Answer on Question#72234 – Physics – Electromagnetism

The company that you work for produces a range of power supplies which are supplied in large quantities to businesses that manufacture computers and IT equipment. More range of power supplies is being added and the company has developed a 50W unit. From the first batch of 1000 units a 10% sample has been taken and the power output of each unit tested shown in Table 2(a). Using this data calculate the mean, median and mode, explaining the significance of each. PS50 50W Nominal rating

Power output	Number
49.60 – 49.69	1
49.70 – 49.79	1
49.80 – 49.89	4
49.90 – 49.99	7
50.00 – 50.09	19
50.10 – 50.19	31
50.20 – 50.29	21
50.30 – 50.39	8
50.40 – 50.49	5
50.50–50.59	2
50.60–50.69	1

Solution.

To find the mean value, we construct a table

Power output	Midpoint x	Number n	nx
49.60 – 49.69	49.645	1	49.645
49.70 – 49.79	49.745	1	49.745
49.80 – 49.89	49.845	4	199.38
49.90 – 49.99	49.945	7	349.615
50.00 – 50.09	50.045	19	950.855
50.10 – 50.19	50.145	31	1554.495
50.20 – 50.29	50.245	21	1055.145
50.30 – 50.39	50.345	8	402.76
50.40 – 50.49	50.445	5	252.225
50.50–50.59	50.545	2	101.09
50.60–50.69	50.645	1	50.645
Totals:		100	5015.6

Hence, mean equal to

$$\text{mean} = \frac{Total\ (nx)}{Total(n)} = \frac{5015.6}{100} = 50.156$$

The mean can be considered as an average value of power supplies. So if they found the total power of the produced power supplies and divided by their number.

Find median using formula

$$\text{median} = \text{L} + \frac{\frac{n}{2} - B}{G} \times w$$

where

$L = 50.095$ is the lower class boundary of containing the median;

$n = 100$ is the total number of values;

$B = 32$ is the cumulative frequency of the groups before the median group (1+1+4+7+19=32);

$G = 31$ is the frequency of the median group;

$w = 0.1$ is the group width (50.10-50.00=0.1).

The median is the middle value in the list of numbers. So if we put all the power supplies produced and took one in the middle, then its power would correspond to the value median. Hence, median equal to

$$\text{median} = 50.095 + \frac{50 - 32}{31} \times 0.1 \approx 50.153$$

(rounded to the thousandth).

Find mode using formula

$$Mode = L + \frac{f_m - f_{m-1}}{(f_m - f_{m-1}) + (f_m - f_{m+1})} \times w$$

$L = 50.095$ is the lower class boundary of the modal group;

$f_{m-1} = 19$ is the frequency of the group before the modal group;

$f_m = 31$ is the frequency of the modal group;

$f_{m+1} = 21$ is the frequency of the group after the modal group;

$w = 0.1$ is the group width (50.10-50.00=0.1).

Hence, mode equal to

$$\text{mode} = 50.095 + \frac{31 - 19}{(31 - 19) + (31 - 21)} \times 0.1 \approx 50.150$$

(rounded to the thousandth).

The mode is the value that occurs most often. In our case this is the power value of the same power supplies which are the largest among the selected 100

Answer. $\text{mean} = 50.156$, $\text{median} = 50.153$, $\text{mode} = 50.150$.