

Basic Order Statistics

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The subject of order statistics

OR1-2

Notations

- If the random variables X_1, X_2, \dots, X_n are arranged in ascending order of magnitude and then written as:

$$X_{(1)} \leq X_{(2)} \leq \dots \leq X_{(n)},$$

we call $X_{(i)}$ the i th order statistic.

- The **subject** of order statistics deals with the properties and applications of these ordered random variables, as well as functions involving them.
 - As examples of functions of ordered random variables,

$$\text{the } \textit{range} \ W_n = X_{(n)} - X_{(1)}$$

and

$$\text{the } \textit{extreme deviate} \ D_n = X_{(n)} - \bar{X},$$

where \bar{X} is the average of X_1, \dots, X_n .

The subject of order statistics

OR1-3

- As an example of applications, if an experiment fails when k -out-of- n outcomes are beyond a threshold, then $(n - k + 1)$ th order statistic can give the probability of experimental failure.
- One may also give a better estimate with small number of samples, if outliers (extremes) are removed.