Question

A continuous random variable X was measured 10 times. The sorted data are shown below, along with each datum's index.

i	x
1	35.259
2	35.672
3	36.289
4	37.912
5	38.610
6	39.238
7	40.233
8	41.531
9	59.741
10	81.073

The total of the measurements is 445.558.

Answerlist

- Determine the percentile rank of the value 41.531. In other words, determine what percent of data are less than or equal to 41.531.
- Determine the datum corresponding to a percentile rank of 0.9. In other words, determine x such that 90% of the data are less than or equal to x.
- Determine the mean of the measurements.
- Determine the median of the measurements.

Solution

Let x represent a datum of interest. Let i represent that datum's index. Let ℓ represent that datum's percentile. Let n represent the sample size (number of measurements). In general,

$$\ell = \frac{i}{n}$$

Answerlist

- We are given $x = 41.531$. This means $i = 8$. We know $n = 10$. Determine the percentile ℓ.

  $$\ell = \frac{8}{10}$$

  $$\ell = 0.8$$

  So, the answer is 0.8, or 80%.
- We are given $\ell = 0.9$. We can use algebra to solve for i.

  $$\ell = \frac{i}{n}$$

Multiply both sides by n.

$$n \cdot (\ell) = n \cdot \left(\frac{i}{n}\right)$$

Simplify both sides.

$$n\ell = i$$

To make me happy, switch the sides.

$$i = n\ell$$

Now, we can evaluate i.

$$i = (10)(0.9)$$

$$i = 9$$

Determine the x associated with $i = 9$.

$$x = 59.741$$

- The mean is $\frac{445.558}{10} = 44.5558$
- If n is odd, then median is $x_{\frac{n+1}{2}}$, the value of x when $i = \frac{n+1}{2}$. Otherwise median is mean of $x_{\lfloor \frac{n+1}{2} \rfloor}$ and $x_{\lceil \frac{n+1}{2} \rceil}$. So, median = 38.924.

Meta-information

extype: string exsolution: yup exname: reading hist extol: 0.01