Math 3339

Section 27204
MWF 10-11:00am AAAud 2

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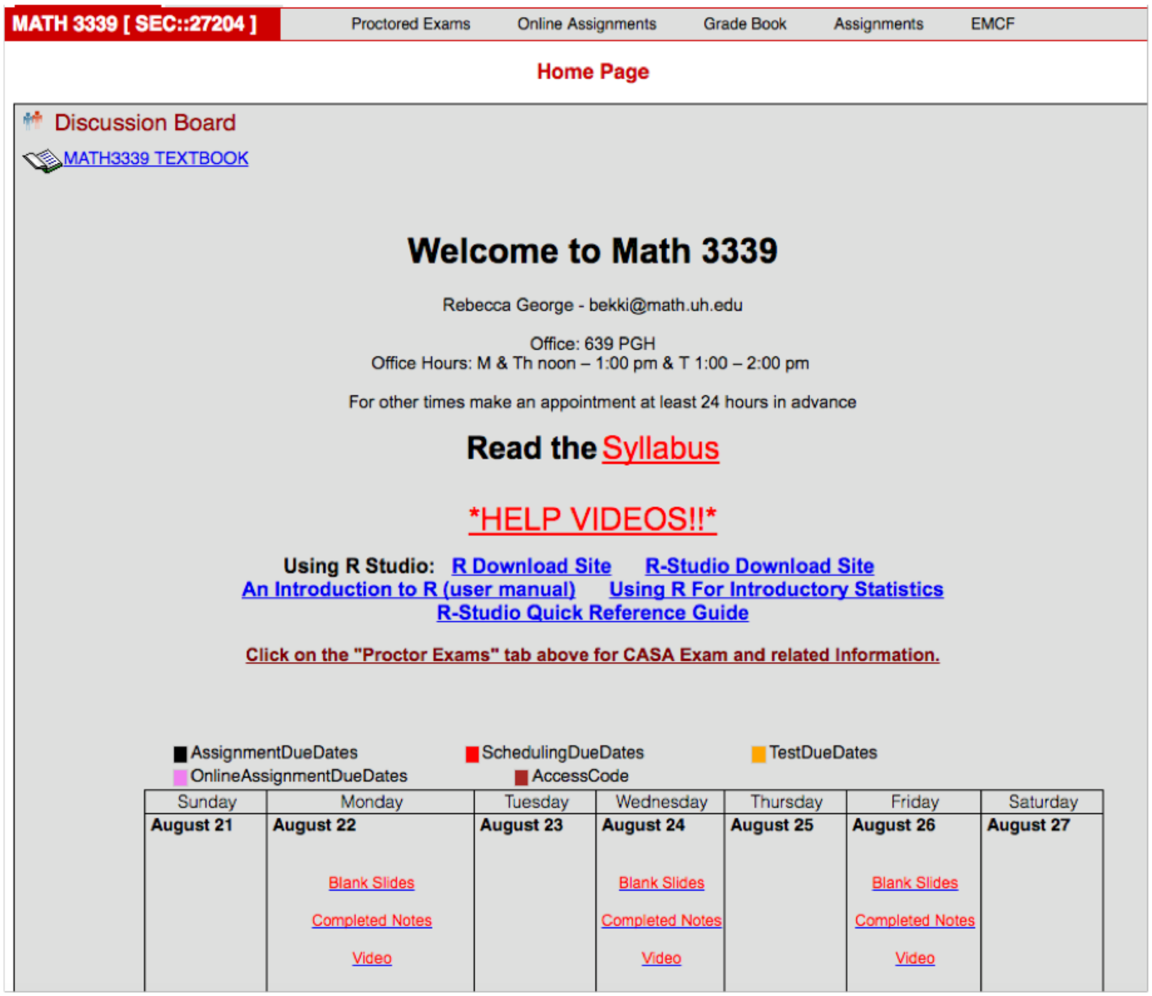
Office Hours:
M & Th noon – 1:00 pm & T 1:00 – 2:00 pm
and by appointment

All class information is found on CASA

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



MATH 3339 [SEC::27204] | Proctored Exams | Online Assignments | Grade Book | Assignments | EMCF

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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**

Buy your popper (bubbling) forms and Course Access Code from the **Bookstore** by **9/6**. Take your class and section number to get the correct bubbling forms.

Print off notes (4 per page unless you write large) before class to make note-taking easier.

Probability – what do we know so far?

| given

∩ intersect , and

∪ union , or

Rules:

1. $0 \le P(A) \le 1$ for all events A.
2. $P(Sample\ Space) = 1$
3. Complement: A' *or* A^C *or* $\sim A$ represents the complement of A. (Not A)

   $P(A') = 1 - P(A)$ $\quad$ $P(A) = 1 - P(A')$

4. Mutually Exclusive (disjoint) Events: $A \cap B = \varnothing$
5. Independent Events: $P(A \cap B) = P(A) \cdot P(B)$ OR $P(A) = P(A|B)$
6. For any two events: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

   $P(A \cap B) = P(A) + P(B) - P(A \cup B)$

7. For any two events: $P(A|B) = \dfrac{P(A \cap B)}{P(B)} \Rightarrow P(A \cap B) = P(A|B) \cdot P(B)$

   (| = given)

have P(E|F) want P(F|E)

8. Bayes' Theorem: If a random experiment can result in *k* mutually exclusive and exhaustive outcomes $A_1, A_2, A_3, \ldots A_k$, then for an event *B*

$$P(A_j \mid B) = \frac{P(B \mid A_j)P(A_j)}{P(B)} = \frac{P(B \mid A_j)P(A_j)}{\sum_i P(B \mid A_i)P(A_i)}$$

$P(A_1 \cap B) + P(A_2 \cap B) + P(A_3 \cap B) + \cdots$

$P(B \mid A_1) \cdot P(A_1) + P(B \mid A_2)P(A_2) + \cdots$

General counting 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.

Permutations and Combinations:

Permutation (order does matter):

$$P_{k,n} = \frac{n!}{(n-k)!}$$

Perm(n,K)

${}_nP_n = n!$

Combination (order doesn't matter)

${}_nC_n = 1$

$C_{k,n}$ or ${}_nC_k$ or $\binom{n}{k}$, and is read "*n* choose *k*" and $\binom{n}{k} = \frac{n!}{k!(n-k)!}$

Choose(n,K)

Q1 #4 2 #'s then 7 letters

no repeats ↑ 0-9 ↑ A-Z

$\underline{10}\ \underline{9}\quad \underline{26}\ \underline{25}\ \underline{24}\ \underline{23}\ \underline{22}\ \underline{21}\ \underline{20}$

repeats

$\underline{10}\ \underline{10}\quad \underline{26}\ \underline{26}\ \underline{26}\ \underline{26}\ \underline{26}\ \underline{26}\ \underline{26}$

MISSISSIPPI $\dfrac{n!}{r_1!\,r_2!\,r_3!\dots}$ $\dfrac{11!}{4!\,4!\,2!}$

how many arrangements?

	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)					
3						
A						
5						
6						(6,6)

36

∼

(green, red)

E = { (1,2)(2,1)(1,4)(4,1)
(1,6)(6,1)(2,3)(3,2)
....

Examples:

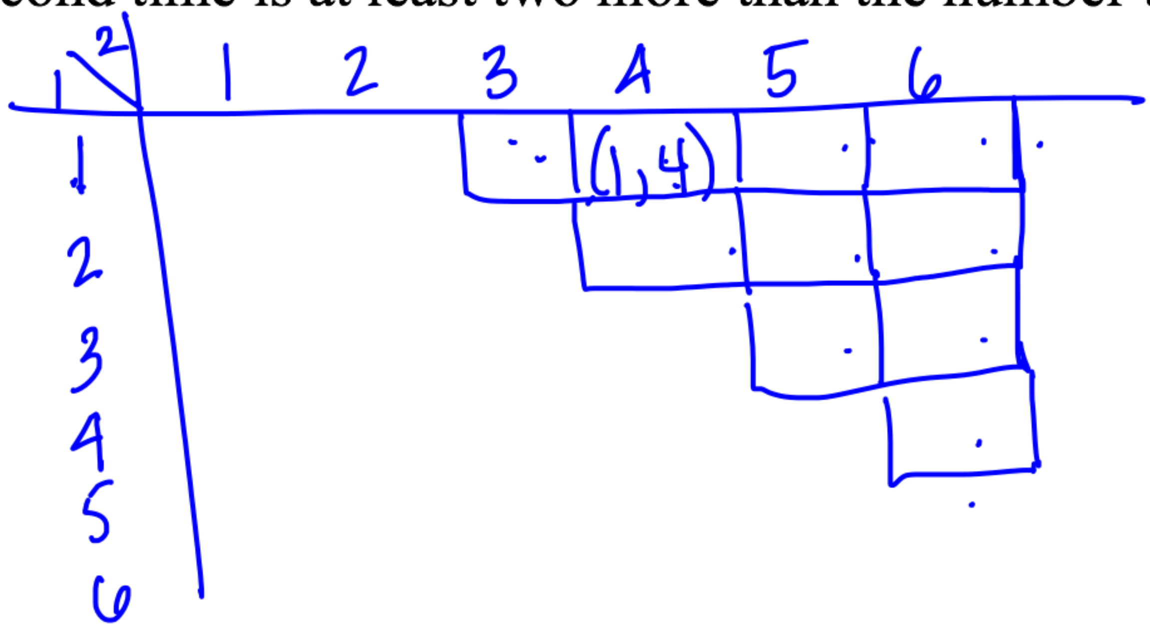
Three coins are tossed at the same time. What is the probability of obtaining exactly one head?

$\#S = 2 \cdot 2 \cdot 2 = 8$

$S = \{HHH, HHT, HTH, THH, \underline{HTT}, \underline{THT}, \underline{TTH}, TTT\}$

$P(1H) = 3/8$

A die is thrown 2 times. What is the probability that the number thrown the second time is at least two more than the number thrown the first time?



$\frac{10}{36} = \frac{5}{18}$

A committee of 5 people is to be selected from a group of 6 men and 7 women.

$\#S = {}_{13}C_5 = \text{choose}(13,5)$

What is the probability that the committee will have 3 men and 2 women?

$$P(3m, 2w) = \frac{{}_6C_3 \cdot {}_7C_2}{{}_{13}C_5}$$

What is the probability that the committee will have all men?

$$P(5m) = \frac{{}_6C_5 \; {}_7C_0}{{}_{13}C_5} \qquad {}_nC_0 = 1$$

What is the probability that the committee will have at least one woman?

#W 0 | 1 2 3 4 5 |

$1 - P(\text{no } w)$

$$1 - P(5m) = 1 - \frac{{}_6C_5}{{}_{13}C_5}$$

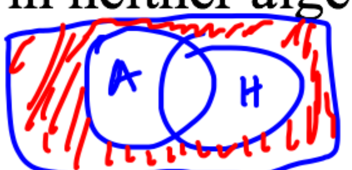
Kara is a good student. She figures that her probability of making an A is 0.92 for algebra and 0.88 for history. Assume that the grades she receives are independent. What is her probability of making each of the following grades?

A in algebra and history. $P(A \cap H) = (.92)(.88) = .8096$

No A in algebra $P(A') = 1 - P(A) = 1 - .92 = .08$

No A in history $P(H') = 1 - P(H) = 1 - .88 = .12$

A in neither algebra nor history $1 - P(A \cup H) = 1 - .9904 = .0096$



At least one A

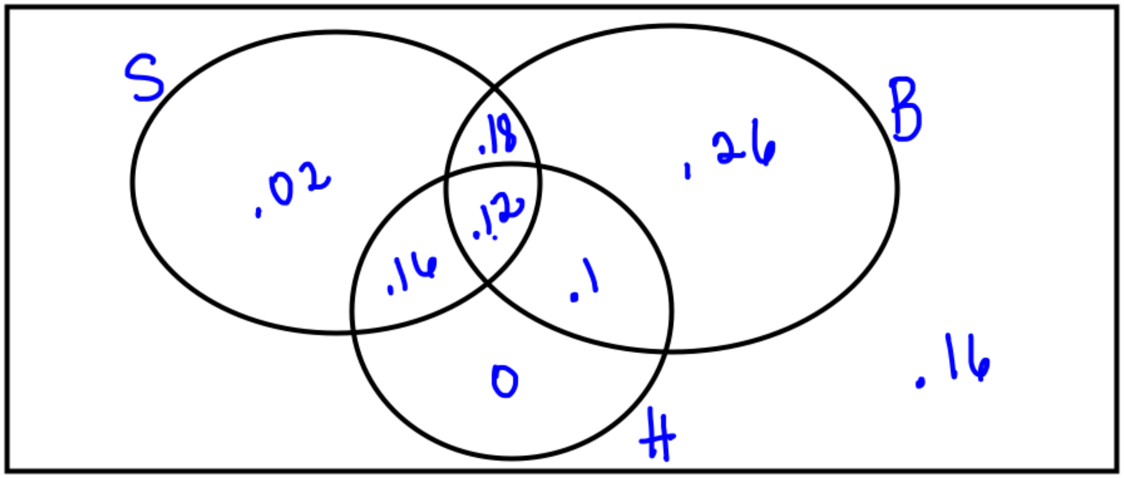
$$P(A \cup H) = P(A) + P(H) - P(A \cap H)$$

$$= .92 + .88 - (.92)(.88)$$

$$= .9904$$

A sports survey taken at MCHS shows that 48% of the respondents liked soccer, 66% liked basketball and 38% liked hockey. Also, 30% liked soccer and basketball, 22% liked basketball and hockey, and 28% liked soccer and hockey. Finally, 12% liked all three sports.

Draw a Venn diagram to represent the given information.



What is the probability that a randomly selected student likes basketball or hockey? Solve this by also using an appropriate formula.

$P(B \cup H) = P(B) + P(H) - P(B \cap H)$

$.66 + .38 - .22 = .82$

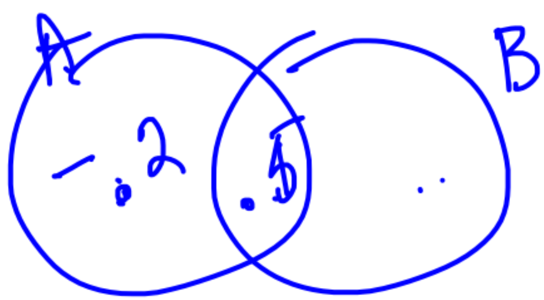
What is the probability that a randomly selected student does not like any of these sports? $.16$

If $P(M) = .2$ and $P(L) = .5$ and M and L are independent events.

$P(M \cap L) = P(M) \cdot P(L) = (.2)(.5) = .1$

$P(M \cup L) = P(M) + P(L) - P(M \cap L)$

$= .2 + .5 - .1 = .6$



$P(A \cap B) = .5$

$P(A) = .3$

The table below gives the results of a survey of the diet and exercise habits of 1200 adults:

	Diet (D)	Don't diet (D')	Total
(E) Exercise	315	165	480
(E') Don't exercise	585	135	720
Total	900	300	1200

```
     diet dontdiet
[1,] 0.2625   0.1375
[2,] 0.4875   0.1125
```

What is the probability that someone in this group exercises?

$P(E) = \frac{480}{1200}$

What is the probability that a dieter is also an exerciser?

$P(E|D)$ $P(D \cap E) = .2625$

What is the probability that someone diets?

$P(D) = \frac{900}{1200}$

What is the probability that an exerciser is also a dieter?

$P(E \cap D) = .2625$

Prob doesnt exercise given they Diet?

$P(E'|D) = \frac{.4875}{900/1200}$

A psychologist interested in right-handedness versus left-handedness and in IQ scores collected the following data from a random sample of 2000 high school students.

	Right-handed	Left-handed	Total
High IQ	190	10	200
Normal IQ	1710	90	1800
Total	1900	100	2000

What is the probability that a student from this group has a high IQ?

$P(HIQ) = 200/2000$

What is the probability that a student has a high IQ given that she is left-handed?

$P(HIQ \mid L) = \frac{10/2000}{100/2000} = \frac{10}{100} = .1$

Are high IQ and left-handed independent? Why or why not? Yes

$P(HIQ)\,P(L) \stackrel{?}{=} P(HIQ \cap L)$

$200/2000 \cdot 100/2000 = 10/2000$

A VCR manufacturer receives 70% of his parts from factory F1 and the rest from factory F2. Suppose that 3% of the output from F1 are defective while only 2% of the output from F2 are defective.

What is the probability that a received part is defective?

If a randomly chosen part is defective, what is the probability it came from factory F1?

An analysis of the registered voters in the last primary indicated that 55% of the voters were women. Of the female voters, 35% are registered Democrats, 35% are registered Republicans, and the rest are assumed to be Independents. Of the male voters, the percentages are 30%, 45%, and 25%. Find each probability:

A voter chosen at random is a woman

A voter chosen at random is a male Republican

A Democrat chosen at random is male

Suppose that three branches of a local bank average, respectively, 120, 180, and 100 clients per day. Suppose further that the probabilities that a client will transact business involving more than $100 during a visit are, respectively, .5, .6, .7. A client is chosen at random.

What is the probability that the client will transact business involving over $100?

What is the probability that the client went to the first branch given that she transacted business involving over $100?