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	1 - 4	4 - 7	7 - 10	10 - 13	13 - 16	16 - 19
No. of surnames	6	30	40	16	4	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.

Ans. For Median:

No. of letters	Number of surnames (f_i)	Cumulative Frequency
1 - 4	6	6
4 - 7	30	36
7 - 10	40	76
10 - 13	16	92
13 - 16	4	96
16 - 19	4	100
Total	$\sum f_i = n = 100$	

Here, $\sum f_i = n = 100$, then $\dfrac{n}{2} = \dfrac{100}{2} = 50$, which lies in interval $7 - 10$.

$\therefore$ Median class $= 7 - 10$

So, $l = 7$, $n = 100$, $f = 40$, $cf = 36$ and $h = 3$

Now, Median $= l + \left[\dfrac{\dfrac{n}{2} - cf}{f} \right] \times h$

$= 7 + \left[\dfrac{50 - 36}{40} \right] \times 3$

$= 7 + \dfrac{14 \times 3}{40}$

$= 7 + 1.05$

$= 8.05$

For Mean:

No. of letters	(f_i)	Class Marks (x_i)	$u_i = \dfrac{x_i - a}{h}$	$f_i u_i$
1 – 4	6	2.5	– 2	– 12
4 – 7	30	5.5	– 1	– 30
7 – 10	40	8.5	0	0
10 – 13	16	11.5	1	16
13 – 16	4	14.5	2	8
16 – 19	4	17.5	3	12
	$\sum f_i = 100$			$\sum f_i u_i = -6$

From given data, Assume mean $(a) = 8.5$, Width of the class $(h) = 3$

$\therefore \bar{u} = \dfrac{\sum f_i u_i}{\sum f_i} = \dfrac{-6}{100} = 0.06$

Using formula, Mean $(\bar{x}) = a + h\bar{u} = 8.5 + 3\,(-0.06)$
$= 8.5 - 0.18 = 8.32$

For Mode:

In the given data, maximum frequency is 40 and it corresponds to the class interval 7 – 10.

∴ Modal class = 7 – 10

And $l = 7$, $f_1 = 40$, $f_0 = 30$, $f_2 = 16$ and $h = 3$

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

$$= 7 + \left[\frac{40 - 30}{2(40) - 30 - 16} \right] \times 3$$

$$= 7 + \frac{10}{80 - 46} \times 3$$

$$= 7 + \frac{30}{34}$$

$$= 7 + 0.88 \text{ (approx.)}$$

$$= 7.88$$

Hence, median, mean and mode of given data is 8.05 letters, 8.32 letters and 7.88 letters respectively.

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

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

Ans.

Weight (in kg)	Number of students (f_i)	Cumulative Frequency
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
Total	$\sum f_i = n = 30$	

Here, $\sum f_i = n = 30$, then $\dfrac{n}{2} = \dfrac{30}{2} = 15$, which lies in interval $55 - 60$.

$\therefore$ Median class $= 55 - 60$

So, $l = 55$, $n = 30$, $f = 6$, $cf = 13$ and $h = 5$

Now, Median $= l + \left[\dfrac{\dfrac{n}{2} - cf}{f} \right] \times h$

$= 55 + \left[\dfrac{15 - 13}{6} \right] \times 5$

$= 55 + \dfrac{2 \times 5}{6}$

$= 55 + 1.66666$

$= 5 + 1.67$ (approx.)

$= 56.67$

Hence median weight of the students are 56.67 kg.

********** END *********