Class 1

Daniel B. Rowe, Ph.D.

Department of Mathematical and Statistical Sciences

Agenda:

Syllabus

Math Review

Lecture Chapter 1

Syllabus

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Daniel B. Rowe, Ph.D.

Department of Mathematical and Statistical Sciences

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Marquette University

Syllabus
Fall 2024

Course: MATH 1700
Time: 3:30 pm – 4:45 pm TuTh
Instructor: Daniel B. Rowe, Ph.D.

MATH 1700

Description: Fundamental theory and methods of statistics without calculus. Descriptive statistics, elements of probability theory, estimation, tests of hypotheses, regression, correlation, introduction to computer methods of statistical tabulation and analysis. Recommended for students seeking a general introduction to statistical concepts and not intended to be a final course in statistics for students who need a thorough working knowledge of statistical methods.

Prereq: Two years of college preparatory mathematics. May not be taken for credit by students who have received college credit for another probability or statistics course.

Grading: 2 exams given throughout the semester. No make-ups. If "unavoidable absence" as defined in Arts and Sci Undergrad Bulletin, then % added to final.

Grading:

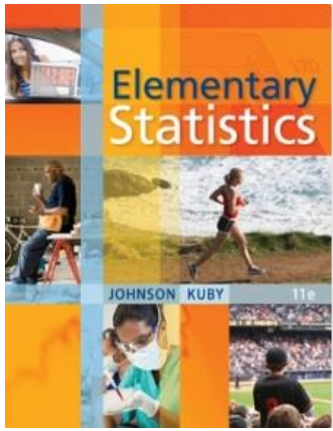
Attendance	5%
WebAssign Homework	15%
Midterm Exam 1	25%
Midterm Exam 2	25%
Final Exam	30%

Grades and Points	
93-100	A
90-92.9	A-
87-89.9	B+
83-86.9	B
80-82.9	B-
77-79.9	C+
73-76.9	C
70-72.9	C-
67-69.9	D+
60-66.9	D
Below 60	F

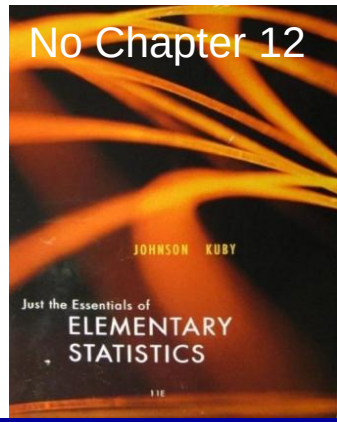
Drop Date: Last day without a W 9/3/2024, with a W 11/15/24.

Course Materials: WebAssign for Johnson/Kuby's Elementary Statistics by Johnson ISBN 13: 9781337766234

Texts: The book is included ISBN-13: 978-0538733502
Just the Essentials of Elementary Statistics
Johnson and Kuby, 11th ed (don't buy)



Calculators: You will need a calculator for the homework & exams.



Homework: Homework assignments will be through WebAssign. More details to follow.

Exams:
Two exams: Tuesday Sep 24 and Thursday Oct 24
Final Exam: Thursday Dec 12, 8:00 am – 10:00 am.

Instructor: Daniel B. Rowe, Ph.D.
Office: Cudahy 313
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TA: Qishi Zhan
Email: qishi.zhan@marquette.edu

Tentative Schedule

Exam 1	Exam 2	Final
Math Review,1.1	6.1, 6.2, 6.3	9.1
2.1, 2.2, 2.3, 2.4	7.1, 7.2, 7.3	9.2
2.5, 3.1	8.1, 8.2	9.3
3.2,3.3	8.2, 8.3	10.1, 10.2
3.2, 3.3	8.3, 8.4	10.3
4.1, 4.2		10.4
4.3, 4.4, 4.5		11.1, 11.2
5.1,5,2,5.3		12.1, 12.2
		12.3

Help Desk: Floor 4 of Cudahy see webpage for hours.
https://www.marquette.edu/mathematical-and-statistical-sciences/student-resources.php

ROLES

Professor: Required to use this book and cover material in it.
Explain and answer questions on the material.
Assess your knowledge of material through exams.

TA: Explain and answer questions on the material.
Work through homework problems.

Student: Learn material by attending class or reading book.
Ask Professor questions on material and mechanics.
Ask TA questions on mechanics of problems.
Demonstrate mastery of material and mechanics of problems on homework and exams.

RESOURCES

https://d2l.mu.edu/d2l/login

Lecture: Professor, explaination of material and examples.
If something in lecture not crystal clear, ask!

Help Desk: Math 1700 TAs have many hours/week. CU 4th Fl
https://www.marquette.edu/mathematical-and-statistical-sciences/student-resources.php

Small Group: https://www.marquette.edu/tutoring/

Office Hours: Professor weekly office desk hours.
If something not clear after lecture or discussion or need help on homework then come!

Frequently Asked Questions

Q: Will you teach us only how to put numbers in the formulas?
A: No. You will learn where things come from and why in addition to how use the statistical formulas. Critical thinkers.

Q: Will you give us a practice test just like the one you are going to give us in class but with different numbers?
A: No. You would only memorize how to narrowly solve.

Q: Will you give us a study guide for each test?
A: No. You will have your solutions to homework problems and scheduled revies sessions. Exam will give formulas.

Algebra Review

1. Summation Notation
2. Factorials
3. Computations
4. Simple Linear Equations

1. Summation Notation

We use symbols to indicate general math operations

Let $x_1, x_2, ..., x_n$ and $y_1, y_2, ..., y_n$ be two sets of numbers.

The following notation will be used in course:

$$\sum_{i=1}^{n} x_i = x_1 + x_2 + ... + x_n$$

$$\left(\sum_{i=1}^{n} x_i \right)^2 = \left(x_1 + x_2 + ... + x_n \right)^2$$

$$\sum_{i=1}^{n} x_i^2 = x_1^2 + x_2^2 + ... + x_n^2$$

$$\sum_{i=1}^{n} x_i y_i = x_1 y_1 + x_2 y_2 + ... + x_n y_n$$

Examples to follow:

1. Summation Notation

Example: $x_1, x_2, ..., x_n$

Given numbers: 2,1,3.

We have three numbers
n=3

We associate each number with an x as:
x_1=2, x_2=1, x_3=3

1. Summation Notation

n=3

x_1=2, x_2=1, x_3=3

When we write

$$\sum_{i=1}^{3} x_i = x_1 + x_2 + x_3$$

What we mean is

$$\sum_{i=1}^{3} x_i = 2 + 1 + 3 = 6$$

1. Summation Notation

n=3

x_1=2, x_2=1, x_3=3

When we write

$$\sum_{i=1}^{3} x_i^2 = x_1^2 + x_2^2 + x_3^2$$

What we mean is

$$\sum_{i=1}^{3} x_i^2 = 2^2 + 1^2 + 3^2 = 14$$

1. Summation Notation

n=3

x_1=2, x_2=1, x_3=3

When we write

$$\left(\sum_{i=1}^{3} x_i\right)^2 = \left(x_1 + x_2 + x_3\right)^2$$

What we mean is

$$\left(\sum_{i=1}^{3} x_i\right)^2 = \left(2+1+3\right)^2 = 36$$

1. Summation Notation

n=3

x_1=2, x_2=1, x_3=3 and y_1=1, y_2=2, y_3=3

When we write

$$\sum_{i=1}^{3} x_i y_i = x_1 y_1 + x_2 y_2 + x_3 y_3$$

What we mean is

$$\sum_{i=1}^{3} x_i y_i = 2\times 1 + 1\times 2 + 3\times 3 = 13$$

2. Factorials

A factorial is a multiplication process.

n factorial is written symbolically as $n!$

and means $n! = n \times (n-1) \times (n-2) \times \cdots \times 2 \times 1$

Example:

$$3! = 3 \times 2 \times 1 = 6$$

2. Factorials

A factorial is a multiplication process.

n factorial is written symbolically as $n!$

and means $n! = n \times (n-1) \times (n-2) \times \cdots \times 2 \times 1$

Example:

$4! = 4 \times 3 \times 2 \times 1 = 24$

Your turn!

$5! = ?$

3. Computations

Suppose x=20, y=14, s=16, w=-2, m=15, n=10.

Compute $x + 2y - 4w$

3. Computations

Suppose x=20, y=14, s=16, w=-2, m=15, n=10.

Compute $x + 2y - 4w$

Solution
$$= 20 + 2(14) - 4(-2)$$
$$= 20 + 28 + 8$$
$$= 56$$

3. Computations

Suppose x=20, y=14, s=16, w=-2, m=15, n=10.

Compute $x+6w-4s$

3. Computations

Suppose x=20, y=14, s=16, w=-2, m=15, n=10.

Compute $x+6w-4s$

Solution
$$= 20+6(-2)-4(16)$$
$$= 20-12-64$$
$$= -56$$

3. Computations

Suppose x=20, y=14, s=16, w=-2, m=15, n=10.

Compute $x + y \cdot \frac{\sqrt{s}}{n}$

3. Computations

Suppose x=20, y=14, s=16, w=-2, m=15, n=10.

Compute $x + y \cdot \dfrac{\sqrt{s}}{n}$

Solution

$$= 20 + 14\frac{\sqrt{16}}{10}$$

$$= 20 + 14\frac{4}{10}$$

$$= 20 + \frac{56}{10}$$

$$= 25.6$$

3. Computations

Suppose x=20, y=14, s=16, w=-2, m=15, n=10.

Compute $\sqrt{\frac{1}{n}+\frac{1}{m}}$

3. Computations

Suppose x=20, y=14, s=16, w=-2, m=15, n=10.

Compute $\sqrt{\frac{1}{n}+\frac{1}{m}}$

Solution

$$= \sqrt{\frac{1}{10}+\frac{1}{15}}$$

$$= \sqrt{\frac{1}{10}\frac{3}{3}+\frac{1}{15}\frac{2}{2}}$$

$$= \sqrt{\frac{5}{30}} = \sqrt{\frac{1}{6}} = 0.4082$$

3. Simple Linear Equations

Find x for:

$$1 - x = 0.23$$

3. Simple Linear Equations

Find x for:

$$1 - x = 0.23$$

Solution:

Subtract 1 from both sides:

$$-x = 0.23 - 1$$

$$-x = -.77$$

Multiply both sides by -1:

$$-x = -0.77$$

$$x = 0.77$$

3. Simple Linear Equations

Find x for:

$$2-2x=3x+3$$

3. Simple Linear Equations

Find x for:

$$2-2x=3x+3$$

Solution:

Add $2x$ to both sides:

$$2-2x+2x=3x+3+2x$$

$$2=5x+3$$

Subtract 3 from both sides:

$$2-3=5x+3-3$$

$$-1=5x$$

$\longrightarrow$ Divide both sides by 5:

$$x=-\frac{1}{5}$$

Lecture Chapter 1

Chapter 1: Statistics

Daniel B. Rowe, Ph.D.

Department of Mathematical and Statistical Sciences

1: Statistics

1.1 Americans Here's Looking at you

Statistics is all around us!

How much time between Internet usage?

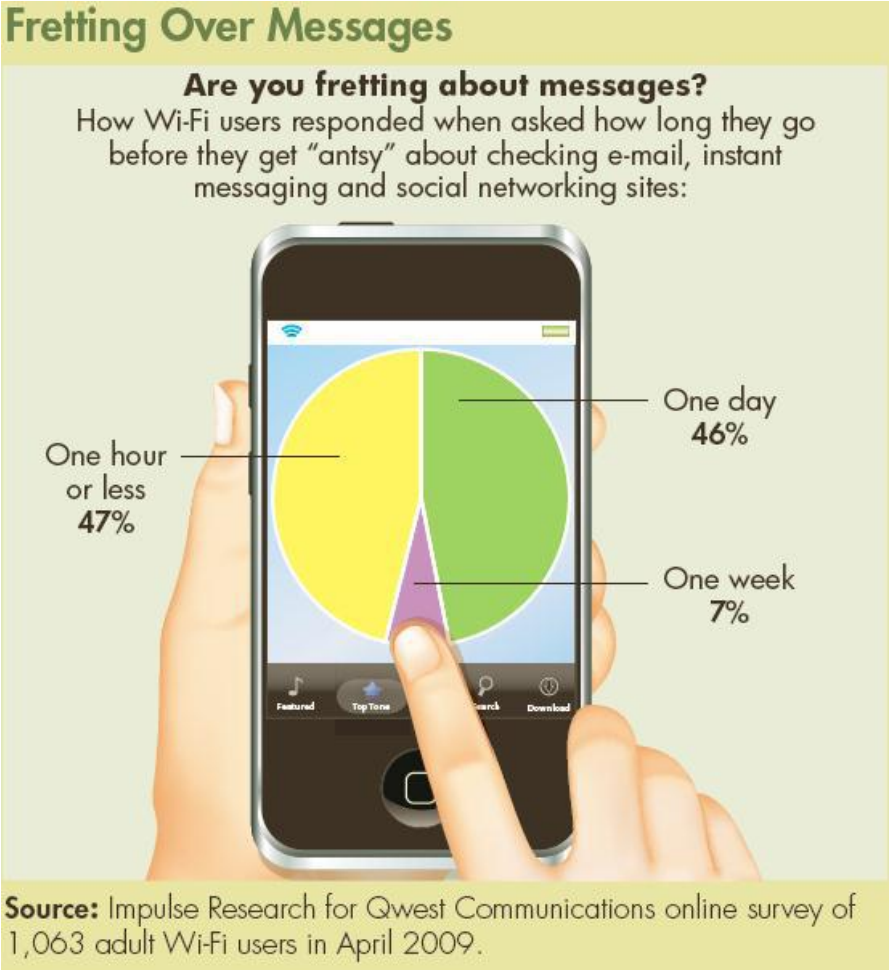


Figure from Johnson & Kuby, 2012.

1: Statistics

1.1 Americans Here's Looking at you

We are presented statistics from a variety of topics.

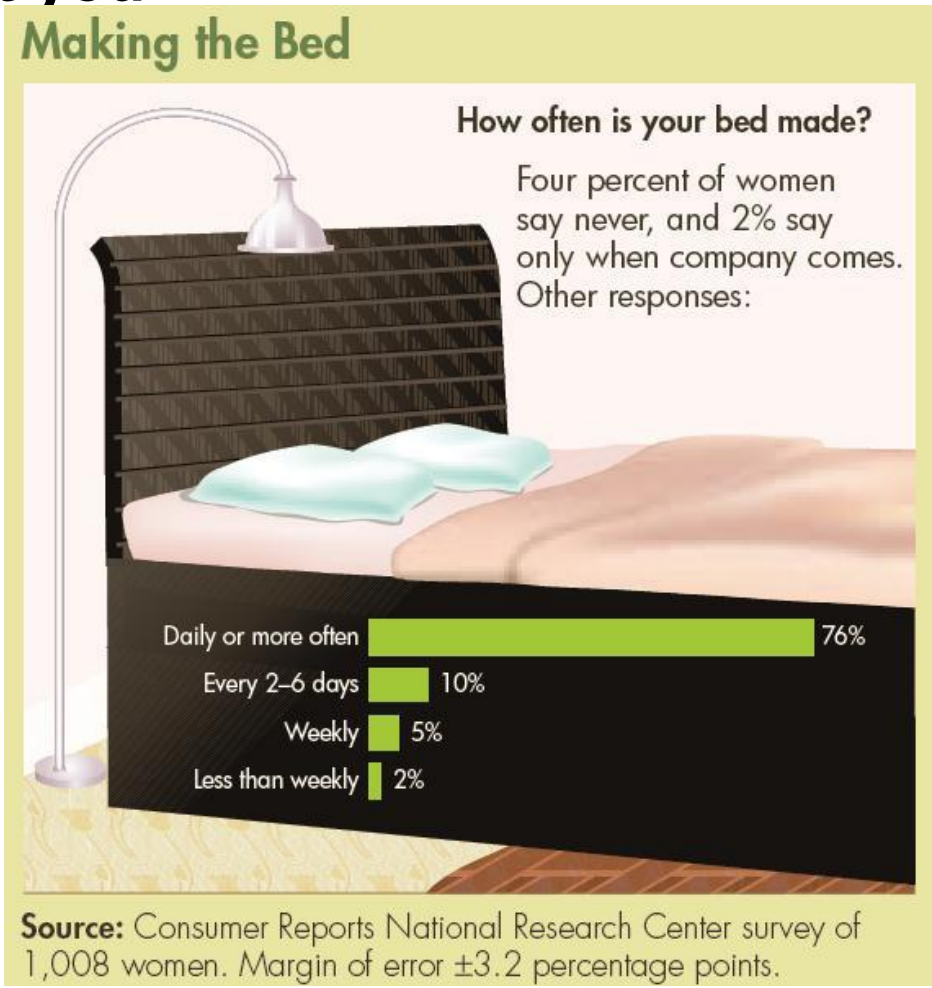


Figure from Johnson & Kuby, 2012.

1: Statistics

1.1 Americans Here's Looking at you

We are presented statistics from a variety of topics.

APPLIED EXAMPLE 1.1

FISH'S AGE

Jose Luis Pelaez/Photographer's Choice/Getty Images

HOW OLD IS MY FISH

Average age by length of largemouth bass in New York State.

Length, in.	8	9	10	11	12	13	14
Age, yrs.	2	3	3	4	4	5	5

Source: NYS DEC Freshwater Fishing Guide

Forget about my dad's and my grandpa's age, I just want to know, "How old is my fish?" How does that work? **Statistics!** You will learn about "averages" in Chapter 2. This information also seems to imply that if the fish's length is measured, the fish's age is then known. Additional statistical techniques can be used to describe the relationship between the fish's age based on the fish's length, and as a result age can be estimated. You will learn about the statistical method for data like this in Chapter 3.

Figure from Johnson & Kuby, 2012.

1: Statistics

1.1 What is Statistics?

Statistics is the universal language of science and we need to master both the “science” and “art” of using statistical methodology correctly.

These methods include

(1) carefully defining the situation,
(2) gathering data,
(3) accurately summarizing the data,
(4) deriving and communicating meaningful conclusions.

Statistics involves numbers and graphs to summarize the information contained in a set of data, then interpreting this information.

1: Statistics

1.1 What is Statistics?

The field of statistics can be divided into two main branches.

Descriptive statistics which involves the collection, presentation, and description of sample data. This is where we describe the information contained in a set of data.

Inferential statistics which involves the interpretation of the values from the descriptive techniques and making decisions and drawing conclusions about a population of data. This is where we infer from the sample back to the larger population. i.e. population has similar properties as sample.

1: Statistics

1.1 What is Statistics?

Statistics: The science of collecting, describing, and interpreting data.

Population: A collection, or set, of individuals, objects, or events whose properties are to be analyzed.

Sample: Subset of the population.

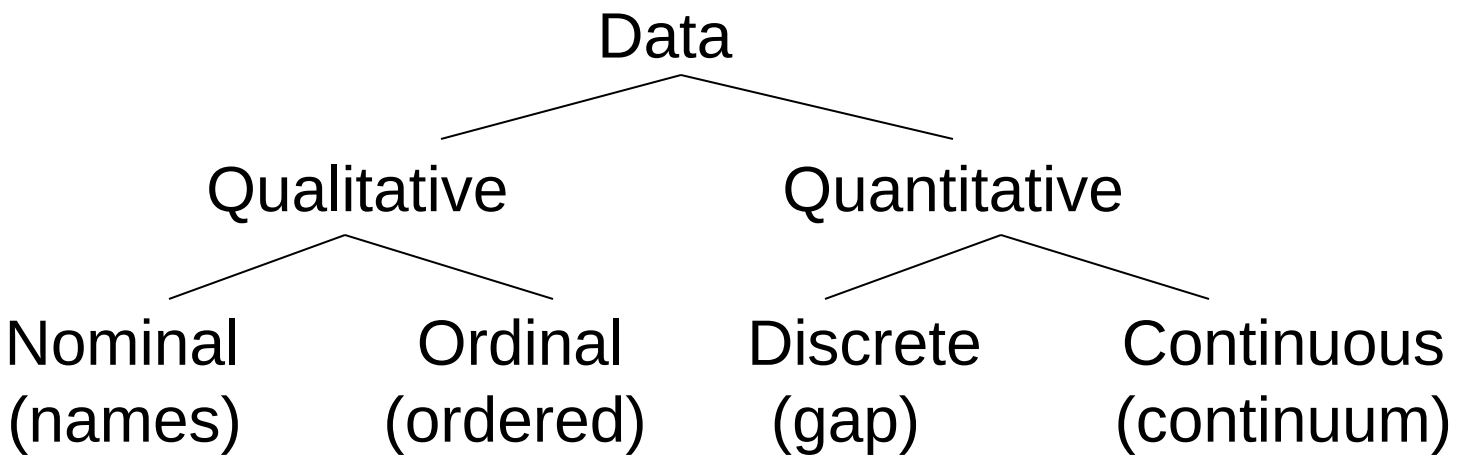
Variable: A characteristic of interest about each individual element of a population or sample.

Data value: The value of the variable associated with one element of a population or sample. (number, a word, or a symbol)

1: Statistics

1.1 What is Statistics?

Data: The set of values collected from the variable from each of the elements that belong to the sample.



1: Statistics

1.1 What is Statistics?

Data: The set of values collected from the variable from each of the elements that belong to the sample.

Experiment: A planned activity whose results yield a set of data.

Sample: Subset of the population.

Parameter: A numerical value summarizing all the data of an entire population.

Statistic: A numerical value summarizing the sample data.

1: Statistics

1.1 What is Statistics?

Qualitative variable: A variable that describes or categorizes an element of a population.

Nominal variable: A qualitative variable that characterizes an element of a population. No ordering. No arithmetic.

Ordinal variable: A qualitative variable that incorporates an ordered position, or ranking.

1: Statistics

1.1 What is Statistics?

Quantitative variable: A variable that quantifies an element of a population.

Discrete variable: A quantitative variable that can assume a countable number of values. Gap between successive values.

Continuous variable: A quantitative variable that can assume an uncountable number of values. Continuum of values.

1: Statistics

Questions?

Homework: Read Chapter1 WebAssign
Problems: 1.7, 1.9, 1.11, 1.41, 1.49a
vocabulary on page 27