Probability

Event Space ⇒ Space of all <u>measurable</u> events.

Ω

measurable → means we can sensibly assign a probability.

- $A, B, C, D, \ldots$ reserved for events in Ω
- $P(A)$ = the probability of event A happening.

$0 \leq P(A) \leq 1$

Simple cases where events are uniformily distributed.

ex flipping 2 coins $\Omega = \{HH, HT, TH, TT\}$

$P(\text{2 heads}) = \frac{1}{4}$ $P(\text{not getting } HH, TT) = \frac{2}{4} = \frac{1}{2}$

ex picking out a card from a deck.

$P(\text{drawing a face card}) = \frac{12}{52} = \frac{3}{13}$

Def if our event A can happen in $n(A)$ equally likely ways and Ω has $n(\Omega)$ equally likely outcomes

then $P(A) = \frac{n(A)}{n(\Omega)}$

ex

6 boys and 6 girls and we randomly choose 2 copresidents.

$P\{\text{they will both be girls}\} = \frac{{}_6C_2}{{}_{12}C_2} = \frac{15}{66}$

$= \frac{5}{22}$

${}_{12}C_2 = \frac{12 \cdot 11}{2}$

$P(G_1) = \frac{1}{2}$

$P(G_2 \mid G_1) = \frac{5}{11}$

Conditional probability.

ex being dealt 5 random cards

~~Pro~~ P(being dealt one pair)

$$\frac{13 \cdot {}_4C_2 \cdot 48 \left(\quad \right)}{{}_{52}C_5}$$

ex pick 5 (Lottery)

x_1 x_2 x_3 x_4 x_5

$1 \le x_i \le 30$

$$P = \frac{1}{{}_{30}C_5}$$