

# Auxiliary Concept: Engineering Statistics and Probability

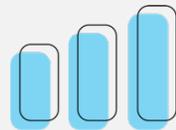
**Engineering Literacy Dimension:** Engineering Knowledge

**Domain:** Engineering Mathematics

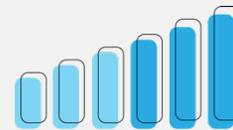
**Overview:** *Statistics* is a branch of mathematics that focuses on the methods of collecting, representing, collating, comparing, analyzing, and interpreting data. Statistics is typically combined with the study of *probability* theory, which involves the mathematical analysis of random phenomena to determine how likely they are to occur. These areas of mathematics are important to Engineering Literacy as engineering professionals frequently select and use statistical content and practices in the testing, simulation, and analysis of solutions to engineering problems. For example, the related mathematical applications can help one to calculate how likely an outcome of repeated experiments may be, and how a specific intervention may influence the outcome, based on the analysis of collected data. As such, engineers use statistics and probability theory to evaluate the outcome of possible solutions to engineering problems.

## Performance Goal for High School Learners

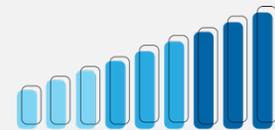
I can, when appropriate, draw upon the knowledge of statistics/probability content and practices, such as (1) *probability distributions*, (2) *descriptive statistics and measures of central tendencies (mean, median, mode)*, (3) *inferential statistics and tests of significance*, and (4) *using probability to make decisions*, to evaluate/justify solutions to problems in a manner that is analytical, predictive, repeatable, and practical.



Basic



Proficient



Advanced

### PROBABILITY DISTRIBUTION

I can identify the likelihood of a certain event through basic probability rules.

I can identify a probability distribution among a variety of distributions (binomial, geometric, exponential, Poisson, Bernoulli, etc.) to describe the likelihood of a certain event.

I can analyze the likelihood of a certain event through the appropriate distribution table.

### DESCRIPTIVE STATISTICS AND MEASURES OF CENTRAL TENDENCY

I can statistically summary a set of data through its descriptive statistics (mean, median, mode, standard deviation, etc.).

I can compare sets of data through their descriptive statistics.

I can standardize data through the normal distribution transformation to identify statistical differences of multiple groups.

### INFERENCE STATISTICS & TESTS OF SIGNIFICANCE

I can identify data (not normally distributed) and most appropriate statistical test and inference for given hypotheses.

I can apply the appropriate method of statistical hypothesis testing to test a given hypotheses for a specific data set.

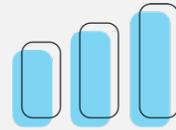
I can develop and assess a hypothesis, executing an appropriate statistical test, and then describe the result with possible statistical errors (Type I and II) in a data set.

## Auxiliary Concept: Engineering Statistics and Probability Cont.

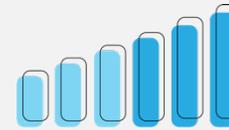
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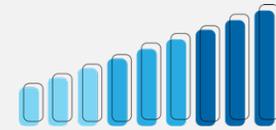
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### USING PROBABILITY TO MAKE DECISIONS

I can recognize when statistical/probability analysis is needed to solve a given problem.

I can use and identify a variety of statistical/probability analysis methods and select the most appropriate method to solve a given problem.

I can evaluate and apply the most appropriate statistical/probability analysis methods to solve a given problem that will inform a decision.