Chapter-statistics

Q1.

The lengths of 50 leaves of a plant are measured correct to the nearest millimetre and the data obtained is represented in the following table

Length (in mm)	109–117	118–126	127–135	136–144	145–153	154–162	163–171
No. of leaves	4	6	14	13	6	4	3

Find the mean length of the leaves.

Q2.

The Median of the following distribution is 35.Find the value of x:

Class Interval	0–10	10–20	20–30	30–40	40–50	50–60	60–70
Frequency	2	3	x	6	5	3	2

Q3.

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.

Q4.

The weights of tea in 70 packets are shown in the following table.

Weight (in gm)	200–201	201–202	202–203	203–204	204–205	205–206
No. of packets	13	27	18	10	1	1

Find the mean weight of packets using step deviation method.

Q5.A survey regarding the height (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	Number 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

Q6.

For the month of February, a class teacher of Class IX has the following absentee record for 30 students. Find the mean number of days, a student was absent.

Number of Days of Absent	0–4	4–8	8–12	12–16	16–20	20–24
Number of Students	18	3	6	2	0	1

Q7.

The table below shows the salaries of 280 persons:

Salary (In thousand ₹)	No. of Persons
5–10	49
10–15	133
15–20	63
20–25	15
25–30	6
30–35	7
35–40	4
40–45	2
45–50	1

Calculate the median salary of the data.

Q8.

If empirical relationship between mean, median and mode is expressed as mean $= k$(3 median $-$ mode), then find the value of k. [CBSE Term 1, 2016]

Q9.

The mode of the following frequency distribution is 36. Find the missing frequency f.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	10	f	16	12	6	7

Q10.

The mean and median of 100 observation are 50 and 52 respectively. The value of the largest observation is 100. It was later found that it is 110. Find the true mean and median.

SOLUTIONS

Q1.

Solution:

Given frequency distribution is not continuous. So first we have to make it continuous.

Class Interval	x_i	f_i	$u_i = \frac{x_i - 140}{9}$	$f_i u_i$
108.5 – 117.5	113	4	–3	–12
117.5 – 126.5	122	6	–2	–12
126.5 – 135.5	131	14	–1	–14
135.5 – 144.5	140	13	0	0
144.5 – 153.5	149	6	1	6
153.5 – 162.5	158	4	2	8
162.5 – 171.5	167	3	3	9
Total		$\Sigma f_i = 50$		$\Sigma f_i u_i = -15$

Here, assumed mean $(a) = 140$; class size $= 9$

Now, $$\text{mean } (\bar{x}) = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$$

$$= 140 + 9\left(\frac{-15}{50}\right)$$

$$= 140 - \frac{27}{10} = 140 - 2.7 = 137.30$$

Hence, mean length of the leaves = 137.30 mm.

Q2.

Solution:

Class Interval	f_i	c.f.
0 – 10	2	2
10 – 20	3	5
20 – 30	x	$5+x$
30 – 40	6	$11+x$
40 – 50	5	$16+x$
50 – 60	3	$19+x$
60 – 70	2	$21+x$

Median C.I. as median = 35(given)

$$\text{Median} = l + \frac{\left(\frac{N}{2} - c.f.\right)}{f} \times h \Rightarrow 35 = 30 + \frac{\left\{\frac{21+x}{2} - (5+x)\right\}}{6} \times 10$$

$$\Rightarrow 35 = 30 + \frac{(21+x-10-2x)}{12} \times 10 \Rightarrow 35 = 30 + \left(\frac{11-x}{12}\right) \times 10$$

$$\Rightarrow 5 = \frac{5(11-x)}{6} \Rightarrow 6 = 11 - x \Rightarrow x = 5$$

Hence, $x = 5$

Q3.

mode = 55
Modal class = 45 – 60
Modal class preceding $f_1 = 5$
After the modal class = $f_2 = 10$

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

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

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

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

$$20f - 150 = 15f - 75$$

$$5f = 75$$

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

Q4.

Solution:

Class Interval	x_i	f_i	$u_i = \frac{x_i - 202.5}{1}$	$f_i u_i$
200 – 201	200.5	13	–2	–26
201 – 202	201.5	27	–1	–27
202 – 203	202.5	18	0	0
203 – 204	203.5	10	1	10
204 – 205	204.5	1	2	2
205 – 206	205.5	1	3	3
Total		$\Sigma f_i = 70$		$\Sigma f_i u_i = -38$

Now, $\bar{u} = \frac{\Sigma f_i u_i}{\Sigma f_i} = \frac{-38}{70}$

$\because \quad \bar{x} = A + h\bar{u}$

$$= 202.5 + 1\left(\frac{-38}{70}\right) = 202.5 - \frac{38}{70} = \frac{14175 - 38}{70} = \frac{14137}{70} = 201.96$$

Q5.

Solution:

Height (in cm)	*No of girls (c.f)*	*F*
135 – 140	*4*	*4*
140 – 145	*11*	*7*
145 – 150	*29*	*18*
150 – 155	*40*	*11*

155 – 160	*46*	*6*
160 – 165	*51*	*5*
		51

Here, ∑F/2 = 51/2 = 25.5 or 26 which lies in the class interval belonging to 145-150

Therefore,

l= 145, F= 11, f= 18, h= 5

$$Median = l + \frac{\frac{N}{2} - F}{f} * h$$
$$145 + \frac{25.5-11}{18} * 5$$
$$145 + \frac{14.5}{18} * 5$$
$$145 + \frac{72.5}{18}$$

= 145 + 4.03 = 149.03

Q6.

C.I.	f_i	x_i (mid-value)	$d = x_i - A$	$f_i \times d_i$
0–4	18	2	–12	–216
4–8	3	6	–8	–24
8–12	6	10	–4	–24
12–16	2	A = 14	0	00
16–20	0	18	4	00
20–24	1	22	8	08
	$\Sigma f_i = 30$			$\Sigma f_i d_i = -256$

$$\text{Mean} = A + \frac{\Sigma f_i d_i}{\Sigma f_i} = 14 + \left(\frac{-256}{30}\right)$$
$$= 14 - 8.53$$
$$= 5.47$$

Q7.

Salary	No. of Persons	Cummulative frequency (*c.f.*)
5–10	49	49
10–15	133	182
15–20	63	245
20–25	15	260
25–30	6	266
30–35	7	273
35–40	4	277
40–45	2	279
45–50	1	280
Total	280	

$$\frac{N}{2} = \frac{280}{2} = 140$$

The cumulative frequency just greater than 140 is 182.

$\therefore$ Median class is 10 – 15.

$\Rightarrow l = 10, h = 5, N = 280,\ c.f. = 49$ and $f = 133$

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

$$= 10 + \left(\frac{140 - 49}{133}\right) \times 5$$

$$= 10 + \frac{91 \times 5}{133}$$

$$= 10 + \frac{455}{133}$$

$$= 10 + 3.42$$

$$= 13.42$$

Q8.

$$\text{Given, mean} = k(3\ \text{median} - \text{mode})$$

$$\text{As we know, mode} = 3\ \text{median} - 2\ \text{mean}$$

$$\therefore \text{mean} = k[3\ \text{median} - (3\ \text{median} - 2\ \text{mean})]$$

$$\Rightarrow \text{mean} = k[3\ \text{median} - 3\ \text{median} + 2\ \text{mean}]$$

$$\Rightarrow \text{mean} = 2k\ \text{mean}$$

$$\Rightarrow 2k\ \text{mean} - \text{mean} = 0$$

$$\Rightarrow \text{mean}\ [2k - 1] = 0$$

$$\Rightarrow 2k - 1 = 0$$

$$\Rightarrow 2k = 1$$

$$\therefore k = 1/2$$

Q9.

Mode is 36 which lies in class 30-40, therefore this is model class.

Here, $f_0 = f$, $f_1 = 16$, $f_2 = 12$, $l = 30$ and $h = 10$

Mode, $$M_o = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right)h$$

$$36 = 30 + \frac{16 - f}{2 \times 16 - f - 12} \times 10$$

$$6 = \frac{16 - f}{20 - f} \times 10$$

$$120 - 6f = 160 - 10f$$

$$4f = 40 \Rightarrow f = 10$$

Q10.

Ans :

Mean, $$M = \frac{\sum fx}{\sum f}$$

$$50 = \frac{\sum fx}{100}$$

$$\sum fx = 5000$$

Correct, $$\sum fx' = 5000 - 100 + 110$$

$$= 5010$$

Correct Mean $$= \frac{5010}{100}$$

$$= 50.1$$

Median will remain same i.e median is 52.