STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

TELANGANA, HYDERABAD

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Class: 10 **Medium:** English **Subject:** Mathematics

Name of the chapter: Statistics

Topic/ concept: Median for grouped, ungrouped data and Ogive curves WORK SHEET

Learning outcomes

After completing this worksheet you will be able to

1. Find the median of ungrouped and grouped data.
2. Represent the frequency cumulative data graphically.

Conceptual Understanding

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

Let us observe

Example 1: Find the median of given terms 2,6,11,3,8,7,9.

Solution: The given terms are 2,6,11,3,8,7,9.

If we arrange these terms in ascending order 2,3,6,7,8,9,11.

Then the central tendency is 7. Then the median of given data is 7.

Example 2: Find the median of 1,5,7,4,3,2,6,8.

Solution: When we arrange these data in ascending order 1.2.3.4.5.6.7.8.

Then here we have 2 central terms 4 and 5.

if n is even, then the median will be average of the $\left(\frac{n}{2}\right)$th and $\left(\frac{n}{2}+1\right)$observations.

Therefore, n=8 so $\frac{8}{2}=4$. and $\frac{8}{2}+1=4+1=5$,

So the average is $\frac{4+5}{2}=4.5$

Suppose, we have to find the median of the following data, which is about the marks, out of 50 obtained by 100 students in a test

Marks obtained	20	29	28	33	42	38	43	25
Number of students	6	28	24	15	2	4	1	20

First, we arrange the marks in ascending order and prepare a frequency table.

Marks obtained	Number of students(frequency)
20 25 28 29 33 38 42 43	6 20 24 28 15 4 2 1
total	100

Here, n = 100, which is even. The median will be the average of the $\left(\frac{n}{2}\right)$ and $\left(\frac{n}{2}+1\right)$ observations. i.e. the 50^{th} and 51^{st} observations. To find the position of these middle values, we construct cumulative frequency.

Marks obtained	Total number of students	Cumulative frequency
20 Upto 25 Upto 28 Upto29 Upto 33 Upto 38 Upto 42 Upto 43	6 6+20=26 26+24=50 50+28=78 78+15=93 93+4=97 97+2=99 99+1=100	6 26 50 78 93 97 99 100

Now we add another column depicting this information to the frequency table above and name it as cumulative frequency column.

From the table above, we see that: 50^{th} observation is 28 (Why?)

51^{st} observation is 2

Median = $\left(\frac{28+29}{2}\right)$= 28.5

Let us observe the finding the median of grouped data.

marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Number of students	5	3	4	3	3	4	7	9	7	8

Solution:

Marks	Number of students	Cumulative frequency (cf)
0-10	5	5
10-20	3	8
20-30	4	12
30-40	3	15
40-50	3	18
50-60	4	22
60-70	7	29
70-80	9	38
80-90	7	45
90-100	8	53

Here n=53, so $\frac{n}{2}$= 26.5

Now 60-70 is the class whose cumulative frequency 29 is greater than (and nearest to) $\frac{n}{2}$ i.e.26.5

Therefore, 60-70 is the median class.

After finding the median class, we use the following formula for calculating the median.

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

where l = lower boundary of median class,

n = number of observations,

cf = cumulative frequency of class preceding the median class,

f = frequency of median class,

h = class size (size of the median class).

Substituting the values $\frac{n}{2}$ = 26.5, $l = 60$, cf = 22, f = 7, h = 10

In the formulae above we get

$$\text{Median} = 60 + \frac{26.5 - 22}{7} \times 10$$

$$= 60 + \frac{45}{7}$$

$$= 66.4$$

So, about half the students have scored marks less than 66.4,

and the other half have scored marks more than 66.4.

GRAPHICAL REPRESENTATION OF CUMULATIVE FREQUENCY DISTRIBUTION

Watch the Youtube video corresponding to the QR code.

Worksheet

1. A life insurance agent found the following data about distribution of ages of 100 policy holders. Calculate the median age. [Policies are given only to persons having age 18 years onwards but less than 60 years.]

Age (in years)	Below 20	Below 25	Below 30	Below 35	Below 40	Below 45	Below 50	Below 55	Below 60
Number of policyholders	2	6	24	45	78	89	92	98	100

2. The following table gives the distribution of the life-time of 400 neon lamps

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

Find the median lifetime of a lamp.

3. Draw Ogive curves for above tables.

Instructions

Example:

1. See Page no.350, solve exercise 14.3.

2. See Page no.355, solve exercise 14.4.

What I have learnt

	Perfectly	Partially	Can't do
1. I can find the median of ungrouped and grouped data.			
2. I can draw ogive curves of given data.			