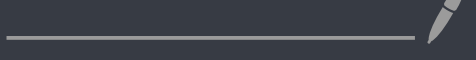

Week 4 Lecture Notes

$E \cup \bar{E} = S \Rightarrow P(E) + P(\bar{E}) = 1$ ← $P(S) = 1$

Example:

1. What is the probability that in a group of six people, at least two will have birthdays in the same month assuming all months are equally likely?

   a) What is S?

   Set of all ordered 6-tuples: $\{(x_1, x_2, x_3, x_4, x_5, x_6) \mid x_i \in [1, \ldots, 12]\}$

   b) What is E?

   The event where at least two of the numbers are the same.

   c) Solve

   Using the property:

   $$\sum_{x \in S} P(x) = 1$$

   $\bar{E}$ = event where all #s are distinct
   $|\bar{E}|$ = permutation of 6 #s from $\{1, 2, \ldots, 12\} = P(12, 6)$

   Probability that two or more people have the same birthday month is:

   $$P(E) = 1 - P(\bar{E}) = \boxed{1 - \frac{P(12,6)}{12^6} \approx 1 - 0.22 \approx 0.78}$$