CBSE Test Paper 04
Chapter 14 Statistics

1. The median of first 10 prime numbers is **(1)**

   a. 12.5

   b. 13

   c. 11

   d. 12

2. The mean of 25 observations is 36. If the mean of first 13 observations is 32 and that of the last 13 observations is 39, then the 13th observation is **(1)**

   a. 13

   b. 23

   c. 32

   d. 36

3. To represent 'the more than type' graphically, we plot the_____on the x – axis. **(1)**

   a. class marks

   b. lower limits

   c. upper limits

   d. class size

4. If $\sum f_i x_i = 1860$ and $\sum f_i = 30,$ then the value of $\overline{x}$ is **(1)**

   a. 26

   b. 63

   c. 64

   d. 62

5. The empirical relationship between the three measures of central tendencies is **(1)**

   a. 3 mode = mean + 2 median

   b. Mode= 3 median - 2 mean

   c. 3 mean = median + 2 mode

   d. None of these

6. From the following frequency distribution, find the median class : **(1)**

Cost of living index	1400-1550	1550-1700	1700-1850	1850-2000
Number of weeks	8	15	21	8

7. Find the mode of the following data: **(1)**

   25,16,19, 48,19, 20,34,15, 19, 20, 21, 24,19, 16, 22, 16 ,18, 20,16, 19

8.

x	f	c.f.
1	8	8
2	10	18
3	11	29
4	16	45
5	20	65
6	25	90
7	15	105
8	9	114
9	6	120

Find the median for the above frequency distribution. **(1)**

9. Find the mode of the data , using a empirical formula , when it is given that median = 41.25 and mean = 33.75 **(1)**

10. Find the mode of the following data: **(1)**

    120, 110, 130, 110, 120, 140, 130, 120, 140, 120

11. Thirty women were examined in a hospital by a doctor and the number of heart beats per minute was recorded and summarized as follows. Find the mean heartbeats per minute for these women, choosing a suitable method. **(2)**

Number of heart beats per minute	65-68	68-71	71-74	74-77	77-80	80-83	83-86
Number of women	2	4	3	8	7	4	2

12. Find the unknown entries a, b, c, d in the following distribution of heights of students in a class : **(2)**

Height (in cm)	Frequency	Cumulative Frequency
150-155	12	12
155-160	a	25
160-165	10	b
165-170	c	43
170-175	5	48
175-180	2	d

13. The data regarding marks obtained by 48 students of a class in a class test is given below. Calculate the modal marks of students. **(2)**

Marks obtained	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
Number of students	1	0	2	0	0	10	25	7	2	1

14. The following distribution shows the daily pocket allowance given to the children of a multistorey building. The average pocket allowance is Rs.18.00. Find out the missing frequency. **(3)**

Class Interval	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Frequency	7	6	9	13	-	5	4

15. The mean of the following frequency distribution is 62.8 and the sum of all the frequencies is 50. Compute the missing frequency f_1 and f_2. **(3)**

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	5	f_1	10	f_2	7	8

16. The arithmetic mean of the following data is 14. Find the value of k. **(3)**

x_i	5	10	15	20	25
f_i	7	k	8	4	5

17. The following table gives the number of children of 150 families in a village

No. of children (x)	0	1	2	3	4	5
No. of families (f)	10	21	55	42	15	7

Find the average number of children per family. **(3)**

18. Calculate the median from the following data: **(4)**

Marks below	10	20	30	40	50	60	70	80
No. of students	15	35	60	84	96	127	198	250

19. Calculate the average daily income (in Rs) of the following data about men working in a company: **(4)**

Daily income (Rs)	< 100	< 200	< 300	< 400	<500
Number of men	12	28	34	41	50

20. On annual day of a school, 400 students participated in the function. Frequency distribution showing their ages is as shown in the following table :

Ages (in years)	05-07	07-09	09-11	11-13	13-15	15-17	17-19
Number of students	70	120	32	100	45	28	5

Find mean and median of the above data. **(4)**

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Solution

1. d. 12

    Explanation: The first 10 prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29.

    Here n = 10, which is even number.

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

    $= \frac{1}{2}$ [5th term + 6th term] $= \frac{1}{2}[11 + 13]$

    $= \frac{1}{2} \times 24$

    = 12

2. b. 23

    Explanation: Let terms be $x_1, x_2, x_3, \ldots\ldots, x_{25}$.

    According to the question,

    $\frac{x_1+x_2+x_3+\ldots\ldots+x_{25}}{25} = 36 \Rightarrow x_1 + x_2 + x_3 + \ldots\ldots + x_{25} = 900$ ....(i)

    And $\frac{x_1+x_2+x_3+\ldots\ldots+x_{13}}{13} = 32$

    $\Rightarrow x_1 + x_2 + x_3 + \ldots\ldots + x_{13} = 416$ ....(ii)

    Also, $\frac{x_{13}+x_{14}+x_{15}+\ldots\ldots+x_{25}}{13} = 39$

    $\Rightarrow x_{13} + x_{14} + x_{15} + \ldots\ldots + x_{25} = 507$ ....(iii)

    Adding eq. (ii) and (iii), we get,

    $x_1 + x_2 + \ldots\ldots x_{13} + x_{13} + x_{14} \ldots\ldots + x_{25} = 416 + 507 = 923$

    $\Rightarrow x_1 + x_2 + \ldots\ldots + x_{25} + x_{13} = 923$

    $\Rightarrow 900 + x_{13} = 923$

    $\Rightarrow x_{13} = 23$

3. b. lower limits

    Explanation: The lower limit for every class is the smallest value in that class on the other hand the upper limit for every class is the greatest value in that class.

    To represent 'the more than type' graphically, we plot the lower limits on the x-axis and cumulative frequency on the y-axis to find the median.

4. d. 62

Explanation: $\overline{x} = \dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{1860}{30} = 62$

5.   b. Mode= 3 median - 2 mean

Explanation: The empirical relationship between the three measures of central tendencies is

3 Median = Mode + 2 Mean

The relationship is as per observation.

a distribution in which the values of mean, median and mode coincide (i.e. mean = median = mode) is called symmetrical distribution. conversely when the values of mean, median, mode are not equal, the distribution is called asymmetrical or skewed.

knowing any two values, the third can be computed by this formula

3 median = 2 mean + mode

2 mean = 3 median - mode

mean = 1/2 {3 median - mode}

6.

C.I	$1400 - 1550$	$1550 - 1700$	$1700 - 1850$	$1850 - 2000$
f	8	15	21	8
c.f	8	$8 + 15 = 23$	$23 + 21 = 44$	$44 + 8 = 52$

$\dfrac{\Sigma f}{2} = 26$

$\Rightarrow$ Median class = 1700 - 1850

7. Given, data

25,16,19, 48,19, 20,34,15, 19, 20, 21, 24,19, 16, 22, 16 ,18, 20,16,19

Value (x_i)	15	16	18	19	20	21	22	21	25	34	48
Frequency (f_i)	1	4	1	5	3	1	1	1	1	1	1

We observe that the value 19 has the maximum frequency i.e. 5.

Therefore, mode of the given data is 19.

8. n = 120

$\Rightarrow \dfrac{n}{2} = 60$

Median is average of 60th and 61st observation

Median = $\frac{5+5}{2}$ = 5

So, Median is 5.

9. We know , Mode = 3(Median) - 2(Mean)

   Given, Median = 41.25 and Mean = 33.75

   Therefore , Mode = $3 \times 41.25 - 2 \times 33.75$

   $= 123.75 - 67.50$

   $= 56.25$

   So, mode is 56.25.

10. Let us first form the frequency table for the given data as given below:

Value x_i	110	120	130	140
Frequency f_i	2	4	2	2

We observe that the value 120 has the maximum frequency.

Hence, the mode or modal values is 120.

11. Take a = 75.5, h = 3

Number of heart beats per minute	Number of women (f_i)	Class mark (x_i)	$d_i = x_i - 75.5$	$u_i = \dfrac{x_i - 75.5}{3}$	$f_i u_i$
65-68	2	66.5	–9	–3	–6
68-71	4	69.5	–6	–2	–8
71-74	3	72.5	–3	–1	–3
74-77	8	75.5	0	0	0
77-80	7	78.5	3	1	7
80-83	4	81.5	6	2	8
83-86	2	84.5	9	3	6
Total	$\sum f_i = 30$				$\sum f_i u_i = 4$

Using the step-deviation method,

$$\overline{x} = a + \frac{\sum f_i x_i}{\sum f_i} \times h = 75.5 + \left[\frac{4}{30}\right] \times 3 = 75.5 + 0.4 = 75.9$$

Hence, the mean heart beats per minute are 75.9.

12.

Height (in cm)	Frequency	Cumulative Frequency
150-155	12	12
155-160	a	25
160-165	10	b
165-170	c	43
170-175	5	48
175-180	2	d

From the table,

$12 + a = 25$

$\Rightarrow a = 25 - 12 = 13$

$25 + 10 = b$

$\Rightarrow b = 35,$

$b + c = 43$

$\Rightarrow c = 43 - b = 43 - 35 = 8$

and $48 + 2 = d$

$\Rightarrow d = 50$

13. Modal class is 30 - 35, l = 30, $f_1 = 25$, $f_0 = 10$,

$f_2 = 7$, h = 5

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

or, Mode = 30 + $\left(\dfrac{25 - 10}{2(25) - 10 - 7} \right) \times 5$

$\Rightarrow$ Mode = 30 + $\dfrac{25 - 10}{50 - 10 - 7} \times 5$

or, Mode = 30 + $\dfrac{15}{33} \times 5$

or, Mode = 30 + 0.454 × 5

= 30 + 2.27 or 32.27 approx.

14. Given mean = 18,

Let the missing frequency be 'v'.

Class interval	Mid value x_i	Frequency f_i	$f_i x_i$
11 – 13	12	7	84
13 – 15	14	6	88
15 – 17	16	9	144
17 – 19	18	13	234
19 – 21	20	x	20x
21 – 23	22	5	110
23 – 25	14	4	56
		$\sum x_i = 44 + x$	$\sum f_i x_i = 752 + 20x$

$$Mean = \frac{\sum f_i x_i}{\sum f_i}$$
$$18 = \frac{752 + 20x}{44 + x}$$
$$792 + 18x = 752 + 20x$$
$$2x = 40$$
$$\therefore x = 20$$

15.

Class Interval	Mid value x_i	Frequency f_i	$f_i x_i$
0 – 20	10	5	50
20 – 40	30	f_1	$30f_1$
40 – 60	50	10	500
60 – 80	70	f_2	$70f_2$
80 – 100	90	7	630
100 – 120	110	8	880
		N = 50	Sum = $30f_1 + 70f_2$ + 2060

Given,

sum of frequency = 50

$5 + f_1 + 10 + f_2 + 7 + 8 = 50$

$f_1 + f_2 = 20$

$3f_1 + 3f_2 = 60$ ... (1) [multiply both side by 3]

And mean = 62.8

$$\frac{Sum}{N} = 62.8$$

$$\frac{30f1 + 70f_2 + 2060}{50} = 62.8$$

$30f1 + 70f_2 = 3140 - 2060$

$30f1 + 70f_2 = 1080$

$3f1 + 7f_2 = 108$ ...(2) [divide it by 10]

subtract equation (1) from equation (2)

$3f1 + 7f2 - 3f_1 - 3f_2 = 108 - 60$

$4f_2 = 48$

$f_2 = 12$

Put value of f_2 in equation (1)

$3f_1 + 3(12) = 60$

$$f_1 = \frac{24}{3} = 8$$

$f_1 = 8$, $f_2 = 12$

16.

x_i	f_i	f_ix_i
5	7	35
10	k	10k
15	8	120
20	4	80
25	5	125
	= k + 24	= 10k + 360

Given

$\Rightarrow$ Mean = 14

$\Rightarrow \quad \dfrac{\sum f_i x_i}{\sum f_i} = 14$

$\Rightarrow \quad \dfrac{10k + 360}{k + 24} = 14$

$\Rightarrow 10k + 360 = 14k + 336$

$\Rightarrow 14k - 10k = 360 - 336$

$\Rightarrow 4k = 24$

$\Rightarrow \quad k = \dfrac{24}{4} = 6$

17. Let the assumed mean (A) = 2

No of children x_i	No of families f_i	$f_i x_i$
0	10	0
1	21	21
2	55	110
3	42	126
4	15	60
5	7	35
	$\sum f = 150$	$\sum f_i x_i = 352$

Average number of children per family = $\dfrac{352}{150}$ = 2.35 (approx)

18.

Marks below	No. of students	Class interval	Frequency	Cumulative frequency
10	15	0-10	15	15
20	35	10-20	20	35
30	60	20-30	25	60
40	84	30-40	24	84
50	96	40-50	12	96(F)
60	127	50-60	31(f)	127

70	198	60-70	71	198
80	250	70-80	52	250
			N=250	

$N = 250$

$\therefore \quad \frac{N}{2} = \frac{250}{2} = 125$

The cumulative frequency just greater than $\frac{N}{2}$ is 127

hence, median class is 50 - 60.

$$median = l + \frac{\frac{N}{2} - F}{f} \times h$$

Here,

l = Lower limit of median class

F = Cumulative frequency of class prior to median class.

f = Frequency of median class.

h = Class size.

$l = 50, f = 31, F = 96, h = 60 - 50 = 10$

$= 50 + \frac{125 - 96}{31} \times 10$

$= 50 + \frac{29 \times 10}{31}$

$= 50 + 9.35$

$= 59.35$

19.

Class	x_i (class mark)	f_i	$f_i x_i$
0 -100	50	12	600
100-200	150	16	2400
200-300	250	6	1500
300-400	350	7	2450
400-500	450	9	4050
Total		$\sum f_i = 50$	$\sum f_i x_i = 11,000$

Mean = $\frac{\sum x_i f_i}{\sum f_i} = \frac{11000}{50}$

= 220

$\therefore$ Average daily income = Rs 220

20.

class intervel	f_i	cumulative frequency	x_i	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
05-07	70	70	6	-3	-210
07-09	120	190	8	-2	-240
09-11	32	222	10	-1	-32
11-13	100	322	12	0	0
13-15	45	367	14	1	45
15-17	28	395	16	2	56
17-19	5	400	18	3	15
	$\Sigma f_i = 400$				$\Sigma f_i u_i = -366$

a= assumed mean = 12

we know that,

Mean$= \overline{x} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$

Mean $= 12 + \frac{-366}{400} \times 2$

$= 12 - \frac{183}{100}$

$= 12 - 1.83$

$= 10.17$

Median Class $= \frac{N}{2}$ th term $= \frac{400}{2}$ = 200th term

i.e.$09 - 11$

Median $= l + \left(\frac{\frac{N}{2} - c.f}{f} \right) \times h$

$\Rightarrow$ Median $= 9 + \frac{200 - 190}{32} \times 2$

$= 9 + 0.625$

$= 9.625$