

STAT 117 Introduction to Statistics

Weekly Topics, Readings, and Assignments

As you do the readings and work on practice exercises, pay attention to the terminology, notation, and formulas used. Note the context in which terminology is used, the manner in which calculations are performed, and the way in which supporting work is written: you are expected to be able to define all terms and use these terms *correctly* in your analysis, and you are expected to understand and to be able to use all formulas in the manner in which they are presented and used in examples together with appropriate notation. You must be able to perform all calculations using the formulas discussed throughout the course: you may NOT use the statistics/probability functions programmed in calculators such as TI-83 and TI-84. As part of the study of statistics, you are expected to learn to use the various formulas and tables necessary to perform the analysis associated with summary/descriptive statistics, linear regression and correlation, probability, confidence intervals, and hypothesis testing.



The course begins on Tuesday, May 25, 2021, and each course week (except for the first and last weeks) begins on Monday and ends on the following Sunday. The dates for each week of the course, the assignments, discussions, and the examinations are listed below.

The last day to drop a class *without* a W-grade is Thursday, May 27, 2021, and the last day to drop a class *with* a W-grade is Tuesday, June 22, 2021. The course ends on Tuesday, July 13, 2021.

Week 1: Tuesday, May 25, 2021 – Sunday, May 30, 2021

Topics/Readings/Exercises: Modules 1 – 3 (Chapters 1 and 2).

- **Written Assignment** –Box Plots and Stem Plots: *available* Friday, May 28, 2021
- **Related MyStatLab Assignments:** An Introduction to Statistics and Variables; Samples; Frequency Distributions and Relative Frequency Distributions; Distributions, Bar Graphs, and Pie Charts; Bar Graphs; Dot Plots and Stem Plots

Discussions on Blackboard

- **Meet Me Online!** – Due: Friday, May 28, 2021 by 11:59 PM
- **What is/are Statistics/statistics???** – Thread must be posted by Friday, May 28, 2021 by 11:59 PM

Week 2: Monday, May 31, 2021 – June 6, 2021

Topics/Readings/Exercises: Modules 3 and 4 (Chapters 2 and 3).

- **Written Assignment** –Box Plots and Stem Plots: *due* Thursday, June 3, 2021
- **Related MyStatLab Assignments:** Histograms, Box Plots and Classifying Distributions; Five-Number Summary, Outliers, and Box Plot; Measures of Center; Measures of Spread; Mean, Standard Deviation, and Z-Scores

Discussion on Blackboard

- **What is/are Statistics/statistics???** – Response and Replies to Thread must be posted by Friday, June 4, 2021 at 11:59 PM

Week 3: Monday, June 7, 2021 – June 13, 2021

Topics/Readings/Exercises: Modules 5 and 6 (Chapters 5 and 6).

- **Written Assignment** – Basic Probability: *available* Thursday, June 10, 2021
- **Related MyStatLab Assignments:** Basic Probability; Probability: Addition Rule and Complements; Probability: Independence and Multiplication Rule; Conditional Probability; Counting Techniques; Probability: Putting It All Together

- **MyStatLab Assignments** (Chapters 1, 2, and 3) *due* Tuesday, June 8, 2021 by 11:59 PM

- **Exam I** (Chapters 1, 2, and 3): Wednesday, June 9, 2021

Discussion on Blackboard

- **Statistics in the News: Summary Statistics** – Post Thread by Friday, June 11, 2021 by 11:59 PM

Week 4: Monday, June 14, 2021 – June 20, 2021

Topics/Readings/Exercises: Module 6 (Chapters 6 and 7)

- **Related MyStatLab Assignments:** Probability Distributions; Binomial Probability Distribution; Normal Distribution: Applications; Normal Approximation to Binomial Distribution
- **Written Assignment** – Basic Probability: *due* Wednesday, June 16, 2021

Discussion on Blackboard

- **Statistics in the News: Summary Statistics** – Post Response and Reply by Friday, June 18, 2021 by 11:59 PM

Week 5: Monday, June 21, 2021 – June 27, 2021

Topics/Readings/Exercises: Modules 6 and 7 (Chapters 7 and 8)

- **Related MyStatLab Assignments:** Sampling Distributions
- **MyStatLab Assignments** (Chapters 5, 6, and 7) *due* Thursday, June 24, 11:59 PM
- **Exam II** (Chapters 5, 6, and 7): Friday, June 25, 2021

Week 6: Monday, June 28, 2021 – July 4, 2021

Topics/Readings/Exercises: Module 7 (Chapters 9 and 10).

- **Written Assignment** – Confidence Intervals: *available* Friday, July 2, 2021
- **Related MyStatLab Assignments:** Confidence Intervals; Hypothesis Testing: Error Types; Hypothesis Test for Population Mean; Hypothesis Test for Population Proportion

Discussion on Blackboard

- **Statistics in the News: Confidence Intervals** – Post Thread by Friday, July 2, 2021 by 11:59 PM

Week 7: Monday, July 5, 2021 – July 11, 2021

Topics/Readings/Exercises: Module 7 (Chapter 10) and Module 8 (Chapter 4).

- **Related MyStatLab Assignments:** Linear Regression
- **Written Assignment** – Confidence Intervals: *due* Thursday, July 8, 2021

Discussion on Blackboard

- **Statistics in the News: Confidence Intervals** – Post Response and Reply by Friday, July 9, 2021 by 11:59 PM

Week 8: Monday, July 12, - July 13, 2021

- **MyStatLab Assignments** (Chapters 8, 9, 10 and 4) *due* Monday, July 12, 2021, 11:59 PM
- **Final Exam** (Chapters 1 – 10): Tuesday, July 13, 2021



Readings and Exercises

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For each of the eight (8) modules, read the PowerPoint Class Notes, read the corresponding sections of the textbook, and work on the practice exercises. While the practice exercises are not submitted for a grade, the practice exercises are related to and may be used in written assignments, and examinations; related and similar exercises are included on MyStatLab.

▲ Module 1: An Introduction to Statistics

What is Statistics? What are statistics? How are statistics used in various disciplines?

What is Statistics?

- Some [History of Statistics](#)
- [Statistics](#) on Math Careers

Why Statistics??? Many undergraduate major/minor concentrations (for example, at Framingham State University, programs in Biology, Business, Chemistry, Computer Science, Economics, Education, Fashion Design and Retailing, Geography,

History, Mathematics, Political Science, Psychology, and Sociology require or recommend that students take a statistics course) and graduate programs require students to take statistics courses. Statistics are widely used, for example, in advertising (Trident gumⁱ and Toyotaⁱⁱ), for information related to health and the economy (illnessⁱⁱⁱ and student debt^{iv}), policy and public opinion issues (same-sex marriage^v), internet business^{vi}, and college/university acceptance rates^{vii}. Statistics are used and *misused* to present a variety of information; the misuse of statistics prompted Darrell Huff (a journalist and *not* a statistician), in 1954, to write the book *How to Lie with Statistics*, a general introduction to statistics that provides information regarding how the intentional and unintentional errors in the representation of data/information and the interpretation of statistics can lead to false/problematic conclusions.

The hyperlinks to the following TED Talks are provided as “food for thought”.

- [Arthur Benjamin: Teach statistics before calculus!](#)
- [Alan Smith: Why you should love statistics](#)
- [Chris Jordan: Turning powerful statistics into art](#) (Statistics are the foundation/basis of his art)
- [Malte Spitz: Your phone company is watching](#)

♥ **Module 2: Data Collection, Sampling, and Design of Experiments**

How does one gather or collect data? What makes a data set representative of the target subjects? Can data be “bad”?

The hyperlinks to the following TED Talks are provided as “food for thought”.

- [Ben Goldacre: Battling bad science](#)
- [Eric Mead: The magic of the placebo](#)
- [Michael Specter: The danger of science denial](#)

Chapter 1 - Data Collection: Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [An Introduction to Statistics](#)
- [Designing Experiments to Reduce Variability](#)
- [Sampling](#)
- [Random Samples](#)

Handout:

- [Cautions and Hints about Sampling](#)
- [Random Digits Table](#)

- 1.1 Introduction to the Practice of Statistics: Read pp. 3 – 11; Do p. 11, #1 – 54.
- 1.2 Observational Studies Versus Designed Experiments: Read pp. 15 – 19; Do p. 19, #1 – 20.
- 1.3 Simple Random Sampling: Read pp. 22 – 26; Do p. 27, #1 – 16.
- 1.4 Other Effective Sampling Methods: Read pp. 30 – 36; Do p. 36, #1 – 38.
- 1.5 Bias in Sampling: Read pp. 38 – 42; Do p. 42, #1 – 27.
- 1.6 The Design of Experiments: Read pp. 45 – 50; Do, p. 50, #1 – 23.
- Chapter 1 Review: Read pp. 55 – 56; Review Exercises: Do p. 56, #1 – 32; Chapter Test: Do p. 59, #1 – 20.

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♦ **Module 3: Organizing Data and Summarizing Data Graphically**

How can we present data in a manner so that it can be easily understood? What types of representations can be used or cannot be used with different types of data? Can a graphical representation for data be misleading?

The hyperlinks to the following TED Talks are provided as “food for thought”.

- [Mark Liddell: How statistics can be misleading](#)
- [David McCandless: The beauty of data visualization](#)
- [Hans Rosling: The best stats you've ever seen](#) (Statistics and the World Health)
- [Steven Levitt: Surprising stats about child carseats](#)
- [Anne Milgram: Why smart statistics are the key to fighting crime](#)
- [Lea Gaslowitz: How to spot a misleading graph](#)

Chapter 2 - Organizing and Summarizing Data: Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [Frequency Distributions and Relative Frequency Distributions](#)
- [Visualizing Distributions](#)
- Graphical Displays for

Handout:

- [Frequency Distributions and Relative Frequency Distributions](#)

Videos:

- [Creating Stem and Leaf Plots](#)

[Qualitative Variables](#)
[Quantitative Variables](#)

- [What Makes a Good Graph?](#)
- [Misleading Graphs](#)

- [Creating Stem and Leaf Plots with Split Stems](#)
- [Creating Back-to-Back Stem and Leaf Plots](#)

- 2.1 Organizing Qualitative Data: Read pp. 63 – 69; Do p. 69, #1 – 27.
- 2.2 Organizing Quantitative Data: The Popular Displays: Read pp. 77 – 90; Do p. 90, #1 – 49.
- 2.3 Graphical Misrepresentations of Data: Read pp. 100 – 105; Do p. 106, #1 – 11, 18, 19, 20.
- Chapter 2 Review: Read pp. 109 – 110; Review Exercises: Do p. 110, #1 – 12; Chapter Test: Do p. 113, #1 – 8.

♣ **Module 4: Summarizing Data Numerically**

How can we represent data numerically using as few numbers as possible to convey the information associated with the data? How can data be summarized numerically? When is it impossible to summarize data numerically?

The hyperlinks to the following TED Talks are provided as “food for thought”.

- [Sebastian Wernicke: Lies, damned lies and statistics \(about TEDTalks\)](#)
- [Mike Biddle: We can recycle plastic](#)
- [Niall Ferguson: The 6 killer apps of prosperity](#)

Chapter 3 - Numerically Summarizing Data: Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [Measures of Center and Spread](#)

Videos:

- [Standard Deviation](#)
- [Two More Examples for Calculating Standard Deviation](#)
- [Determining the Five-Number Summary](#)
- [Creating Box Plots](#)
- [Creating Modified Box Plots](#)

Handouts:

- [Standard Deviation and Linear Regression \(Pages 1 – 3, inclusive\)](#)
- [Determining the Five-Number Summary](#)
- [CAUTIONS about Box Plots and Modified Box Plots](#)

- 3.1 Measures of Central Tendency: Read pp. 117 – 124; Do p. 124, #1 – 35, 43.
- 3.2 Measures of Dispersion: Read pp. 130 – 140; Do p. 140, #1 – 30.
- 3.3 Measures of Central Tendency and Dispersion from Grouped Data: Read pp. 147 – 151; Do p. 151, #1 – 6, 13, 14.
- 3.4 Measures of Position and Outliers: Read pp. 153 – 159; Do p. 159, #1 – 17, 21 – 28.
- 3.5 The Five-Number Summary and Boxplots: Read pp. 163 – 167; Do p. 168, #1 – 16.
- Chapter 3 Review: Read pp. 171 – 172; Review Exercises: Do p. 172, #1 – 10; Chapter Test: Do p. 174, #1 – 10.

How do we summarize a data set?

- [Measures of Central Tendency](#)
- [Measures of Variability](#)

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♣ **Module 5: Probability and Random Variables**

What is probability? How does probability affect what we expect to have happen? What does it mean for a die or a game to be “fair”? How can probability be used to determine one’s expected winnings for a game of chance, a raffle, or the lottery?

The hyperlink to the following TED Talk is provided as “food for thought”.

- [Dan Katz: Can you solve the cheating royal riddle?](#)
- [Yannay Khaikin: How many ways can you arrange a deck of cards?](#)
- [Leonardo Barichello: The last banana: A thought experiment in probability](#)
- [Peter Donnelly: How juries are fooled by statistics](#)

Chapter 5 - Probability: Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [Basic Probability](#)

Handouts:

- [Dice Chart](#)

- [Probability of Compound Events](#)
- [Conditional Probability](#)
- [Basic Counting](#)

Videos:

- [Basic Counting Techniques](#)
- [Probability](#)
- [More Probability](#)

- 5.1 Probability Rules: Read pp. 233 – 242; Do p. 242, #1 – 32, 35 – 42, 46, 47.
- 5.2 The Addition Rule and Complements: Read pp. 247 – 254; Do p. 254, #1 – 26, 30 – 34, 37 – 42, 44 – 46.
- 5.3 Independence and the Multiplication Rule: Read pp. 258 – 262; Do p. 262, #1 – 22.
- 5.4 Conditional Probability and the General Multiplication Rule: Read pp. 264 – 270; Do p. 270, #1 – 17, 19, 20, 22 – 24, 28 – 30.
- 5.5 Counting Techniques: Read pp. 274 – 283; Do p. 283, #1 – 65.
- 5.6 Putting It Together: Which Method Do I Use?: Read pp. 286 – 289; Do p. 289, #1 – 24, 27 – 31.
- Chapter 5 Review: Read pp. 291 – 292; Review Exercises: Do p. 293, #1 – 26, 29, 32; Chapter Test: Do p. 295, #1 – 17, 19, 20.

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♥ **Module 6: The Normal and Binomial Distributions**

How is the standard normal distribution related to any normal distribution, and how do we use the standard normal distribution to determine probabilities? What distinguishes a binomial probability distribution from other probability distributions? What is the connection between a binomial probability distribution and the standard normal distribution?

Chapter 6 - Discrete Probability Distributions: Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [Binomial Distribution](#)
- [Random Variables and Discrete Probability Distributions](#)

Handouts:

- [Standard Normal Table](#)

Video:

- [Binomial Probability](#)

- 6.1 Discrete Random Variables: Read pp. 298 – 305; Do p. 305, #1 – 32.
- 6.2 The Binomial Probability Distribution: Read pp. 309 – 319; Do p. 320, #1 – 41, 43 – 47.
- 7.4 The Normal Approximation to the Binomial Probability Distribution: Read pp. 356 – 359; Do p. 359, #1 – 28.
- Chapter 6 Review: Read p. 324; Review Exercises: Do p. 324, #1 – 8; Chapter Test: Do p. 326, #1 – 4, 6 – 9.
- Chapter 7 Review: Read p. 361; Review Exercises: Do p. 362, #1 – 13; Chapter Test: Do p. 363, #1 – 9.

How do we calculate probability?

- [What is a probability distribution function?](#)
- [Discrete Random Variables: Probability Distribution Function \(PDF\) for a Discrete Random Variable](#)

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Chapter 7 - The Normal Probability Distribution: Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [Normal Distribution](#)

Handouts:

- [Standard Normal Table](#)

Video:

- [Normal Distribution](#)

- 7.1 Properties of the Normal Distribution: Read pp. 329 – 334; Do p. 335, #1 – 12, 19 – 36.
- 7.2 Applications of the Normal Distribution: Read pp. 338 – 345; Do p. 345, #1 – 45.
- 7.3 Assessing Normality: Read pp. 350 – 353.

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♣ **Module 7: Inferential Statistics**

How is inferential statistics different from descriptive statistics? What is a confidence interval? What is meant by margin for error, and how is the margin for error related to the confidence interval? What is meant by hypothesis testing, and how is hypothesis testing used in experiments, studies, and surveys?

Chapter 8 – Sampling Distributions Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [Sampling Distributions](#)

Video:

- [Sampling Distributions](#)

- 8.1 Distribution of the Sample Mean: Read pp. 367 – 375; Do p. 376, #1 – 30.
- 8.2 Distributions of the Sample Proportion: Read pp. 379 – 384; Do p. 384, #1 – 24.
- Chapter 8 Review: Read p. 387; Review Exercises: Do p. 387, #1 – 10; Chapter Test: Do p. 388, #1 – 6.

More about sampling distributions

- [Introduction to Sampling Distributions](#)
- [Sampling Distribution of the Mean](#)

Chapter 9 – Estimating the Value of a Parameter Using Confidence Intervals: Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [Confidence Intervals](#)

Video:

- [Confidence Intervals](#)

- 9.1 Estimating a Population Proportion: Read pp. 391 – 401; Do p. 401, #1 – 30, 33 – 40.
- 9.2 Estimating a population Mean: Read pp. 405 – 412; Do p. 412, #1 – 8, 15 – 26, 31 – 34.
- 9.3 Putting It Together: Which Procedure Do I Use?: Read pp. 420 – 421; Do p. 421, #1 – 12.
- Chapter 9 Review: Read p. 423; Review Exercises: Do p. 424, #1 – 12; Chapter Test: Do p. 425, #1 – 5.

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Chapter 10 - Hypothesis Testing Regarding a Parameter: Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [Hypothesis Testing](#)

Video:

- [Hypothesis Testing](#)

- 10.1 The Language of Hypothesis Testing: Read pp. 429 – 434; Do p. 434, #1 – 40.
- 10.2 Hypothesis Tests for a Population Proportion: Read pp. 436 – 444; Do p. 444, #1 – 26.
- 10.3 Hypothesis Tests for a Population Mean: Read pp. 449 – 454; Do p. 454, #1 – 20, 31, 32.
- 10.4 Putting It Together: Which Method Do I Use?: Read p. 460; Do p. 461, #1 – 10.
- Chapter 10 Review: Read pp. 462 – 463; Review Exercises: Do p. 463, #1 – 12, 15 – 18; Chapter Test: Do p. 465, #1 – 3, 5 – 7.

What is hypothesis testing?

- [Hypothesis Testing](#)

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▲ **Module 8: Analyzing and Representing the Relationship Between Two Variables**

How do we determine if two variables are associated, and what types of relations are there between variables? How can we determine, analyze, and interpret a relation between two variables? How do we determine the strength of the association between two variables? What is meant by correlation?

Chapter 4 - Describing the Relationship between Two Variables: Read the chapter, and select practice exercises to help you to apply the topics/methods. Visit [MyStatLab](#) for additional resources.

PowerPoint Class Notes:

- [Scatterplots \(a.k.a. Scatter Plots and Scatter Diagrams\)](#)
- [Least Squares Regression Line](#)
- [Interpreting the Slope and the y-Intercept](#)
- [Correlation](#)

Handouts:

- [Standard Deviation and Linear Regression \(Pages 4 – 9, inclusive\)](#)

- 4.1 Scatter Diagrams and Correlation: Read pp. 178 – 186; Do p. 186, #1 – 46.
- 4.2 Least-Squares Regression: Read pp. 194 – 202; Do p. 202, #1 – 28.
- 4.3 The Coefficient of Determination: Read pp. 208 – 211; Do p. 211, #1 – 15.
- Chapter 4 Review: Read pp. 224 – 225; Review Exercises: Do p. 226, #1 – 6; Chapter Test: Do p. 229, #1, 2, 5 – 7.

How do we analyze bivariate data? (Use these apps to develop your “eye” for correlation coefficients.)

- [Guess the Correlation](#)
- [Guessing Correlations](#)
- [Guess the Correlation](#) (Rossman/Chance)

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The hyperlinks to the following TED Talks are provided as “food for thought”. Think about the use of data, graphs, and statistics in these talks. Are the statistics presented in context? Are the graphs meaningful and labeled so that the information can be understood? Are the graphs and statistics used effectively and presented in a comprehensible manner?

- [Talithia Williams: Own your body’s data](#)
- [Aaron Koblin: Visualizing ourselves ... with crowd-sourced data](#)
- [Jean-Baptiste Michel and Erez Lieberman Aiden: What we learned from 5 million books](#)
- [Mitchell Besser: Mothers helping mothers fight HIV](#)
- [Laurie Garrett: Lessons from the 1918 flu](#)

i <http://www.nytimes.com/2009/07/28/business/media/28adco.html>

ii <http://www.toyota.com/corolla/awards.html>

<https://www.balisetoyotaofwarwick.com/compare-toyota-vs-other-brands-welcome-all-challengers/>

iii <https://www.nytimes.com/interactive/2021/us/massachusetts-covid-cases.html>

https://covid.cdc.gov/covid-data-tracker/#trends_dailytrendsdeaths

iv <http://ticas.org/posd/home> | <https://ticas.org/our-work/student-debt/>

<https://ticas.org/content/pub/student-debt-and-class-2015>

<http://www.marketwatch.com/story/class-of-2015-has-the-most-student-debt-in-us-history-2015-05-08>

v <https://www.pewforum.org/fact-sheet/changing-attitudes-on-gay-marriage/>

<http://www.gallup.com/poll/183272/record-high-americans-support-sex-marriage.aspx>

<http://www.gallup.com/poll/154529/Half-Americans-Support-Legal-Gay-Marriage.aspx>

vi <http://www.statista.com/statistics/268252/comparison-of-unique-us-visitors-to-facebook-and-google/>

<https://www.statista.com/statistics/271412/most-visited-us-web-properties-based-on-number-of-visitors/>

vii <https://www.usnews.com/best-colleges/framingham-state-2185>

<https://www.usnews.com/best-colleges/worcester-state-2190>

<https://www.usnews.com/best-colleges/bridgewater-state-college-2183>

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<https://www.usnews.com/best-colleges/westfield-state-college-2189>