DIS 8A

SAMPLE SPACES

the sample space (Ω) of an experiment consists of all sample points (ω), each representing a different outcome.

example: a sequence of 3 coin flips

$$\Omega = \{\text{HHH}, \text{HTH}, \text{THH}, \text{TTH}, \text{HHT}, \text{HTT}, \text{THT}, \text{TTT}\}$$

$\text{TTT} \rightarrow \omega$

an event is a subset of the sample space

$E_1 = \{\text{HHH}, \text{TTT}\}$

$E_2 = \{\text{HHT}, \text{HTH}, \text{THH}\}$ (from Ω above)

PROBABILITY SPACES

a probability space consists of a sample space (Ω) and a probability for each sample point ($P(\omega)$)

the probabilities must satisfy

1. $0 \le P(\omega) \le 1$ for all $\omega \in \Omega$
2. $\sum_{\omega \in \Omega} P(\omega) = 1$

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if every sample point has equal probability, the probability space is uniform

$$P(\omega) = \frac{1}{|\Omega|} \quad \forall \omega \in \Omega$$

PROBABILITIES OF EVENTS

to calculate the probability of an event E:

$$P(E) = \sum_{w \in E} P(w)$$

if the probability space is uniform, this is equivalent to

$$P(E) = \frac{|E|}{|\Omega|}$$

we can use counting techniques to find the size of these sets!

sometimes it's helpful to calculate $P(E)$ by finding $P(E) = 1 - P(\overline{E})$ where $\overline{E}$ is the complement of E $(\overline{E} = \Omega \setminus E)$