



Statistical Reasoning

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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	Online Stat Book
JB Statistics	Jeremy Balka, University of Guelph		YouTube Channel

Alta Statistical Reasoning is a one- to two-semester course introducing basic concepts of logic and applications of statistics. Many students pursuing a degree that has a general education math requirement will take this course. To develop this course, Knewton used four main sources of content: OpenStax Introductory Statistics, OpenStax Prealgebra, Washington Open Course Library, and videos from an Online Stat book developed by Rice University, University of Houston, and Tufts University, along with a team of Subject Matter Experts. The SMEs come from diverse backgrounds and are all accomplished academics in the field of statistics, and have taught in pathway math programs. Alta Statistical Reasoning covers the breadth of statistical reasoning topics, and also provides the necessary depth to ensure the course is manageable and engaging for instructors and students alike.

Alta Statistical Reasoning has two instructional sequences for every learning objective, giving students multiple opportunities to learn new concepts. Between our text, video, and original SME content, we were able to solicit ideas from statistical reasoning instructors and students at all levels of higher education, from community colleges to Ph.D- granting universities. Alta Statistical Reasoning 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). The Version 1 of these chapters aligns closely to the OpenStax text, while the Version 2 of these chapters focuses on a a step-by-step walkthrough, break up of critical value and p-value approaches, and additionally includes technology applications.

* indicates changes in assessments from multiple choice to free response.

** indicates changes in assessments from multiple choice to desmos graphing.

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Chapter 1: Data Collection and Sampling

1.1 Evidence, Claims and Study Types

- Evaluate the strength of evidence against a claim about a population proportion
- Identify and describe the steps in the statistical analysis process
- Determine whether a study is observational or an experiment and appropriate use cases
- Identify components of the experimental design in a given experiment: use of a control group, use of a placebo, and blinding
- Identify confounding variables

1.2 Variables and Measures of Data

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

1.3 Sampling Methods

- Understand the definitions of population, sample, statistic, parameter, and data

1.4 Comparing Sampling Methods

- Identify and distinguish between stratified, cluster, systematic, and convenience sampling
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- Construct and understand frequency tables for a set of data with technology - Excel
 - Construct and understand relative frequency tables for a set of data with technology - Excel
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- Compute the variance and standard deviation with technology - Excel
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Excel

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- Calculate and create the continuous density distribution with technology - Excel
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- Find the z-score given the confidence level
 - Calculate the margin of error for a confidence interval for a mean (standard deviation known)
 - Determine the z-score for a stated confidence level and compute the error bound
-

- Calculate and interpret the confidence interval for a population mean with a known standard deviation*
- Find the sample size required to estimate a population mean with a given confidence level*

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Chapter 11: Hypothesis Testing for One Population - V1

11.1 Introduction to Hypothesis Testing

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

11.2 Hypothesis Test for Mean - Population Standard Deviation Known

- Compute the value of the test statistic (z-value) for a hypothesis test for one population mean with a known standard deviation
 - 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 using the Critical Value Approach with a known standard deviation

11.3 Hypothesis Test for Mean - Population Standard Deviation Known - P-Value

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Chapter 11: Hypothesis Testing for One Population - V2

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12.6 Conducting a Two-Mean Hypothesis Tests - Population Standard Deviation Unknown - P-Value Approach

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12.11 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)
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14.1 ANOVA Basics - Critical Value Approach

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- Make a decision for the hypothesis test using critical value/rejection region method and interpret results - Excel
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- Make a decision for the hypothesis test using the p-value method and interpret results - Calculator

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- Make a decision for the hypothesis test using the p-value method and interpret results - Excel

Chapter 15: Basic Math Appendix

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- Understand and identify prime and composite numbers
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- Find the prime factorization of a number

15.2 Integers

- Understand integers and find opposites of numbers
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- Understand additive inverse
- Add and subtract integers
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- Identify multiples and apply divisibility tests
- Find the prime factorization of a number

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- Translate an English phrase to an algebraic expression

15.6 Multiply and Divide Integers

- Understand and evaluate absolute value
 - Add integers
 - Subtract integers
 - Multiply integers
 - Divide integers
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- Multiply fractions
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- Evaluate variable expressions with fractions

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- Add and subtract decimals
- Divide decimals
- Multiply decimals
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- Understand the relationship between the slope and y-intercept of a line and its equation
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- Understand exponent notation

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- Simplify expressions with square roots
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 - Simplify variable expressions with square roots
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