# Statistics Course Offerings

Nate Wells

Math 141, 4/6/22

### Outline

In this lecture, we will...

#### Outline

In this lecture, we will...

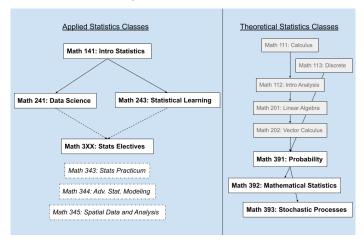
- Describe advanced statistics classes offered by Math Department
- Perform Triangle Experiment to assess differences in LaCroix flavors

### Section 1

Statistics Course Offerings

### A Preview of Coming Attractions

After Math 141, the Math Department offers several statistics classes:



- Offered in Fall 2022; Prerequisite: Math 141
- Statistical Learning is a framework for building models for estimation and prediction based on data; it also provides tools for decomposing data in meaningful ways

- Offered in Fall 2022; Prerequisite: Math 141
- Statistical Learning is a framework for building models for estimation and prediction based on data; it also provides tools for decomposing data in meaningful ways
- Stat Learning is closely related to Machine Learning and Artificial Intelligence
  - In contrast to those Comp. Sci. topics, Stat Learning is informed by statistical theory

- Offered in Fall 2022; Prerequisite: Math 141
- Statistical Learning is a framework for building models for estimation and prediction based on data; it also provides tools for decomposing data in meaningful ways
- Stat Learning is closely related to Machine Learning and Artificial Intelligence
  - In contrast to those Comp. Sci. topics, Stat Learning is informed by statistical theory
- Math 243 builds on the study of linear and multilinear models from Math 141

- Offered in Fall 2022; Prerequisite: Math 141
- Statistical Learning is a framework for building models for estimation and prediction based on data; it also provides tools for decomposing data in meaningful ways
- Stat Learning is closely related to Machine Learning and Artificial Intelligence
  - In contrast to those Comp. Sci. topics, Stat Learning is informed by statistical theory
- Math 243 builds on the study of linear and multilinear models from Math 141
  - In addition to models for predicting quantitative variables (regression), Math 243 studies models for predicting categorical variables (classification)

- Offered in Fall 2022; Prerequisite: Math 141
- Statistical Learning is a framework for building models for estimation and prediction based on data; it also provides tools for decomposing data in meaningful ways
- Stat Learning is closely related to Machine Learning and Artificial Intelligence
  - In contrast to those Comp. Sci. topics, Stat Learning is informed by statistical theory
- Math 243 builds on the study of linear and multilinear models from Math 141
  - In addition to models for predicting quantitative variables (regression), Math 243 studies models for predicting categorical variables (classification)
- Some questions you'll be able to answer by the end of Math 243:

- Offered in Fall 2022; Prerequisite: Math 141
- Statistical Learning is a framework for building models for estimation and prediction based on data; it also provides tools for decomposing data in meaningful ways
- Stat Learning is closely related to Machine Learning and Artificial Intelligence
  - In contrast to those Comp. Sci. topics, Stat Learning is informed by statistical theory
- Math 243 builds on the study of linear and multilinear models from Math 141
  - In addition to models for predicting quantitative variables (regression), Math 243 studies models for predicting categorical variables (classification)
- Some questions you'll be able to answer by the end of Math 243:
  - What are some alternatives to the linear model?

- Offered in Fall 2022; Prerequisite: Math 141
- Statistical Learning is a framework for building models for estimation and prediction based on data; it also provides tools for decomposing data in meaningful ways
- Stat Learning is closely related to Machine Learning and Artificial Intelligence
  - In contrast to those Comp. Sci. topics, Stat Learning is informed by statistical theory
- Math 243 builds on the study of linear and multilinear models from Math 141
  - In addition to models for predicting quantitative variables (regression), Math 243 studies models for predicting categorical variables (classification)
- Some questions you'll be able to answer by the end of Math 243:
  - What are some alternatives to the linear model?
  - How do we determine the best model for prediction with a given data set?

- Offered in Fall 2022; Prerequisite: Math 141
- Statistical Learning is a framework for building models for estimation and prediction based on data; it also provides tools for decomposing data in meaningful ways
- Stat Learning is closely related to Machine Learning and Artificial Intelligence
  - In contrast to those Comp. Sci. topics, Stat Learning is informed by statistical theory
- Math 243 builds on the study of linear and multilinear models from Math 141
  - In addition to models for predicting quantitative variables (regression), Math 243 studies models for predicting categorical variables (classification)
- Some questions you'll be able to answer by the end of Math 243:
  - What are some alternatives to the linear model?
  - How do we determine the best model for prediction with a given data set?
  - How do I know whether a mushroom is poisonous?

Throughout the term, students work together in groups on a project applying Math 243 techniques to a real data set.

Throughout the term, students work together in groups on a project applying Math 243 techniques to a real data set.

- "Addressing Inequality Through Modeling: Updating Public Defense Funding Models In Washington State"
  - Simon Ahn, Taylor Blair, Robin Hardwick, Maxwell VanLandschoot; Fall 2021

Throughout the term, students work together in groups on a project applying Math 243 techniques to a real data set.

- "Addressing Inequality Through Modeling: Updating Public Defense Funding Models In Washington State"
  - Simon Ahn, Taylor Blair, Robin Hardwick, Maxwell VanLandschoot; Fall 2021
- "Variables of a Marriage: What Tends to Lead to Marriage Relationships?
  - Sky Peterson, Emma Thoron, Calvin Beeman-Weber, Jakob Shimer; Fall 2021

Throughout the term, students work together in groups on a project applying Math 243 techniques to a real data set.

- "Addressing Inequality Through Modeling: Updating Public Defense Funding Models In Washington State"
  - Simon Ahn, Taylor Blair, Robin Hardwick, Maxwell VanLandschoot; Fall 2021
- "Variables of a Marriage: What Tends to Lead to Marriage Relationships?
  - Sky Peterson, Emma Thoron, Calvin Beeman-Weber, Jakob Shimer; Fall 2021
- "Modeling Pitcher Performance and Salary"
  - Josh Yamamoto, Riley Leonard, Andy Zhao; Fall 2020

Throughout the term, students work together in groups on a project applying Math 243 techniques to a real data set.

- "Addressing Inequality Through Modeling: Updating Public Defense Funding Models In Washington State"
  - Simon Ahn, Taylor Blair, Robin Hardwick, Maxwell VanLandschoot; Fall 2021
- "Variables of a Marriage: What Tends to Lead to Marriage Relationships?
  - Sky Peterson, Emma Thoron, Calvin Beeman-Weber, Jakob Shimer; Fall 2021
- "Modeling Pitcher Performance and Salary"
  - Josh Yamamoto, Riley Leonard, Andy Zhao; Fall 2020
- "Swing Stacks: Predicting political party affiliation via model stacks"
  - Shisham Adhikari, Maggie Slein, Grayson White; Fall 2020

- Offered in Spring 2023; Prerequisite: Math 141
- Data Science is the study of extracting and communicating knowledge and insights from structured and unstructured data.

- Offered in Spring 2023; Prerequisite: Math 141
- Data Science is the study of extracting and communicating knowledge and insights from structured and unstructured data.
- Data Science helps you telling compelling and accurate stories with data
  - Data Science emphasizes effective communication with data, both to the specialized and non-specialized audience.

- Offered in Spring 2023; Prerequisite: Math 141
- Data Science is the study of extracting and communicating knowledge and insights from structured and unstructured data.
- Data Science helps you telling compelling and accurate stories with data
  - Data Science emphasizes effective communication with data, both to the specialized and non-specialized audience.
- Math 241 builds on data visualization (ggplot2) and data wrangling (dplyr) skills from Math 141

- Offered in Spring 2023; Prerequisite: Math 141
- Data Science is the study of extracting and communicating knowledge and insights from structured and unstructured data.
- Data Science helps you telling compelling and accurate stories with data
  - Data Science emphasizes effective communication with data, both to the specialized and non-specialized audience.
- Math 241 builds on data visualization (ggplot2) and data wrangling (dplyr) skills from Math 141
  - In addition, Data Science provides tools for gathering data from the web (scraping), building interactive tools to explore data (shiny apps), and working with non-standard data (spatial coordinates, words, dates, and more!)

- Offered in Spring 2023; Prerequisite: Math 141
- Data Science is the study of extracting and communicating knowledge and insights from structured and unstructured data.
- Data Science helps you telling compelling and accurate stories with data
  - Data Science emphasizes effective communication with data, both to the specialized and non-specialized audience.
- Math 241 builds on data visualization (ggplot2) and data wrangling (dplyr) skills from Math 141
  - In addition, Data Science provides tools for gathering data from the web (scraping), building interactive tools to explore data (shiny apps), and working with non-standard data (spatial coordinates, words, dates, and more!)
- Some questions you'll be able to answer by the end of Math 241:

- Offered in Spring 2023; Prerequisite: Math 141
- Data Science is the study of extracting and communicating knowledge and insights from structured and unstructured data.
- Data Science helps you telling compelling and accurate stories with data
  - Data Science emphasizes effective communication with data, both to the specialized and non-specialized audience.
- Math 241 builds on data visualization (ggplot2) and data wrangling (dplyr) skills from Math 141
  - In addition, Data Science provides tools for gathering data from the web (scraping), building interactive tools to explore data (shiny apps), and working with non-standard data (spatial coordinates, words, dates, and more!)
- Some questions you'll be able to answer by the end of Math 241:
  - How can you recreate any graph you encounter in ggplot2?

- Offered in Spring 2023; Prerequisite: Math 141
- Data Science is the study of extracting and communicating knowledge and insights from structured and unstructured data.
- Data Science helps you telling compelling and accurate stories with data
  - Data Science emphasizes effective communication with data, both to the specialized and non-specialized audience.
- Math 241 builds on data visualization (ggplot2) and data wrangling (dplyr) skills from Math 141
  - In addition, Data Science provides tools for gathering data from the web (scraping), building interactive tools to explore data (shiny apps), and working with non-standard data (spatial coordinates, words, dates, and more!)
- Some questions you'll be able to answer by the end of Math 241:
  - How can you recreate any graph you encounter in ggplot2?
  - What are R packages and how do we make them?

- Offered in Spring 2023; Prerequisite: Math 141
- Data Science is the study of extracting and communicating knowledge and insights from structured and unstructured data.
- Data Science helps you telling compelling and accurate stories with data
  - Data Science emphasizes effective communication with data, both to the specialized and non-specialized audience.
- Math 241 builds on data visualization (ggplot2) and data wrangling (dplyr) skills from Math 141
  - In addition, Data Science provides tools for gathering data from the web (scraping), building interactive tools to explore data (shiny apps), and working with non-standard data (spatial coordinates, words, dates, and more!)
- Some questions you'll be able to answer by the end of Math 241:
  - How can you recreate any graph you encounter in ggplot2?
  - What are R packages and how do we make them?
  - How can we quantify the sentiment of a book review?

In past years, students worked on a significant project and shared the results with their peers via blog posts.

In past years, students worked on a significant project and shared the results with their peers via blog posts.

- "Waste Washing Up On Shores: A Look at Plastic Pollution in Earth's Oceans"
  - Maximilian Halperin, Anne Cao, Delaney Brubaker; Spring 2021

In past years, students worked on a significant project and shared the results with their peers via blog posts.

- "Waste Washing Up On Shores: A Look at Plastic Pollution in Earth's Oceans"
  - Maximilian Halperin, Anne Cao, Delaney Brubaker, Spring 2021
- "'This Book Is A Flop': An Analysis of Negative Amazon Book Reviews"
  - Dylan Wong, Sarah Wu, Jess Yang; Spring 2021

In past years, students worked on a significant project and shared the results with their peers via blog posts.

- "Waste Washing Up On Shores: A Look at Plastic Pollution in Earth's Oceans"
  - Maximilian Halperin, Anne Cao, Delaney Brubaker, Spring 2021
- "'This Book Is A Flop': An Analysis of Negative Amazon Book Reviews"
  - Dylan Wong, Sarah Wu, Jess Yang; Spring 2021
- "Counting Crows in Downtown PDX"
  - Ian Cates-Doglio, Sarah Maebius, Gabe Preising; Spring 2020

In past years, students worked on a significant project and shared the results with their peers via blog posts.

- "Waste Washing Up On Shores: A Look at Plastic Pollution in Earth's Oceans"
  - Maximilian Halperin, Anne Cao, Delaney Brubaker; Spring 2021
- "'This Book Is A Flop': An Analysis of Negative Amazon Book Reviews"
  - Dylan Wong, Sarah Wu, Jess Yang; Spring 2021
- "Counting Crows in Downtown PDX"
  - Ian Cates-Doglio, Sarah Maebius, Gabe Preising; Spring 2020
- "Blego: The Lego Blog" (Building and analyzing Lego sets in R)
  - Ingrid Zoll, Isabelle Caldwell; Spring 2020

- Math 391 is offered Fall 2022. Pre-requisites: Math 111, 112, 113, 201, 202
  - Probability is the study and quantification of randomness and uncertainty

- Math 391 is offered Fall 2022. Pre-requisites: Math 111, 112, 113, 201, 202
  - Probability is the study and quantification of randomness and uncertainty
- Math 392 is offered Spring 2023; Pre-requisites: Math 391
  - Mathematical Statistics is the rigorous study of statistical inference, estimation, and modeling

- Math 391 is offered Fall 2022. Pre-requisites: Math 111, 112, 113, 201, 202
  - Probability is the study and quantification of randomness and uncertainty
- Math 392 is offered Spring 2023; Pre-requisites: Math 391
  - Mathematical Statistics is the rigorous study of statistical inference, estimation, and modeling
- Together Math 391 and Math 392 provide theory for procedures studied in Math 141.

- Math 391 is offered Fall 2022. Pre-requisites: Math 111, 112, 113, 201, 202
  - Probability is the study and quantification of randomness and uncertainty
- Math 392 is offered Spring 2023; Pre-requisites: Math 391
  - Mathematical Statistics is the rigorous study of statistical inference, estimation, and modeling
- Together Math 391 and Math 392 provide theory for procedures studied in Math 141.
- Some questions you'll be able to answer by the end of Math 391:

- Math 391 is offered Fall 2022. Pre-requisites: Math 111, 112, 113, 201, 202
  - Probability is the study and quantification of randomness and uncertainty
- Math 392 is offered Spring 2023; Pre-requisites: Math 391
  - Mathematical Statistics is the rigorous study of statistical inference, estimation, and modeling
- Together Math 391 and Math 392 provide theory for procedures studied in Math 141.
- Some questions you'll be able to answer by the end of Math 391:
  - What's actually going with continuous random variables?
  - Why is everything Normal (i.e. why is the Central Limit Theorem true)?

- Math 391 is offered Fall 2022. Pre-requisites: Math 111, 112, 113, 201, 202
  - Probability is the study and quantification of randomness and uncertainty
- Math 392 is offered Spring 2023; Pre-requisites: Math 391
  - Mathematical Statistics is the rigorous study of statistical inference, estimation, and modeling
- Together Math 391 and Math 392 provide theory for procedures studied in Math 141.
- Some questions you'll be able to answer by the end of Math 391:
  - What's actually going with continuous random variables?
  - Why is everything Normal (i.e. why is the Central Limit Theorem true)?
- Some guestions you'll be able to answer by the end of Math 392:
  - Why does Bootstrapping work?
  - Where does the formula for sample variance come from?

### Section 2

LaCroix Taste Test Instructions

**Research Question**: Can the average Reed student reliably distinguish a difference between two different types of carbonated water?

**Research Question**: Can the average Reed student reliably distinguish a difference between two different types of carbonated water?

**Experimental Design**: Each student will be served three samples of carbonated water. Two of the samples will be the same type of carbonated water, and one will be different. Students will be asked to identify the sample which is different from the other two.

**Research Question**: Can the average Reed student reliably distinguish a difference between two different types of carbonated water?

**Experimental Design**: Each student will be served three samples of carbonated water. Two of the samples will be the same type of carbonated water, and one will be different. Students will be asked to identify the sample which is different from the other two.

#### Instructions

- ${\bf 0}$  Go out to the lawn between ETC and the Library, where Nick has set up the taste test.
- 2 Nick will have 3 colors of cups. Take a cup of each color.
- Try to determine which cup color contains a type of sparking water which is different than the other two.
- Submit your answer to a Google form (Nick will have a QR code. Also a link on course webpage.)
- Take any extra time you have to check in with your group members on the assignment due Friday.

**Research Question**: Can the average Reed student reliably distinguish a difference between two different types of carbonated water?

**Experimental Design**: Each student will be served three samples of carbonated water. Two of the samples will be the same type of carbonated water, and one will be different. Students will be asked to identify the sample which is different from the other two.

#### Instructions

- Go out to the lawn between ETC and the Library, where Nick has set up the taste test.
- 2 Nick will have 3 colors of cups. Take a cup of each color.
- Try to determine which cup color contains a type of sparking water which is different than the other two.
- Submit your answer to a Google form (Nick will have a QR code. Also a link on course webpage.)
- Take any extra time you have to check in with your group members on the assignment due Friday.

**Important!** Don't discuss your answer with other students, particularly those who have not yet submitted their own answer!