



Business Statistics

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Source	Author(s) (Text or Video)	Title(s)	Link (where applicable)
OpenStax	Barbara Illowsky, De Anza College Susan Dean, De Anza College	Introductory Statistics	OpenStax
www.onlinestatbook.com	David Lane Developed by Rice University , University of Houston Clear Lake, and Tufts University	Online Statistics Education: An Interactive Multimedia Course of Study	OnlineStatBook
JB Statistics	Jeremy Balka, University of Guelph		YouTube Channel

Alta Business Statistics was developed to meet the scope and sequence of an introductory business statistics course. To develop the course, Knewton used four main sources of content: OpenStax, Rice University’s Online Stat Book, videos created by a Statistics professor at the University of Guelph, and a team of Subject Matter Experts (SMEs). The SMEs come from diverse backgrounds and are all accomplished academics in the field of Business Statistics. Alta Business Statistics covers the breadth of statistics topics and also provides the necessary depth to ensure the course is manageable and engaging for instructors and students alike.

Alta Business Statistics has two instructional sequences for every learning objective, giving students multiple opportunities to learn new concepts. Between our text and video content and Knewton SMEs, we were able to solicit ideas from statistics instructors and students at all levels of higher education, from community colleges to Ph.D- granting universities. Alta Business Statistics provides a level of academic rigor, while also promoting relevance and accessibility for students. Knewton has added current and relevant contexts and examples to instruction and assessments.

This course features two versions of the hypothesis testing chapters (chapters 9 and 10). First versions focus on business applications in hypothesis testing, while the second versions focus on a most step by step walkthrough, and break up of critical value and p-value approaches, as well as technology applications.

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Chapter 1: Sampling and Data

1.1 Sampling and Parameters

- Understand the definitions of population, sampling, statistic, parameter, and data in business applications
- Identify stratified, cluster, systematic, and convenience sampling in business applications
- Identify sampling errors and bias in business applications
- Identify situations in which business statistics can be misleading

1.2 Statistical Study Design

- Determine whether a study is observational or an experiment and appropriate use cases
- Identify and describe the steps in the statistical analysis process

1.3 Variables and Measures of Data

- Identify explanatory and response variables in an experiment using business examples
- Identify levels of measurement of business-related data
- Define and distinguish between qualitative, quantitative, discrete, and continuous variables

Chapter 2: Descriptive Statistics

2.1 Frequency Tables

- Constructing and understanding frequency tables for a set of data
- Construct and understand relative frequency tables for a set of data
- Construct and understand cumulative relative frequency tables for a set of data

2.2 Histograms and Frequencies

- Construct and understand frequency tables for a set of business-related data
- Create and interpret histograms
- Create and interpret stem-and-leaf plots

2.3 Line and Bar Graphs

- Create and interpret bar graphs
- Create and interpret line graphs of data
- Choose appropriate graphs and charts to display data

2.4 Dot plots, Line and Bar graphs with Technology - Calculator

- Create and interpret dot plots with technology - Calculator
- Create and interpret line and bar graphs of data with technology - Calculator

2.5. Dot plots, Line and Bar graphs with Technology - Excel

- Create and interpret dot plots with technology - Excel
- Create and interpret line and bar graphs of data with technology - Excel

2.6 Measures of Central Tendency

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- Find the mean from a frequency table
- Find the median of a set of data
- Find the mode of a set of data
- Determine whether the mean, median, or mode is the best measure of center for a data set

2.7 Quartiles and Box Plots

- Find and interpret percentiles and quartiles of a business-related data set
 - Find the five-number summary of a business-related data set
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- Identify the interquartile range and potential outliers in a set of business-related data
- Construct and understand box-and-whisker plots in business contexts

2.8 Skewness and Standard Deviation

- Determine if a data set is skewed in business examples
- Compute variance and standard deviation
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- Compute z-scores and use them to compare values from different data sets

2.9 Calculate measures of center and spread using Technology – Calculator

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- Create and interpret box and whisker plot using Technology - Calculator

2.10 Calculate measures of center and spread using Technology – Excel

- Calculate mean, median and mode for a dataset using Technology – Excel
- Create and interpret box and whisker plot using Technology - Excel

2.11 Calculate Variance and Standard Deviation with Technology - Calculator

- Compute the variance and standard deviation with technology - Calculator
- Compute z-scores and use them to compare values from different data sets with technology - Calculator

2.12 Variance, Standard Deviation and Z-scores with technology - Excel

- Compute the variance and standard deviation with technology - Excel
- Compute z-scores and use them to compare values from different data sets with technology - Calculator-Excel

Chapter 3: Probability Topics

3.1 Probability Terminology and Notation

- Understand definitions of events, outcomes, trials, independent/dependent events, and mutually exclusive events
- Use and, or, and not notation to describe events
- Use conditional probability notation to describe events

3.2 Basic Probability

- Compute basic probability in a situation where there are equally-likely outcomes
- Compute probability involving and, or, and not
- Compute probability using the complement rule

3.3 Independent and Mutually Exclusive Events

- Understand mutually exclusive events
- Find the conditional probabilities of independent and mutually exclusive events
- Distinguish between independent or mutually exclusive events given conditional probability information

3.4 Counting Principles

- Understand factorial notation
- Calculate and apply combinations
- Calculate and apply permutations

3.4 Addition and Multiplication Rules

- Use the multiplication rule for conditional probabilities
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- Use the multiplication rule for independent event probabilities
- Use the addition rule for probabilities
- Use the addition rule for mutually exclusive event probabilities

3.5 Diagrams and Contingency Tables

- Interpret and complete a contingency table
- Use a contingency table to find conditional probabilities
- Use a tree diagram to list outcomes and compute probabilities
- Use a venn diagram to compute compound and conditional probabilities

Chapter 4: Discrete Random Variables

4.1 Discrete Probability Density Functions

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- Understand the parameters of the binomial distribution
- Use the binomial distribution to compute probability

4.3 Geometric Distribution

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- Create and interpret a Binomial Distribution with Technology - Excel
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 - Use the uniform distribution to compute conditional probability
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- Use the normal distribution to compute probability with technology - Excel
- Use the normal distribution to compute a value for a random variable given probability - Excel
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- Use both forms of the Central Limit Theorem to compute probability

Chapter 8: Confidence Intervals

8.1 Confidence Intervals for Population Mean

- Find and interpret confidence interval estimates in business examples using the empirical rule
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- Find the sample size required to estimate a population mean with a given confidence level in business applications

8.2 Student's T-Distribution

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8.3 Confidence Intervals for Population Proportion

- Find the confidence interval given a population proportion in business examples
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8.4 Confidence Intervals for Two Samples

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8.6 Calculating Confidence Intervals with Technology - Excel

- Calculate a Confidence Interval for the Mean, population standard deviation known - Excel
- Calculate a Confidence Interval for the Mean, population standard deviation unknown - Excel
- Calculate a Confidence Interval for a Proportion - Excel

Chapter 9: One-Mean Hypothesis Testing

9.1 Introduction to Hypothesis Testing

- Identify the null and alternative hypotheses for an experiment with one population mean in business applications
- Distinguish between one- and two-tailed hypotheses tests and understand possible conclusions in business examples
- Differentiate between Type I and Type II errors when performing a hypothesis test in business examples

9.2 One-Mean Z-Test

- Compute the value of the test statistic (z-value) for a hypothesis test for one population mean with a known standard deviation in business examples
- Determine the critical value(s) of a one-mean z-test at a given significance level to define a rejection region in business contexts
- Make a conclusion and interpret the results of a one-mean hypothesis test using the Critical Approach with a known standard deviation in business contexts

9.3 One-Mean Hypothesis Test Using a P-Value

- Use the p-value to make a conclusion and interpret the results of a one-mean hypothesis test with a known standard deviation in business contexts
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- Find the p-value using a table given test statistic value (z-score) of a one-mean hypothesis test

9.4 One-Mean T-Test

- Determine the degrees of freedom for a t-test, and use a table to determine the critical values of a hypothesis test with an unknown standard deviation
- Make a conclusion and interpret the results of a one-mean hypothesis test with an unknown standard deviation in business contexts
- Understand the assumptions and conditions for using the t-test for hypothesis testing, and compute the value of the test statistic

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Chapter 9: Hypothesis Testing for One Population - V2

9.1 Hypothesis Test for the Mean - Population Standard Deviation Known

- Identify the null and alternative hypotheses for an experiment with one population mean
- Distinguish between one- and two-tailed hypothesis tests and understand possible conclusions
- Differentiate between Type I and Type II errors when performing a hypothesis test
- Compute the value of the test statistic (z-value) for a hypothesis test for one population mean with a known standard deviation*

9.2 Conduct a Hypothesis Test for Mean – Population Standard Deviation Known - Critical Value/Rejection Region Approach

- Determine the critical value(s) of a one-mean z-test at a given significance level to define a rejection region*
- Make a conclusion and interpret the results of a one-mean hypothesis test (population standard deviation known) using the Critical Value/Rejection Region Approach

9.3 Conduct a Hypothesis Test for Mean - Population Standard Deviation Known: P-Value Approach

- Find the p-value using a table given test statistic value (z-score) of a one-mean hypothesis test
- Make a conclusion and interpret the results of a one-mean hypothesis test (population standard deviation known) using the P-Value Approach

9.4 Developing Hypothesis and understanding Possible Conclusions

- Compute the value of the test statistic (t-value) and degrees of freedom for a hypothesis test for one population mean with an unknown population standard deviation*

9.5 Conduct a Hypothesis Test for Mean – Population Standard Deviation Unknown - Critical Value/Rejection Region Approach

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9.6 Conduct a Hypothesis Test for Mean - Population Standard Deviation Unknown: P-Value Approach

- Determine the p-value for a hypothesis test for the mean (population standard deviation unknown)
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9.7 Hypothesis Test for Proportion - Developing Hypothesis and understanding Possible Conclusions

- Identify the null and alternative hypotheses for an experiment with one population proportion
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9.8 Conduct a Hypothesis Test for Proportion – Critical Value/Rejection Region Approach

- Determine the critical value(s) for a hypothesis test for the proportion in order to define rejection region(s)
- Make a conclusion and interpret the results of a hypothesis test for a proportion using the Critical Value/Rejection Region Approach

9.9 Conduct a Hypothesis Test for Proportion - P-Value Approach

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- Perform and interpret a hypothesis test for the mean, population standard deviation known using Technology - Excel
- Perform and interpret a hypothesis test for the mean, population standard deviation unknown using Technology - Excel
- Perform and interpret a hypothesis test for a proportion using Technology - Excel

Chapter 10: Two-Mean Hypothesis Testing

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- Calculate the test statistic for a pooled two-mean hypothesis test
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Chapter 10: Hypothesis Testing with Two Populations

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 - Calculate test statistic for testing the difference between two means (z value) - population standard deviations known
 - Two-Mean Hypothesis Test - Population Standard Deviations Known - Critical Value/Rejection Region Approach
-

- Determine the critical value(s) for a hypothesis test for the difference between two means (population standard deviations known) in order to define rejection region(s)
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 - Determine the critical value(s) for a hypothesis test for the mean of the differences for the paired data in order to define rejection region(s)
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- Make a conclusion and interpret the results for testing the difference between means for paired data (dependent samples) using the Critical Value/Rejection Region Approach
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- Two population hypothesis test for proportions (Independent Samples)
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- Two population hypothesis test for proportions (Independent Samples) - Critical Value/Rejection Region Approach
 - Determine the critical value(s) for a hypothesis test to test the difference between two population proportions in order to define rejection region(s)
 - Make a conclusion and interpret the results for a hypothesis test to test the difference between two population proportions using the Critical Value/Rejection Region Approach
- Two population hypothesis test for proportions (Independent Samples) - P-Value Approach
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 - Perform and Interpret a Two-Proportion Hypothesis Test with Technology - Excel

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Chapter 11: Chi-Square Distributions

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- Distinguish between use cases of the chi-square tests

11.2 Chi-Square Goodness-of-Fit Test

- Compute the value of the test statistic using the expected frequencies for a chi-square goodness-of-fit test
- Conduct and interpret a chi-square goodness-of-fit test

11.3 Chi-Square Independence Test

- Compute the value of the test statistic using the expected frequencies for a chi-square independence test
- Conduct and interpret a test of independence with the chi-square distribution

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- Conduct and interpret a test for homogeneity with the chi-square distribution

Chapter 12: Linear Regression

12.1 Linear Regression Equations

- Understand properties of linear equations in business applications
- Understand the relationship between scatter plots and table and determine patterns in business applications
- Find the linear regression equation given a list of data points with business applications

12.2 Uses of Linear Regression

- Find and interpret the correlation coefficient in business contexts
- Make predictions about business scenarios using a line of best fit
- Find outliers in a business-related data set

12.3 Multivariate Relationships

- Identify applications where Multiple Regression can be performed
- Define the format for a multiple regression equation
- Make predictions using the multiple regression equation

12.4 Performing Linear Regressions with Technology – Calculator

- Calculate the correlation coefficient using Technology - Calculator
- Determine the best fit linear regression equation using Technology - Calculator

12.5 Performing Linear Regressions with Technology – Excel

- Calculate the correlation coefficient using Technology - Excel
 - Determine the best fit linear regression equation using Technology - Excel
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Chapter 13: Introduction to ANOVA

13.1 ANOVA Basics – Critical Value Approach

- ANOVA Basics – Critical Value Approach
 - Determine appropriate situations for a one-way ANOVA test and identify the null and alternative hypotheses
 - Determine the degrees of freedom for the numerator and denominator for one-way ANOVA test
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13.3 Performing an ANOVA test with Technology – P-Value Approach

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