Math 3339

Section 27204
MWF 10-11:00am AAAud 2

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Office Hours:
M & Th noon – 1:00 pm & T 1:00 – 2:00 pm
and by appointment

All class information is found on CASA

https://www.casa.uh.edu/

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MATH3339 TEXTBOOK

Welcome to Math 3339

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Office Hours: M & Th noon – 1:00 pm & T 1:00 – 2:00 pm

For other times make an appointment at least 24 hours in advance

Read the Syllabus

HELP VIDEOS!!

Using R Studio: R Download Site R-Studio Download Site
An Introduction to R (user manual) Using R For Introductory Statistics
R-Studio Quick Reference Guide

Click on the "Proctor Exams" tab above for CASA Exam and related Information.

AssignmentDueDates SchedulingDueDates TestDueDates
OnlineAssignmentDueDates AccessCode

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
August 21	**August 22** Blank Slides Completed Notes Video	**August 23**	**August 24** Blank Slides Completed Notes Video	**August 25**	**August 26** Blank Slides Completed Notes Video	**August 27**

Counting Techniques

When determining the probability of an event, we will need to be able to "count" the number outcomes in the event. Here are a series of counting rules to help us.

Proposition: (The Product Rule)

If the first element or object of an ordered pair can be selected n_1 ways and the second element of the pair can be selected n_2 ways, then the number of possible pairs is $n_1 n_2$.

toss a coin 2

roll a die 6

12

Ex: A homeowner doing some remodeling requires the services of both a plumber and an electrician. If there are 12 plumbers and 9 electricians available in the area, how many ways can the pair be chosen?

$$12 \cdot 9 = 108$$

Ex: A family has just moved to a new city and requires both an obstetrician and a pediatrician. There are two easily accessible medical clinic, each having two obstetricians and three pediatricians. If the family wishes to choose both from the same clinic, in how many ways can this be done?

Clinic 1

OB1 OB2

P1 P2 P3 ~~P4~~

Clinic 2

OB3 OB4

P5 P6 P7 ~~P8~~

2 clinic

2 OB

3 P

12

Generalized Product Rule:
The number of ways of choosing a collection of k objects is

$$n_1 n_2 \ldots n_k$$

where n_i represents the number of ways of choosing the i-th object.

Ex: Suppose you are remodeling your kitchen and wish to purchase all new kitchen appliances. You need a stove, fridge, dishwasher, and microwave. Your local appliance store is having a sale on LG appliances if you purchase this brand exclusively. They offer 3 different LG stoves, 4 different LG fridges, 2 LG dishwashers, and 2 LG microwaves. How many different ways are there of purchasing one of each appliance?

$3 \cdot 4 \cdot 2 \cdot 2 = 48$

Permutations and Combinations:

Definitions: An *ordered subset (or list)* is called a ***permutation***. The number of permutations of size k that can be formed from the n individuals or objects in a group will be denoted by $P_{k,n}$ or in some texts ${}_nP_k$.

An unordered subset is called a ***combination***. This is denoted

$C_{k,n}$ or ${}_nC_k$ or $\binom{n}{k}$, and is read "n choose k".

$$P_{k,n} = \frac{n!}{(n-k)!} \quad \text{and} \quad \boxed{\binom{n}{k} = \frac{n!}{k!(n-k)!}}$$

```
> perm<-function(n,r){return(factorial(n)/factorial(n - r))}
> perm(10,6)
[1] 151200
>choose(10,6)
[1] 210
```

choose(n, k)

$$P_{10,6} = \frac{10!}{(10-6)!} = \text{factorial}(10)/\text{factorial}(4)$$

Ex: How many 5 draw poker hands are there?

$${}_{52}C_5 = \text{choose}(52,5) = \underline{2598960}$$

In 5-card stud poker, the cards are dealt sequentially and the order of appearance is important. How many 5 stud poker hands are there?

$${}_{52}P_5 = \text{factorial}(52)/\text{factorial}(52-5)$$

$$311875200$$

How many ways to get a full house?

$$\underbrace{\square\ \square\ \square}_{13 \cdot {}_4C_3} \cdot \underbrace{\square\ \square}_{12 \cdot {}_4C_2} = 3744$$

13 ~~suits~~ ranks A, 2, 3, …, K

$$P(\text{full house}) = \frac{3744}{2598960} = .00144$$

Ex: A university warehouse has received a shipment of 25 printers, of which 10 are laser printers and 15 are inkjet models. If 6 of these 25 are selected at random to be checked by a particular technician, what is the probability that exactly 3 of those selected are laser printers?

$$\frac{{}_{10}C_3 \cdot {}_{15}C_3}{{}_{25}C_6} = \frac{120 \cdot 455}{177100} = .308$$

What is the probability that at least 3 laser printers are selected?

P(3 laser) + P(4 laser) + P(5 laser) + P(6 laser)

What is the probability that at least one laser printer is selected?

P(1 or more) = 1 − P(0)

```
> 1-choose(15,6)/choose(25,6)
[1] 0.9717391
```

```
> choose(10,3)*choose(15,3)/choose(25,6)+choose(10,4)*choose(15,2)/choose(25,6)+choose(10,5)*choose(15,1)/
choose(25,6)+choose(10,6)*choose(15,0)/choose(25,6)
[1] 0.455336
```

Sample space : ${}_{25}C_6 = 177100$

3 laser printers ${}_{10}C_3 = 120$

3 inkjet : ${}_{15}C_3 = 455$

$P(0) + P(1 \text{ or more}) = 1$

Conditional Probability

Suppose a six-die is rolled. What is the probability of getting a 3? $\frac{1}{6}$

Suppose that we know that an odd number was rolled. What is the probability of getting a 3? $\frac{1}{3}$

$$P(3 \mid odd) = \frac{P(3 \text{ and } Odd)}{P(odd)} = \frac{1/6}{1/2} = 1/3$$

The Conditional Probability of an event A given that event B has occurred is given by

and

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)} \quad \text{where } P(B) \neq 0$$

Prob (A given B)

Ex: Suppose that a checkout line at the grocery store either has no waiting time (with probability 1/2), minor waiting time (with probability 1/3) , or considerable waiting time (with probability 1/6).
If a customer approaches the checkout and someone is already there (meaning there will be waiting time) what is the probability that the waiting time will be considerable?

A = no wait $\quad$ B = minor wait $\quad$ C = considerable wait

$P(A) = \frac{1}{2}$ $\quad$ $\underbrace{P(B) = \frac{1}{3} \quad P(C) = \frac{1}{6}}$

any wait: $B \cup C$ $\quad$ $P(B \cup C) = \frac{1}{2}$

$$P(C \mid B \cup C) = \frac{P(C \cap (B \cup C))^{=P(C)}}{P(B \cup C)} = \frac{1/6}{1/2}$$

$$= 1/3$$