05/27

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ENGR 3341

utdallas.edu/~kjp

↳ Teaching

Grading Policy:

Exam I: → 30%

Exam II: → 30%

Exam III: → 30%

Quizzes → 10% →

80 — A-

65 — B-

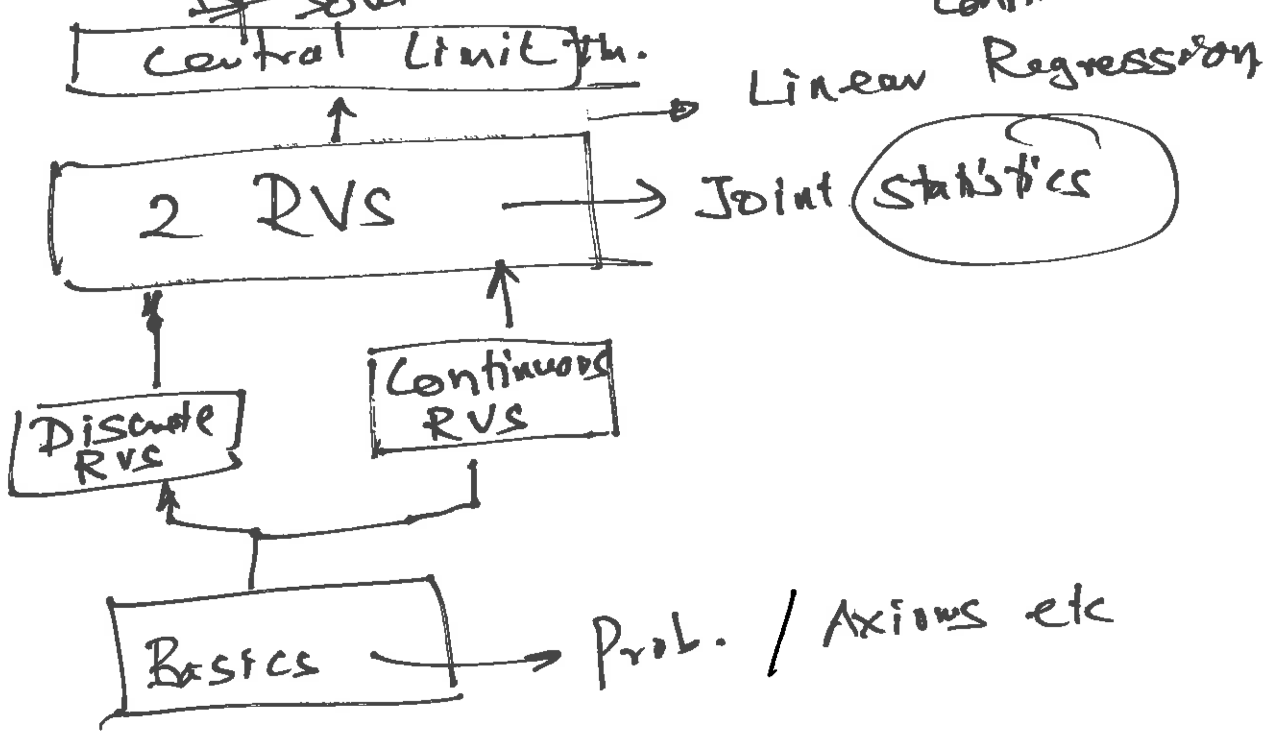
50 — C-

HW Problems will be posted.

↳ solutions

Hypothesis Testing

Estimation → confidence Interval



Set Theory

Elements, Sets

Set Space $\rightarrow$ S

Universal Set U

Set of all elements in the problem

varies from problem to problem

Null Set $\rightarrow$ ϕ $\rightarrow$ no elements in it

Empty Set $\rightarrow$ N

A, B, C $\rightarrow$ Sets

eg:-> students major in EE in the 1st row.

"

Subset

B is a subset of A

ie

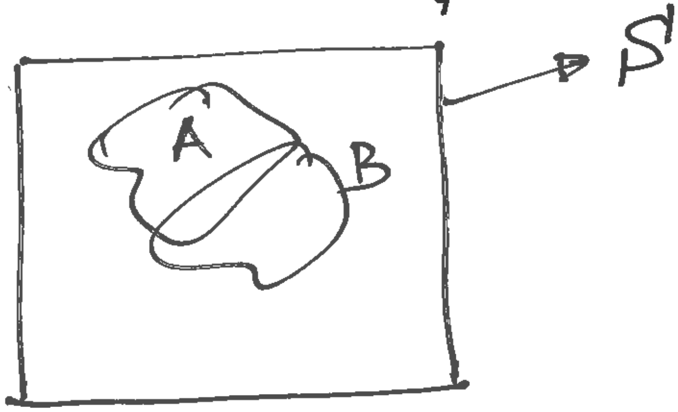
All elements of B are also elements of A

Notⁿ : $B \subset A$

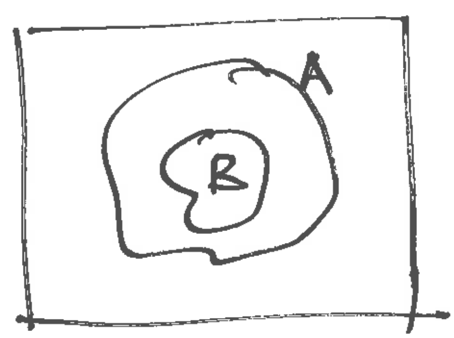
$A \subset S$ $\qquad \phi \subset A$

Graphical Representation

Venn Diagram

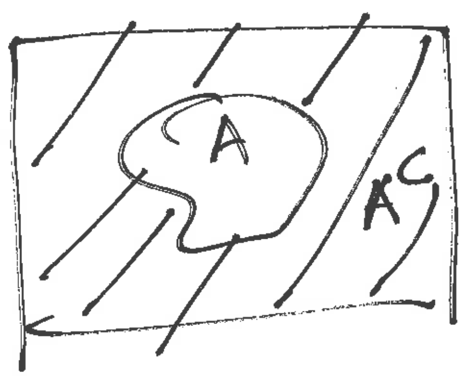


If $B \subset A$



Complement of $A \longrightarrow A^c \quad (\bar{A})$ ④

↳ Set of all elements excluding those of A

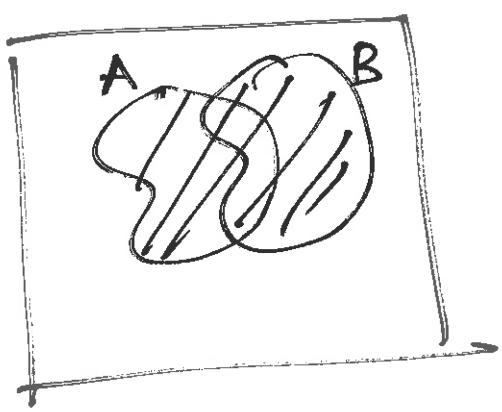


$A^c \not\subset A$

not

Union of A & B

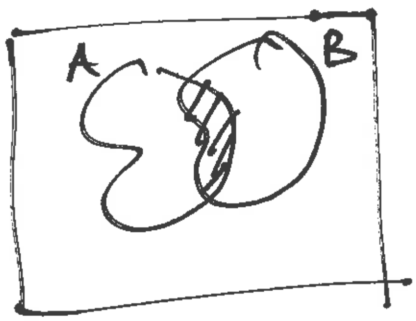
↓ Set of all elements of A, and elements of B including those common to A & B.



Notⁿ: $A \cup B$
$\updownarrow$
$[(A+B)]$

Intersection of A & B

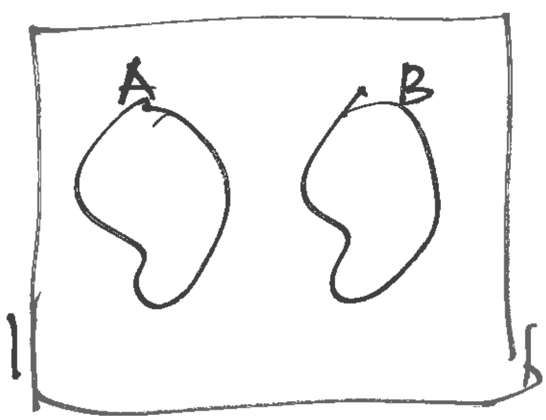
Set of elements common to both A & B



$A \cap B$

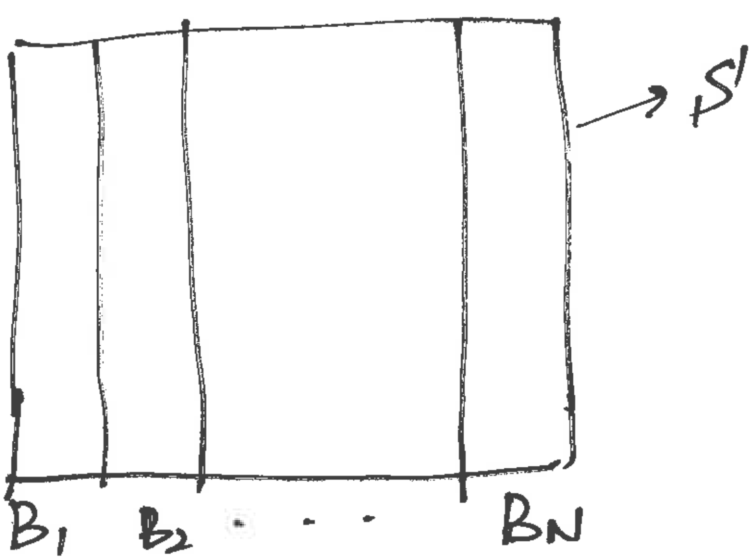
or

AB



$AB = \phi$

A & B are Disjoint



$B_i \cap B_j = \phi$

B_i-s are disjoint

$B_1 + B_2 + \ldots + B_N = S$

$\bigcup_{i=1}^{N} B_i = S$

eg :- $A = \{1, 3, 5, 6, 8, 10\}$

$B = \{2, 3, 7, 8, 12, 14\}$

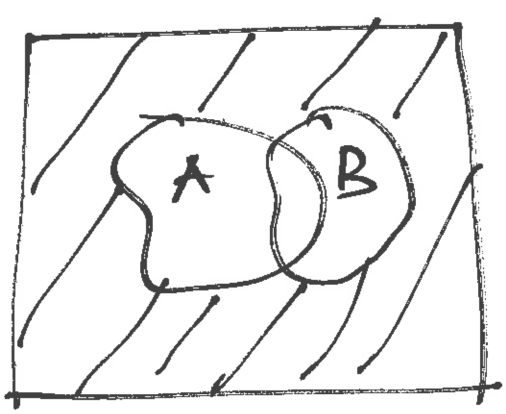
$(A+B) = \{1, 2, 3, 5, 6, 7, 8, 10, 12, 14\}$

$AB = \{3, 8\}$

$A^C =$ Not enough information.

De Morgan's Thm

1. $(A+B)^C = A^C B^C \rightarrow$ Complement of a union is equal to the intersection of the complements



2. $(AB)^C = A^C + B^C \rightarrow$ Complement of ~~the~~ an intersection is the union of the complements.

Prob. Theory

Prob. → Chance of occurance.

eg:- 2% of products are defective.

On the average, 2 out of 100 are defective.

Set. Theory → Prob. Theory (perform an experiment)

Sets A, B, S, ϕ → Event A

S → Sure Event S

ϕ → Impossible Event → ϕ

Experiment → Can be selecting a student from the class

" a product from a store.

Sets + Experiment

↘ chance a set occurs.

randomly select a student

↪ every one has the same chance.

eg:- 40 students in the class

P[Any particular student gets selected] $= \frac{1}{40}$

$P[A]$ = Chance that A occurs when the experiment is performed.

All set operations are valid with events too.

↙

Can use the Venn Diagram.

Axioms of Prob.

1. $P[A] \geq 0$

2. $P[S] = 1$ → chance that the space occurs

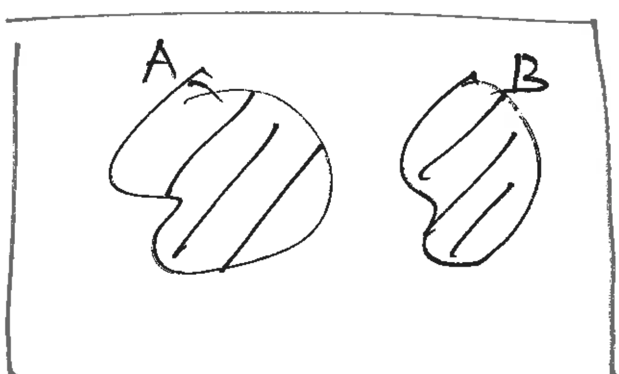
3. If A & B cannot occur simultaneously

$$P[A+B] = P[A] + P[B]$$

A&B are called Mutually Exclusive

↓

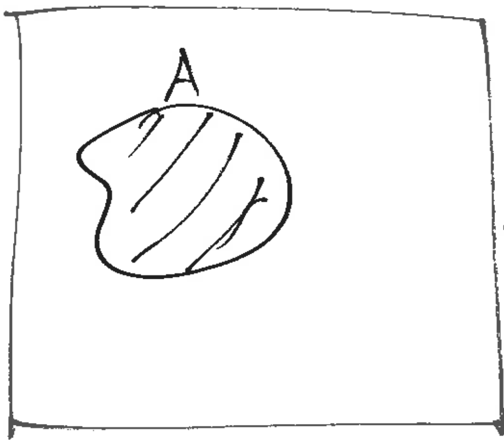
come from disjoint sets



Prob. Mass

unit less $P[A] =$ Mass of A on the Venn Diagram.

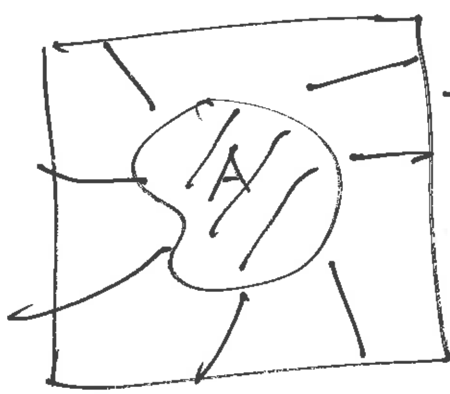
$\frac{\text{Mass of } A}{\text{Mass of } S}$



Mass of $S = 1$

$P[A] =$ Mass of A

$P[A^c] =$



Mass $= 1$

$P[A^c] =$ Mass of A^c

$= 1 - P[A]$

Proof of $P[A^c] = 1 - P[A]$

A & A^c are Mutually Exclusive

$$\therefore \; P[\underbrace{A + A^c}_{S}] = P[A] + P[A^c]$$

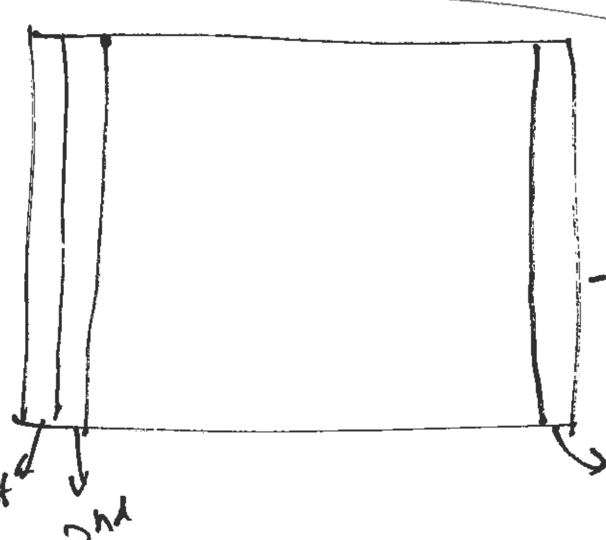
3rd Axiom

$$\underbrace{P[S]}_{=1} = P[A] + P[A^c]$$

2nd Axiom

$$\therefore \; P[A^c] = 1 - P[A]$$

eg:- Selecting a student out of 40 Stu



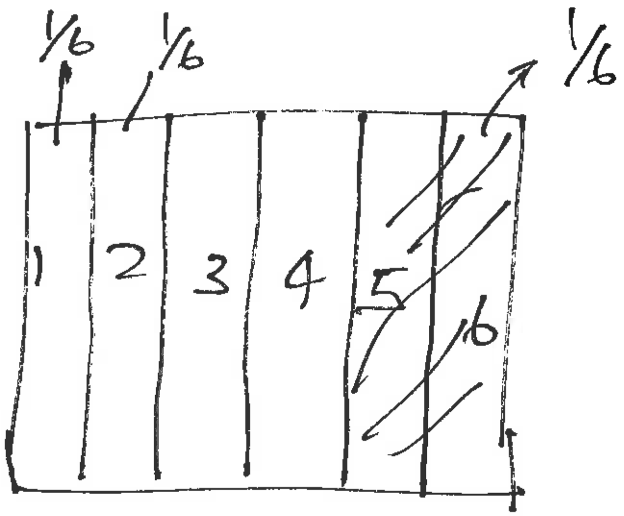
Mass of $S = 1$

Mass of every strip is the same.

Mass of an individual strip = $\frac{1}{40}$

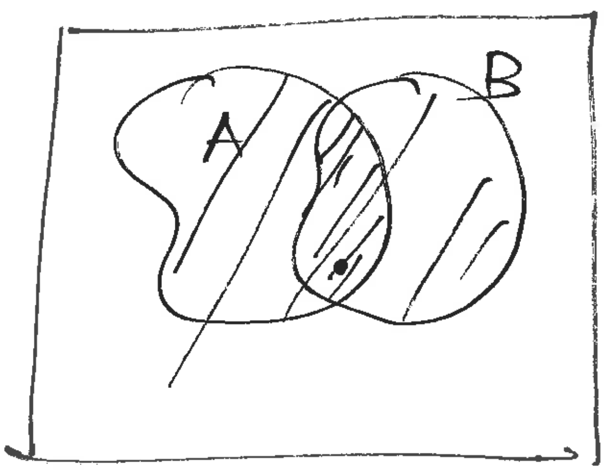
eg:- Roll a fair dice

Find the Prob. of getting a number above 4



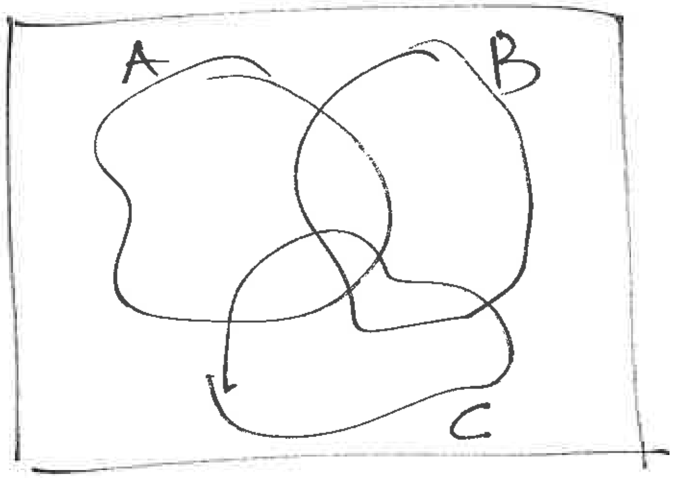
$P[\text{Above } 4] = \text{Mass of } [5 \,\&\, 6]$

$= \frac{1}{3}$



$P[A+B] = P[A] + P[B] - P[AB]$

HW



Find $P[A+B+C]$

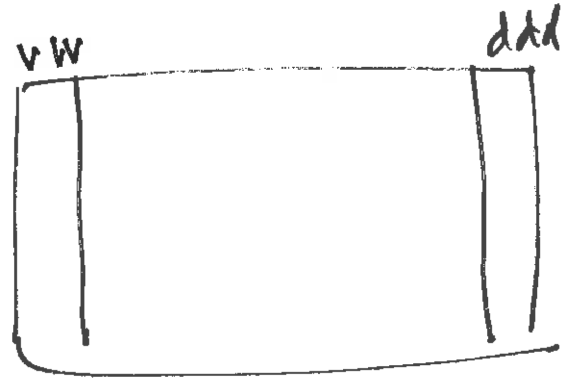
eg:- Monitor 3 calls

Each call is classified as Voice (v)

or Data (d)

$S = \{vvv, vvd, vdv, vdd, dvv, dvd, ddv, ddd\}$

$2^3 = 8$ possible outcomes.



Disjoint

	0.6 L	0.4 B
0.7 V	0.35	0.35
0.3 D	0.25	0.05

voice

$P[V] = 0.7$

$P[L] = 0.6$

long

$P[VL] = 0.35$

Prob. that the call is voice and long

$P[D] = 0.3$

$P[B] = 0.4$

$P[DL] = 0.25$

$P[D \cup L] = 1 - 0.35$

$P[LB] = 0$

Conditional Prob.

A & B are 2 events.

P[A] , P[B] , P[AB] , P[A+B]

Told B has occured

or Given.

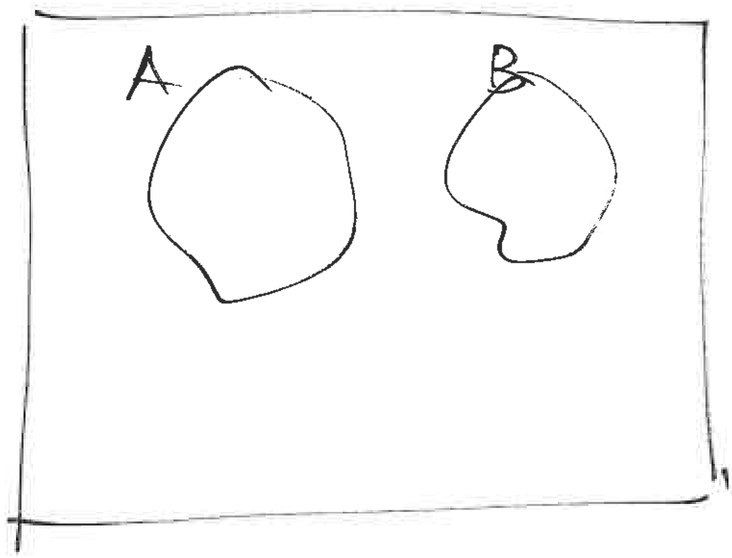
~~P[B~~ chance that A occurs when it is known that B has occured.

diffrent from the P[A]

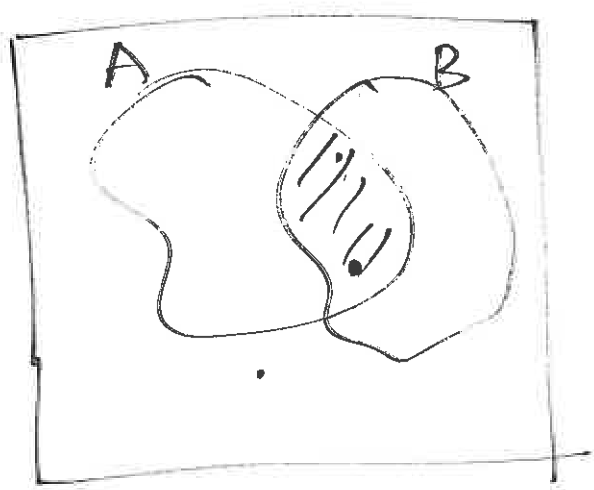
is called a conditional prob.

Notn: $P[A|B] = ?$

eg:-



$P[A|B] = 0$



$P[A|B] = \frac{\text{Mass of } AB}{\text{Mass of } B}$

$\hookrightarrow$ S shrinks down to B

$$P[A|B] = \frac{P[AB]}{P[B]}$$

$$P[B|A] = \frac{P[AB]}{P[A]}$$

$$P[A|B]\,P[B] = P[B|A]\,P[A] = P[AB]$$

Bayes' thm