ODM EDUCATIONAL GROUP
Changing your Tomorrow

STATISTICS
PPT-5

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 14
CHAPTER NAME : STATISTICS

Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: 1800 120 2316
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

PREVIOUS KNOWLEDGE TEST

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

(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]

LEARNING OUTCOMES

1 Students will be able to know median.

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

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

Class-interval	Frequency
0 – 10	5
10 – 20	x
20 – 30	20
30 – 40	15
40 – 50	y
50 – 60	5
Total	60

Class-interval	Frequency
0 – 10	5
10 – 20	x
20 – 30	20
30 – 40	15
40 – 50	y
50 – 60	5
Total	60

Class interval	Frequency	Cumulative frequency
0 – 10	5	5
10 – 20	x	$5 + x$(c)
20 – 30	20(f)	$25 + x$
30 – 40	15	$40 + x$
40 – 50	y	$40 + x + y$
50 – 60	5	$45 + x + y$
Total	$n = 60$	

We have $45 + x + y = 60$ ...(i) [Given]

$\because n = 60 \quad \therefore \frac{n}{2} = \frac{60}{2} = 30$

Since the median lies in the class interval (20 – 30), so the median class is (20 – 30).

Hence, $l = 20, f = 20, cf = 5 + x$ and $h = 10$.

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

$$\Rightarrow \quad 28.5 = 20 + \left(\frac{30 - 5 - x}{20}\right) \times 10$$

$$\Rightarrow \quad 28.5 = 20 + \left(\frac{25 - x}{2}\right)$$

$$\Rightarrow \quad 57 = 40 + 25 - x \Rightarrow 25 - x = 57 - 40$$

$$\Rightarrow 25 - x = 17 \Rightarrow \boldsymbol{x} = 25 - 17 = \mathbf{8}.$$

Putting $x = 8$ in equation (i), we get:

$$\Rightarrow \quad 45 + 8 + y = 60 \Rightarrow \boldsymbol{y} = 60 - 53 = \mathbf{7}.$$

A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 years.

Age (in years)	Number 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

Age (in years)	Number of policy holders	Cumulative frequency
0 – 20	2	2
20 – 25	6 – 2 = 4	6
25 – 30	24 – 6 = 18	24
30 – 35	45 – 24 = 21	45
35 – 40	78 – 45 = 33	78
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	100	

Here, $\frac{n}{2} = \frac{100}{2} = 50$

$\therefore$ Median class= 35 – 40, So, $l = 35, cf = 45, h = 5, f = 33$

We have, $\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h = 35 + \left(\frac{50 - 45}{33}\right) \times 5 = 35 + \frac{25}{33}$

$= 35 + 0.76 = 35.76$ years

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

Number of letters	Number of surnames
1 – 4	6
4 – 7	30
7 – 10	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.

Here, $h = 3$.

Class interval	Frequency (f_i)	Cumulative frequency (cf)	Class marks (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
1 – 4	6	6	2.5	–2	–12
4 – 7	30(f_1)	36(c)	5.5	–1	–30
7 – 10	40(f_m)	76	8.5 = a	0	0
10 – 13	16(f_2)	92	11.5	1	16
13 – 16	4	96	14.5	2	8
16 – 19	4	100	17.5	3	12
			$n = 100$		$\Sigma f_i u_i = -6$

$\because \quad n = 100$

$\therefore \quad \frac{n}{2} = \frac{100}{2} = 50$

Since 40 is the maximum frequency, so the median class is (7 – 10).

Here, $l = 7, f_m = 40, cf = 36$ and $h = 3$.

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

$$= 7 + \left(\frac{50 - 36}{40}\right) \times 3 = 7 + \frac{14}{40} \times 3$$

$$= 7 + \frac{21}{20} = 7 + \frac{10.5}{10}$$

$$= 7 + 1.05 = \textbf{8.05}$$

$$\textbf{Mean} = a + \frac{\sum f_i u_i}{\sum f_i} \times h = 8.5 + \frac{(-6)}{100} \times 3$$

$$= 8.5 + \frac{(-18)}{100} = 8.50 - 0.18 = \textbf{8.32}.$$

Now since the maximum number of letters in surnames = 40

$\therefore$ Modal class = 7 – 10

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

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

$$= 7 + \frac{10}{34} \times 3 = 7 + \frac{30}{34} = 7 + 0.88$$

$$= \textbf{7.88}.$$

ODM EDUCATIONAL GROUP
Changing your Tomorrow

HOME ASSIGNMENT Ex. 14.3 Q. No 4 to Q7

ODM EDUCATIONAL GROUP
Changing your Tomorrow

THANKING YOU

ODM EDUCATIONAL GROUP