This is infinity; time: Kolmogorov; next partitions; time: permutations & combinations

AMS 131, 2 Aug 18

P(being infected in 100 acts) ①

= P(1 or more infections in 100 acts) (*)

same as T-S

(*) = 1 − P(no inf. in 100 acts)

	T-S	HN
$p =$	$\frac{1}{4}$	$\frac{1}{500}$
$n =$	5	100

= 1 − P(not inf. on 1st and not inf. on 2nd and . . . and not inf on 100th)

biology → (I) FD

= 1 − P(not inf. on 1st) · P(not inf. on 2nd) . . .

P(A and B) $\overset{\text{if indep}}{=}$ P(A) · P(B)

$\overset{I(ID)}{=}$ $1 - \left(1 - \frac{1}{500}\right)\left(1 - \frac{1}{500}\right) \cdots$ P(not inf. on 100th)

$= 1 - \left(1 - \frac{1}{500}\right)^{100} \doteq 0.18$ $\left(1 - \frac{1}{500}\right)$

$A \cap B = \emptyset$

no overlap — can't both be T

A, B mutually exclusive iff P(A and B) = 0

A, B indep. iff P(B | A) = P(B)

P(A | B) = P(A)

P(A and B) = P(A) · P(B)

②

$P(\text{inf. in } \underset{n}{500} \text{ acts}) = 1 - \left(1 - \frac{1}{500}\right)^{500}$

$1 - (1-p)^n \doteq 0.63$

Ⓘ ok

Ⓘ

$P(\text{inf. from HIV-}\oplus \text{ partner } i \text{ in } 1 \text{ act})$

$= p_i$

$P(\text{inf. in } n \text{ acts}) =$

$$1 - (1-p_1)(1-p_2)\cdots(1-p_n)$$

$$= 1 - \prod_{i=1}^{n}(1-p_i)$$

$\frac{1}{1000} \le p_i \le \frac{1}{100}$

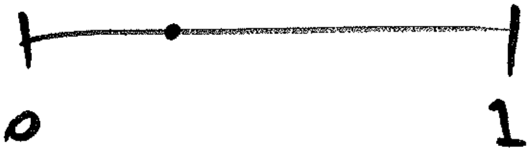
pretend all $p_i = p$

right answer $1 - (1-p)^n = np + (\text{negative stuff})$ (exact if $n \le 1$)

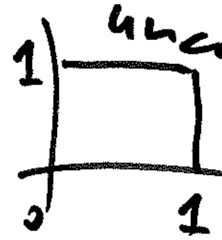
Dr. S np

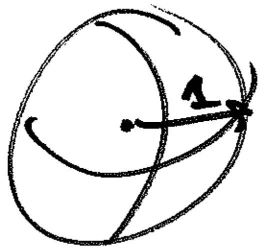
extra notes 31-jul p.

uncountable



uncountable

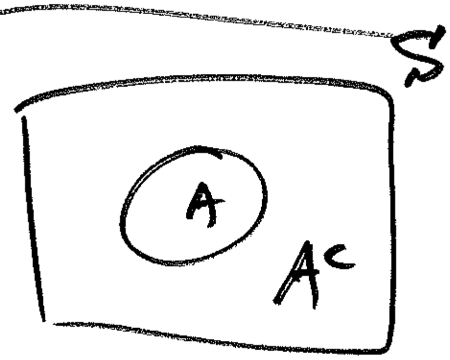




uncountable

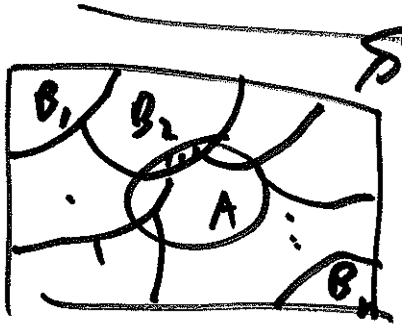
Axiom of choice

If I have an uncountably infinite # of sets, I can make a new set by taking 1 element from each of those sets



(9, 59)

$\doteq$ ← is defined to be



$\{B_1, \dots, B_n\}$ ↔ partition of S

$$A = (A \cap B_1) \cup (A \cap B_2) \cup \cdots \cup (A \cap B_n)$$

$$= (A \text{ and } B_1) \text{ or } (A \text{ and } B_2) \text{ or} \cdots \text{or} (A \text{ and } B_n)$$

$$P(A) = P\left[(A \text{ and } B_1) \text{ or } (A \text{ and } B_2) \text{ or} \ldots \text{ or } (A \text{ and } B_n)\right]$$

$$= P(A \text{ and } B_1) + P(A \text{ and } B_2) + \ldots + P(A \text{ and } B_n)$$

$$\boxed{P(A) = \sum_{i=1}^{n} P(A \text{ and } B_i)}$$

$$P(A \text{ and } B_i) = P(B_i) \cdot P(A \mid B_i)$$

$$\boxed{P(A) = \sum_{i=1}^{n} P(B_i) \cdot P(A \mid B_i)}$$

Law of Total probability (LTP)

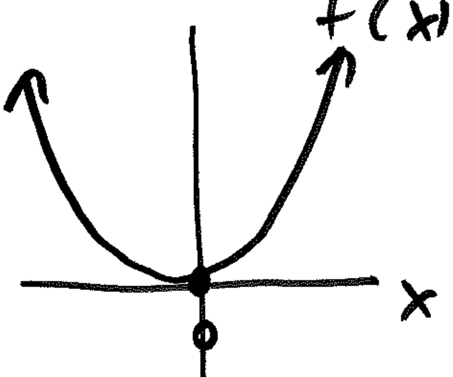
$P_K(A) : \mathcal{C} \to [0,1]$

non-weird subsets of S

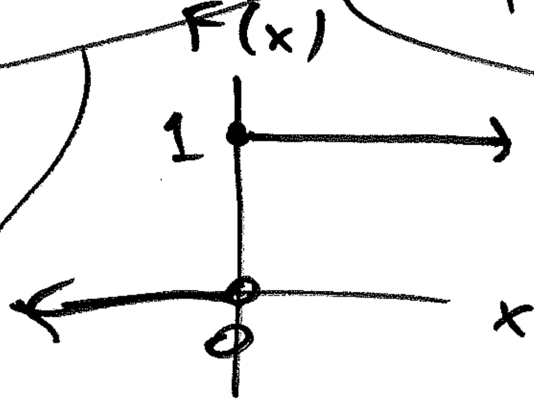
maps into

Axiom 3'

(equivalent to Axiom 3)



continuous (nice)



discontinuous at 0

Axiom 3' (informally)

if A is "close" to B

then $P(A) \doteq P(B)$

(10.53)

$$= 1 - \frac{365!}{272! \, 365^{93}}$$

$$\doteq 1 - \left(\frac{365}{365}\right)\left(\frac{364}{365}\right)\left(\quad \right) \cdot \left(\, \right)$$