

Class X : MATH Chapter 13 : Statistics Questions & Answers - Exercise : 13.3 - NCERT Book

Q1. The following frequency distribution gives the monthly consumption of electricity of 68 con sumers of a locality. Find the median, mean and mode of the data and compare them.

Monthly cons <mark>umptio</mark> n	Number of	
(in units)	consumers	
65-85	4	
85-105	5	
105-125	13	
125-145	20	
145-165	14	
165-185	8	
185-205	4	

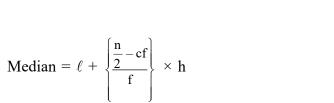
Sol.(i)

Monthly consumption (in units)	Number of consumers f_i	Cumulative frequency
65-85 85-105 105-125 125-145 145-165 165-185	4 5 13 20 14 8	4 9 22 42 56 64
185-205 Total	$\frac{4}{n=68}$	68

n = 68 gives $\frac{n}{2}$ = 34 So, we have the median class (125-145) ℓ = 125, n = 68, f = 20, cf = 22, h = 20

Class X Maths





$$= 125 + \left\{\frac{34 - 22}{20}\right\} \times 20 = 137 \text{ units.}$$

(ii) Modal class is (125 - 145) having maximum frequency $f_m = 20$, $f_1 = 13$, $f_2 = 14$, $\ell = 125$ and h = 20

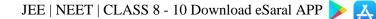
Mode =
$$\ell + \left\{ \frac{f_m - f_1}{2f_m - f_1 - f_2} \right\} \times h$$

= $125 + \left\{ \frac{20 - 13}{40 - 13 - 14} \right\} \times 20 = 125 + \frac{7 \times 20}{13}$
= $125 + \frac{140}{13} = 125 + 10.76 = 135.76$ units

(iii)
$$n = 68$$
, $a = 135$, $h = 20$ and $\Sigma f_{i}u_{i} = 7$

Monthly consumption (in units)	Number of consumers f _i	Class mark _X	$u_i = \frac{x_i - 135}{20}$	$f_i \times u_i$	
65-85	4	75	-3	-12	
85-105	5	95	-2	-10	
105-125	13	115	-1	-13	
125-145	20	135 – a	0	0	
145-165	14	155	1	14	
165-185	8	175	2	16	
185-205	4	195	3	12	
Total	n=68			7	

Class X Maths



n = 68, a = 135, h = 20 and $\Sigma f_i u_i = 7$ By step-deviation method.

*****Saral

Mean = a + h ×
$$\frac{1}{n}$$
 × Σ f_iu_i = 135 + 20 × $\frac{1}{68}$ × 7
= 135 + $\frac{35}{17}$ = 135 + 2.05 = 137.05 units

Q2. If the median of the distribution given below is 28.5, find the values of x and y.

Class interval	Frequency	Cumulative frequency
0-10	5	5
10-20	Х	5+x
20-30	20	25+x
30-40	15	40 + x
40-50	у	40 + x + y
50-60	5	45+x+y
Total	60	

Sol. Median = 28.5 lies in the class-interval (20-30).

Then median class is (20-30).

So, we have $\ell = 20$, f = 20, cf = 5 + x, h = 10, n = 60

Median =
$$\ell + \left\{\frac{\frac{n}{2} - cf}{f}\right\} \times h = 28.5 \ 28.5 = 20 + \left\{\frac{30 - (5 + x)}{20}\right\} \times 10$$

$$\Rightarrow 8.5 = \frac{25 - x}{2} \Rightarrow 17 = 25 - x \Rightarrow x = 8$$

Find the given table, we have

i.e., x + y + 45 = 60 or x + y = 15

$$\Rightarrow$$
 y = 15 - x = 15 - 8 = 7, i.e., y = 7

Q3. A life insurance agent found the following data for distribution of ages of 100 policy





holders. Calculate the median age, if policies are only given to persons having age 18 years onwards but less than 60 year.

Age (in years)	No. of policy holders
Below 20	2
Below 25	6
Below 30	24
Below 35	45
Below 40	78
Below 45	89
Below 50	92
Below 55	98
Below 60	100

Class X Maths

JEE | NEET | CLASS 8 - 10 Download eSaral APP ≽ 🙏



Sol.

	Age (in years)	Number of policy holders f _i	Cumulative frequency
	Below20	2 = 2	2
	20-25	(6-2)=4	6
	25-30	(24 <u>-6)=1</u> 8	24
	30-35	(45– <mark>24)=</mark> 21	45
median class	35-40	(78-4 <mark>5)=3</mark> 3	78
CRISS	40-45	(89–78)=11	89
	45-50	(92–89)=3	92
	50-55	(98–92)=6	98
	55-60	(100–98)=2	100
	Total	n = 100	

Here, $\ell = 35$, n = 100, f = 33, cf = 45, h = 5

Median =
$$\ell + \left\{ \frac{\frac{n}{2} - cf}{f} \right\} \times h$$

= $35 + \left\{ \frac{50 - 45}{33} \right\} \times 5$
= $35 + \frac{25}{33}$
= $35 + 0.76$
= 35.76 years.

Class X Maths



Q4.

Length (in mm)	No. of leaves
118-126	3
127-135	5
136-144	9
145-153	12
154-162	5
163-171	4
172-180	2

The length of 40 leaves of a plant are measured correct to the nearest millimetre, and the data obtained is represented in the following table. Find the median length of the leaves.

Sol. The given series is in inclusive form. We may prepare the table in exclusive form and prepare the cumulative frequency table as given below :

Length (in mm)	No. of leaves (f,)	Cumulative frequency
117.5-126.5	3	3
126.5-135.5	5	8
135.5-144.5	9	17
144.5-153.5	12	29
153.5-162.5	5	34
162.5-171.5	4	38
171.5-180.5	2	40
	N=40	

Here, N = 40

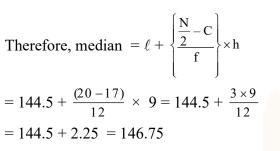
 $\therefore \frac{N}{2} = 20$

The cumulative frequency just greater than 20 is 29 and the corresponding class is 144.5-153.5.

So, the median class is 144.5-153.5.

 $\therefore \ \ell = 144.5, N = 40, C = 17, f = 12 \text{ and } h = 9 \\ Class X Maths www.esaral.com$





Hence, median length of leaves is 146.75 mm.

Q5. The following table gives the distribution of the life time of 400 neon lamps :

Life Time (i <mark>n hour</mark> s)	No. <mark>of lam</mark> ps
1500-20 <mark>00</mark>	14
2000-2500	56
2500-3000	60
3000-3500	85
3500-4000	74
4000-4500	62
4500-5000	48

Find the median life time of a lamp.

Sol .

Life time (in hrs.)	No. of lamps (f _i)	Cf
1500 - 2000	14	14
2000-2500	56	70
2500-3000	60	130
3000-3500	85	215
3500-4000	74	289
4000 - 4500	62	351
4500 - 5000	48	399

 $\frac{N}{2} = \frac{399}{2} = 199.5$ Median class = 3000 - 3500

Median =
$$\ell + \left\{\frac{\frac{N}{2} - C}{f}\right\} \times h$$

Class X Maths





$$= 3000 + \left\{ \frac{199.5 - 130}{85} \right\} \times 500 = 3408.82$$

Hence, median life time of a lamp 3408.82 hrs.

Q6. 100 surnames were randomly picked up from a local telephone directory and the frequency distribution of the number of letters in the English alphabets in the surnames was obtained as follows:

No. of letters	No. of Surnames
1-4	6
4-7	30
7 - 1 0	40
10-13	16
13-16	4
16-19	4

Determine the median number of letters in the surnames. Find the mean number of letters in the surnames? Also, find the modal size of the surnames.

	Number of letters	Number of surnames f _i	Cumulative frequency	
	1-4	6	6=6	
	4-7	30	6+30=36	
Median class	7-10	40	36+40=76	$50 = \frac{n}{2}$
Class	10-13	16	76+16=92	
	13-16	4	92+4=96	
	16-19	4	96+4=100	
	Total	n = 100		

(i) Here,

Sol.

Class X Maths

*****Saral



 $\ell = 7, n = 100, f = 40, cf = 36, h = 3$ Median = $\ell + \left\{ \frac{\frac{n}{2} - cf}{f} \right\} \times h$ $= 7 + \left\{\frac{50 - 36}{40}\right\} \times 3 = 7 + \frac{21}{20} = 8.05$

(ii) Modal class is
$$(7 - 10)$$
.

$$\ell = 7, f_m = 40, f_1 = 30, f_2 = 16, h = 3$$

$$Mode = \ell + \left\{ \frac{f_m - f_l}{2 f_m - f_l - f_2} \right\} \times h$$

$$= 7 + \left\{ \frac{40 - 30}{80 - 30 - 16} \right\} \times 3 = 7 + \frac{30}{34} = 7.88$$

(iii) Here, a = 8.5, h = 3, n = 100 and $\Sigma f_{i}u_{i} = -6$.

	Number of letters	f	Class mark _{Xi}	$u_i = \frac{x_i - 8.5}{3}$	$\mathbf{f}_{i} \! imes \! \mathbf{u}_{i}$		
	1-4	6	2.5	-2	-12		
	4-7	30	5.5	-2 -1	-30		
	7-10	40	8.5 – a	0	0		
	10-13	16	11.5	1	16		
	13-16	4	14.5	2	8		
	16-19	4	17.5	3	12		
	Total	n = 100			-6		
Mean = a + h × $\frac{1}{n}$ × Σ fu = 8.5 + 3 × $\frac{1}{100}$ × (- 6) = 8.5 - $\frac{18}{100}$ = 8.5 - 0.18 = 8.32							

Class X Maths





Q7. The distribution below gives the weights of 30 students of a class. Find the median weight of the students.

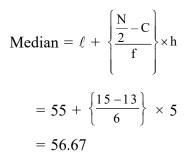
Weight (in kg)	No. of students			
40-45	2			
45-50	3			
50-55	8			
55-60	6			
60-65	6			
65-70	3			
70-75	2			

Weight (in kg)	No. of students	Cumulative frequency
		1 2
40-45	2	2
45-50	3	5
50-55	8	13
55-60	6	19
60-65	6	25
65-70	3	28
70-75	2	30

Sol.

$$\frac{N}{2} = \frac{30}{2} = 15$$

Median class = 55 - 60



The following frequency distribution gives the monthly consumption of electricity of 68 con Q1. sumers of a locality. Find the median, mean and mode of the data and compare them.

Class X Maths