number of heads per toss **(3)**

No. of heads per toss (x)	0	1	2	3	4	5
No. of tosses (f)	38	144	342	287	164	25

16. Compare the modal ages of two groups of students appearing for an entrance test: **(3)**

Age in years	**16-18**	**18-20**	**20-22**	**22-24**	**24-26**
Group A	50	78	46	28	23
Group B	54	89	40	25	17

17. Calculate the median from the following data: **(3)**

Rent (in Rs.)	15-25	25-35	35-45	45-55	55-65	65-75	75-85	85-95
No. of Houses	8	10	15	25	40	20	15	7

18. From the following information, construct less than and more than Ogive and find out median from it. **(4)**

Wages (Rs.)	0-30	30-40	40-50	50-60	60-70	70-80
No. Of workers	10	15	30	32	8	5

19. The following distribution gives the daily income of 50 workers of a factory :

Daily income (in Rs)	200-250	250-300	300 - 350	350-400	400-450	450-500
Number of workers	10	5	11	8	6	10

Convert the distribution to a 'less than type' cumulative frequency distribution and draw its ogive. Hence obtain the median of daily income. **(4)**

20. To find out the concentration of SO_2 in the air (in parts per million, i.e., ppm), the data was collected for 30 localities in a certain city and is presented below:

Concentration of SO_2 (in ppm)	Frequency
0.00 - 0.04	4
0.04 - 0.08	9
0.08 - 0.12	9
0.12 - 0.16	2
0.16 - 0.20	4
0.20 - 0.24	2

find the mean concentration of SO_2 in the air. **(4)**

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Solution

1. a. 2.5

   Explanation: Arranging the given data in ascending order, we get

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

   Here, n = 10, which is even.

   $\therefore$ Median = $\frac{1}{2}\left[\left(\frac{n}{2}\right)^{th}\text{ term} + \left(\frac{n}{2}+1\right)^{th}\text{ term}\right]$

   = $\frac{1}{2}\left[5^{th}\text{ term} + 6^{th}\text{ term}\right]$

   $\Rightarrow$ Median = $\frac{1}{2}[2+3] = \frac{5}{2}$

   = 2.5

2. b. median

   Explanation: The measure of central tendency that can be obtained graphically is Median.

   The median is less affected by outliers and skewed data distribution i.e. when the distribution is not symmetrical.

3. d. 46

   Explanation: Median = $l + \frac{\frac{n}{2} - cf}{f} \times h$

   = $40 + \frac{\frac{230}{2} - 76}{65} \times 10$

   = $40 + \frac{115-76}{65} \times 10$

   = $40 + \frac{39}{65} \times 10$

   =40 + $\frac{390}{65}$

   = 40 + 6

   = 46

4. d. 27

   Explanation:

Class	65-85	85-105	105-125	125-145	145-165	165-185	185-205
Frequency	4	5	18	20	17	7	4

Cumulative Frequency	4	9	27	47	64	71	75

Therefore, the number of athletes who completed the race in less than 125 seconds is 27.

5. c. 52

Explanation: Mode = $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

= $40 + \frac{7-3}{7\times2-3-6} \times 15$

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

= 40 + 12

= 52

6. $\overline{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$

$\Rightarrow \quad 6 = \frac{2p+52}{11}$

$\Rightarrow$ 2p = 66 - 52

$\Rightarrow$ 2p = 14

$\Rightarrow$ p =7

7. Let numbers be x_1, x_2 .....x_n.

Mean = $\frac{x_1+x_2+\ldots+x_n}{n} = \overline{x}$

New observations = $\frac{kx_1+kx_2+\ldots kx_n}{n}$

$= \frac{k(x_1+x_2+\ldots+x_n)}{n} = k\overline{x}$

8.

Observation	Frequency
5	4
7	6
9	10
12	11
13	3
14	2

Mode = 12

Since, It has highest frequency

9. The frequency table of the given data is as given below:

Value (x_i)	14	15	16	18	20	25	x
Frequency (f_i)	1	3	1	3	3	3	1

It is given that the mode of the given date is 25. So, it must have the maximum frequency. That is possible only when x =25.
Hence, x = 25.

10.

C.I.	5-10	10-15	15-20	20-25
f	30- 23 = 7	23 - 8 = 15	8 - 2 = 6	2

11.

X	**f**	**fx**
5	3	15
15	k	15k
25	3	75
35	6	210
45	2	90
	N = k + 14	**Sum = 15k + 390**

Given mean = 25
$\frac{Sum}{N} = 25$
15k + 390 = 25k + 350
25k – 15k = 40
10k = 40
k = 4

12. The frequency table is as follows:

Classes Profit(in lakhs Rs)	**Frequency Number of shops**
5 - 10	2

10 - 15	12
15 - 20	2
20 - 25	4
25 - 30	3
30 - 35	4
35 - 40	3

The frequency corresponding to the class 20 - 25 is 4.

13.

$\mathbf{x_i}$	$\mathbf{f_i}$	$f_i x_i$
8	12	96
12	16	192
15	20	300
p	24	24p
20	16	320
25	8	200
30	4	120
	$\sum f_i = 100$	$\sum f_i x_i = 24p + 1228$

Mean = 16.6

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

$\frac{24p+1228}{100} = 16.6$

24p + 1228 = 1660

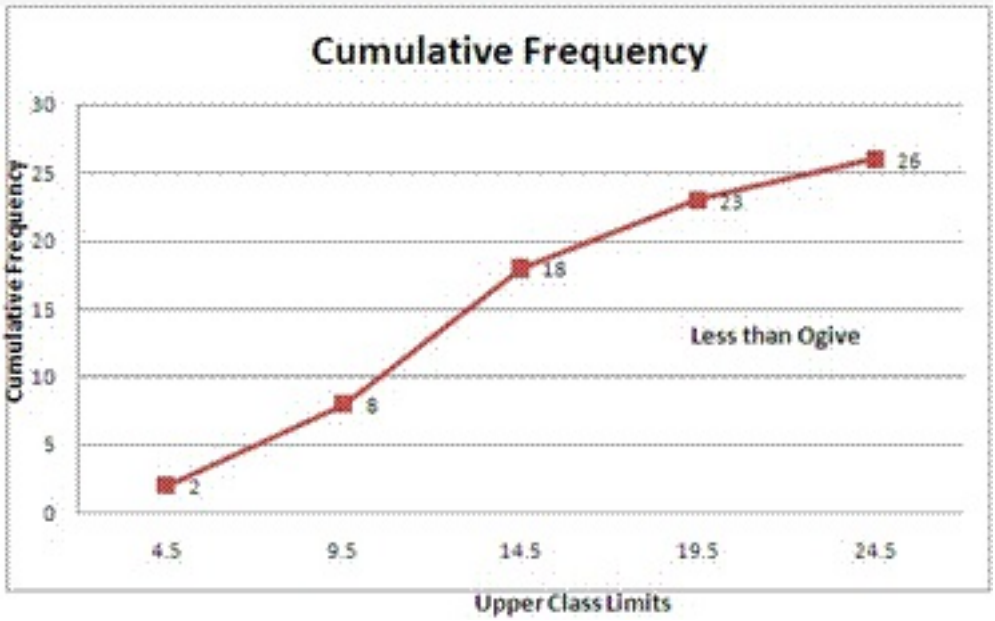
p = $\frac{432}{24}$

p = 18

14. The given frequency distribution is not continuous, so we will first make it continuous and then prepare the cumulative frequency:

Class-interval	No. of Students	Less than	Cumulative frequency
0.5-4.5	2	4.5	2
4.5-9.5	6	9.5	8
9.5-14.5	10	14.5	18
14.5-19.5	5	19.5	23
19.5-24.5	3	24.5	26

Plot the points (4.5, 2), (9.5, 8), (14.5, 18), (19.5, 23), (24.5,26) by taking the upper class limit over the x-axis and cumulative frequency over the y-axis.



15. Let the assumed mean (A) = 2

No. of heads per toss x_i	No of intervals f_i	$ui=A_i-x=A_i-2$	f_iu_i
0	38	-2	-7
1	144	-1	-144
2	342	0	0
3	287	1	287
4	164	2	328
5	25	3	75

	N= 1000		**Sum = 470**

Mean number of per toss = $2 + \frac{470}{1000}$ = 2 + 0.47 =2.47

16.

Age in years	**16-18**	**18-20**	**20-22**	**22-24**	**24-26**
Group A	50	78	46	28	23
Group B	54	89	40	25	17

For Group A:

Here the maximum frequency is 78, then the corresponding class 18 - 20 is modal class.

$l = 18, h = 20 - 18 = 2, f_0 = 78, f_1 = 50, f_2 = 46.$

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

$= 18 + \frac{78-50}{2\times78-50-46} \times 2$

$= 18 + \frac{56}{60}$

$= 18 + 0.93$

$= 18.93\ years$

For group B:

Here the maximum frequency is 89, then the corresponding class 18 - 20 is the modal class.

$l = 18, h = 20 - 18 = 2, f_0 = 89, f_1 = 54, f_2 = 40$

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

$= 18 + \frac{89-54}{2\times89-54-40} \times 2$

$= 18 + \frac{70}{84}$

$= 18 + 0.83$

$= 18.83\ years$

Hence the modal age for the Group A is higher than that for Group B.

17.

Class interval	**Frequency**	**Cumulative frequency**
15-25	8	8

25-35	10	18
35-45	15	33
45-55	25	58(F)
55-65	40(f)	98
65-75	20	118
75-85	15	133
85-95	7	140
	$N=140$	

$N=140$

$\therefore \quad \frac{N}{2}=\frac{140}{2}=70$

The cumulative frequency just greater than $\frac{N}{2}$ is 98.

$\therefore$ median class is 55-65 .

$l=55, f=40, F=58, h=65-55=10$

$\therefore \text{ Median } =l+\frac{\frac{N}{2}-F}{f} \times h$

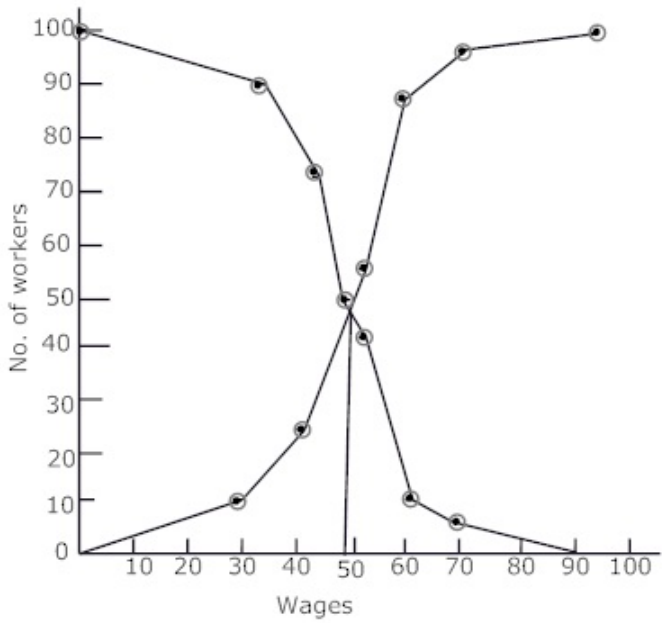
$=55+\frac{70-58}{40} \times 10$

$=55+3$

$=58$

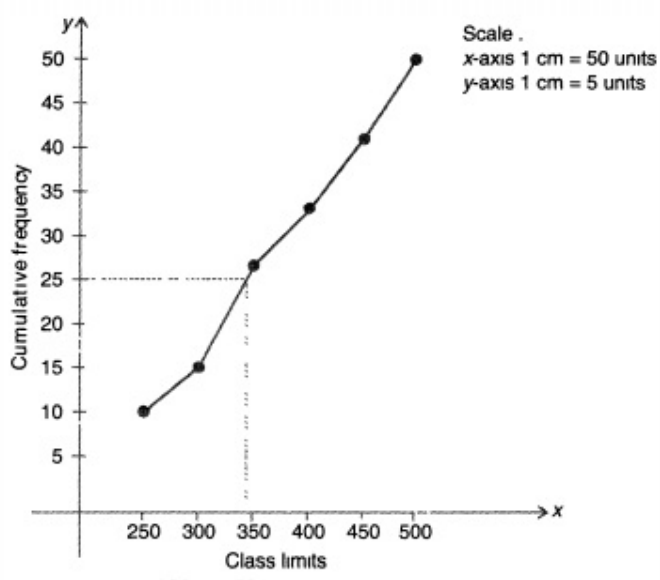
18.

Wages (Rs)	Frequency (less than)	Wages	C.F (More then)	Wages	C.F
0-30	10	30	10	0	100
30-40	15	40	25	30	90
40-50	30	50	55	40	75
50-60	32	60	87	50	45
60-70	8	70	95	60	13
70-80	5	80	100	70	5



19.

Daily income (Classes)	No. of workers (c.f)
Less than 250	10
Less than 300	15
Less than 350	26
Less than 400	34
Less than 450	40
Less than 500	50



From graph, $\frac{N}{2} = \frac{50}{2}$ = 25

Hence, Median of daily income = Rs 345

20. We may find class marks for each interval by using the relation

$x = \frac{\text{upperlimit} + \text{lowerclasslimit}}{2}$

Class size of this data = 0.04

Concentration of SO_2	**Frequency f_i**	**Class interval x_i**	**$d_i = x_i -$ 0.14**	**u_i**	**$f_i u_i$**
0.00 – 0.04	4	0.02	-0.12	-3	-12
0.04 – 0.08	9	0.06	-0.08	-2	-18
0.08 – 0.12	9	0.10	-0.04	-1	-9
0.12 – 0.16	2	0.14	0	0	0
0.16 – 0.20	4	0.18	0.04	1	4
0.20 – 0.24	2	0.22	0.08	2	4
Total	$\sum f_i$ **= 30**				$\sum f_i u_i$ **= -31**

let a = 0.14

$\text{Mean } \overline{x} = a + \left(\frac{\sum f_i u_i}{\sum f_i}\right) \times h$

$= 0.14 + (0.04)\left(\frac{-31}{30}\right)$

= 0.099 ppm