

MATH 1070 - Content Standards

Title: Elementary Statistics

Course Description: Prerequisite High School Algebra II. Descriptive statistics, basic probability and distribution of random variables, estimation and hypothesis tests for means and proportions, regression and correlation, analysis of count data.

Goals: The goals of Elementary Statistics are for students to develop skills that will allow them to gather, organize, display and summarize data. They should be able to draw conclusions or make predictions from the data and assess the relative chances for certain events happening.

The following standards are offered as guidelines for assessing student progress, judging the effectiveness of instructional programs, and developing curricular units. The subject matter outlined in these standards represents the minimum knowledge in which a student should demonstrate proficiency at the successful completion of the course.

- CS 1. Quantitative Reasoning:** Students will use quantitative reasoning in problem solving including: Geometric and symbolic representation and manipulation and pattern recognition.
- CS 2. Graphical and numerical summaries, normal distribution:** Students will be able to construct and interpret graphical displays of univariate data such as the stem plot, histogram, box plot, and time plot; calculate and interpret summary statistics such as the mean, median, standard deviation, and five number summary; describe and use density curves such as the uniform and normal density curves; use the normal density curve to calculate proportions.
- CS 3. Graphical and numerical summaries for bivariate data:** Students will be able to construct and interpret graphical displays of bivariate data: scatter plots, regression lines, residual plots, outliers, and influential points; discuss the meaning of the correlation coefficient and the least-squares regression line.
- CS 4. Samples and experimental designs:** Students will be able to select a simple random sample using a table of random digits; recognize biased sampling such as voluntary and convenience sampling; describe some experimental designs such as completely randomized and block designs.
- CS 5. Sample distributions, probability and random variables:** Students will demonstrate knowledge and be able to examine and understand and use basic probability concepts including the following: sample spaces of possible outcomes of random experiments, random variables and their probability distributions, the sampling distribution of the mean and the central limit theorem.
- CS 6. Z-tests and confidence intervals for means:** Students will demonstrate the ability to understand and use the vocabulary of statistical inference including: confidence intervals, confidence levels and margins of error in general, confidence level in general as the probability to give a correct estimate of the confidence intervals for the mean of a normal population of known variance, or the difference between means of two normal populations of known variances, null and alternative hypotheses, rejection region in terms of the population(s) standard deviation(s) and sample size(s), level of significance and p-values for one and two sided tests for means, when the variance(s) of the underlying normal population(s) is (are) known, or the sample is large.
- CS 7. Z-tests and confidence intervals for proportions:** Students will demonstrate the ability to make design and make correct inferential statements about: sampling distribution of a sample proportion, confidence intervals for a (difference between two) population proportion(s), and sample size for a required margin of error.
- CS 8. T-tests and confidence intervals for means of normal populations:** Students will demonstrate the ability to understand and apply inferential statements including: confidence level as the probability to give a correct estimate of the mean (difference of means) of a (two) normal population(s), when the standard deviation(s) is (are) unknown; level of significance and p-values for one and two sided tests for means, when the variance(s) of the underlying normal population(s) is (are) unknown.
- CS 9. Chi-square tests for two-way tables:** Students will be able to arrange general bivariate categorical data in several groups into a two-way table of counts in all the groups. Students explain what null hypothesis the chi-square statistic tests in a specific two-way table; use percents, comparison of expected and observed counts, and the components of the chi-square statistic to see what deviations from the null hypothesis are important; make a quick assessment of the significance of the statistic by comparing the observed value to the degrees of freedom.
- CS 10. Applications:** When applying analytic, algebraic, geometric, and algorithmic techniques to solving applied statistical problems students will:
- Use appropriate technology
 - Communicate how the problem is modeled by a mathematical/statistical formulation and how to interpret the results of the statistical analysis.