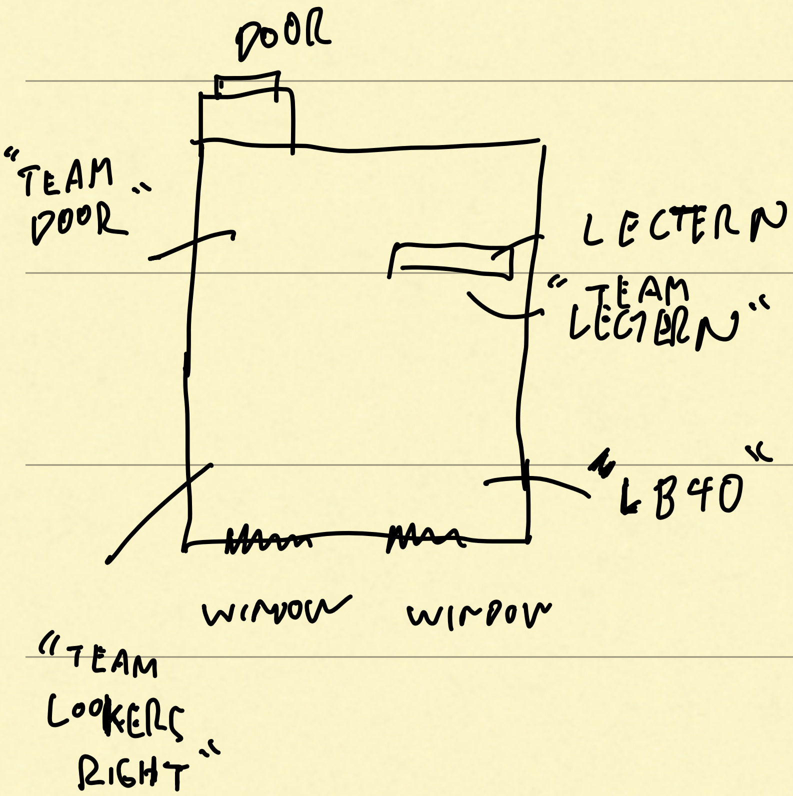


PS1A

i. SUM IS 6

NOT INDEPENDENT

ii. SUM IS 7

INDEPENDENT ✓✓✓

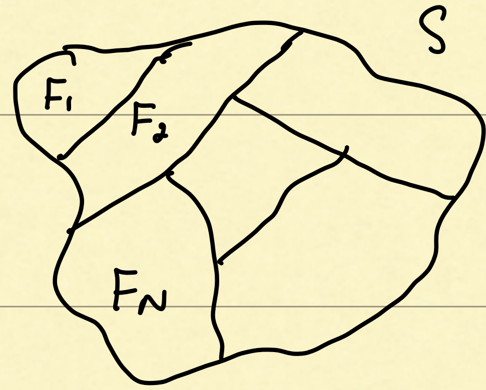
iii.

SUM $= 7 \Rightarrow$ INDEPENDENCE ?

SUPPOSE A SAMPLE SPACE S CAN BE SPLIT INTO SUBSETS

$F_1, \ldots F_N$

SUCH THAT



$$\bigcup F_i = S$$

AND

$$F_i \cap F_j = \text{NOTHING}$$

IF $i \neq j$

THEN $\{F_1 \dots F_N\}$ IS CALLED A PARTITION.

IF $\{F_1 \dots F_N\}$ IS A PARTITION, THEN

$$\mathbb{P}(e) = \mathbb{P}(e \mid F_1)\,\mathbb{P}(F_1) + \mathbb{P}(e \mid F_2)\,\mathbb{P}(F_2) + \dots \mathbb{P}(e \mid F_N)\,\mathbb{P}(F_N)$$

LAW OF TOTAL PROBABILITY

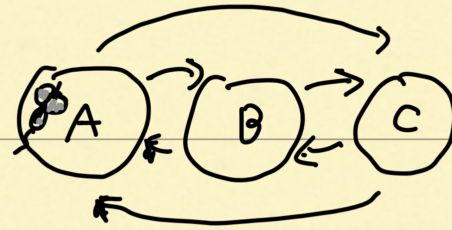
X - RANDOM VARIABLE

A COLLECTION OF RANDOM VARIABLES X_t INDEXED BY t IS A STOCHASTIC PROCESS.

t - DISCRETE OR CONTINUOUS

MARKOV CHAIN

EX EVERY MINUTE, A MOUSE CAN TRAVEL BETWEEN 3 ROOMS



ASSUMPTION

$$\mathbb{P}(X_t = i \mid X_{t-1} = j,\ X_{t-2} = k,\ \ldots\ldots)$$

$$= \mathbb{P}(X_t = i \mid X_{t-1} = j)$$

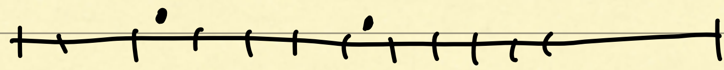
$$\begin{bmatrix} p_A(t+1) \\ p_B(t+1) \\ p_C(t+1) \end{bmatrix} = M \cdot \begin{bmatrix} p_A(t) \\ p_B(t) \\ p_C(t) \end{bmatrix}$$

WHERE

$$p_A(t+1) = \mathbb{P}(X_{t+1} = A) \quad \text{ETC}$$

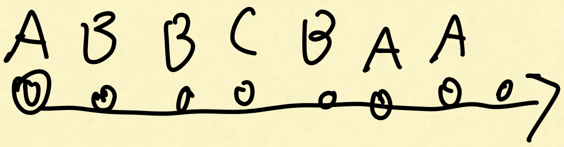
$$M = \begin{bmatrix} \mathbb{P}(X_t = A \mid X_{t-1} = A) & & \mathbb{P}(X_t = A \mid X_{t-1} C) \\ & \ddots & \\ & & \mathbb{P}(X_t = C \mid X_{t-1} = C) \end{bmatrix}$$

EX



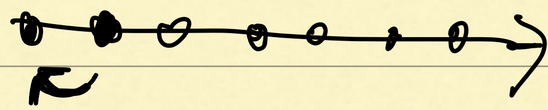
100 ROOMS

PS2



TIME

BASEPAIRS



bp

I or E ?