

MATH 1070 - LEARNING OUTCOMES

Title: Elementary Statistics

Prerequisite: High School Algebra II

Course Description: 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 and make predictions using the data and be able to assess the relative chances of the occurrence of various events and inferential conclusions.

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.

1. 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, and box 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 table to calculate proportions and percentiles.

2. Graphical and numerical summaries for bivariate data

Students will be able to construct and interpret graphical displays of bivariate data, such as the scatterplot; give a reasonable value for the correlation coefficient for a scatterplot; draw a reasonable prediction line on a scatterplot and use the line to find predicted values of the response variable; use given values for the slope, y-intercept, and correlation coefficient to find the equation of the least-squares regression line; use the regression equation to find predicted values of the response variable; interpret the slope in terms of changes in the explanatory and response variables; interpret the square of the correlation coefficient as the proportion of variation explained; discuss the meaning of the least-squares regression line in the context of the error of prediction.

3. Samples and experimental designs

Students will be able to select a simple random sample using a table of random digits and describe basic experimental designs such as completely randomized and matched pairs designs.

4. Probability, random variables, and sampling distributions

Students will demonstrate knowledge of and be able to use basic probability concepts, including sample spaces of possible outcomes of random experiments, random variables and their probability distributions, the sampling distribution of the sample mean, and the central limit theorem.

5. Z-tests and confidence intervals for means of normal populations

Students will be able to calculate confidence intervals for the mean of a population with a known standard deviation (or from a large sample from the population) using the z-distribution table, be able to discuss the relative frequency interpretation of the confidence interval, and be able to use the confidence interval to make a decision about the population mean.

Students will be able to give the appropriate hypotheses for a test of hypotheses to answer a specified question concerning the mean of a population with a known standard deviation (or from a large sample from the population), compute the observed value of the appropriate test statistic, find the p-value for the hypothesis test using the z-distribution table, and draw the appropriate verbal conclusion about the question asked.

6. T-tests and confidence intervals for means of normal populations

Students will be able to calculate confidence intervals for the mean of a population with an unknown standard deviation using the t-distribution, be able to decide whether the z- or the t-distribution is appropriate, and be able to use the confidence interval to make a decision about the population mean.

Students will be able to give the appropriate hypotheses for a test of hypotheses to answer a specified question concerning the mean of a population with an unknown standard deviation, compute the observed value of the appropriate test statistic, find the approximate p-value for the hypothesis test using the t-distribution table, and draw the appropriate verbal conclusion about the question asked.

7. Confidence intervals and hypothesis tests for the difference in means for two populations

Students will be able to distinguish between one sample, two independent samples, and paired samples situations, and be able to use appropriate methods for confidence intervals and hypothesis tests for each of the two-sample situations.

8. Confidence intervals and hypothesis tests for one- and two-sample population proportions.

Students will be able to distinguish between questions about means and proportions, be able to calculate the appropriate confidence intervals and perform the appropriate hypothesis tests for both one-sample and two-sample situations involving proportions for categorical variables.

9. Inference for two categorical variables

Students will be able to recognize situations involving two categorical variables, give appropriate hypotheses to test for association, and be able to use the chi-squared table to determine the significance of such association.

10. Technology

Students will be able to use appropriate technology (such as spreadsheet software and calculators) to calculations and report conclusions from those calculations.