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STATISTICS
PPT-4

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 14
CHAPTER NAME : STATISTICS

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PREVIOUS KNOWLEDGE TEST

1. **Mode:**

(i) Ungrouped Data: The value of the observation having maximum frequency is the mode.

(ii) Grouped Data:

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

- 2. where[l = Lower limit of modal class; f_1 = Frequency of modal class; f_0 = Frequency of the class preceding the modal class; f_2 = Frequency of the class succeeding the modal class; h = Size of class interval. h = Class size] The class with the maximum frequency is called modal class.

LEARNING OUTCOMES

1 Students will be able to know median.

2. Students will be able to apply the knowledge of median in solving questions .

MEDIAN: Median is a measure of central tendency which gives the value of the middle-most observation in the data.

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(i) *Ungrouped data*: *If n is odd* $\rightarrow$ *Median* $= \left(\frac{n+1}{2}\right)^{th}$ *observation*

If n is even $\rightarrow$ *Median* $= \dfrac{\left(\frac{n}{2}\right)^{th} \text{ observation} + \left(\frac{n}{2}+1\right)^{th} \text{ observation}}{2}$

Remember! For ungrouped data, first arrange the observations in ascending order or descending order.

(ii) *Median (Grouped Data):* $\text{Median} = l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h$

where[l = Lower limit of median class; n = Number of observations; f = Frequency of median class; c.f. = Cumulative frequency of preceding class; h = Class size]

The lengths of 40 leaves of a plant are measured correct to nearest millimetre, and the data obtained is represented in the following table:

Length (in mm)	Number of leaves
118 – 126	3
127 – 135	5
136 – 144	9
145 – 153	12
154 – 162	5
163 – 171	4
172 – 180	2

Find the median length of the leaves.

Class interval	Frequency	Cumulative frequency
117.5 – 126.5	3	3
126.5 – 135.5	5	8
135.5 – 144.5	9	17 (c)
144.5 – 153.5	12 (f)	29
153.5 – 162.5	5	34
162.5 – 171.5	4	38
171.5 – 180.5	2	40
	$n = 40$	

$\because n = 40 \quad \therefore \frac{n}{2} = \frac{40}{2} = 20.$

Since 12 is the maximum frequency, so the median class is (144.5 – 153.5).

Here, $l = 144.5, f = 12, cf = 17$ and $h = 9$

$$\therefore \text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$$

$$= 144.5 + \left(\frac{20 - 17}{12}\right) \times 9$$

$$= 144.5 + \frac{9}{4}$$

$$= 144.5 + 2.25 = 146.75 \text{ mm.}$$

Hence, the median length of leaves is **146.75 mm**.

The following table gives the distribution of the lifetime of 400 neon lamps:

Life time (in hours)	Number of lamps
1500 – 2000	14
2000 – 2500	56
2500 – 3000	60
3000 – 3500	86
3500 – 4000	74
4000 – 4500	62
4500 – 5000	48

Find the median lifetime of a lamp.

Lifetime (in hours)	Number of lamps	*cf*
1500 – 2000	14	14
2000 – 2500	56	70
2500 – 3000	60	130
3000 – 3500	86	216
3500 – 4000	74	290
4000 – 4500	62	352
4500 – 5000	48	400
Total	400	

Here, $\frac{n}{2} = \frac{400}{2} = 200$

$\therefore$ Median class = 3000 – 3500

So, $f = 86, cf = 130, h = 500$

We have, $\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$

$= 3000 + \left(\frac{200 - 130}{86}\right) \times 500$

$= 3000 + \frac{35000}{86} = 3000 + 406.98 = 3406.98$ hours

HOME ASSIGNMENT Ex. 14.3 Q. No 1 to Q4

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