MATH 3339
Statistics for the Sciences
Live Lecture Help

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Session 1

Office Hours: see schedule in the "Office Hours" channel on Teams
Course webpage: www.casa.uh.edu

Email policy

When you email me you **MUST** include the following

- MATH 3339 Section 20024 and a description of your issue in the **Subject Line**
- Your name and ID# in the **Body**
- Complete sentences, punctuation, and paragraph breaks
- Email messages to the class will be sent to your Exchange account (user@cougarnet.uh.edu)

About the class

Class information will be posted in a combination of two locations, with some overlap. These are the Teams page for our class and the CASA website. We will not use UH Blackboard.

www.casa.uh.edu

- The first portion of these materials is freely available for the first two weeks of class.
- All students must purchase a Course Access Code and enter it on CourseWare by the first day of the third week of class to continue accessing the course learning materials.
- A Course Access Code can be purchased for about $50 from the University Bookstore, via AccessUH.
- The deadline to purchase the code is 9/09/2021.

About the class

Prerecorded Video Poppers

- Quiz questions will be given during the recorded videos.
- You will go to the EMCF tab on the CASA website (www.casa.uh.edu) to answer the questions to get credit for watching these videos.

About the class

EMCF tab on CASA

- Electronic Multiple Choice Form
- This is the place you will enter responses to multiple choice problems I assign.
- Video poppers will be answered here for sure, with the possibility of using this for any multiple-choice homework problems.

Assignments tab on CASA

- Written homework assignments
- Will be posted and submitted on CASA under Assignments tab

About the class

Online Quizzes via the Online Assignments tab on CASA

- Online quizzes will be given on CASA starting yesterday.
- You may take them each multiple times.
- The highest score is recorded.
- They close at 11:59 PM on date listed.
- Watch for when they are to be closed, and don't wait until the last day (or minute) to complete them. The system may become overloaded and thus may prevent you from receiving credit.
- Once an online quiz closes, it will NOT reopen.

About the class

Exams

- 2 Midterm Exams and a Final Exam.
- All exams will be given at the CASA testing center.
- You can schedule the time of your exam on CASA under Proctored Exams.
- The scheduler will be available two weeks prior to the exam.
- There are NO Make up Exams and there is NO Standby testing.
- Double check your date and time prior to testing. You MUST have a scheduled time.
- Plan on arriving early so if you are stuck in traffic, have overslept, or whatever, you don't miss the exam.

About the class

Grades

- Poppers = 5%
- Online Quizzes = 15%
- Homework = 10%
- Each midterm = 20% each (40% total)
- Final Exam = 30%

About the class

What I expect from you:

- Be respectful to your fellow students and instructor
- Pay attention and let me know if you see a mistake
- Ask and answer questions
- Don't wait until the end of the semester to tell me that you are having an issue
- Make it easy on us to give you the grades you want

About the class

What I want for you:

- Learn some ~~calculus~~ *stats!* and have a successful outcome

- Hopefully, challenge yourself in this course

- Participate and (legitimately) collaborate with your classmates

- Have fun

Using R and R-Studio

1. Download R from https://cran.r-project.org/
2. Download R-Studio from https://www.rstudio.com/

A Data Set: Course Grades From Previous Session

Student	Score	Grade	Tests	Quiz	HW	Opt-out	Session
1	100.707	A	99.233	87.308	101.270	yes	Sp16
2	81.310	B	75	98.231	64.444	yes	Sp16
3	8.194	F	14.667	12.769	3.175	no	Sp16
4	90.449	A	91.533	77.231	82.222	yes	Sp16
5	68.461	D	65.783	81.769	68.571	no	Sp16
6	103.955	A	103.32	97.923	101.905	yes	Sp16
7	92.889	A	95.6	85.923	75.556	no	Sp16
8	84.805	B	83.2	79.385	75.238	yes	Sp16
9	91.640	A	89.967	91.231	85.079	yes	Sp16
10	22.316	F	17.433	40.615	44.444	no	Sp16
11	98.363	A	94.167	99.231	101.587	yes	Sp16
12	49.250	F	43.917	73.077	78.095	no	Sp16
13	16.967	F	15.5	20.077	29.841	no	Sp16
14	50.747	F	45.533	67.385	57.460	no	Sp16
15	43.184	F	72.983	47.462	38.413	no	Sp16
16	100.845	A	98.667	96.231	100.317	yes	Sp16
17	84.195	B	77.5	87.154	95.556	yes	Sp16
18	84.400	B	78.733	78.615	82.540	yes	Sp16
19	67.170	D	74.3	68.538	72.063	no	Fal15
20	87.413	B	92	82.077	77.778	yes	Fal15
21	67.899	D	71.8	71.077	84.127	no	Fal15
22	74.676	C	70.083	83.308	73.016	no	Fal15
23	40.054	F	44.133	21.308	33.333	no	Fal15
24	101.014	A	101.08	98.923	95.873	no	Fal15
25	11.972	F	17.1	10.385	3.810	no	Fal15
26	79.831	B	86.233	71.923	46.667	no	Fal15
27	83.301	B	94.6	69.692	60.317	no	Fal15
28	72.299	C	64.967	67.615	99.394	no	Sum16
29	83.821	B	77.2	80.923	83.030	yes	Sum16
30	90.703	A	83.617	87.923	80.000	no	Sum16

Two Types of Variables

Go back to the example of grades. We have several variables, score, grade, tests, quiz, hw, opt-out, & session.

- The variables **grade, opt-out, & session** are *categorical variables*. **Categorical variables** (**Factor variables**) place a case into one of several groups or categories. In some cases these variables can be **ordered**.

- The variables **scores, tests, quiz & hw** is a **quantitative variable**. **Quantitative Variables** take numerical values for which arithmetic operations such as adding and averaging make sense.

Definitions

- A **set** is a collection of objects.

- The items that are in a set called **elements**.

- We typically denote a set by capital letters of the English alphabet. Usually, E_i

- Examples: $E_1 = \{$knife, spoon, fork$\}$, $E_2 = \{2, 4, 6, 8\}$.

- The set E_2 could also be written as
  $E_2 = \{x | x$ are even integers between 0 and 10$\}$.

- The **sample space** of a random phenomenon is the set of all possible outcomes. Ω is used to denote sample space.

Notations for Sets

Notation	Description
$a \in A$	The object a is an element of the set A.
$A \subseteq B$	Set A is a subset of set B.
	That is every element in A is also in B.
$A \subset B$	Set A is a proper subset of set B.
	That is every element that is is in A is also in set B and
	there is at least one element in set B that is not in set A.
$A \cup B$	A set of all elements that are in A **or** B.
$A \cap B$	A set of all elements that are in A **and** B.
Ω	Called the **universal set**, all elements we are interested in.
$\sim A, \ A^c$	The set of all elements that are in the universal set
	but are not in set A. The complement of A
$\bigcup_i E_i$	$E_1 \cup E_2 \cup \ldots$, the union of multiple sets
$\bigcap_i E_i$	$E_1 \cap E_2 \cap \ldots$, the intersection of multiple sets

Examples

The following are sets: $\Omega = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$,
$E_1 = \{1, 2, 3, 4, 5, 6, 9, 10\}$, $E_2 = \{3, 4, 7, 8\}$, and $E_3 = \{2, 3, 9, 10\}$

$$E_1^c = \Omega \setminus E_1 = \{7, 8\}$$

$$E_1 \cap E_2^c = \{1, 2, 5, 6, 9, 10\}$$

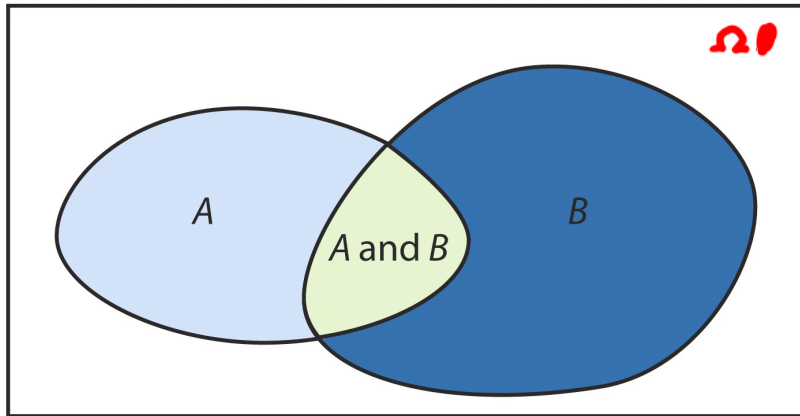$$E_1^c \cup E_3 = \{2, 3, 7, 8, 9, 10\}$$

$$E_1^c \cap E_3 = \emptyset$$

$$1 \in E_1, \quad \{1\} \subseteq E_1$$

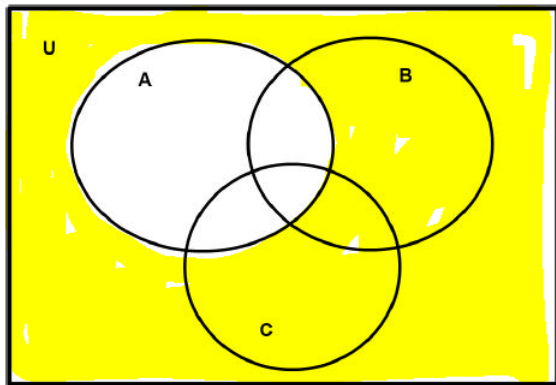$$E_i^c = \Omega \setminus E_i = \{7, 8\}$$

$$\{\phi, \{7\}, \{8\}, \{7, 8\}\}$$

Graph of Venn Diagrams

Venn Diagrams

Shade A^C:

Venn Diagrams

Shade $A \cup B$:

$$A \cup B = (A \cap B^c) \cup (A \cap B) \cup (A^c \cap B)$$
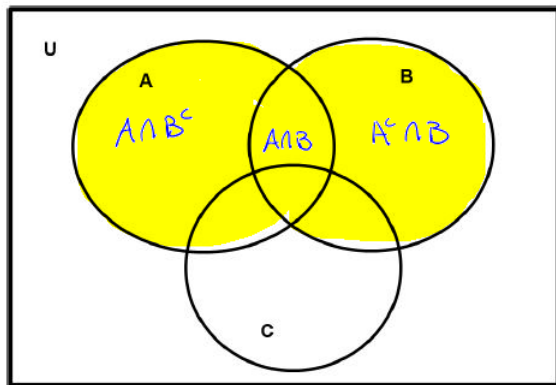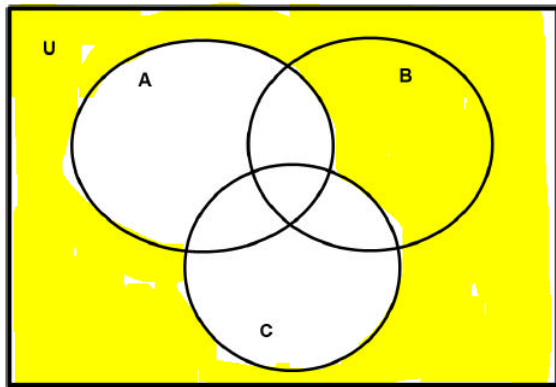
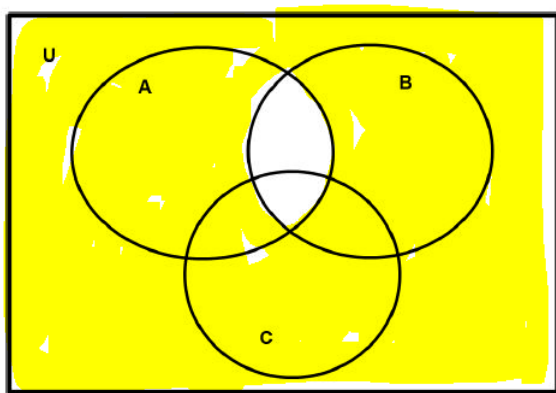# Venn Diagrams

Shade $A \cap C$:
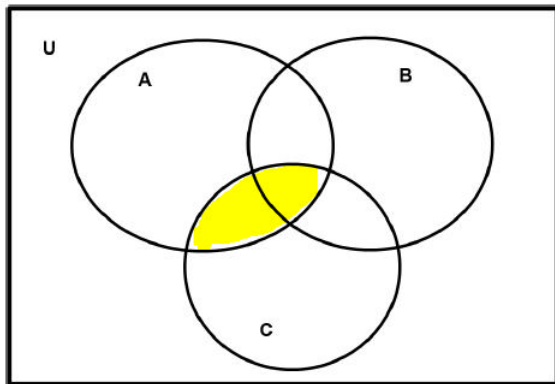
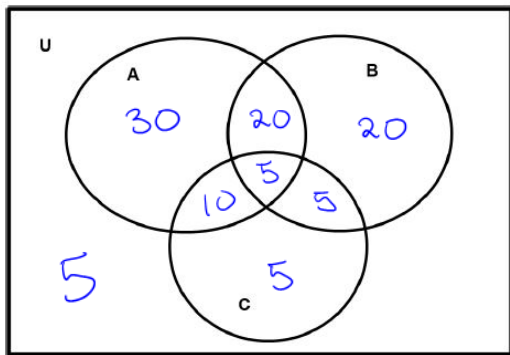# Venn Diagrams

Shade $\sim(A \cup C)$:

Venn Diagrams

Shade $(A \cap B)^C$:

Soft Drink Preference

A group of 100 people are asked about their preference for soft drinks. The results are as follows: 65 like Coke, 25 like Diet Coke, 50 like Pepsi, 15 like Coke and Diet Coke, ~~5 like all 3 soft drinks~~, ~~25 like Coke and Pepsi~~, ~~5 only like Diet Co~~ke (nothing else). Fill in the the Venn diagram with these numbers.

A − coke, B − pepsi, C − Diet

Using R and R-Studio

1. Download R from https://cran.r-project.org/
2. Download R-Studio from https://www.rstudio.com/