



Math 207: Introduction to Statistics

Course Topics

- Controlled experiments
- Descriptive statistics
 - histograms and bar plots
 - mean, median, quartiles, percentiles and range
 - standard deviation and variance
 - z scores
- The normal curve
 - item
- Regression
 - scatter plots
 - correlation $r = \frac{1}{n-1} \sum_{i=1}^n \left(\frac{x_i - \mu_x}{\sigma_x} \right) \left(\frac{y_i - \mu_y}{\sigma_y} \right)$
 - properties of correlation
 - regression line equation: $y - \mu_y = r \frac{\sigma_y}{\sigma_x} (x - \mu_x)$
 - item
 - normality of $P(Y | x)$
 - item
- Probability
 - basic examples with coins, dice, cards and box models
 - frequency definition of probability and basic properties
 - conditional probability
 - multiplication rule and independence
 - addition rule and mutually exclusive events
 - binomial formula
- Sampling distributions
 - item
- Hypothesis testing
 - confidence intervals
 - z -test
 - t -test
 - two-sample z -test
 - p -values

Math 207: Example Syllabi from Other Institutions

Institution : University of Illinois at Chicago
Course : Stat 101: Introduction to Statistics
Text : *Intro Stats* by De Veaux, Velleman and Bock, 5th edition

- 1 Ch 1–2 Displaying Data, Bar Chart, Histogram, Descriptive Statistics
- 2 Ch 3–4 Contingency Table, Boxplot
- 3 Ch 5 Normal Distribution,
- 4 Ch 6–7 Scatter Plots, Correlation, Linear Regression, Multivariate Regression
- 5 Ch 8 More about Regression, Exam 1
- 6 Ch 9–11 Multiple Regression, Surveys, Experiments
- 7 Ch 12 Probability
- 8 Ch 12 Probability
- 9 Ch 13 Sampling Distribution Models, Confidence Intervals Proportions
- 10 Ch 14 Exam 2
- 11 Ch 14 CLT, Confidence Intervals for Means
- 12 Ch 15 Hypothesis testing
- 13 Ch 16 More about Tests
- 14 Ch 17 Comparing Two Populations
- 15 Ch 18 Paired Samples, Review for Final Exam, Final Exam



Math 207: Example Syllabi from Other Institutions

Institution : Utah State University
Course : Stat 1040: Introduction to Statistics
Text : *Statistics* by Freedman, Pisani and Purves. 4th Ed.

1. Design of experiments: controls, randomization, blind and double blind, placebos. The Salk vaccine trial, historical controls.
2. Observational studies: association and causation, confounding factors, the clofibrate trial, sex-bias in graduate admissions.
3. Descriptive statistics: the histogram, the density scale, cross-tabulation, the average and the SD and their relationship to the histogram, the median, the normal approximation for data, percentiles, percentiles and the normal curve, measurement error, outliers, bias versus chance error, plotting points and lines, the slope and the intercept of a line.
4. Correlation: the scatter diagram, the correlation coefficient, properties of the correlation coefficient (invariance to change of location and scale, symmetry), ecological correlations, correlation does not imply causation, examples, the SD line.
5. Regression: the graph of averages, regression to the mean, the regression method for individuals, the regression fallacy, there are two regression lines, the r.m.s. error, plotting residuals, heteroscedasticity, looking at vertical strips, using the normal curve inside vertical strips, the slope and the intercept, the method of least squares, does regression make sense?
6. Probability: the long run argument, conditional probabilities, the multiplication rule, independence, the Collins case, listing the ways, the addition rule the Paradox of Chevalier de Mere, are real dice fair? The binomial formula.
7. Chance variability: What does the law of averages really say? Chance processes, the sum of the draws, making box models, the expected value and the standard error, using the normal curve, probability histograms, the normal approximation for probability histograms and its scope.
8. Sampling: The Literary Digest poll, the year the polls elected Dewey, using chance in survey work, how well do probability methods work, a close look at the Gallup poll, telephone surveys, chance error, bias, quota samples, samples of convenience.
9. Chance errors in sampling: the standard error, the correction factor, the Gallup poll, the accuracy of percentages, confidence intervals and their interpretation, the accuracy of averages, the SE and expected value of an average.
10. Tests of significance: null and alternative hypotheses, test statistics and significance levels, the role of the box model, zero-one boxes, the one-sample z-tests and t-tests, the standard error for a difference, comparing two sample averages, comparing two proportions, experiments, the χ^2 -tests for independence and goodness-of-fit, how Fisher used the χ^2 -test to show that Mendel's data was fudged, was the result significant? Was it important? Data snooping, the importance of the box model.



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Institution : University of Minnesota at Morris
Course : Stats 1150: Introduction to Statistics
Text : *Introduction to the Practice of Statistics* by Moore and McCabe, G. P., 6th Edition

1. Introduction: Definition and Uses of Statistics
2. Looking at Data: Distributions
 - (a) Displaying Distributions (excluding Time Plots)
 - (b) Describing Distributions
 - (c) The Normal Distributions (excluding Assessing Normality, Quantile and Normal Plots)
3. Looking at Data: Relationships
 - (a) Scatterplots
 - (b) Correlation
 - (c) Least-Squares Regression
 - (d) Cautions about Regression and Correlation
 - (e) The question of Causation
4. Producing Data
 - (a) First Steps
 - (b) Design of Experiments
 - (c) Sampling Design
 - (d) Toward Statistical Inference
5. Probability: The Study of Randomness
 - (a) Randomness
 - (b) Probability Models
 - (c) Random Variables
 - (d) Mean and Variances of Random Variables
 - (e) Probability Laws
6. Sampling Distributions
 - (a) Counts and Proportions
 - (b) Sample Means
7. Introduction to Inference
 - (a) Estimating with Confidence
 - (b) Tests of Significance
 - (c) Use and Abuse of Tests (excluding Power and Inference as Decision)
8. Inference for Distributions
 - (a) Inference for the Mean of a Population
 - (b) Comparing Two Means
9. Inference for Count Data
 - (a) Inference for a Single Proportion
 - (b) Comparing Two Proportions
10. Inference for Two-Way Tables
 - (a) Data Analysis for Two-Way (Relations in Categorical Data)
 - (b) Inference for Two-Way Tables
 - (c) Formulas and Models for Two-Way Tables
11. Inference for Regression
 - (a) Simple Linear Regression
12. Multiple Regression
13. One-Way Analysis of Variance
14. Two-Way Analysis of Variance
15. Nonparametric Tests
 - (a) Wilcoxon Rank Sum Test
 - (b) The Wilcoxon Signed Rank Test
 - (c) The Kruskal-Wallis Test



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